

PROGRAMME REGULATIONS & CURRICULUM

2021-25

PRESIDENCY SCHOOL OF COMPUTER SCIENCE & ENGINEERING

BACHELOR OF TECHNOLOGY (B.TECH.) COMPUTER ENGINEERING

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PRESIDENCY SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

Program Regulations and Curriculum 2021-2025

BACHELOR OF TECHNOLOGY (B.Tech.) in

COMPUTER ENGINEERING

based on Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

(As amended up to the 24thMeeting of the Academic Council held on 3rd August 2024. This document supersedes all previous guidelines)

Regulations No: PU/AC-24.05/SOCSE04/COM/2021-2025

AUGUST-2024

Resolution No. 05 of the 24th Meeting of the Academic Council held on 3rd August 2024, and ratified by the Board of Management in its 24th Meeting held on 5th August 2024.

Table of Contents

Clause No.	Contents	Page Number
	PART A – PROGRAM REGULATIONS	
1.	Vision & Mission of the University and the School / Department	4
2.	Preamble to the Program Regulations and Curriculum	4
3.	Short Title and Applicability	5
4.	Definitions	5
5.	Program Description	7
6.	Minimum and Maximum Duration	8
7.	Programme Educational Objectives (PEO)	8
8.	Programme Outcomes (PO) and Programme Specific Outcomes (PSO)	9
9.	Admission Criteria (as per the concerned Statutory Body)	10
10.	Lateral Entry / Transfer Students requirements	11
11.	Change of Branch / Discipline / Specialization	12
12.	Specific Regulations regarding Assessment and Evaluation	14
13.	Additional clarifications - Rules and Guidelines for Transfer of Credits from MOOC, etc.	16
	PART B: PROGRAM STRUCTURE	<u> </u>
14.	Structure / Component with Credit Requirements Course Baskets & Minimum Basket wise Credit Requirements	18
15.	Minimum Total Credit Requirements of Award of Degree	19
16.	Other Specific Requirements for Award of Degree, if any, as prescribed by the Statutory Bodies	21
	PART C: CURRICULUM STRUCTURE	L
17.	Curriculum Structure – Basket Wise Course List	23
18.	Practical / Skill based Courses – Internships / Thesis / Dissertation / Capstone Project Work / Portfolio / Mini project	28
19.	List of Elective Courses under various Specializations / Stream Basket	29
20.	List of Open Electives to be offered by the School / Department (Separately for ODD and EVEN Semesters).	30

21.	List of MOOC (NPTEL) Courses	31
22.	Recommended Semester Wise Course Structure / Flow including the Program / Discipline Elective Paths / Options	32
23.	Course Catalogue of all Courses Listed including the Courses Offered by other School / Department and Discipline / Program Electives	37

PART A – PROGRAM REGULATIONS

1. Vision & Mission of the University and the School / Department

1.1 Vision of the University

To be a Value-driven Global University, excelling beyond peers and creating professionals of integrity and character, having concern and care for society.

1.2 Mission of the University

- Commit to be an innovative and inclusive institution by seeking excellence in teaching, research and knowledge-transfer.
- Pursue Research and Development and its dissemination to the community, at large.
- Create, sustain and apply learning in an interdisciplinary environment with consideration for ethical, ecological and economic aspects of nation building.
- Provide knowledge-based technological support and services to the industry in its growth and development.
- To impart globally-applicable skill-sets to students through flexible course offerings and support industry's requirement and inculcate a spirit of new-venture creation.

1.3 Vision of Presidency School of Computer Science and Engineering

• To be a value based, practice-driven School of Computer Science and Engineering, committed to developing globally-competent Engineers, dedicated to developing cutting-edge technology, towards enhancing Quality of Life.

1.4 Mission of Presidency School of Computer Science and Engineering

- Cultivate a practice-driven environment with a contemporary Learning-pedagogy, integrating theory and practice.
- Attract and nurture world-class faculty to excel in Teaching and Research, in the field of Core Engineering.
- Establish state-of-the-art facilities for effective Teaching and Learningexperiences.
- Promote Interdisciplinary Studies to nurture talent and impart relevant skill-sets for global impact.
- Instil Entrepreneurial and Leadership Skills to address Social, Environmental, and Community-needs.

2. Preamble to the Program Regulations and Curriculum

This is the subset of Academic Regulations and it is to be followed as a requirement for the award of B.Tech degree.

The Curriculum is designed to take into the factors listed in the Choice Based Credit System (CBCS) with focus on Social Project Based Learning, Industrial Training, and Internship to enable the students to become eligible and fully equipped for employment in industries, choose higher studies or entrepreneurship.

In exercise of the powers conferred by and in discharge of duties assigned under the relevant provision(s) of the Act, Statutes and Academic Regulations, 2025 of the University, the Academic Council hereby makes the following Regulations.

3. Short Title and Applicability

- a. These Regulations shall be called the Bachelor of Technology Degree Program Regulations and Curriculum 2021-2025.
- b. These Regulations are subject to, and pursuant to the Academic Regulations.
- c. These Regulations shall be applicable to the ongoing Bachelor of Technology Degree Programs of the 2021-2025 batch, and to all other Bachelor of Technology Degree Programs which may be introduced in future.
- d. These Regulations shall supersede all the earlier Bachelor of Technology Degree Program Regulations and Curriculum, along with all the amendments thereto.
- e. These Regulations shall come into force from the Academic Year 2024-2025.

4. Definitions

In these Regulations, unless the context otherwise requires:

- a. "Academic Calendar" means the schedule of academic and miscellaneous events as approved by the Vice Chancellor;
- b. "Academic Council" means the Academic Council of the University;
- c. "Academic Regulations" means the Academic Regulations, of the University;
- d. "Academic Term" means a Semester or Summer Term;
- e. "Act" means the Presidency University Act, 2013;
- f. "AICTE" means All India Council for Technical Education;
- *g.* "Basket" means a group of courses bundled together based on the nature/type of the course;
- h. "BOE" means the Board of Examinations of the University;
- *i.* "BOG" means the Board of Governors of the University;
- *j.* "BOM" means the Board of Management of the University;
- *k.* "BOS" means the Board of Studies of a particular Department/Program of Study of the University;
- *I.* "CGPA" means Cumulative Grade Point Average as defined in the Academic Regulations;
- *m.* "Clause" means the duly numbered Clause, with Sub-Clauses included, if any, of these Regulations;
- *n.* "COE" means the Controller of Examinations of the University;
- o. "Course In Charge" means the teacher/faculty member responsible for developing and organising the delivery of the Course;
- *p.* "Course Instructor" means the teacher/faculty member responsible for teaching and evaluation of a Course;
- q. "Course" means a specific subject usually identified by its Course-code and Coursetitle, with specified credits and syllabus/course-description, a set of references, taught by some teacher(s)/course-instructor(s) to a specific class (group of students) during a specific Academic Term;
- r. "Curriculum Structure" means the Curriculum governing a specific Degree Program offered by the University, and, includes the set of Baskets of Courses along with minimum credit requirements to be earned under each basket for a degree/degree with specialization/minor/honours in addition to the relevant details of the Courses and Course catalogues (which describes the Course content and other important

information about the Course). Any specific requirements for a particular program may be brought into the Curriculum structure of the specific program and relevant approvals should be taken from the BOS and Academic Council at that time.

- s. "DAC" means the Departmental Academic Committee of a concerned Department/Program of Study of the University;
- t. "Dean" means the Dean / Director of the concerned School;
- u. "Degree Program" includes all Degree Programs;
- v. "Department" means the Department offering the degree Program(s) / Course(s) / School offering the concerned Degree Programs / other Administrative Offices;
- w. "Discipline" means specialization or branch of B.Tech. Degree Program;
- *x.* "HOD" means the Head of the concerned Department;
- *y.* "L-T-P-C" means Lecture-Tutorial-Practical-Credit refers to the teaching learning periods and the credit associated;
- z. "MOOC" means Massive Open Online Courses;
- aa. "MOU" means the Memorandum of Understanding;
- bb. "NPTEL" means National Program on Technology Enhanced Learning;
- cc. "Parent Department" means the department that offers the Degree Program that a student undergoes;
- *dd.* "Program Head" means the administrative head of a particular Degree Program/s;
- ee. "Program Regulations" means the Bachelor of Technology Degree Program Regulations and Curriculum, 2021-2025;
- ff. "Program" means the Bachelor of Technology (B.Tech.) Degree Program;
- gg. "PSOE" means the Presidency School of Engineering;
- *hh.* "Registrar" means the Registrar of the University;
- *ii.* "School" means a constituent institution of the University established for monitoring, supervising and guiding, teaching, training and research activities in broadly related fields of studies;
- *jj.* "Section" means the duly numbered Section, with Clauses included in that Section, of these Regulations;
- *kk.* "SGPA" means the Semester Grade Point Average as defined in the Academic Regulations, 2021;
- II. "Statutes" means the Statutes of Presidency University;
- *mm.* "Sub-Clause" means the duly numbered Sub-Clause of these Program Regulations;
- nn. "Summer Term" means an additional Academic Term conducted during the summer break (typically in June-July) for a duration of about eight (08) calendar weeks, with a minimum of thirty (30) University teaching days;
- oo. "SWAYAM" means Study Webs of Active Learning for Young Aspiring Minds.
- pp. "UGC" means University Grant Commission;
- qq. "University" means Presidency University, Bengaluru; and
- *rr.* "Vice Chancellor" means the Vice Chancellor of the University.

5. Program Description

The Bachelor of Technology Degree Program Regulations and Curriculum 2021-2025 are subject to, and, pursuant to the Academic Regulations, 2021. These Program Regulations shall be applicable to the following ongoing Bachelor of Technology (B.Tech.) Degree Programs of 2021-2025 offered by the Presidency School of Computer Science and Engineering (PSCS):

1. Bachelor of Technology in Computer Science and Engineering, abbreviated as B.Tech. Computer Science and Engineering;

- 2. Bachelor of Technology in Computer Science and Technology (Big Data), abbreviated as B.Tech. Computer Science and Technology (Big Data);
- 3. Bachelor of Technology in Computer Science and Engineering (Block Chain), abbreviated as B.Tech. Computer Science and Engineering (Block Chain);
- 4. Bachelor of Technology in Computer Science and Technology (Dev Ops), abbreviated as B.Tech. Computer Science and Technology (Dev Ops);
- 5. Bachelor of Technology in Computer Science and Engineering (Cyber Security), abbreviated as B.Tech. Computer Science and Engineering (Cyber Security);
- 6. Bachelor of Technology in Computer Science and Engineering (Internet of Things), abbreviated as B.Tech. Computer Science and Engineering (Internet of Things);
- 7. Bachelor of Technology in Computer Science and Engineering (Data Science), abbreviated as B.Tech. Computer Science and Engineering (Data Science);
- Bachelor of Technology in Computer Science and Technology (Artificial Intelligence and Machine Learning), abbreviated as B.Tech. Computer Science and Technology (Artificial Intelligence and Machine Learning);
- 9. Bachelor of Technology in Information Science and Technology, abbreviated as B.Tech. Information Science and Technology;
- 10. Bachelor of Technology in Computer Science and Information Technology, abbreviated as B.Tech. Computer Science and Information Technology;
- 11. Bachelor of Technology in Computer Science and Engineering (Networks), abbreviated as B.Tech. Computer Science and Engineering (Networks);
- 12. Bachelor of Technology in Computer Engineering (Artificial Intelligence and Machine Learning), abbreviated as B.Tech. Computer Engineering (Artificial Intelligence and Machine Learning);
- 13. Bachelor of Technology in Information Science and Engineering (Artificial Intelligence and Robotics), abbreviated as B.Tech. Information Science and Engineering (Artificial Intelligence and Robotics); and
- 14. Bachelor of Technology in Computer Science and Engineering (Artificial Intelligence and Machine Learning) abbreviated as B.Tech. Computer Science and Engineering (Artificial Intelligence and Machine Learning);

5.1 These Program Regulations shall be applicable to other similar programs, which may be introduced in future.

5.2 These Regulations may evolve and get amended or modified or changed through appropriate approvals from the Academic Council, from time to time, and shall be binding on all concerned.

5.3 The effect of periodic amendments or changes in the Program Regulations, on the students admitted in earlier years, shall be dealt with appropriately and carefully, so as to ensure that those students are not subjected to any unfair situation whatsoever, although they are required to conform to these revised Program Regulations, without any undue favour or considerations

6. Minimum and Maximum Duration

6.1 Bachelor of Technology Degree Program is a Four-Year, Full-Time Semester based program. The minimum duration of the B.Tech. Program is four (04) years and each

year comprises of two academic Semesters (Odd and Even Semesters) and hence the duration of the B.Tech. program is eight (08) Semesters.

- 6.2 A student who for whatever reason is not able to complete the Program within the normal period or the minimum duration (number of years) prescribed for the Program, may be allowed a period of two years beyond the normal period to complete the mandatory minimum credits requirement as prescribed by the concerned Program Regulations and Curriculum. In general, the permissible maximum duration (number of years) for completion of Program is 'N' + 2 years, where 'N' stands for the normal or minimum duration (number of years) for completion of the concerned Program as prescribed by the concerned Program Regulations and Curriculum.
- 6.3 The time taken by the student to improve Grades/CGPA, and in case of temporary withdrawal/re-joining (Refer to Clause 16.1 of Academic Regulations), shall be counted in the permissible maximum duration for completion of a Program.
- 6.4 In exceptional circumstances, such as temporary withdrawal for medical exigencies where there is a prolonged hospitalization and/or treatment, as certified through hospital/medical records, women students requiring extended maternity break (certified by registered medical practitioner), and, outstanding sportspersons representing the University/State/India requiring extended time to participate in National/International sports events, a further extension of one (01) year may be granted on the approval of the Academic Council.
- 6.5 The enrolment of the student who fails to complete the mandatory requirements for the award of the concerned Degree (refer Section 19.0 of Academic Regulations) in the prescribed maximum duration (Sub-Clauses 18.1 and 18.2 of Academic Regulations), shall stand terminated and no Degree shall be awarded.

7 Programme Educational Objectives (PEO)

After four years of successful completion of the program, the graduates shall be:

PEO1. Demonstrate expertise as competent and ethical Computer Engineering professionals by leveraging foundational knowledge, technical skills, and innovative approaches to analyze, design, and develop cutting-edge solutions in the fields of Artificial Intelligence, Machine Learning, and related technologies.

PEO2. Become a teaching and research professional in the area of Computer Engineering through lifelong learning.

PEO3. Evolve as a consultant in the Computer Engineering Industry.

PEO4. Transform as an entrepreneur in the Computer Engineering and other related areas of specialization.

8 Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

8.1 Programme Outcomes (PO)

On successful completion of the Program, the students shall be able to:

PO1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

- **PO2. Problem Analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **PO3**. **Design/Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **PO4.** Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO5. Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **PO6.** The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **PO7. Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **PO8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **PO9.** Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11. Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **PO12. Life-Long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

8.2 Program Specific Outcomes (PSOs):

On successful completion of the Program, the students shall be able to:

- **PSO 01:** Use and develop cloud software, administrative features Infrastructure services and architectural patterns: ethical hacking and forensic security technologies
- **PSO 02:** Gain knowledge on design and control strategy; techniques to secure information and adapt to the fast-changing world of information
- **PSO 03:** Acquire knowledge on emerging software tools and technologies and apply the knowledge of secure computing tools and techniques in the field of Information science and technology for solving real world problems.

9 Admission Criteria (as per the concerned Statutory Body)

The University admissions shall be open to all persons irrespective of caste, class, creed, gender or nation. All admissions shall be made on the basis of merit in the qualifying examinations; provided that forty percent of the admissions in all Programs of the University shall be reserved for the students of Karnataka State and admissions shall be made through a Common Entrance Examination conducted by the State Government or its agency and seats shall be allotted as per the merit and reservation policy of the State Government from time to time. The admission criteria to the B.Tech. Program is listed in the following Sub-Clauses:

- 9.1 An applicant who has successfully completed Pre-University course or Senior Secondary School course (+2) or equivalent such as (11+1), 'A' level in Senior School Leaving Certificate Course from a recognized university of India or outside or from Senior Secondary Board or equivalent, constituted or recognized by the Union or by the State Government of that Country for the purpose of issue of qualifying certificate on successful completion of the course, may apply for and be admitted into the Program.
- 9.2 Provided further, the applicant must have taken Physics and Mathematics as compulsory subjects in the Pre-University / Higher Secondary / (10+2) / (11+1) examination, along with either Chemistry / Biology / Electronics / Computer Science / Biotechnology subject, and, the applicant must have obtained a minimum of 45% of the total marks (40% in case of candidates belonging to the Reserved Category as classified by the Government of Karnataka) in these subjects taken together.
- 9.3 The applicant must have appeared for Joint Entrance Examinations (JEE) Main / JEE (Advanced) / Karnataka CET / COMED-K, or any other State-level Engineering Entrance Examinations.
- 9.4 Reservation for the SC / ST and other backward classes shall be made in accordance with the directives issued by the Government of Karnataka from time to time.
- 9.5 Admissions are offered to Foreign Nationals and Indians living abroad in accordance with the rules applicable for such admission, issued from time to time, by the Government of India.
- 9.6 Candidates must fulfil the medical standards required for admission as prescribed by the University.
- 9.7 If, at any time after admission, it is found that a candidate had not in fact fulfilled all the requirements stipulated in the offer of admission, in any form whatsoever, including possible misinformation and any other falsification, the Registrar shall report the matter to the Board of Management (BOM), recommending revoking the admission of the candidate.
- 9.8 The decision of the BOM regarding the admissions is final and binding.

10 Lateral Entry / Transfer Students requirements

10.1 Lateral Entry

The University admits students directly to the second year (3rd Semester) of the B.Tech. Degree program as per the provisions and/or regulations of the Government of Karnataka pertaining to the "Lateral Entry" scheme announced by the Government from time to time. Further, the general conditions and rules governing the provision of Lateral Entry to the B.Tech. Program of the Presidency University are listed in the following Sub-Clauses:

- 10.1.1 Admission to 2nd year (3rd Semester) of the B.Tech. Degree program shall be open to the candidates who are holders of a 3-year Diploma in Engineering (or equivalent qualification as recognized by the University), who have secured not less than forty-five percentage (45%) marks in the final year examination (5th and 6th Semesters of the Diploma Program) in the appropriate branch of Engineering. Provided that, in case of SC / ST and OBC candidates from Karnataka the minimum marks for eligibility shall be forty percent (40%).
- 10.1.2 Provided further that, candidates seeking Lateral Entry may be required to complete specified bridge Courses as prescribed by the University. Such bridge Courses, if any, shall not be included in the CGPA computations.
- 10.1.3 All the existing Regulations and Policies of the University shall be binding on all the students admitted to the Program through the provision of Lateral Entry.
- 10.1.4 The Course requirements prescribed for the 1st Year of the B.Tech. Program shall be waived for the student(s) admitted through Lateral Entry and the duration of the B.Tech. Program for such students is three (03) years, commencing from the 3rd Semester (commencement of the 2nd Year) of the B.Tech. Program and culminating with the 8th Semester (end of the 4th Year) of the B.Tech. Program.
- 10.1.5 Provided that, if a Lateral Entry student misses any mandatory program specific courses that are typically offered in the 1st year (1st or 2nd semesters), then those courses must be cleared by the students as soon as possible, preferably during the Summer Term.
- 10.1.6 The existing Program Regulations of the concerned Program to which the student is admitted through the provision of Lateral Entry shall be binding on the student with effect from the 3rd Semester of the Program. i.e., the Program Structure and Curriculum from the 3rd to 8th Semesters of the Program concerned shall be binding on the student admitted through Lateral Entry. Further, any revisions / amendments made to the Program Regulations thereafter, shall be binding on all the students of the concerned Program.
- 10.1.7 All the Courses (and the corresponding number of Credits) prescribed for the 1st Year of the concerned B.Tech. Program shall be waived for the student(s) admitted to the B.Tech Program in Computer Engineering through Lateral Entry. Further, the *Minimum Credit Requirements* for the award of the B.Tech. Degree in the B.Tech Program in Computer Engineering shall be prescribed / calculated as follows:

The *Minimum Credit Requirements* for the award of the Bachelor of Technology (B.Tech.) Degree prescribed by the concerned Bachelor of

Technology Degree Program Regulations and Curriculum, 2021-2025, minus the number of Credits prescribed / accepted by the Equivalence Committee for the 1st Year (1st and 2nd Semesters) of the B.Tech. Program.

For instance, if the *Minimum Credit Requirements* for the award of the Bachelor of Technology (B.Tech.) Degree as prescribed by the Regulations for B.Tech. (Computer Engineering) is "N" Credits, and, if the total credits prescribed in the 1st Year (total credits of the 1st and 2nd Semesters) of the Program concerned is "M" Credits, then the *Minimum Credit Requirements* for the award of the B.Tech. in Computer Engineering for a student who joins the Program through the provision of the Lateral Entry, shall be "N – M" Credits.

10.1.8 Further, no other waiver except the Courses prescribed for the 1st year of the B.Tech. Program of the University shall be permissible for students joining the B.Tech. Program through the provision of Lateral Entry.

10.2 Transfer of student(s) from another recognized University to the 2nd year (3rd Semester) of the B.Tech. Program of the Presidency University

A student who has completed the 1st Year (i.e., passed in all the Courses / Subjects prescribed for the 1st Year) of the B.Tech. Four-Year Degree Program from another recognized University, may be permitted to transfer to the 2nd Year (3rd Semester) of the B.Tech. Program of the University as per the rules and guidelines prescribed in the following Sub-Clauses:

- 10.2.1 The concerned student fulfils the criteria specified in Sub-Clauses 10.1.1, 10.1.2, and 10.1.3.
- 10.2.2 The student shall submit the Application for Transfer along with a non-refundable Application Fee (as prescribed by the University from time to time) to the Presidency University no later than July 10 of the concerned year for admission to the 2nd Year (3rd Semester) B.Tech. Program at Presidency University commencing on August 1 on the year concerned.
- **10.2.3** The student shall submit copies of the respective Marks Cards / Grade Sheets / Certificates along with the Application for Transfer.
- **10.2.4** The transfer may be provided on the condition that the Courses and Credits completed by the concerned student in the 1st Year of the B.Tech./ B.E/ B.S. Four Degree Program from the concerned University, are declared equivalent and acceptable by the Equivalence Committee constituted by the Vice Chancellor for this purpose. Further, the Equivalence Committee may also prescribe the Courses and Credits the concerned students shall have to mandatorily complete, if admitted to the 2nd Year of the B.Tech. Program of the University.
- **10.2.5** The Branch / Discipline allotted to the student concerned shall be the decision of the University and binding on the student.

11 Change of Branch / Discipline / Specialization

A student admitted to a particular Branch of the B.Tech. Program will normally continue studying in that Branch till the completion of the program. However, the University reserves the right to provide the option for a change of Branch, or not to provide the option for a change of Branch, at the end of 1st Year of the B.Tech. Program to eligible students in accordance with the following rules and guidelines: framed by the University from time to time.

- 11.1 Normally, only those students, who have passed all the Courses prescribed for the 1st Year of the B.Tech. Program and obtained a CGPA of not less than 6.50 at the end of the 2nd Semester, shall be eligible for consideration for a change of Branch.
- 11.2 Change of Branch, if provided, shall be made effective from the commencement of the 3rd Semester of the B.Tech. Program. There shall be no provision for change of Branch thereafter under any circumstances whatsoever.
- 11.3 The student provided with the change of Branch shall fully adhere to and comply with the Program Regulations of the concerned Branch of the B.Tech. Program, the Fee Policy pertaining to that Branch of the B.Tech. Program, and, all other rules pertaining to the changed Branch existing at the time.
- 11.4 Change of Branch once made shall be final and binding on the student. No student shall be permitted, under any circumstances, to refuse the change of Branch offered.
- 11.5 The eligible student may be allowed a change in Branch, strictly in order of *inter se* merit, subject to the conditions given below:
 - 11.5.1 The actual number of students in the 3rd Semester in any particular Branch to which the transfer is to be made, should not exceed the intake fixed by the University for the concerned Branch;
 - 11.5.2 The actual number of students in any Branch from which transfer is being sought does not fall below 75% of the total intake fixed by the University for the concerned Branch.

The process of change of Branch shall be completed within the first five days of Registration for the 3rd Semester of the B.Tech. Program.

12 Specific Regulations regarding Assessment and Evaluation (including the Assessment Details of NTCC Courses, Weightages of Continuous Assessment and End Term Examination for various Course Categories)

- **12.1** The academic performance evaluation of a student in a Course shall be according to the University Letter Grading System based on the class performance distribution in the Course.
- 12.2 Academic performance evaluation of every registered student in every Course registered by the student is carried out through various components of Assessments spread across the Semester. The nature of components of Continuous Assessments and the weightage given to each component of Continuous Assessments (refer Clause 8.8 of Academic Regulations) shall be clearly defined in the Course Plan for every Course, and approved by the DAC.
- **12.3** Format of the End-Term examination shall be specified in the Course Plan.
- **12.4** Grading is the process of rewarding the students for their overall performance in each Course. The University follows the system of Relative Grading with statistical approach to classify the students based on the relative performance of the students registered in the concerned Course except in the following cases:
 - Non-Teaching Credit Courses (NTCC)
 - Courses with a class strength less than 30

Absolute grading method may be adopted, where necessary with prior approval of concerned DAC.

Grading shall be done at the end of the Academic Term by considering the aggregate performance of the student in all components of Assessments prescribed for the Course. Letter Grades (Clause 8.10 of Academic Regulations) shall be awarded to a student based on her/his overall performance relative to the class performance distribution in the concerned Course. These Letter Grades not only indicate a qualitative assessment of the student's performance but also carry a quantitative (numeric) equivalent called the Grade Point.

	Table 1: Assessment Component and Weightage												
S.N o	Credit Struct	Percenta ge/ Marks	CA		Mid-Term		End-term		Proie				
	ure [L- T-P-C]		Theory	Practi cal	Theor y	Practi cal	Theo ry	Practi cal	ct	ct	Total	Exam Conducted by	
1	3-0-0- 3	Percenta ge	25%	-	25%	-	50 %	-	-	100 %	Mid-Term & End Term by CoE		
		Marks	50	-	50	-	100	-	-	200			
2	2-0-2- 3	Percenta ge	12.50%	12.50 %	12.50 %	12.50 %	25%	25%	-	100 %	Mid-Term & End Term by CoE * Except for full		
	5	Marks	25	25	25	25	50	50	-	200	stack courses		

12.5 Assessment Components and Weightage

3	1-0-4- 3	Percenta ge	-	25	5%	10%	40 %	5%	20 %			100 %	Mid-Term & End Term by School
		Marks	-	2	5	10	40	5	20		-	100	
4	2-0-4- 4	Percenta ge	12.50%	, 12 . %	.50 ⁄₀	10%	15%	20%	30%		-	100 %	*Mid-Term & End Term by CoE
		Marks	25	2	5	20	30	40	60		-	200	
5	0-0-4- 2	Percenta ge	-	50)%	-	-	-	-	50	%	100 %	Project evaluated by IC at School
		Marks	-	5	0	-	-	-	-	5	0	100	level
6	0-0-2- 1	Percenta ge	-	10	0%	-	-	-	-			100 %	Only CA at School Level
4 5 6 7 8		Marks	-	10	00	-	-	-	-		-	100	
7	3-0-2- 4	Percenta ge	12.50%	, 12 . %	.50 ⁄₀	15%	10%	30%	20%			100 %	Mid-Term & End Term by CoE
		Marks	25	2	5	30	20	60	40		-	200	
8	2-0-0- 2	Percentage	e 25 %	-	:	25%	-	50 %	-	-	100 %)	Mid-Term & End Term by CoE
		Marks	50	-		50	-	100	-	-	200)	

*CSE3150-Front End Full stack development

CSE3151-Java Full Stack Development

CSE3152-.Net Full Stack development

The exact weightages of Evaluation Components shall be clearly specified in the concerned PRC and respective Course Plan.

Normally, for Practice/Skill based Courses, without a defined credit structure (L– T–P) [NTCC], but with assigned Credits (as defined in Clause 5.2 of the Academic Regulations), the method of evaluation shall be based only on Continuous Assessments. The various components of Continuous Assessments, the distribution of weightage among such components, and the method of evaluation/assessment, shall be as decided and indicated in the Course Plan/PRC. The same shall be approved by the respective DAC.

12.6 Minimum Performance Criteria:

12.6.1 Theory only Course and Lab/Practice Embedded Theory Course

A student shall satisfy the following minimum performance criteria to be eligible to earn the credits towards the concerned Course:

- a. A student must obtain a minimum of 30% of the total marks/weightage assigned to the End Term Examinations in the concerned Course.
- b. The student must obtain a minimum of 40% of the AGGREGATE of the marks/weightage of the components of Continuous Assessments, Mid Term Examinations and End Term Examinations in the concerned Course.

12.6.2 Lab/Practice only Course and Project Based Courses

The student must obtain a minimum of 40% of the AGGREGATE of the marks/weightage of all assessment components in the concerned Course.

12.6.3 A student who fails to meet the minimum performance criteria listed above in a Course shall be declared as "Fail" and given "F" Grade in the concerned Course. For theory Courses, the student shall have to reappear in the "Make-Up Examinations" as scheduled by the University in any subsequent semester, or, re-appear in the End Term Examinations of the same Course when it is scheduled at the end of the following Semester or Summer Term, if offered. The marks obtained in the Continuous Assessments (other than the End Term Examination) shall be carried forward and be included in computing the final grade, if the student secures the minimum requirements (as per Sub Clauses 8.9.1 and 8.9.2 of Academic Regulations) in the "Make-Up Examinations" of the concerned Course. Further, the student has an option to re-register for the Course and clear the same in the summer term/ subsequent semester if he/she wishes to do so, provided the Course is offered.

13 Additional clarifications - Rules and Guidelines for Transfer of Credits from MOOC, etc.

The University allows students to acquire credits from other Indian or foreign institutions and/or Massive Open Online Course (MOOC) platforms, subject to prior approval. These credits may be transferred and counted toward fulfilling the minimum credit requirements for the award of a degree. The process of transfer of credits is governed by the following rules and guidelines:

- 13.1 The transfer of credits shall be examined and recommended by the Equivalence Committee (Refer Annexure B of Academic Regulations) and approved by the Dean - Academics.
- **13.2** Students may earn credits from other Indian or foreign Universities/Institutions with which the University has an MOU, and that MOU shall have specific provisions, rules and guidelines for transfer of credits. These transferred credits shall be counted towards the minimum credit requirements for the award of the degree.
- **13.3** Students may earn credits by registering for Online Courses offered by *Study Web* of Active Learning by Young and Aspiring Minds (SWAYAM) and National Program on Technology Enhanced Learning (NPTEL), or other such recognized Bodies/ Universities/Institutions as approved by the concerned BOS and Academic Council from time to time. The concerned School/Parent Department shall publish/include the approved list of Courses and the rules and guidelines governing such transfer of credits of the concerned Program from time to time. The Rules and Guidelines for the transfer of credits specifically from the Online Courses conducted by SWAYAM/ NPTEL/ other approved MOOCs are as stated in the following Sub-Clauses:
 - 13.3.1 A student may complete SWAYAM/NPTEL/other approved MOOCs as mentioned in Clause 17.3 (as per Academic Regulations) and transfer equivalent credits to partially or fully complete the mandatory credit requirements of Discipline Elective Courses and/or the mandatory credit requirements of Open Elective Courses as prescribed in the concerned Curriculum Structure. However, it is the sole responsibility of the student Page 16 of 527

to complete the mandatory credit requirements of the Discipline Elective Courses and the Open Elective Courses as prescribed by the Curriculum Structure of the concerned Program.

- **13.3.2** SWAYAM/NPTEL/ other approved MOOCs as mentioned in Clause 17.3 (as per Academic Regulations) shall be approved by the concerned Board of Studies and placed (as Annexures) in the concerned PRC.
- **13.3.3** Parent Departments may release a list of SWAYAM/NPTEL/other approved MOOCs for Pre-Registration as per schedule in the Academic Calendar or through University Notification to this effect.
- **13.3.4** Students may Pre-Register for the SWAYAM/NPTEL/other approved MOOCs in the respective Departments and register for the same Courses as per the schedule announced by respective Online Course Offering body/institute/ university.
- **13.3.5** A student shall request for transfer of credits only from such approved Courses as mentioned in Sub-Clause 13.3.2 above.
- **13.3.6** SWAYAM/NPTEL/other approved MOOCs Courses are considered for transfer of credits only if the concerned student has successfully completed the SWAYAM/NPTEL/other approved MOOCs and obtained a certificate of successful/satisfactory completion.
- **13.3.7** A student who has successfully completed the approved SWAYAM/NPTEL/ other approved MOOCs and wants to avail the provision of transfer of equivalent credits, must submit the original Certificate of Completion, or such similar authorized documents to the HOD concerned, with a written request for the transfer of the equivalent credits. On verification of the Certificates/Documents and approval by the HOD concerned, the Course(s) and equivalent Credits shall forwarded to the COE for processing of results of the concerned Academic Term.
- **13.3.8** The credit equivalence of the SWAYAM/NPTEL/other approved MOOCs are based on Course durations and/or as recommended by the Course offering body/institute/university. The Credit Equivalence mapped to SWAYAM/ NPTEL approved Courses based on Course durations for transfer of credits is summarised in Table shown below. The Grade will be calculated from the marks received by the Absolute Grading Table 8.11 in the Academic Regulations.

Table 2: Durations and Credit Equivalence for Transfer of
Credits from SWAYAM-NPTEL/ other approved MOOC Courses

SI. No.	Course Duration	Credit Equivalence
1	4 Weeks	1 Credit
2	8 Weeks	2 Credits
3	12 Weeks	3 Credits

13.3.9 The maximum permissible number of credits that a student may request for credit transfer from MOOCs shall not exceed 20% of the mandatory

minimum credit requirements specified by the concerned Program Regulations and Curriculum for the award of the concerned Degree.

- **13.3.10** The University shall not reimburse any fees/expense; a student may incur for the SWAYAM/NPTEL/other approved MOOCs.
- **13.4** The maximum number of credits that can be transferred by a student shall be limited to forty percent (40%) of the mandatory minimum credit requirements specified by the concerned Program Regulations and Curriculum for the award of the concerned Degree. However, the grades obtained in the Courses transferred from other Institutions/MOOCs, as mentioned in this Section (13.0), shall not be included in the calculation of the CGPA.

14. Structure / Component with Credit Requirements Course Baskets & Minimum Basket wise Credit Requirements

The B.Tech. (Computer Engineering) Program Structure (2021-2025) totalling 161 credits. Table 3 summarizes the type of baskets, number of courses under each basket and the associated credits that are mandatorily required for the completion of the Degree.

Ta Ma	Table 3: B.Tech. (Computer Engineering) 2021-2025: Summary of Mandatory Courses and Minimum Credit Contribution from various Baskets									
SI. No.	Baskets	Credit Contribution								
1	School Core	55								
4	Program Core	61								
5	Discipline Elective	30								
6	Open Elective	15								
	Total Credits	161 (Minimum)								

In the entire Program, the practical and skill based course component contribute to an extent of approximately 57% out of the total credits of 161 for B.Tech. (Computer Engineering) program of four years' duration.

15. Minimum Total Credit Requirements of Award of Degree

As per the AICTE guidelines, a minimum of 161 credits is required for the award of a B.Tech. degree.

16.Other Specific Requirements for Award of Degree, if any, as prescribed by the Statutory Bodies,

- 16.1 The award of the Degree shall be recommended by the Board of Examinations and approved by the Academic Council and Board of Management of the University.
- 16.2 A student shall be declared to be eligible for the award of the concerned Degree if she/he:
 - a. Fulfilled the Minimum Credit Requirements and the Minimum Credits requirements under various baskets;
 - b. Secure a minimum CGPA of 4.50 in the concerned Program at the end of the Semester/Academic Term in which she/he completes all the requirements for the award of the Degree as specified in Sub-Clause 19.2.1 of Academic Regulations;
 - c. No dues to the University, Departments, Hostels, Library, and any other such Centers/ Departments of the University; and
 - d. No disciplinary action is pending against her/him.

PART C – CURRICULUM STRUCTURE

17.Curriculum Structure – Basket Wise Course List (not Semester Wise) List of Courses Tabled – aligned to the Program Structure

	Table 3.1 : School (Core				
S.No	Course Name	L	Т	Р	С	
1	Foundation of English/ Technical English	1	0	2	2	
2	Technical English/ Advanced English	1	0	2	2	
4	PPS (Soft Skills)	0	0	2	1	
5	Kali Kannada / Thili Kannada	1	0	0	1	
6	PPS (Soft Skills for Engineers)	0	0	2	1	
7	(PPS) Introduction to Aptitude	0	0	2	1	
9	Aptitude for Employability	0	0	2	1	
10	Preparedness for Interview	0	0	2	1	
11	Reasoning and Employment Skills	0	0	2	1	
12	Being Corporate Ready	0	0	2	1	
13	Calculus and Linear Algebra	3	0	2	4	
14	Applied Statistics	1	0	2	2	
15	Optoelectronics and Device Physics	2	0	2	3	
16	Transform Techniques, Partial Differential Equations and Their Applications	3	0	0	3	
17	Numerical Methods for Engineers	1	0	2	2	
18	Elements of Electronics Engineering	3	0	2	4	
19	Problem Solving using JAVA	2	0	2	3	
20	Innovative Projects - Arduino using Embedded 'C'	0	0	4	2	
21	Coding Skills in Python	2	0	2	3	
22	Data Structures and Algorithms	3	0	2	4	
23	Innovative Projects Using Raspberry Pi	0	0	4	2	
24	Capstone Project	0	0	0	4	
25	Internship	0	0	0	9	
		Tota	l No. of	Credits	57	

(Course Code, Course Name, Credit Structure (LTPC), Contact Hours, Course Basket, Type of Skills etc., as applicable).

	Table 3.2 : List of Prog	Iram Cor	es		
S. No	Course Name	L	Н	Р	С
1	Discrete Mathematical Structures	3	0	0	3

2	Theory of Computation	3	0	0	3
3	Digital Design	2	0	2	3
4	Software Engineering	3	0	0	3
5	Advanced Java Programming	1	0	4	3
6	Data Base Management System	2	0	2	3
7	Design and Analysis of Algorithms	3	0	0	3
8	Fundamentals of Data Analytics	3	0	0	3
9	Computer Organization and Architecture	3	0	0	3
10	Operating Systems	3	0	0	3
11	Data Communication and Computer Networks	3	0	0	3
12	Artificial Intelligence and Machine Learning	2	0	2	3
13	Cryptography and Network Security	3	0	0	3
14	Cloud Computing	2	0	2	3
15	Data Analysis and Visualization	2	0	4	4
16	IoT: Architecture and Protocols	3	0	0	3
17	Web 2.0	2	0	2	3
18	Distributed Systems	3	0	0	3
19	IoT Platforms and Application Development	3	0	0	3
20	Digital Image Processing	2	0	2	3
		Tot	al No. of	Credits	61

18.Practical / Skill based Courses – Internships / Thesis / Dissertation / Capstone Project Work / Portfolio / Mini project

Practical / Skill based Courses like internship, project work, capstone project, research project / dissertation, and such similar courses, where the pedagogy does not lend itself to a typical L-T-P-C Structure as defined in Clause 5.1 of the Academic Regulations, 2021, are simply assigned the number of Credits based on the quantum of work / effort required to fulfill the learning objectives and outcomes prescribed for the concerned Courses. Such courses are referred to as Non-Teaching Credit Courses (NTCC). These Courses are designed to provide students with hands-on experience and skills essential for their professional development. These courses aim to equip students with abilities in problem identification, root cause analysis, problem-solving, innovation, and design thinking through industry exposure and project-based learning. The expected outcomes are first level proficiency in problem solving and design thinking skills to better equip B.Tech. graduates for their professional careers. The method of evaluation and grading for the Practical / Skill based Courses shall be prescribed and approved by the concerned

Departmental Academic Committee (refer Annexure A of the Academic Regulations). The same shall be prescribed in the Course Handout.

18.1 Internship

A student may undergo an Internship for a period of 10-12 weeks in an industry / company or academic / research institution during the Semester Break between 4^{th} and 5^{th} Semesters or 6^{th} and 7^{th} Semesters, subject to the following conditions:

18.1.1 The Internship shall be in conducted in accordance with the Internship Policy prescribed by the University from time to time.

- 18.1.1 The selection criteria (minimum CGPA, pass in all Courses as on date, and any other qualifying criteria) as applicable / stipulated by the concerned Industry / Company or academic / research institution for award of the Internship to a student;
- 18.1.2 The number of Internships available for the concerned Academic Term. Further, the available number of internships shall be awarded to the students by the University on the basis of merit using the CGPA secured by the student. Provided further, the student fulfils the criteria, as applicable, specified by the Industry / Company or academic / research institution providing the Internship, as stated in Sub-Clause 18.1.2 above.
- 18.1.3 A student may opt for Internship in an Industry / Company or academic / research institution of her / his choice, subject to the condition that the concerned student takes the responsibility to arrange the Internship on her / his own. Provided further, that the Industry / Company or academic / research institution offering such Internship confirms to the University that the Internship shall be conducted in accordance with the Program Regulations and Internship Policy of the University.
- 18.1.4 A student selected for an Internship in an industry / company or academic / research institution shall adhere to all the rules and guidelines prescribed in the Internship Policy of the University.

18.2 Capstone Project

A student may undergo a Capstone Project for a period of 12-14 weeks in the 7th Semester as applicable, subject to the following conditions:

- 18.2.1 The Capstone Project shall be in conducted in accordance with the Capstone Project Policy prescribed by the University from time to time.
- 18.2.2 The selection criteria (minimum CGPA, pass in all Courses as on date, and any other qualifying criteria) as applicable / stipulated by the concerned Industry / Company or academic / research institution for award of the Capstone Project to a student;
- 18.2.3 The number of Capstone Project available for the concerned Academic Term. Further, the available number of Capstone Project shall be awarded to the students by the University on the basis of merit using the CGPA secured by the student. Provided further, the student fulfils the criteria, as applicable, specified by the Industry / Company or academic / research institution providing the Capstone Project, as stated

in Sub-Clause 18.3.2 above.

- 18.2.4 A student may opt for Capstone Project in an Industry / Company or academic / research institution of her / his choice, subject to the condition that the concerned student takes the responsibility to arrange the I Capstone Project on her / his own. Provided further, that the Industry / Company or academic / research institution offering such Capstone Project confirms to the University that the Capstone Project shall be conducted in accordance with the Program Regulations and Internship Policy of the University.
- 18.2.5 A student selected for a Capstone Project in an industry / company or academic / research institution shall adhere to all the rules and guidelines prescribed in the Capstone Project Policy of the University.

18.3 **Research Project / Dissertation**

A student may opt to do a Research Project / Dissertation for a period of 12-14 weeks in an Industry / Company or academic / research institution or the University Department(s) as an equivalence of Capstone Project, subject to the following conditions:

18.3.1 The Research Project / Dissertation shall be approved by the concerned HOD and be carried out under the guidance of a faculty member.

The student may do the Research Project / Dissertation in an Industry / Company or academic / research institution of her / his choice subject to the above mentioned condition (Sub-Clause 18.3.1). Provided further, that the Industry / Company or academic / research institution offering such Research Project / Dissertation confirms to the University that the Research Project / Dissertation work will be conducted in accordance with the Program Regulations and requirements of the University.

19.List of Elective	e Courses	under various	Specialisations	/ Stream Basket
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Table 3. Track -	Table 3.6: Professional Electives Courses/Specialization Tracks Track -1 Artificial Intelligence and Machine Learning Basket												
Sl.No	Course Code	Course Name	L	Т	Р	С	S/EM		Prerequisite				
1	CSE3005	Applied Artificial Intelligence	3	0	0	3	S		CSE3001				
2	CSE3016	Neural Networks and Fuzzy Logic	3	0	0	3	S/ EM		MAT1002				
3	CSE3087	Applied Machine Learning	2	0	2	3	S		CSE3001				
4	CSE3009	Optimization Techniques for Machine Learning	3	0	0	3	S/EM		CSE3087				

Sl.No 1 2 3 4	Course Code CSE2021 CSE2022 CSE2023 CSE2023	Course Name Data Mining Domain Specific Predictive Analytics Data Warehousing and its Applications No SQL Databases	L 3 3 3 2	T 0 0 0 0 0	P 0 0 0 2	C 3 3 3 3	S/EM S/ EM S/EM S/EM	-	Prerequisite MAT1001 CSE2027 MAT1001 CSE2074	-
Sl.No 1 2 3	Course Code CSE2021 CSE2022 CSE2023	Course Name Data Mining Domain Specific Predictive Analytics Data Warehousing and its Applications	L 3 3 3	T 0 0 0 0	P 0 0 0 0	C 3 3 3	S/EM S/EM S/EM	-	Prerequisite MAT1001 CSE2027 MAT1001	-
Sl.No 1 2	Course Code CSE2021 CSE2022	Course Name Data Mining Domain Specific Predictive Analytics	L 3 3	T 0 0	P 0 0	C 3 3	S/EM S/ EM S/EM	-	Prerequisite MAT1001 CSE2027	-
Sl.No	Course Code CSE2021	Course Name Data Mining	L 3	Т 0	P 0	C 3	S/EM	-	MAT1001	-
Sl.No	Course Code	Course Name	L	Т	Р	C	S/EM		Prerequisite	
							a			
I rack -2	2 ыg Data B	asket								
Trools	2 Dia Data D	lookot								
14	CSE3108	Expert Systems	3	0	0	3	S/ EM		CSE3008	
13	CSE3103	Cognitive Science & Analytics	3	0	0	3	S/ EM		CSE3008	
12	CSE3088	Business Intelligence and Analytics	3	0	0	3	S/ EM		CSE3008	
11	CSE3019	Stochastic Decision Making	3	0	0	3	S/ EM		MAT1003	
10	CSE3018	Digital Health and Imaging	3	0	0	3	S/ EM		CSE3008	
9	CSE3017	Autonomous Navigation and Vehicles	3	0	0	3	S/ EM		MAT1002	
8	CSE3015	Processing	2	0	2	3	5/ EM		CSE3014	
0	CSE2015	Processing	2	0	2	2	S/EM		CSE2014	
7	CSE3014	Fundamentals of Natural Language	3	0	0	3	S		CSE3001	
6	CSE3011	Reinforcement Learning	2	0	2	3	S		CSE3008	
C	CSE3010	Deep Learning Techniques	3	0	0	3	S		CSE3087	

1	CSE3021	Blockchain for Public Sector	3	0	0	3	S/EM	-	CSE2020	-
2	CSE3022	Crypto Currency Technology	3	0	0	3	S/EM		CSE2019	-
3	CSE3024	Emerging Areas in Blockchain	3	0	0	3	S/EM	-	CSE2020	-
4	CSE3025	Industry Use Cases using Blockchain	3	0	0	3	S/EM	-	CSE2020	-
5	CSE2019	Foundations of Blockchain Technology	3	0	0	3	S	-		
6	CSE2020	Blockchain Technology And Applications	3	0	0	3	S	-		
7	CSE3020	Smart Contract and Solidity	2	0	2	3	S	-	CSE2019	
8	CSE3023	Distributed Ledger Technology	2	0	2	3	S		CSE 2019	
9	CSE3028	Blockchain Security and Performance	2	0	2	3	S		CSE2019	
Track -4	4 Cyber Secu	arity Basket			<u> </u>		l	l	L	L
Sl.No	Course	Course Name		L	Т	Р	С	S/EM		
1	Coue CSE2037	Cuber Foransias	2	0	2	3	S		MAT1001	
1	CSE2057	Cyber Forensics	2	0	2	3	3		WIATIOUT	
2	CSE2038	Privacy and Security in Online Social Media	3	0	0	3	S/EM		CSE1001	
3	CSE2039	Ethical Hacking	2	0	2	3	S		CSE1001	
4	CSE2040	Cyber Threats for IoT and Cloud	3	0	0	3	S			
5	CSE3145	Intrusion Detection and Prevention	3	_						-
6		System	0	0	0	3	S	-	CSE2037	
Ū.	CSE3094	System Cyber Security	3	0	0 0	3	S S/EM	-	CSE2037 CSE3078	
7	CSE3094 CSE3096	System Cyber Security Cyber Digital Twin	3	0 0 0 0	0 0 0	3 3 3	S S/EM S/EM	-	CSE2037 CSE3078 CSE2013	
7	CSE3094 CSE3096 CSE3097	System Cyber Security Cyber Digital Twin Web Security	3 3 2	0 0 0 0	0 0 0 2	3 3 3 3	S S/EM S/EM S	-	CSE2037 CSE3078 CSE2013 CSE2011	
7 8 9	CSE3094 CSE3096 CSE3097 CSE3098	System Cyber Security Cyber Digital Twin Web Security Vulnerability Assessment and Penetration Testing	3 3 2 3	0 0 0 0	0 0 2 0	3 3 3 3 3	S S/EM S/EM S/EM	-	CSE2037 CSE3078 CSE2013 CSE2011 CSE3078	
7 8 9 10	CSE3094 CSE3096 CSE3097 CSE3098 CSE3099	System Cyber Security Cyber Digital Twin Web Security Vulnerability Assessment and Penetration Testing Digital and Mobile Forensics	3 3 2 3 2 2	0 0 0 0 0	0 0 2 0 2	3 3 3 3 3	S S/EM S/EM S/EM	-	CSE2037 CSE3078 CSE2013 CSE2011 CSE3078 CSE2011	
7 8 9 10 11	CSE3094 CSE3096 CSE3097 CSE3098 CSE3099 CSE3100	System Cyber Security Cyber Digital Twin Web Security Vulnerability Assessment and Penetration Testing Digital and Mobile Forensics Security Assessment and Testing	3 3 3 2 2 2 2	0 0 0 0 0 0	0 0 2 0 2 2	3 3 3 3 3 3	S S/EM S/EM S/EM S/EM	-	CSE2037 CSE3078 CSE2013 CSE2011 CSE2011 CSE2011	
7 8 9 10 11 12	CSE3094 CSE3096 CSE3097 CSE3098 CSE3099 CSE3100 CSE3101	SystemCyber SecurityCyber Digital TwinWeb SecurityVulnerability Assessment and Penetration TestingDigital and Mobile ForensicsSecurity Assessment and TestingDigital Watermarking and Steganography	3 3 2 2 2 2 3	0 0 0 0 0 0 0	0 0 2 0 2 2 0	3 3 3 3 3 3 3	S S/EM S/EM S/EM S/EM S/EM	-	CSE2037 CSE3078 CSE2013 CSE2011 CSE3078 CSE2011 CSE2011 CSE2011	

Track –	5 Data Scie	nce Basket								
Sl.No	Course Code	Course Name	L	Т	Р	C	S/EM		Prerequisite	
1	CSE2025	Business Continuity and Risk Analysis	3	0	0	3	S/EM	-	CSE2027	-
2	CSE2026	Data Handling and Visualization	2	0	2	3	S/EM	-	CSE2027	
3	CSE2028	Statistical Foundations of Data Science	2	0	2	3	S/EM		MAT1003	
4	CSE2029	Web Data Analytics	2	0	2	3	S/EM		CSE2027	-
5	CSE3035	R programming for Data Science	1	0	4	3	S		CSE2027	-
6	CSE3036	Predictive Analytics	2	0	2	3	S	-	CSE2026	
7	CSE3037	Optimization for Data Science	2	0	2	3	S		CSE2027	
8	CSE3038	Applied Data Science	2	0	2	3	S		CSE2027	
9	CSE3039	Social Media Analytics	2	0	2	3	S		CSE3036	-
10	CSE3136	E-Business and Marketing Analytics	3	0	0	3	S/EM		CSE2025	
11	CSE3137	Text Mining and Analytics	3	0	0	3	S/EM	-	CSE3001	
Track -	6 DevOps Ba	lsket		I	I			1	1	1
Sl.No	Course Code	Course Name	L	Т	Р	C	S/EM		Prerequisite	
1	CSE3040	Agile Structures and Frameworks	3	0	0	3	S	-		-
2	CSE3042	Applied DevOps	2	0	2	3	S/EM	-	CSE2014	-
3	CSE3043	Automated Test Management	2	0	2	3	S	-	CSE2014	-
4	CSE3044	Build and Release Management	3	0	0	3	S/EM	-	CSE2014	-
5	CSE3045	Development Automation	2	0	2	3	S	-	CSE2014	-
6	CSE3046	DevOps Tools Internals	2	0	2	3	S	-		-
7	CSE3050	Software Project Management	3	0	0	3	S/EM	-	CSE2014	-
8	CSE3051	System Monitoring	3	0	0	3	S/EM	-	CSE3120	-
9	CSE3052	System Provisioning and Configuration Management	3	0	0	3	S	-	CSE2014	-

Track -'	7 IoT Basket	t								
Sl.No	Course Code	Course Name	L	Т	Р	C	S/EM		Prerequisite	
1	CSE2032	Introduction to Fog Computing	3	0	0	3	S	-	CSE2011	
2	CSE3053	Big Data Analytics for IoT	1	0	4	3	S	-	CSE3002	
3	CSE3055	Wireless Communication in IoT	3	0	0	3	S	-	CSE2011	
4	CSE3063	Privacy and Security in IoT	3	0	0	3	S		CSE3078	
5	CSE3066	Mobile Application for IoT	3	0	0	3	S		CSE2011	
6	ECE3075	IoT: Architecture and Protocols	3	0	0	3	S / EM			
7	ECE3076	IoT Platforms and Application Development	2	0	2	3	S / EM			
8	ECE3086	Industrial Internet of Things (IIoT)	3	0	0	3	S / EM	-		
9	ECE3088	Internet of Medical Things (IoMT)	3	0	0	3	S / EM	-		
Track -	8 General Ba	asket	I	1	1	1	I	I	1	
Sl.No	Course Code	Course Name	L	Т	Р	C	S/EM		Prerequisite	
1	CSE2033	Go Programming	3	0	0	3	S/ EM	-	CSE1002	-
2	CSE2066	Computer Graphics	3	0	0	3	S	-		-
3	CSE3146	Advanced Java Programming	1	0	4	3	S	-	CSE1001	-
4	CSE2036	Programming in C++	1	0	4	3	S/ EM	-	CSE1001	-
5	CSE3068	Advanced Database Management Systems	2	0	2	3	S/ EM	-	CSE2074	-
6	CSE3069	Introduction to Bioinformatics	3	0	0	3	S/ EM	-		-
7	CSE3070	Advanced Computer Networks	3	0	0	3	S/ EM		CSE2011	-
8	CSE3071	Computer Vision	2	0	2	3	S/ EM	-	MAT 1003	-
	CSL5071	Computer vision	2	Ť					MAT 1005	
9	CSE3072	Wireless Sensor Networks	3	0	0	3	S/ EM		CSE 2011	
9 10	CSE3072 CSE3073	Wireless Sensor Networks Game Design and Development	3	0	0	3	S/ EM	-	CSE 2011	-

12	CSE3075	Mobile Application Development	1	0	4	3	S	-	CSE1001	-
13	CSE3077	Compiler Design	2	0	2	3	S	-		-
10	CDLCOTT		-	0	-	U	2			
14	CSE3079	Parallel Computing	3	0	0	3	S/ EM	-	CSE2009	-
15	CSE3080	Quantum Computing	3	0	0	3	S/ EM	-	MAT1002	-
16	CSE3081	Digital Image Processing	2	0	2	3	S/ EM		MAT1002	-
17	CSE3082	Object Oriented Analysis and Design	3	0	0	3	S	-	CSE1001	
18	CSE3083	Advanced Computer Architecture	3	0	0	3	S/ EM	-	CSE2009	-
19	CSE3084	Software Quality Assurance	2	0	2	3	S/ EM	-	CSE2014	-
20	CSE3085	Real Time Operating System	3	0	0	3	S/ EM	-	CSE2010	-
21	CSE3086	Information Theory and Coding	3	0	0	3	S/ EM		MAT1002	-
22	CSE3089	Software Architecture	3	0	0	3	S/ EM	-	CSE2009	
23	CSE3090	5G Networking	3	0	0	3	S/ EM		CSE2011	-
24	CSE3091	Programming in C# and .NET	1	0	4	3	S/ EM	-	CSE1001	
25	CSE2052	Distributed Systems	3	0	0	3	S/ EM	-	CSE2010,	-
Track-9	Cloud Com	puting Basket					1			
Sl.No	Course Code	Course Name	L	T	Р	C	S/EM		Prerequisite	
1	CSE2034	Edge Computing	3	0	0	3	S/EM	-	CSE2011	
2	CSE3095	Cloud Security	3	0	0	3	S/EM	-	CSE2013	
3	CSE3054	Data Center Design	3	0	0	3	S/EM	-	CSE2013	
4	CSE3127	Cloud Application Development	3	0	0	3	S/EM		CSE2013	
5	CSE3129	Middleware Technologies	3	0	0	3	S/EM	-	CSE2011	
Track 1	0 - Informat	ion Science & Engineering Basket		<u>.</u>	-		<u>.</u>			-
Sl.No	Course Code	Course Name	L	Т	Р	C	S/EM		Prerequisite	
1	CSE3126	E-Commerce	3	0	0	3	S/EM	-	CSE2007	

Track -	11 Informati	ion Science & Technology Basket								
Sl.No	Course Code	Course Name	L	Т	Р	C	S/EM		Prerequisite	
1	CSE2054	Storage Area Networks	3	0	0	3	S	-	CSE2011	
2	CSE2055	Information System Audit	3	0	0	3	S	-	CSE2011	
3	CSE2056	Web 2.0	2	0	2	3	S/EM	-	CSE2007	
4	CSE2057	Cloud Computing and Virtualization	3	0	0	3	S/EM	-	CSE2011	
5	CSE2058	Firewall and Internet Security	2	0	2	3	S		CSE2011	
6	CSE2059	Mobile Networking	2	0	2	3	S	-	CSE2011	
7	CSE2060	Information Security and Management	3	0	0	3	S/EM		CSE2011	
8	CSE3128	Human Computer Interaction	3	0	0	3	S/EM	-	CSE2007	
9	CSE3143	Infrastructure Management	3	0	0	3	S/EM		CSE2011	
10	CSE3132	Network Management Systems	3	0	0	3	S	-	CSE2011	

20.List of Open Electives to be offered by the School / Department (Separately for ODD and EVEN Semesters.

Table	e 3.7 : Ope	n Elective Courses Baskets: Minimun	۱C	red	lits	to	be earne	ed from t	this Ba	sket i	s 9
SI. No.	Course Code	Course Name	L	т	Р	с	Type of Skill/ Focus	Course Caters to	Prere quisit es/ Core quisit es	Anti requ isite s	Future Course s that need this as a Prereq uisite
Cherr	nistry Baske	et					-				
1	CHE1003	Fundamentals of Sensors	3	0	0	3	S	ES	-	-	-
2	CHE1004	Smart materials for IOT	3	0	0	3	S	ES	-	-	-
3	CHE1005	Computational Chemistry	2	0	0	2	S	ES	-	-	-
4	CHE1006	Introduction to Nano technology	3	0	0	3	S	ES	-	-	-
5	CHE1007	Biodegradable electronics	2	0	0	2	S	ES	-	-	-
6	CHE1008	Energy and Sustainability	2	0	0	2	S	ES	-	-	-
7	CHE1009	3D printing with Polymers	2	0	0	2	S	ES	-	-	-

8	CHE1010	Bioinformatics and Healthcare IT	2	0	0	2	S	ES	-	-	-
9	CHE1011	Chemical and Petrochemical catalysts	3	0	0	3	S	ES	-	-	-
10	CHE1012	Introduction to Composite materials	2	0	0	2	S	ES	-	-	-
11	CHE1013	Chemistry for Engineers	3	0	0	3	S	ES	-	-	-
12	CHE1014	Surface and Coatings technology	3	0	0	3	S	ES	-	-	-
13	CHE1015	Waste to Fuels	2	0	0	2	S	ES	-	-	-
14	CHE1016	Forensic Science	3	0	0	3	S	FS	-	_	-
Civil	Engineering	Basket		•		0	0				
1	CIV1001	Disaster mitigation and management	3	0	0	3	S	-	-	-	-
2	CIV1002	Environment Science and Disaster Management	3	0	0	3	FC	-	-	-	-
3	CIV2001	Sustainability Concepts in Engineering	3	0	0	3	S	-	-	-	-
4	CIV2002	Occupational Health and Safety	3	0	0	3	S	-	-	-	-
5	CIV2003	Sustainable Materials and Green Buildings	3	0	0	3	EM	-	-	-	-
6	CIV2004	Integrated Project Management	3	0	0	3	EN	-	-	-	-
7	CIV2005	Environmental Impact Assessment	3	0	0	3	EN	-	-	-	-
8	CIV2006	Infrastructure Systems for Smart Cities	3	0	0	3	EN	-	-	-	-
9	CIV2044	Geospatial Applications for Engineers	2	0	2	3	EM	-	-	-	-
10	CIV2045	Environmental Meteorology	3	0	0	3	S	-	-	-	-
11	CIV3046	Project Problem Based Learning	3	0	0	3	S	-	-	-	-
		Sustainability for Professional	-	-		_					
12	CIV3059	Practice	3	0	0	3	EN	-	-	-	-
Comr	nerce Bask	et		I							
		Introduction to Human Resource									
1	COM2001	Management	2	0	0	2	F	HP/GS	-	-	-
2	COM2002	Finance for Non Finance	2	0	0	2	S	-	-	-	-
3	COM2003	Contemporary Management	2	0	0	2	F	_	-	-	-
4	COM2004	Introduction to Banking	2	0	0	2	F	_	-	-	-
5	COM2005	Introduction to Insurance	2	0	0	2	F	_	-	-	-
6	COM2006	Fundamentals of Management	2	0	0	2	F	_	-	-	_
7	COM2007	Basics of Accounting	2	0	0	2	F	_	_	-	_
, Comr	uter Scienc	re Basket	5	U	U	5	1				
1		Programming in Java	2	Δ	2	З	S/FM	_	-	_	_
2	CSE2002	Social Network Analytics	2	0	0	ך ג	S	GS	_	_	_
2	CSE2003	Python Application Programming	2	0	2	ך ג	S/ FM	-		_	_
4	CSE2005	Web design fundamentals	2	0	2	3	S/ S/ EM/EN	-	-	-	-
5	CSE3111	Artificial Intelligence : Search Methods For Problem Solving	3	0	0	3	S/ EM/EN	_	-	-	-
6	CSE3112	Privacy And Security In Online	3	0	0	3	S/ EM/EN	_	-	-	-
7	CSE3113	Computational Complexity	3	0	0	3	S/ FM/FN	-	-	-	-
8	CSE3114	Deep Learning for Computer Vision	3	0	0	3	S/ EM/EN	-	-	-	-
9	CSE3115	Learning Analytics Tools	3	0	0	3	S/ EM/EN	-	-	-	-
Desig	in Basket	1	1				, ,=			ı	
1	DES1001	Sketching and Painting	0	0	2	1	S	-	-	-	-
2	DES1002	Innovation and Creativity	2	ñ	0	2	F	_	-	-	_
3	DES1121	Introduction to UX design	1	0	2	2	S	-	-	-	_
4	DFS1121	Introduction to lewellery Making	1	0	2	2	S S	-	-	_	_
5	DES1122	Snatial Stories	1	0	2	2	5 6			-	_
6	DFS1125	Polymer Clay	1	n	2	2	S	-	-	-	_
			1 -		1 -				1	1	

7	DES2001	Design Thinking	3	0	0	3	S	-	-		-	-
8	DES1003	Servicability of Fashion Products	1	0	2	2	F	ES	-		-	-
9	DES1004	Choices in Virtual Fashion	1	0	2	2	F	ES, GS HP	5, -		-	-
10	DES1005	Fashion Lifestyle and Product Diversity	1	0	2	2	F	ES, GS HP	5, -		-	1
11	DES1006	Colour in Everyday Life	1	0	2	2	F	ES	-		-	-
12	DES2080	Art of Design Language	3	0	0	3	S	-	-		-	-
13	DES2081	Brand Building in Design	3	0	0	3	S	-	-		-	-
14	DES2085	Web Design Techniques	3	0	0	3	S	-	-		-	-
15	DES2089	3D Modeling for Professionals	1	0	4	3	S	-	-		-	-
16	DES2090	Creative Thinking for Professionals	3	0	0	3	S	-	-		-	-
17	DES2090	Idea Formulation	כ ר	0	0	3 3	S S	-	-		-	-
- / Flectr	ical and Fle	actronics Basket	5	U	U	5	5					
LIECU		Int based Smart Building										
1	EEE1002	Tochnology	3	0	0	3	S	-	-		-	-
л Г		Recipione Circuit Applycia	2	0	0	2	c					
2	LLLIUUS	Dasic Circuit Analysis	5	U	U	5	3	-	-		-	-
3	EEE1004	Automation	3	0	0	3	S	-	-		-	-
4	EEE1005	Electric Vehicles & Battery Technology	3	0	0	3	S	-	-		-	-
5	EEE1006	Smart Sensors for Engineering Applications	3	0	0	3	S	-	-		-	-
Electr	onics and (Communication Basket										
1	ECE1003	Fundamentals of Electronics	3	0	0	3	F	-	-		-	-
2	ECE1004	Microprocessor based systems	3	0	0	3	F	-	-		-	-
3	ECE3089	Artificial Neural Networks	3	0	0	3	S	-	-		-	-
ح ۵	ECE3097	Smart Electronics in Agriculture	ך א	0	0	ך ג	5 F/FM	-	-		-	_
т 5	ECE3097	Environment Monitoring Systems	ך א	0	0	ך א	F/EM	_	_		_	_
5	ECE2102	Concumer Electronics	ר כ	0	0	с С		-			-	-
0	ECESIUZ		С	U	U	С		-	-		-	-
7	ECE3103	Product Design of Electronic Equipment	3	0	0	3	S/F/ EM / EN	-	-		-	-
8	ECE3106	Introduction to Data Analytics	3	0	0	3	F/EM	-	-		-	-
9	ECE3107	Machine Vision for Robotics	3	0	0	3	F/EM	-	-		-	-
Enalis	sh Basket		-	-	-	-	.,					
1	ENG1008	Indian Literature	2	0	0	2	_	GS/ H	D _		-	-
2	ENG1009	Reading Advertisement	<u>ר</u>	0	0	<u>ר</u>	S	-	-		-	_
2 2	ENG1000	Verbal Antitude for Placement	2	0	2	л Г	S S	_	_		-	_
J 1	ENG1010	English for Career Development	∠ γ	0	<u>ک</u>	ך ג	5 C	_			-	_
т 5	ENG1011	Condor and Society in India	ך כ	0	0	ך כ	-	CC/ H	D _		_	_
5	ENC1012	Indian English Drama	2	0	0	2	-	63/ H			-	-
0	ENC1014	Logic and Art of Negatistian	ך ר	0	0 2	с С	-	-			-	-
/	LINGIUI4	Drefessional Communication Chille	2	U	2	5	-	-	-		-	-
8	ENG1015	for Engineers	1	0	0	1	-	-	-		-	-
DSA I	Basket			-	-		_			,		
1	DSA2001	Spirituality for Health	2	0	0	2	F	HP	-		-	-
2	DSA2002	Yoga for Health	2	0	0	2	S	HP	-		-	-
3	DSA2003	Stress Management and Well Being	2	0	0	2	F	-	-]	-	-
Kanna	ada Basket											
1	KAN1001	Kali Kannada	1	0	0	1	S	-	-		-	-
2	KAN1003	Kannada Kaipidi	3	0	0	3	S	-	-		-	-
3	KAN2001	Thili Kannada	1	0	0	1	S	-	-		-	-
4	KAN2003	Pradharshana Kale	1	0	2	2	S	-	-		-	-
5	KAN2004	Sahithya Vimarshe	2	0	0	2	S	-	-		-	-
6	KAN2005	Anuvadha Kala Sahithya	3	0	0	3	S	-	_		-	-
7	KAN2006	Vichara Manthana	2	0	0	2	S	_	_		-	_
, 8	KAN2007	Katha Sahithya Sampada	ך ר	ñ	ñ	ך ג	S S	_			_	_
9	KAN2007	Ranga Pradarshana Kala	ך א	0	0	ך ג	S	_			-	_
Foreir		e Basket	5	5	5	5	5	I				
	, ii Lunguay											

1	FRL1004	Introduction of French Language	2	0	0	2	S	S	-	-	-
2	FRL1005	Fundamentals of French	2	0	0	2	S	S	-	-	-
3	FRL1009	Mandarin Chinese for Beginners	3	0	0	3	S	S	-	-	-
law F	Basket		-	-	-	-	-	-			
1	LAW1001	Introduction to Sociology	2	0	0	0	2	F	НР	_	-
-	L/111001		-	Ŭ	Ŭ	Ŭ	-	•	HP/G		
2	LAW2001	Indian Heritage and Culture	2	0	0	0	2	F	ς ς	-	-
3	LAW2002	Introdcution to Law of Succession	2	0	0	0	2	F		-	-
4		International to Commence Low	2	_	_	0	2	-	2		
4	LAW2003	Introduction to Company Law	2	0	0	0	2		ΗΡ	-	-
5	LAW2004	Introduction to Contracts	2	0	0	2	F	НР	-	-	-
6	LAW2005	Introduction to Copy Rights Law	2	0	0	2	F	HP	-	-	-
7	LAW2006	Introduction to Criminal Law	2	0	0	2	F	HP	-	-	-
8	LAW2007	Introduction to Insurance Law	2	0	0	2	F	HP	-	-	-
9	LAW2008	Introduction to Labour Law	2	0	0	2	F	HP	-	-	-
10	LAW2009	Introduction to Law of Marriages	2	0	0	2	F	HP/GS	-	-	-
11	LAW2010	Introduction to Patent Law	2	0	0	2	F	HP	-	-	-
4.0		Introduction to Personal Income	•	~	~	~	-				
12	LAW2011	Тах	2	0	0	2	F	ΗΡ	-	-	-
13	LAW2012	Introduction to Real Estate Law	2	0	0	2	F	НР	-	_	-
14	LAW2013	Introduction to Trademark Law	2	0	0	2	F	HP	-	-	-
15		Introduction to Competition Law	2 2	0	0	2	F	HD	_	_	_
16		Cyber Law	ך כ	0	0	2					_
10	LAW2015		<u>כ</u>	0	0	2 2			-	-	-
1/	LAW2016	Law on Sexual Harrassment	2	0	0	2		HP/GS	-	-	-
18	LAW2017	Media Laws and Ethics	2	0	0	2	F	HP/GS	-	-	-
Mathe	ematics Bas	sket	_	-	-	_	-				
1	MAT2008	Mathematical Reasoning	3	0	0	3	S	-	-	-	-
2	MAT2014	Advanced Business Mathematics	3	0	0	3	S	-	-	-	-
3	MAT2041	Functions of Complex Variables	3	0	0	3	S	-	-	-	-
4	MAT2042	Probability and Random Processes	3	0	0	3	S	-	-	-	-
5	MAT2043	Elements of Number Theory	3	0	0	3	S	-	-	-	-
6	NAAT2044	Mathematical Modelling and	2	~	~	~	<u> </u>				
6	MA12044	Applications	3	0	0	3	5	-	-	-	-
Mech	anical Bask	et (not to be offered for Mechanical									
Depa	rtment stuc	lents)									
		Fundamentals of Automobile									
1	MEC1001	Engineering	3	0	0	3	F	-	-	-	-
2	MEC1002	Introduction to Matlab and Simulink	z	0	0	R	S/FM	_	_	_	_
2	MEC1002	Engineering Drawing	1	0	1	2	S/LM				_
3	MEC2001	Depoweble Epergy Systems	1 2	0	4	ン っ	5		-	-	-
4	MECZUUI	Convertience Descende 0	З	U	U	2	Г	E3	-	-	-
5	MEC2002	Operations Research &	3	0	0	3	F	-	-	-	-
		Management									
6	MEC2003	Supply Chain Management	3	0	0	3	S/ EM/	-	-	-	-
-			-	-	-	_	EN				
										MEC	
7	MEC2004	Six Sigma for Professionals	3	0	0	3	S/EM	-	-	200	-
			-							8	
0	MECOODE	Fundamentals of Aerospace	2	0	0	2	E				
0	MECZOUS	Engineering	5	U	U	5	Г	-	-	-	-
9	MEC2006	Safety Engineering	3	0	0	3	S/EM	ES	-	-	-
10	MEC2007	Additive Manufacturing	3	0	0	3	F/EM	-	-	-	-
11	MEC3069	Engineering Optimisation	3	0	0	3	S/EM	-	-	-	-
12	MEC3070	Electronics Waste Management	3	0	0	3	F/S	FS	-	_	_
13	MEC3071	Hybrid Electric Vehicle Design	े २	n	0	ך ר	S/FM	ES	_	_	-
10		Thermal Management of Electronic	5	<u>۲</u>	<u> </u>	5	5/ டா	-5			
14	MEC3072	Appliances	3	0	0	3	S/EM	-	-	-	-
		Appliances									
15	MEC3200	Sustainable rechnologies and	3	0	0	3	S/EM	-	-	-	-
10	MECODAL	Fidulices	ſ	<u> </u>	0	2					
10		industry 4.0	ک	U	U	ک	5/EM	-	-	-	-
1) of mo	Ioum Backs	+									

1	PET1011	Energy Industry Dynamics	3	0	0	3	FC	ES	-	NIL	-
2	PET1012	Energy Sustainability Practices	3	0	0	3	FC	ES	-	NIL	-
Phvsi	cs Basket										
1	PHY1003	Mechanics and Physics of Materials	3	0	0	3	FC / SD				
2	PHY1004	Astronomy	3	0	0	3	FC				
3	PHY1005	Game Physics	2	0	2	3	FC / SD				
4	PHY1006	Statistical Mechanics	2	0	0	2	FC				
5	DHV1007	Physics of Nanomaterials	2	0	0	2	FC				
5		Advonturos in nanoworld	2	0	0	2	FC				
0		Medical Devoice	2	0	0	2	FC	EC			
/			Z 1	0	0	2		L2			
8 0	PHY2002		1	0	2	2	FC / SD				
9	PHY2003	Computational Physics	1	0	2	2	FC	50			
10	PHY2004	Laser Physics	3	0	0	3	FC	ES			
11	PHY2005	Science and Technology of Energy	3	0	0	3	FC	ES			
12	PHY2009	Essentials of Physics	2	0	0	2	FC				
Mana	gement Bas	sket- I					-		-		
1	MGT2007	Digital Entrepreneurship	3	0	0	3	S/EM/E N	-	-	-	-
2	MGT2015	Engineering Economics	3	0	0	3	S	-	-	-	-
_					_		S/EM/				
3	MGT2023	People Management	3	0	0	3	EN	HP	-	-	-
Mana	gement Bag	sket- II									
1	MGT1001	Introduction to Psychology	٦	0	0	З	F	НР	-	_	_
1 2	MGT1001	Business Intelligence	2	0	0	2		-			
2	MGT1002	NCO Management	2 2	0	0	2 2		-	-	-	-
3	MGT1003		3	0	0	3		-	-	-	-
4	MG11004	Essentials of Leadership	3	0	0	3	EM/EN	GS/ HP	-	-	-
5	MGT1005	Cross Cultural Communication	3	0	0	3	S/EM/ EN	HP	-	-	-
6	MGT2001	Business Analytics	3	0	0	3	S/ EM/EN	-	-	-	-
7	MGT2002	Organizational Behaviour	3	0	0	3	F	НР	-	_	-
, 8	MGT2003	Competitive Intelligence	3	0	0	3	S	-	-	_	-
9	MGT2004	Development of Enterprises	3	0	0	3	S/EM/E	-	-	-	-
-	MOTOOF		-	-	-	-	N				
10	MG12005	Economics and Cost Estimation	3	0	0	3	S/EM	-	-	-	-
11	MG12006	Decision Making Under Uncertainty	3	0	0	3	S	-	-	-	-
12	MGT2008	Econometrics for Managers	3	0	0	3	S	-	-	-	-
13	MGT2009	Management Consulting	3	0	0	3	S/EM/E N	-	-	-	-
14	MCT2010	Managing Roople and Porfermance	2	0	0	2	S/EM/E		_	_	_
14	11012010		5	0	0	5	N	117/05	_		_
15	MGT2011	Personal Finance	3	0	0	3	F	-	-	-	-
16	MGT2012	E Business for Management	3	0	0	3	S/EM	-	-	-	-
17	MGT2013	Project Management	3	0	0	3	EN / EM	GS/HP/ ES	-	-	-
18	MGT2014	Project Finance	3	0	0	3	EN /	HP	_	-	-
10	MCT2016	Pusiness of Entertainment	2	0	0	2					
12	01012010		2	U	U	S		-	-	-	-
20	MGT2017	Principles of Management	3	0	0	3	S/EM/ EN	-	-	-	-
21	MGT2018	Professional and Business Ethics	3	0	0	3	S/EM/ EN	HP	-	-	-
22	MGT2019	Sales Techniques	3	0	0	3	S/EM/ EN	HP	-	-	-
23	MGT2020	Marketing for Engineers	3	0	0	3	S/EM/ EN	HP	-	-	-
24	MGT2021	Finance for Engineers	3	0	0	3	S/EM/ EN	HP	-	-	-
25	MGT2022	Customer Relationship Management	3	0	0	3	S/EM/	HP	-	-	-
Media	Studios Ba		\vdash	I	I	I			1		

1	BAJ3050	Corporate Filmmaking and Film Business	0	0	4	2	EM	HP	-	-	-
2	BAJ3051	Digital Photography	2	0	2	3	EM	HP	-	-	-
3	BAJ3055	Introduction to News Anchoring and News Management	0	0	2	1	EM	-	-	-	-

21.List of MOOC (NPTEL) Courses

21.1 NPTEL - Discipline Elective Courses for B. Tech. (Computer Science Engineering)

SI. No.	Course ID	Course Name	Duration
1	noc25-cs22	Deep Learning for Natural Language Processing	12 Weeks
2	noc25-cs49	Machine Learning for Engineering and Science Applications	12 Weeks
3	noc25-cs06	Algorithms in Compuatational Biology and Sequence Analysis	12 Weeks
4	noc25-cs45	Introduction to Large Language Models (LLMs)	12 Weeks
5	noc25-cs61	Quantum Algorithms and Cryptography	12 Weeks

21.2 NPTEL - Open Elective Courses for B. Tech. (Computer Science and Engineering)

S1. No.	Course ID	Course Name	Duration
1	BBA2022	Supply Chain digitization	12 Weeks
2	BBA2021	E Business	12 Weeks
3	BBB2016	Business Analytics for Management Decisions	12 Weeks
4	BBB2015	Artifcial Intelligence for Investments	12 Weeks

The following Open-Elective courses are not to be offered for Computer Science and Engineering students and Allied Branches.
SI. No	Course Code	Course Name	Total Credits	L-T-P-C
1	CSE3111	Artificial Intelligence : Search Methods For Problem Solving	3	3-0-0-3
2	CSE3112	Privacy And Security In Online Social Media	3	3-0-0-3
3	CSE3113	Computational Complexity	3	3-0-0-3
4	CSE3114	Deep Learning for Computer Vision	3	3-0-0-3
5	CSE3115	Learning Analytics Tools	3	3-0-0-3
6	CSE502	Technical Skills in JAVA	3	0-0-6-3
7	CSE503	Technical Skills in Python	3	0-0-6-3
8	CSE504	Comprehensive Technical Skills	5	0-0-10-5
9	CSE505	The Joy Of Computing Using Python	3	3-0-0-3
10	CSE3119	Coding Skills in Python	3	3-0-0-3
11	CSE3121	Parallel Computer Architecture	3	3-0-0-3
12	CSE3124	Games and Information	3	3-0-0-3
13	CSE3140	Introduction To Industry 4.0 And Industrial Internet Of Things	3	3-0-0-3
14	CSE3142	Affective Computing	3	3-0-0-3
15	CSE3112	Privacy and Security in Online Social Media	3	3-0-0-3
16	CSE3196	Foundations of Cyber Physical Systems	3	3-0-0-3
17	CSE3197	Getting Started with Competitive Programming	3	3-0-0-3
18	CSE3198	GPU Architectures And Programming	3	3-0-0-3
19	CSE3199	Artificial Intelligence: Knowledge Representation And Reasoning	3	3-0-0-3
20	CSE3200	Programming in Modern C++	3	3-0-0-3
21	CSE3201	Circuit Complexity Theory	3	3-0-0-3
22	CSE3202	Basics of Computational Complexity	3	3-0-0-3
23	CSE3212	ion to Computer and Network Performance Analysis Using Queuing	1	1-0-0-1
24	CSE3213	C Programming And Assembly Language	1	1-0-0-1
25	CSE3214	Python For Data Science	1	1-0-0-1
26	CSE3215	Software Conceptual Design	1	1-0-0-1
27	CSE3117	Industrial Digital Transformation	3	3-0-0-3
28	CSE3118	Blockchain for Decision Makers	3	3-0-0-3
29	CSE3349	Technology for Lawyers	3	3-0-0-3
30	CSEXXXX	Deep Learning for Natural Language Processing	3	3-0-0-3
31	CSEXXXX	Machine Learning for Engineering and science applications	3	3-0-0-3
32	CSEXXXX	Algorithms in Computational Biology and Sequence Analysis	3	3-0-0-3
33	CSEXXXX	Introduction to Large Language Models (LLMs)	3	3-0-0-3
34	CSEXXXX	Quantum Algorithms and Cryptography	3	3-0-0-3

22. Recommended Semester Wise Course Structure / Flow including the Programme / Discipline Elective Paths / Options

	Semester 1													
	COURCE				ST	CRE RU	EDIT CTURE		ТҮРЕ	COURSE				
S. NO	CODRSE	COURSE NAME	L	Т	Ρ	С	CONTACT HOURS	BASKET	OF SKILL	ADDRESSES TO				
1.	MAT1001	Calculus and Linear Algebra	3	0	2	4	5	School Core						
2.	CSE1001	Problem Solving using JAVA	2	0	2	3	4	School Core						
3.	ECE1001	Elements of Electronics Engineering	3	0	2	4	5	School Core						
4.	ENG1001/ ENG1002	Foundational English/ Technical English	1	0	2	2	3	School Core						
5.	xxxxxx	Open Elective – I	3	0	0	3	3	Open Elective						

6.	PPS1001	Introduction to soft skills	0	0	2	1	2	School Core	
7.	CSE1002	Innovative Projects - Arduino using embedded 'C'	0	0	4	2	4	School Core	
		TOTAL	12	0	14	19	26		-

			5	Se	m	est	er 2			
					(CRI	EDIT			
S. NO	COURSE CODE	COURSE NAME	L	Т	ST P	RU C	CTURE CONTACT HOURS	BASKET	TYPE OF SKILL	COURSE ADDRESSES TO
1.	MAT1002	Transform Techniques, Partial Differential Equations and Their Applications	3	0	0	3	3	School Core		
2.	MAT1003	Applied Statistics	1	0	2	2	3	School Core		
3.	CSE2001	Data Structures and Algorithms	3	0	2	4	5	School Core		
4.	CSE2018	Theory of Computation	3	0	0	3	3	Program Core		
5.	CSE2014	Software Engineering	3	0	0	3	3	Program Core		
6.	XXX XXXX	Open Elective – II	3	0	0	3	3	Open Elective		
7.	ENG1002/ ENG2001	Technical English/ Advanced English	1	0	2	2	3	School Core		
8.	CHE1001	Environmental Studies	2	0	0	0	2	School Core		-
9.	PHY1002	Optoelectronics and device Physics	2	0	2	3	4	School Core		
10.	KAN1001/ KAN2001	Kali Kannada / Thili Kannada	1	0	0	1	1	School Core		
11.	PPS1002	Soft skills for Engineers	0	0	2	1	2	School Core		
		TOTAL	22	0	10	25	32			

	Semester 3												
	COURSE				ST	CR RU	EDIT CTURE		ТҮРЕ	COURSE			
S. NO.	CODE	COURSE NAME	L	Т	Ρ	С	CONTACT HOURS	BASKET	OF SKILL	ADDRESSES TO			
1.	CSE2009	Computer Organization and Architecture	3	0	0	3	3	Program Core					

2.	CSE2011	Data Communications and Computer Networks	3	0	0	3	3	Program Core	
3.	MAT2004	Discrete Mathematical Structures	3	0	0	3	3	Program Core	
4.	CSE2027	Fundamentals of Data Analytics	3	0	0	3	3	Program Core	
5.	ECE2007	Digital Design	2	0	2	3	4	Program Core	
6.	CSE2074	Database Management Systems	3	0	0	3	3	Program Core	
7.	PPS2001	Reasoning and Employment Skills	0	0	2	1	2	School Core	
8.	CSE 1003	Innovation Project - Raspberry Pi using Python	0	0	4	2	4	School Core	-
9.		TOTAL	17	0	8	21	25		

	Semester 4													
	COURSE						CRI RU	EDIT CTURE		ТҮРЕ	COURSE			
s.	NO.	CODRSE	COURSE NAME	L	т	Ρ	С	CONTACT HOURS	BASKET	OF SKILL	ADDRESSES TO			
	1.	MAT2003	Numerical Methods for Engineers	1	0	2	2	3	School Core					
	2.	CSE2007	Design and Analysis of Algorithms	3	0	0	3	3	Program Core					
	3.	CSE3001	Artificial Intelligence and Machine Learning	2	0	2	3	4	Program Core					
	4.	CSE2015	Data Analysis and Visualization	2	0	4	4	6	Program Core					
	5.	CSE3146	Advanced Java Programming	1	0	4	3	5	Program Core					
	6.	CSE2010	Operating Systems	3	0	0	3	3	Program Core					
	7.	CSEXXXX	Discipline Elective – I	3	0	0	3	3	Discipline Elective					
	8.	PPS2002	Being Corporate Ready	0	0	2	1	2	School Core		-			
	9.		TOTAL	15	0	14	22	29						

	Semester 5												
	COURSE			S	ST	CRI RU	EDIT CTURE		ТҮРЕ	COURSE			
S. NO.	S. NO. COURSE COURSE NAME		L	Т	Ρ	С	CONTACT HOURS	BASKET	OF SKILL	ADDRESSES TO			
1.	ECE3075	IoT: Architecture and Protocols	3	0	0	3	3	Program Core					
2.	CSE2056	Web 2.0	2	0	2	3	4	Program Core					

3.	CSE2052	Distributed Systems	3	0	0	3	3	Program Core	
4.	CSEXXXX	Discipline Elective – II	3	0	0	3	3	Discipline Elective	
5.	CSEXXXX	Discipline Elective – III	3	0	0	3	3	Discipline Elective	
6.	CSEXXXX	Discipline Elective – IV	3	0	0	3	3	Discipline Elective	
7.	xxxxxx	Open Elective-III (Management Basket)	3	0	0	3	3	Open Elective	
8.	PPS4002	Introduction to Aptitude	0	0	2	1	2	School Core	-
9.		TOTAL	20	0	4	22	24		

	Semester 6												
	COURCE			:	ST	CRI RU	EDIT CTURE		ТҮРЕ	COURSE			
S. NO	CODE COURSE NAME	L	т	Ρ	С	CONTACT HOURS	BASKET	OF SKILL	ADDRESSES TO				
1.	CSE3343	Cloud Computing	3	0	0	3	4	Program Core					
2.	ECE3076	IoT Platforms and Application Development	3	0	0	3	3	Program Core					
3.	CSE3081	Digital Image Processing	2	0	2	3	4	Program Core					
4.	CSE3078	Cryptography and Network Security	3	0	0	3	3	Program Core					
5.	CSEXXXX	Discipline Elective – V	3	0	0	3	3	Discipline Elective					
6.	CSEXXXX	Discipline Elective – VI	3	0	0	3	3	Discipline Elective					
7.	CSEXXXX	Discipline Elective – VII	3	0	0	3	3	Discipline Elective					
8.	CSE3119	Coding Skills in Python	2	0	2	3	4	Open Elective		-			
9.	PPS4005	Aptitude for Employability	0	0	2	1	2	School Core					
10.	PIP1001	Apprenticeship	0	0	0	0	0	School Core					
11.		TOTAL	21	0	8	25	29						

	Semester 7												
COURSE				Ś	ST	CR RU	EDIT CTURE		ТҮРЕ	COURSE			
S. NO.	CODE	COURSE NAME	L	т	Ρ	С	CONTACT HOURS	BASKET	OF SKILL	ADDRESSES TO			
1.	CSEXXXX	Discipline Elective – VIII	3	0	0	3	3	Discipline Elective					
2.	CSEXXXX	Discipline Elective – IX	3	0	0	3	3	Discipline Elective					

3.	CSEXXXX	Discipline Elective – X	3	0	0	3	3	Discipline Elective	
4.	PIP2001	Capstone Project	-	0	-	4	4	School Core	
5.	XXX XXXX	Open Elective-V (Management Basket)	3	0	0	3	3	Open Elective	
6.	PPS3018	Preparedness for Interview	0	0	2	1	2	School Core	
7.	XXXXXXX	Open Elective-VI**	-	-	-	1	-	Open Elective	
8.		TOTAL	12	0	2	18	18		-
Stu	idents who ł registrat	nave not earned the 15 crection and completion of the (dits Op	of en	f O i Ele	pen ectiv	Elective until /e VI course u	6th semester are eli nder NPTEL MOOC	gible towards the Swayam

	Semester 8											
	COURSE		CREDIT STRUCTURE			ТҮРЕ	COURSE					
S. NO.	CODE	COURSE NAME	L	Т	Ρ	С	CONTACT HOURS	BASKET	OF SKILL	ADDRESSES TO		
1.	PIP4004	Internship	-		-	9		School Core				
		TOTAL				9						

Open Elective-VI**

Students who have not earned the 15 credits of Open Elective until 7th semester are eligible towards the registration and completion of the Open Elective VI course under NPTEL MOOC Swayam

23. Course Catalogue

Course Catalogue of all Courses Listed including the Courses Offered by other School / Department and Discipline / Programme Electives – Course Code, Course Name, Prerequisite, Anti-requisite, Course Description, Course Outcome, Course Content (with Blooms Level, CO, No. of Contact Hours), Reference Resources.

Course Catalogues:

Each course shall have a course catalogue with the following details:

- i) Pre-Requisites of the course
- ii) Course Description
- iii) Course Outcome
- iv) Course Content
- iv) Reference Resources.

The Course Catalogues for the Courses offered in each basket are attached below:

Course Code: CSE 2007	Course Title: Data Struct Type of Course: Integrate	tures and Algor. d	ithms	L- T-P- C	3	0	2	4			
Version No.	1.0				1 1						
Course Pre- requisites	Problem Solving Using	Java									
Anti-requisites	NIL										
Course Description	This course introduces emphasize the importa technique for program d which emphasizes on un structures using Java pr fundamental concepts implementing them, the software applications.	nhas course introduces the fundamental concepts of data structures and to nphasize the importance of choosing an appropriate data structure and chnique for program development. This course has theory and lab component hich emphasizes on understanding the implementation and applications of data ructures using Java programming language. With a good knowledge in the ndamental concepts of data structures and practical experience in plementing them, the student can be an effective designer, developer for new oftware applications.									
Course Objective	The objective of the cours Structures and Algorithms techniques.	ne objective of the course is to familiarize the learners with the concepts of Data cructures and Algorithms and attain Skill Development through Experiential Learning chniques.									
Course Out C omes	 On successful completion of the course the students shall be able to: CO1: Implement program for given problems using fundamentals of data structures. [Application] CO2: Apply an appropriate linear data structure for a given scenarios. [Application] CO3: Apply an appropriate non-linear data structure for a given scenarios. [Application] CO4: Explain the performance analysis of given searching and sorting algorithms. 										
Course Content:											
Module 1	Introduction to Data Structure and Linear Data Structure – Stacks and Queues	Assignment	Program act	ivity			18	Sessions			
Introduction – Introduction to Data Structures, Types and concept of Arrays. Stack - Concepts and representation, Stack operations, stack implementation using array and Applications of Stack. Queues - Representation of queue, Queue Operations, Queue implementation using array, Types of Queue and Applications of Queue.											

-		-		
	Linear Data			

	Linear Data			
Module 2	Structure- Linked List	Assignment	Program activity	17 Sessions

Topics: Linked List - Singly Linked List, Operation on linear list using singly linked storage structures, Circular List, Applications of Linked list.

Recursion - Recursive Definition and Processes, Programming examples.

Module 3	Non-linear Data Structures - Trees and Graph	Assignment	Program activity	15 Sessions					
Topics: Trees - Introduction to Trees, Binary tree: Terminology and Properties, Use of Doubly									
Linked List, Binary tree traversals: Pre-Order traversal, In-Order traversal, Post - Order traversal.									
Graph - Basic Concept of Graph Theory and its Properties, Representation of Graphs.									

	Searching & Sorting							
Module 4	Performance	Assignment	Program activity	14sessions				
	Analysis							
Topic: Sorting &	Searching - Sequer	ntial and Binary Sea	arch, Sorting - Sel	ection and Insertion				
sort.								
Performance Ana	lysis - Time and spa	ace analysis of algo	rithms - Average,	best and worst case				
analysis.								
List of Laboratory Ta	isks:							
Lab sheet -1								
Level 1: Prompt the	user, read input and	print messages.Progr	ams using class, met	hods and objects				
Level 2: Programmir	ng Exercises on funda	mental Data structure	e - Arrays based on S	Scenario.				
Lab sheet -2								
Level 1: Programm	ing Exercises on Sta	ick and its operation	ns					
Level 2: Programm	ing Exercises on Sta	ack and its operation	ons with condition					
Lab sheet -3								
Level 1: Programming on Stack application infix to postfix Conversion								
Level 2: -		-						
Lab sheet -4								
Level 1: Programm	ning Exercises on Q	ueues and its opera	tions with condition	ons				
Level 2: -	C C	1						
Lab sheet -5								
Level 1: Program	ming Exercises on I	Linked list and its or	perations.					
Level 2: Programn	ning Exercises on L	inked list and its op	erations with vario	us positions				
Lab sheet -6				F				
Level 1: -								
Level 2: Program	ming scenario hased	application using I	inked List					
Lab sheet -7	lining section oused	application using I						
Level 1: Program	ming Exercises on f	actorial of a number	r					
Level 2: Program	ming the tower of H	anoi using recursion	n					
Lab sheet -8	thing the tower of H		1					
Level 1 Lovel 2: Program	ming the tower of F	Janoi using recursio	n					
Level 2. 110gram		failor using recursio	11					
Lawel 1: Program	ming Evercise on C	oubly linked list an	d its operations					
Level 1. Flogram	inning Exercise on L	oubly miked list an	u its operations					
Lever Z								
Lau Sheet -10	n to Construct Pino	w Soorah Troo and (Graph					
Level 1. Flogran	n to traverse the Pin	y Search Tree and V	Jiapii Thraa waxa (in arda)	r pro order and				
Level 2: Flogial	n to traverse the Dill	ary Search free mit	inee ways(in-order	i, pre-order and				
post-order) and mig	plement BFS and Di	rs						
		Linear Coardh & Die	owy Coord					
Level 1: Program	n to implement the I	Linear Search & Bil	hary Search					
Level 2: Program	n to Estimate the 11	me complexity of L	inear Search					
Lab sheet -12			1					
Level 1: Program	to Implement and	Estimate the Time of	complexity of Inser	tion Sort				
Level 2: Program	to Implement and	Estimate the Time c	omplexity of Inser	tion Sort				
Lab sheet -13		1 1 1 1 1	1					
Level 1: Program	n to Implement and	Estimate the Time	complexity of Sele	ection Sort				
Level 2: Program	to Implement and	Estimate the Time	complexity of Sele	ction Sort				
Targeted Application	n & Tools that can be	used						
Use of PowerPoint so	oftware for lecture slid	des and use of Ubuntu	tor lab programs to	execute. Tool is				
Codetantra tool.								
	Pro	ject work/Assignme	nu					

Assignment: Students should complete the lab programs by end of each practical session and module wise assignments before the deadline.

Text Book

T1 Narasimha Karumanchi: "*Data Structures and Algorithms Made Easy in Java*", 5th Edition, CareerMonk Publications, 2017.

References

R1 Mark Allen Weiss: "*Data Structures and Algorithm Analysis in Java*", 4th Edition, Pearson Educational Limited, 2014.

R2 Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser: "Data Structures and Algorithms in Java", 6th Edition, John Wiley & Sons, Inc., ISBN: 978-1-118-77133-4, 2014.

R3 Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, 2017: *"Introduction to Algorithms"*, 3rd Edition, PHI Learning Private Limited.

Web resources:

- 1. For theory: <u>https://onlinecourses.nptel.ac.in/noc20_cs85/preview</u>
- 2. For Lab : codetantra tool
- 3. <u>https://puniversity.informaticsglobal.com/login</u>

Topics relevant to "SKILL DEVELOPMENT": Llinked list and its type, Tree traversal and hashing tables for Skill Development through Experiential Learning techniques. This is attained through the assessment component mentioned in the course handout.

Course Code:	Course Title: Principles of Art	tificial Intelligence	L- T-P-	3	0	0	3					
CJLZZO	Type of Course: Theory Only		С	5	0	U	5					
Version No												
Course Pre-	Mathematics: Logic 4	Algebra Probability										
requisites	Formal Languages	ingebru, i robubility										
requisites												
Anti-requisites	NIL											
Course	This Course will introduce	the basic principles	s in artif	icial	intel	ligen	ice. It					
Description	will cover representation sci	hemes, problem sol	lving par	adigi	ms, c	const	traint					
	Reasoning	gles, kilowieuge ie	presenta	ation	, FIC	Duau	msuc					
	Topics include: AI method	lology and fundan	nentals,	intel	liger	nt ag	gents,					
	search algorithms, game pl	aying, supervised a	and unsi	aperv	vised	lear	ning,					
	uncertainty and probabil	ity theory, proba	bilistic	reas	onin	g ir	ı AI,					
	Bayesian networks, statisti	cal learning.										
	The chiective of the course i	s to familiariza tha l			ho o	-	nte of					
Course	Dringiples of Artificial Intelli	s to raminarize the r				UNCE	pis of					
Objective		sence and attain Si	NILL DEV	ELUP		i ui	rougn					
Course	On successful completion of t	ARTICIPATIVE LEARNING techniques										
Outcomos	1 Explain the basic conc	sonts of Artificial Into		ean	e to.							
Outcomes	2 Apply techniques logi	c rules for Knowledge	a Poprose	ntati	ion							
	2. Apply techniques logi	tonce techniques for	soloctod	nroh	lom d	olvin	ur l					
	Apply Artificial Intellig	sence techniques for	Selected	pion	iem :		ıg٠					
Course Content:												
	Introduction to Artificial											
Module 1	Intelligence and Knowledge	Comprehension			9	Sessi	ons					
	based systems											
Introduction to A	rtificial Intelligence, Definition	ns, foundation, Histo	ory and A	pplic	atior	ns; Ag	gents:					
Structure of Inte	elligent agent and its function	ons, reactive agents	s, deliber	ative	age	ents,	goal-					
driven agents,	utility-driven agents, and	learning agents;	Introduct	ion	to I	۲now	ledge					
representation, a	pproaches and issues in know	vledge representatio	n, found	ation	s of I	know	ledge					
representation a	nd reasoning, representing a	and reasoning abou	it objects	s, rel	atior	is, ev	vents,					
actions, time, and	d space, Knowledge-based age	ent and its Structure	e, Knowle	dge-	Base	d Sys	tems;					
Frame Structures	, Conceptual graphs.											
Module 2	Logic based Knowledge Representation	Application			9	Sessi	ons					
Introduction, Syr	ntax and Semantics, Proof	Systems, Natural D	eduction	, Tal	bleau	i Me	ethod,					
Resolution Metho	od, Propositional Logic, Predi	cate Logic, First ord	ler Logic,	Prop	pertie	es of	well-					
formed formulas	(Wffs), Conversion to Clausal	Form, The Resolution	n Princip	le, In	ferer	nce ir	n First					
Order Logic (FOL)		1										
Module 3	Problem Solving by searching	Application			12	Sess	ions					
Introduction to P	roblem space and state space	, State space search	techniqu	es sc	lving	g pro	blems					
by searching: for	ward and backward, state-space	ce, blind, heuristic, pi	roblem-re	educt	ion, /	۹, A*	, AO*,					
minimax, constra	int propagation, neural, stoch	astic, and evolutiona	ry search	n algo	orithr	ns, sa	ample					
applications, Intro	oduction to reasoning, various	types of reasoning m	nethods, (Certa	inty f	acto	rs and					
rule-based systen	ns Dempster Shafer Theory.											
Module 4	Learning and Probabilistic	Application			10) Sess	sions					
Introduction to le	arning Forms of Learning Stat	istical learning Supe	rvisedles	rning	J J In	SUDA	rvised					
Learning Learnin	g rules of Al Prohabilistic rea	isoning in Al Ravesi	an netwo	nrks I	Hidda	n M	arkov					
Model.				,								

Targeted Application & Tools that can be used: Google Colab, Python

Text Book

1. Stuart J. Russell and Peter Norvig, Artificial intelligence: A Modern Approach, 3rd edition, Upper Saddle River, Prentice Hall.

 Elaine Rich, Kevin Knight and ShivashankarB.Nair, "Artificial Intelligence", TataMcGraw-Hill, Third Edition, 2009[R.N.].

References

1. N J Nilsson (1997). Artificial Intelligence- A new synthesis, Elsevier Publications.

2. N J Nilsson (1982). Principles of Artificial Intelligence, Springer.

Patterson, D. W. (1990). Introduction to artificial intelligence and expert systems. Englewood Cliffs, Prentice Hall.

4. Luger, G. F. (2002). Artificial intelligence: Structures and strategies for complex problem solving, Harlow, Pearson Education.

E-Resources

https://puuniversity.informaticsglobal.com

Topics relevant to "SKILL DEVELOPMENT": Knowledge Based Systems, Probabilistic reasoning in AI, Bayesian networks, Hidden Markov Model for Skill Development through Participative Learning techniques. This is attained through the assessment component mentioned in the course handout.

Γ	r				1		r
Course Code:	Course Title: Introduction to D	Data	L-T-P-	0	0	0	2
CSE 260	Science Lab		С				
	Type of Course: Program Core						
Version No	1.0						
Course Pre- requisites	Fundamentals of DS						
course rice requisites	rundamentals of D5						
Anti-requisites	NIL						
Course Description	Objective of this course is to make	students	s learn t	he ba	sics o	of M	lachine Learning
	and data science are transform	ning eng	gineerin	g, h	ealth	care	and scientific
	discovery. In this class we are goir	ng to dis	cuss hov	w to	use d	lata	to build models
	for prediction and inference. W	Ve put	a speci	al er	npha	sis	on engineering
	applications, signal prediction and	modelin	ıg.				
Course Objectives	The objective of the course is to	familiari	ze the I	earn	ers w	/ith	the concepts of
	Introduction to Data Science L	ana ana	attain	SKII	De	veio	pment through
	experiential Learning techniques.						
Course Out Comes	1. To understand the python	libraries	for dat	a scie	ence		
	2. To understand the basic St	tatistical	and Pro	babi	lity m	ieas	ures for data
	science.						
	3. To learn descriptive analyt	tics on th	e bench	marl	k data	a set	ts.
	4. To apply correlation and re	egressio	n analyt	ics or	n star	ndar	d data sets.
	5. To present and interpret d	lata usin	g visuali	zatio	n pao	ckag	es in Python.
Course Content:	On successful completion of the	course th	ne stude	ents s	hall k	be al	ole to:
	CO1: Make use of the python libr	raries for	data sc	ience	5		. (
	CO2: Make use of the basic Statis	stical and	l Probat	oility	meas	ures	s for data
	Science. Lab Manual	cc on the	honchr	nark	data	coto	
	CO3: Perform correlation and rec	ression	analytic	11d1 K	uala	Sets	, data sets
	CS3361 Data Science Laboratory	51051011	unurytic	5 011 3	stante	uru	
	CO5: Present and interpret data	using vis	ualizatio	n pa	ckage	es in	Python.
List of Free order on to	Quiz	Kn	owled	ge ba	ised		No. of
List of Experiments		qu	iz on				Classes:
1. Download, install and	explore the features of NumPy, Sc	iPy, Jupy	ter, Stat	tsmo	dels a	and	Pandas
packages.							
2. Working with Numpy	arrays						
3. Working with Pandas	data frames						
4. Reading data from tex	t files, Excel and the web and expl	oring var	ious cor	nma	nds f	or de	oing descriptive
analytics on the Iris data	set. CS3361 Data Science Laborato	Dry Instaa da					the fellowing.
5. Use the diabetes data	set from OCI and Pima Indians Dia	ibetes da	ta set to	or pei	norn viatio	nng n ci	the following:
Kurtosis		anance, s	stanual	ם שפו	natio	11, 31	NEWTIESS dilu
b. Bivariate analysis: Lin	ear and logistic regression modelin	g					
c. Multiple Regression a	nalvsis	0					
d. Also compare the resu	ults of the above analysis for the tw	vo data s	ets.				

6. Apply and explore various plotting functions on UCI data sets.

a. Normal curves

b. Density and contour plots

c. Correlation and scatter plots

d. Histograms CS3361 Data Science Laboratory Lab Manual

e. Three dimensional plotting

7. Visualizing Geographic Data with Basemap

Targeted Application & Tools that can be used:

- 1. AUTODESK SKETCHBOOK V8.4.3
- 2. AFFINITY PHOTO v 1.9
- 3. AFFINITY DESIGNER v 1.9
- 4. AFFINITY PUBLISHER v 1.9

Project work/Assignment:

Textbook(s):

1. <u>Chris Solarski</u>, "Drawing Basics and Video Game Art: Classic to Cutting-Edge Art Techniques for Winning Video Game Design", Watson Guptill Publications.

2. Marc Taro Holmes, "Designing Creatures and Characters: How to Build an Artist's Portfolio for Video Games, Film, Animation and More", Impact Books.

Web-Resources

1. NPTEL Course

https://iitm.talentsprint.com/adsmi/mobile/?utm_source=googlesearch&utm_medium=tcpa &utm_campaign=ts-googlesearch-iitm-adsmi-tcpa-ds-trainingcertifications&utm_content=pg-in-applied-data-

science&utm_term=Data%20science%20course&gclid=Ci0KCQiA2-

2eBhClARIsAGLQ2RmJTkYGvtgbA1Xx9NLGFHwRL3JQ3OdgDGXr7prF0hw4pMM8UWi3x_kaAj zHEALw_wcB

2. Coursera course

https://www.coursera.org/professional-certificates/ibm-data-science

References:

Topics relevant to "SKILL DEVELOPMENT":

Data Visualization techniques for **Skill developmen**t through **Experiential Learning techniques.** This is attained through the assessment component mentioned in the course handout.

Course Code:	Course Title: S	ocial Media A	nalytics	L- T-P-	2	0	2		3	
CSE 3039	Type of Course:	Integrated		С						
Version No.	1.0									
Course Pre-	Python Pr	rogramming								
requisites										
Anti-requisites										
Course Description	This course will i It focuses on obt text from social j data mining conc media. Students textual data from	introduce conce aining and expl platforms. Stud epts to a domain will learn to e existing social	pts and ap loring tho ents will n that will explore, r platform	pproaches se data, n learn how l likely be nodel, an s.	to n ninir to a fam d pr	ninin ng n appl iliar edic	ng soci etwork y previ to all c ct with	al me s, an ousl of the nety	edia data. d mining y learned m: social work and	
Course	The objective of t	he course is to f	amiliarize	the learne	ers w	ith 1	the con	cepts	of Social	
Objective	Media Analytics a	nd attain Employ	/ability th	rough Expe	erien	tial	Learnin	g tec	hniques.	
Course Out Comes	Course Out Comes On successful completion of the course the students shall be able to: Introduce the idea of social media analytics to the students and assist them in comprehending its importance. Introduce the learners to the social media analytics tools. Give the students the tools they need to learn how to analyse the efficiency of social media for business. 									
Course Content:	Introduction to									
Module 1	Introduction to Social Media Analytics	Assignment	Data Col	lection/Int	terpr	etat	ion	10	Sessions	
Introduction to	Social Media An	alvtics (SMA)	Social n	nedia land	scar	e. N	leed fo	r SM	IA: SMA	
in Small organiza	ations; SMA in la	rge organization	ns; Applie	cation of S	SMA	in	differer	nt are	eas.	
Network funda	mentals and m	nodels: The so	ocial netv	works pei	rspec	ctive	e - no	des,	ties and	
influencers, Socia	al network and we	eb data and met	hods. Gra	aphs and I	Matr	ices	- Basic	mea	sures for	
individuals and n	etworks. Informa	tion visualizatio	on	-						
Module 2	Making connections: & Web analytics tools:	Case studies / Case let	Case	studies / (Case	let		10	Sessions	
Making connect	ions: Link analys	sis. Random gra	phs and r	network ev	volut	ion	. Social	con	texts:	
Affiliation and id	entity.	C								
Web analytics to	ools: Clickstream	analysis, A/B t	esting, on	line surve	eys, '	Weł	o crawli	ing a	nd	
Indexing. Natural	l Language Proce	ssing Techniqu	es for Mi	cro-text A	naly	sis				
Module 3	Network Data Analytics:	Quiz	Case	studies / O	Case	let		11	Sessions	
Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Post- performance on Social Network. Social campaigns. Measuring and Analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis. (LinkedIn Instagram YouTube Twitter etc. Google analytics Introduction (Websites)										
Module 4	Processing a Visualizing Data	nd Quiz	Case s	tudies / C	ase l	et	08 9	Sessi	ons	
Processing and Classification, A Programming, Co	Processing and Visualizing Data, Influence Maximization, Link Prediction, Collective Classification, Applications in Advertising and Game Analytics Introduction to Python Programming, Collecting and analyzing social media data; visualization and exploration.									

Practical: Students should analyze the social media of any ongoing campaigns and present the findings.

Project work/Assignment:

Assignment on: Types of Data, Data Transfer, Fundamental Twitter Terminology

Text Book

T1 Mathew A. Russell, "*Mining the Social Web*", O'Reilly, 3rd Edition, 2019.

T2 Marco Bonzanini, "Mastering Social Media Mining with Python", PacktPub, 2016 References

R1 Michal Krystyanczuk and Siddhartha Chatterjee, "Python Social Media Analytics", Packt Publishing, 2017

R2 Sponder, M "Social media analytics: Effective tools for building, interpreting, and using metrics". McGraw Hill Professional.

E book link R1:

E book link R2

Web resources:

- https://www.coursera.org/learn/social-media-data-analytics a.
- https://www.udemy.com/course/introduction-to-social-analytics/ b.
- https://onlinecourses.nptel.ac.in/noc21_cs28 c.
- https://research.facebook.com/publications/realtime-data-processing-at-facebook/ d.

Weblinks:

- 1. https://www.coursera.org/learn/social-media-analytics-introduction
- 2. https://academy.guintly.com/courses/free-social-media-analytics
- 3. https://presidencyuniversity.in/facility/library/

Topics relevant to "EMPLOYABILITY SKILLS":

Handling Unstrucuted Data for Employability skills through Experiential Learning techniques. This is attained through the assessment component mentioned in the course handout.

Course Code: CSE 3035	Course Title: R Programming For Data Science Type of Course: Integrated	L- T-P- C	1	0	4	3
Version No.	1		1			
Course Pre- requisites	NIL					
Anti-requisites	NIL					
Course Description Course Objective	This course is designed to provide the core concept environment. Initially train them with basic R, then pro- as they move along in the course, capping with adv studies. Mastering the core concepts and techniques of students to apply their knowledge to a wide range of Dat- one of the most popular analytics tools in the world. The objective of the course is to familiarize the lear Programming For Data Science and attain Skill Dev Learning techniques.	ots of da gressivel anced te data anal a Analyti arners w elopmen	ata y ind chni ytics cs. I ith t th	anal crea ique s in R is the rou	ytics in se the di es throu R, will I now cor concep gh Expe	the R fficulty gh case help the nsidered ts of R eriential
	On successful completion of this course the students s	shall be a	ble	to:		l data
Course Out Comes	 Арріу basic к functions pertai analysis. [Application] Interpret data using methods [Application] 	appro	pria	und te	amenta st	i data atistical

	Demon dataset.	strate the Application]	decisio	on trees	concept	with	the	given			
	• Demon Text.	[Applicatior	ıvının 1]	g conce	JIS IOI	both	Dala	anu			
Course Content:											
Module 1	Introduction	Assignment	Dat	ta Collectio	n/Interpre	etation	6 Ses	ssions			
Topics:											
Introduction to F	R, Overview of data analy	sis, Working w	ith dir	ectory in R	, Loading	and har	ndling d	lata in			
R, Data Visualiza	tion with ggplot2, Data T	ransformation	with o	dplyr.							
Module 2	Exploratory Data Analysis	Coding Assignment		Cas	e Study		11 Ses	ssions			
Topics:	- /						1				
Exploring a new	dataset, Anomalies in nu	merical data, \	/isuali	zing relatio	ons betwe	en varia	ables,				
Assumptions of	Linear Regression, Valida	ting Linear Ass	umpti	on, Missing	g Values, (Covariat	tion,				
Patterns and Models, gglot2 Calls.											
		Coding									
Module 3	Regression Analysis	Assignment		Pr	oject		12 Ses	sions			
Topics:		Plooigninent									
Introduction. T	vpes of Regression Analy	sis Models. Lin	ear Re	gression. S	imple Lin	ear Reg	ression	. Non			
Linear Regressio	on. Regression Analysis w	ith Multiple Va	ariable	s. Cross Va	lidation. I	Principa	l Comp	onent			
					Analy	vsis. Fac	tor Ana	alvsis.			
Module 4	Classification	Quiz		Dr		515, Tue		scione			
	classification	Quiz			Oject		0.503	5510113			
Neighbors, Naïv Evaluation. List of Laborator	ve Bayes Classifier, De	cision Tree	Classifi	ication, R	andom F	orest (ation,			
1. Using with and	, d without R objects on cor	nsole									
2. Using mathem	atical functions on conso	le									
3. Write an R scri	ipt, to create R objects for	calculator									
4. Write an R scr	ript to find basic descripti	ve statistics us	ing su	mmary, str	, quartile	functio	n on mi	tcars8			
cars datasets.			0	- //	,						
5. Reading differ	ent types of data sets (.tx	tcsv) from W	eb and	disk and w	riting in f	le in sp	ecific di	isk			
location. b. Read	ing Excel data sheet in R	.,,									
6.Find the data d	listributions using box and	scatter plot.									
7. Find the outlie	ers using plot.	-									
8. Plot the histog	ram, bar chart and pie ch	art on sample (data								
9.Find the correl	ation matrix.	·									
10. Plot the corre	elation plot on dataset an	d visualize givir	ng an o	verview of	relations	nips am	ong dat	a on			
iris data		0	U			•	U				
11.Create a regre	ession model for a given d	ataset									
12.Install relevan	nt package for classificatio	n.									
13. Choose classi	ifier for classification prob	lem. c. Evaluat	e the p	performant	ce of class	ifier.					
14.Install relevan	nt package for classificatio	n.									
15. Choose classi	ifier for classification prob	lem. c. Evaluat	e the p	performant	ce of class	ifier.					
Targeted Applica	ation & Tools that can be	used									
Tools: RStudio /	Google Colab										
	Pro	ject work/Assi	gnmei	nt:							
Assignment:	so students would need	to do codina a		nonte to la	arn to tra	in and		forcet			
models. Sample	coding assignments inclu	de:	issigni	nents to le		in and	use air	rerent			
Analysis of Sales	Report of a Clothes Man	ufacturing Out	let.								

Comcast Telecom Consumer Complaints.

Web Data Anslysis

Text Book

T1 Hadley Wickham and Garrett Grolemund, "R for Data Science", O'reilly, 2017.

References

R1 Dr. Bharati Motwani, "Data Analytics using R", Wiley, 2019.

Veb resources:

- 1. <u>https://www.geeksforgeeks.org/r-programming-for-data-science/</u>
- 2. https://r4ds.had.co.nz/

Topics relevant to "SKILL DEVELOPMENT": Regression model, classifier for **Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Software En	gineering		L- T-P-	3	0	0	3
CSE 2014	Type of Course: School Co	re [Theory Or	nly]	C	-	-	-	
Version No.	1.0							
Course Pre-	NIL							
Anti-requisites	NII							
Course Description	The objective of this cours Engineering process and p The course covers softwar design, implementation ar The course covers softwar	e is to provide rinciples. e requirement nd testing aspe e quality, conf	t engineering ects of softwa figuration ma	processe re systen nagemen	s, sy de t an	vstei vstei velc d m	n analys pment. aintenar	nre sis, nce.
Course Objectives	The objective of the course Software Engineering and techniques.	e is to familiar d attain Skill D	ize the learne evelopment t	ers with th hrough P	ne co artio	once cipa ⁻	epts of tive Lear	ning
Course Out Comes	On successful completion 1] Describe the Soft models(Knowledge) 2] Identify the requirement application(Comprehensionsions) 3] Understand the Agile Propriate point 4] Apply an appropriate point involved in software(Appling)	of this course tware Engin ents, analysis on) rinciples(Know lanning, sched cation)	the students eering prin and appropr rledge) luling, evalua	shall be a ciples, iate desi tion and	ible ethi gn r maii	to: cs mod	and els for hance pr	process a given inciples
		1	1					
Module 1	Introduction to Software Engineering and Process Models	Quiz					09	Hours
	(Knowledge level)					<u>.</u>		
Ethics, Software Er Cycle Models: Waterfall Spiral, Prototype.	Model – Classical Waterf	e of Practice, (all Model, Ite	General Princi	fall Mode	ware	e De volu		ent Life model-
Module 2	Analysis and Design (Comprehension level)	Assignment	documents for scenario	or a giver	ı		11	Hours
Requirements En Software Require modelling-Introdu Life Cycle, Characto Design: Design cor	gineering: Eliciting requir ments Specification (SRS ction to Use Cases, Activity eristics of CASE Tools, Arch neepts, Architectural design	ements, Fund), Requireme diagram and itecture of a C a, Component	ctional and nt Analysis Swim lane dia ASE Environn based design	non- Fur and vali agram. CA nent. , User inte	nctio idati ASE s erfa	onal ion. supp ce d	require Requir port in So esign.	ements, ements oftware
Module 3	Agile Principles & Devops (Knowledge level)	Quiz					09	Hours
Agile : Scrum Roles estimation techniq Devops: Introducti	and activities, Sprint Agile s ues, Product backlogs, Stal on, definition, history, tool	software deve ke holder roles s.	lopment met s, Dynamic Sy	hods - Sca stem Dev	aling elop	;, Us ome	er Storie nt Meth	es, Agile od.
Module 4	Software Testing and Maintenance (Application Level)	Assignment	Apply the tes using Progra	sting conc ming	ept	S	12	Hours
Software Testing- Automation Tools Software Quality Software configura	verification and validation for Testing. Assurance -Elements of sc ation management- SCM pr	, Test Strateg oftware qualit ocess, SCM To	gies - White y assurance, pols (GitHub).	Box Test SQA Tas	ing, ks,	Bla Goa	ck box ⁻ Is and N	Testing. Metrics,

Maintenance- Characteristics of Software Maintenance, Software Reverse Engineering, Software Maintenance Process Models.

Targeted Application & Tools that can be used: Selenium, GitHub, CASE Tools

Text Book

1] Roger S. Pressman, "Software Engineering – A Practitioner's Approach", VII Edition, McGraw-2017.

2] Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", VI Edition, McGraw-2018.

References

Б.

Rajib Mall, "Fundamentals of Software Engineering", VI Edition, PHI learning private limited,

Ian Sommerville, "Software Engineering", IX Edition, Pearson Education Asia, 2011. Agile Software Development Principles, Patterns and Practices.1st Edition, Wiley, 2002

Topics Relevant to "Skill Development: Balck box Testing, White box Testing, Automated Testing for Skill development through Participative Learning Techniques. This is attained through assessment mentioned in the course handout

Course Code:	Course Title:				2	0				
CSE 3002	3002 Big Data Technologies			L- T-P-			2	3		
	Type of Course: Program Cor	e		С						
	Theory and Lab Integrated Co	ourse						L		
Version No.	1.0									
Course Pre-	CSE2012-Database Managem	ient System,								
requisites	CSE1001- Problem solving u	SE1001- Problem solving using Java.								
Anti-requisites	NIL	L								
Course	The purpose of the course is	he purpose of the course is to provide the fundamentals of Big data technology, to								
Description	emphasize the importance of	choosing suita	ble tools for p	processin	g ai	nd a	nalyz	ing big		
	data to gain insights. The student should have know	ladge and skill	to calcot and	use most	0.000	ron	mintal	hia data		
	tools to solve business proble	ms	to select and	use most	app	Top	Tate	Jig uata		
	The associated laboratory pr	ovides an opt	oortunity to i	mplemer	nt tł	ne c	once	pts and		
	enhance critical thinking and	analytical skill	s.	I				L		
	With a good knowledge in the	fundamentals	of Big data teo	chnology	the	stuc	dent c	an gain		
	practical experience in imple	ementing them	, enabling the	e studen	t to	be	an e	ffective		
	solution provider for application	ions that involv	ve huge volum	e of data	l.					
Course	The objective of the course is	to familiarize	the learners v	vith the (ept.	SOTE	Sig Data		
Objectives	technologies and attain SK	ILL DEVELOPIN	VIENT throug	n exper		ΠA	L LEA	ARINING		
	techniques.									
Course		f the course t	ha studente e	1 a 11 h a	- 1- 1 -	4.0.4				
Outcomes	On successful completion of	on the course t	ne students s	aivon d	adie	e lo:	to	ovtroot		
outcomes	• Apply Map-Reduct	lication)	ing on the	given u	ata	sets	10	extract		
	• Employ appropriate	e Hadoon Ec	osystem too	le such	96	500	on	Hhase		
	Hive to perform data a	nalytics for a	given proble	m (Anr	as	atio	n)	mouse,		
	• Use Spark tool to	analyze the	given data	set for	a c	rive	n nr	oblem		
	(Application).	unuryze the	given data		u e	,	n pi	0010111.		
Course Content:										
Modulo 1	Introduction to Progra	mming	Data Colle	ection	an	d 1		00000		
	Hadoop Assign	nment	Analysis			1	UCI	asses		
Introduction to	Big Data and its importa	ance: Basics	of Distribut	ed File	Sys	sten	n, Fo	our Vs,		
Drivers for Big a	lata, Big data applications,	Structured, u	nstructured,	semi-st	ruct	ure	d and	d quasi		
structured data.	Big data Challenges-Trac	ditional versu	is big data	approac	ch,	The	e Big	g Data		
Technology Lanc	scape: No-SQL.					~ .				
The Hadoop: H	listory of Hadoop-Hadoop	use cases,	The Desig	n of H	DF	S, 1	Bloc	ks and		
replication manag	gement, Rack awareness, HI	DFS architect	ure, HDFS F	ederatio	n, I	Nan	ne no	de and		
data node, Anato	Lob Troolson and tools trool	of File read,	Hadoop Ma	ip Reduc	e p	ara Va	aign	i, Map		
Shuffle and so	JOD Tracker and Lask track	er, Map redu	used to W	rito/ P oo	le, 1 d 1	Rey	vall	le pair,		
Hadoon Need for	r Flume and Sacon	JIICI, AI IS	used to w	me/ Nea	uı	nes	5 111	.0/110111		
Anatomy of a V	RN • Hadoon 2.0 Features	Name Node I	High Availah	ility Y	ARI	ΝΑ	rchit	ecture		
Introduction to S	chedulers. YARN scheduler	policies FIF	O. Fair And	Canacity	v sc	hed	luler	ceture,		
	Hadoop EcosystemProgra	mming	Data Colle	ection	an	1				
Module 2	Tools Assign	nment	Analysis			8	8 Cla	isses		
Introduction to S	SQOOP: SOOOP features.	Sqoop Archite	ecture, Sqooi	o Import	Al	l Ta	bles.	Sqoop		
Export All Table	s, Sqoop Connectors, Sqoop	Import from	MySQL to H	IDFS, S	qoo	op v	s flu	me.		
Hive: Apache Hi	ve with Hive Installation, H	live Data Typ	es, Hive Tab	le partit	ion	ing,	, Hiv	e DDL		
commands, Hive	DML commands, and Hi	ve sort by vs	order by,	Hive Jo	inir	ıg t	ables	, Hive		
bucketing.		-	-							
Hbase: Introduct	ion to HBase and its workin	g architecture	- Commands	s for cre	atio	n ai	nd lis	sting of		
tables- disabled a	nd is disabled of table - ena	ble and is ena	abled of table	e- descri	bin	g ar	nd dr	opping		
of table-Put and C	et command - delete and de	lete all comma	and-comman	ds for sc	ean,	cou	int, ti	runcate		

Module 3	Spark	Programming Assignment	Data analysis	8 Classes		
Introduction to Apache Spark A unified Spark, Who uses Spark and for what?, A Brief History of Spark, Spark version and releases, Storage layers for Spark. Programming with RDDs: RDD Basics, Creating RDDs, RDD Operations, Passing functions to Spark, Common Transformations and Actions, Persistence. Spark SQL: Linking with Spark SQL, Using Spark SQL in Applications, Loading and Saving Data, JDBC/ODBC Server, User-defined functions, Spark SQL Performance.						
List of Laborato 1. Level 1: To in Level 1: HDFS Level 2: HDF	ry Tasks: Istall the Hadoop in p S Shell Commands – S Shell Commands -	pseudo cluster mode. Files and Folders. - Management.	<u> </u>			
2. Run a basic Wo Level 1: Find t Level 2: Perfor file).	ord Count Map Redu he number of occurr rming a Map Reduce	ace program to under rence of each word ag bob for word search	stand Map Reduce Parad opearing in the input file(count (look for specific	igm. s) keywords in a		
 3. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather large volume of log data, which is a good candidate for analysis with Map Reduce, since it is record-oriented. Data available at: https://github.com/tomwhite/hadoopbook/tree/master/input/ncdc/all. <a< td=""></a<>						
4. Level 1: Findin sample datase Level 2: Find 1	ng out Number of Pre et natrix multiplication	oducts Sold in Each	Country using map reduc	e with		
5. Level 1: Instal tables) Level 2: Apply	lation of Hive, worki	ing on basic hive con student database/emj	nmands. (Create, Alter ar ployee database.	nd Drop		
6. Level 1: Work Level 2: Conti	ing on advance hive nue the previous exp	commands. (Static P eriment, select and a	Partitioning & Dynamic p pply suitable partitioning	artitioning) technique.		
7. Level 1: Work Level 2: Contin differ	ing on advance hive nue the previous exp ence between partitio	commands-2. (Bucke eriment, apply bucke oning and bucketing.	eting) eting technique to bring o	out the		
8. Level 1: Instal Level 2: Scoop	ling Ecosystem tools 9 – Move Data into H	s such as Scoop, Hbas Iadoop.	se.			
9. Level 1: Work Level 2: Apply	ing on basic Hbase c 7 Hbase commands c	commands (General con Insurance database	commands, DDL Comma e/employee dataset.	nds)		
10. Level 1: Wor Level 2: Cont	king on advanced Hl tinue the previous ex	base commands. (DM periment to demonst	IL). rate CRUD operations.			
11. Level 1: Insta Level 2: Usin write	all, Deploy & configung B RDD and FlatMap e out a list of words	ure Apache Spark. count how many tin whose count is strictl	nes each word appears in ly greater than 4 using Sp	a file and bark		

12. Level 1:	Write a program in Apache spark to count the occurrences words in a given text
file	
	and display only those words starting with 'a' in ascending order of count.
Level 2:	Apache access logs are responsible for recording data for all web page requests
	processed by the Apache server. An access log record written in the Common Log
	Format will look something like this: 127.0.0.1 - Scott [10/Dec/2019:13:55:36 –
	0700] "GET /server-status HTTP/1.1" 200 2326 Where, HTTP 200 status
response	
1	code indicates that the request has succeeded. Write a program to read the records
of	1 1 0
	access log file log.txt and display the number of successful requests using Spark.
13. Level 1:	Chess king moves horizontally, vertically or diagonally to any adjacent cell. Given
	two different cells of the chessboard, determine whether a king can go from the
first	
	cell to the second in one move.
	Write a scala program that receives input of four numbers from 1 to 8, each
	specifying the column and row number, first two - for the first cell, and then the
last	
	two - for the second cell. The program should output YES if a king can go from
the	
	first cell to the second in one move, or NO otherwise.
Level 2:	Data analytics using Apache Spark on Amazon food dataset, find all the pairs of
	items frequently reviewed together.
	Write a single Spark application that:
	• Transposes the original Amazon food dataset, obtaining a Pair RDD of the
	type:
	• Counts the frequencies of all the pairs of products reviewed together:
	• Writes on the output folder all the pairs of products that appear more than
	once and their frequencies. The pairs of products must be sorted by frequency.
Targeted App	lication & Tools that can be used:
Busin	ess Analytical Applications
Socia	l media Data Analysis
Predi	ctive Analytics
Tools: Hadoo	p Framework tools like map reduce, Hive, Hbase, Scoop, Spark.
Text Book	
Seema Achar	ya, Subhashini Chellappan. 2015. <i>Big Data and Analytics</i> . Wiley Publication.
Matei Zaharia	, Bill Chambers. 2018. SPARK: The Definitive Guide. Oreilly.
References	,
Tom White. 2	016. Hadoop: The Definitive Guide. O'Reilley.
Cay S. Horst	mann. 2017. Scala for the Impatient. Wesley.
Topics relevan	t to development of "Skill Development": Real time application development using
Hadoon Ecos	istem tools through Experiential Learning as mentioned in the course handout

Course Code: CSE3125/CSE265	Course Title: Service	Oriented Architecture	e L-1	3 Г-Р-С	0 0		3
	Type of Course: Progra	am Core					
Version No.	2.0						
Course Pre-	CSE207-Data Base	e Management S	ystem, CS	E264 -	Web		
requisites	Technology						
Anti-requisites	NIL						
Course	The study of the co	urse is to enable th	e students to	o underst	and tl	ne dif	ferent
Description	architectural styles explore the basics of Web Services (WS)	and XML based w service-oriented Are and Representationa	eb application chitecture(SC al State Trans	ons whic DA) in tw sfer (RES	ch is yo app ST) ar	requir roach chitec	red to les i.e. cture.
Course Objective	The objective of the co	ourse is to familiarize t	he learners w	ith the co	ncept	s of Se	ervice
	Oriented Architecture	and attain Skill Develo	pment throug	gh Partici	oative	Learni	ing
	techniques.						
Course Out	On successful comple	tion of this course the	students sha	ll ha ahla	to		
Comes	on successful comple				ιυ.		
	 1.Discuss the XML Fundamentals and to manipulate the data using XML. [Comprehension] 2.Define the key principles of SOA [Knowledge] 3.Discuss the web services technology elements for realizing SOA[Comprehension] 4. Illustrate the various Web Service Standards[Application] 						
Course Content:							
Version No.	2.0						
	-						
Module 1	Introduction to XML	Assignment	Program	ming Task	(08 Sessior	ns
Module 1 Topics: XML doc – X-Files,Parsing 2 Databases in XML	Introduction to XML cument structure ,Well f XML – using DOM, SA	Assignment ormed and valid docur AX – XML Transform	Program nents ,Namesp nation and XS	ming Task paces – D L Format	ς ΓD – x ting –	08 Sessior ml Scl Mode	ns hema elling
Module 1 Topics: XML doc – X-Files,Parsing 2 Databases in XML Module 2	Introduction to XML cument structure ,Well f XML – using DOM, SA Service Oriented Architecture	Assignment ormed and valid docur AX – XML Transform Assignment	Program nents ,Namesp nation and XS Architectura	ming Task paces – D´ L Format I study	ς ΓD – x ting –	08 Sessior ml Scl Mode 10 Sessior	ns hema elling ns
Module 1 Topics: XML doc – X-Files,Parsing 2 Databases in XML Module 2 Topics: Types of A	Introduction to XML cument structure ,Well f XML – using DOM, SA Service Oriented Architecture rchitecture,Objectives	Assignment ormed and valid docum AX – XML Transform Assignment of Software architectu	Program nents ,Namesp nation and XS Architectura ure,SOA Plann	ming Task paces – D L Format I study ing and	ς ΓD – x ting –	08 Sessior ml Scl Mode 10 Sessior	ns hema elling ns
Module 1 Topics: XML doo – X-Files,Parsing 2 Databases in XML Module 2 Topics: Types of A analysis,Architectu	Introduction to XML cument structure ,Well f XML – using DOM, SA Service Oriented Architecture rchitecture,Objectives of re patterns and styles ,	Assignment ormed and valid docur AX – XML Transform Assignment of Software architectu Characteristics of SOA	Program nents ,Namesp nation and XS Architectura Ire,SOA Plann , Comparing S	ming Task paces – D' L Format I study ing and GOA with (ς s FD – x ting – s Client-	08 Sessior ml Scl Mode 10 Sessior Server	ns hema elling ns r and
Module 1 Topics: XML doc – X-Files,Parsing 2 Databases in XML Module 2 Topics: Types of A analysis,Architectu Distributed archite	Introduction to XML cument structure ,Well f XML – using DOM, SA Service Oriented Architecture rchitecture,Objectives re patterns and styles , ctures – Benefits of SO/	Assignment ormed and valid docum AX – XML Transform Assignment of Software architectu Characteristics of SOA A ,Security and implen	Program nents ,Namesp nation and XS Architectura Ire,SOA Plann , Comparing S nentation ,Pri	ming Task paces – D' L Format I study ing and SOA with (nciples of	τD – x ting – c Client- Servia	08 Sessior ml Scl Mode 10 Sessior Server	ns hema elling ns r and
Module 1 Topics: XML doc – X-Files,Parsing 2 Databases in XML Module 2 Topics: Types of A analysis,Architectu Distributed archite orientation ,Service	Introduction to XML cument structure ,Well f XML – using DOM, SA Service Oriented Architecture rchitecture,Objectives re patterns and styles , ctures – Benefits of SO/ e Layers, Application de	Assignment ormed and valid docur AX – XML Transform Assignment of Software architectu Characteristics of SOA A ,Security and implen evelopment process,SC	Program nents ,Namesp nation and XS Architectural Ire,SOA Plann , Comparing S nentation ,Pri DA methodolo	ming Task Daces – D' L Format I study ing and GOA with (nciples of pgy for En	Client- Servic terpris	08 Sessior ml Scl Mode 10 Sessior Server ce se.	ns hema elling ns r and
Module 1 Topics: XML doc – X-Files,Parsing 2 Databases in XML Module 2 Topics: Types of A analysis,Architectu Distributed archite orientation ,Service Module 3	Introduction to XML cument structure ,Well f XML – using DOM, SA Service Oriented Architecture rchitecture,Objectives re patterns and styles , ctures – Benefits of SO/ e Layers, Application de Web Services	Assignment ormed and valid docur AX – XML Transform Assignment of Software architectu Characteristics of SOA A ,Security and implen velopment process,SC Quiz	Program nents ,Namesp nation and XS Architectura Ire,SOA Plann , Comparing S nentation ,Pri DA methodolo Data p	ming Task Daces – D' L Format I study ing and GOA with (nciples of pgy for En-	ς FD – x ting – Client- Servic terpris	08 Session Mode 10 Session Server ce se. 08	ns hema elling ns r and
Module 1 Topics: XML doc – X-Files,Parsing 2 Databases in XML Module 2 Topics: Types of A analysis,Architectu Distributed archite orientation ,Service Module 3 Topics: Service De	Introduction to XML cument structure ,Well f XML – using DOM, SA Service Oriented Architecture rchitecture,Objectives re patterns and styles , ctures – Benefits of SO/ e Layers, Application de Web Services	Assignment ormed and valid docum AX – XML Transform Assignment of Software architectu Characteristics of SOA A ,Security and implen velopment process,SC Quiz Jessaging with SOAP	Program nents ,Namesp nation and XS Architectural nre,SOA Plann , Comparing S nentation ,Pri DA methodolo Data p – Service Dis	ming Task paces – D ² L Format I study ing and GOA with (nciples of pgy for Ent patterns	Client- Client- Servic terpris	08 Sessior ml Scl Mode 10 Sessior Server ce ce ce ce se. 08 Sessi - Mes	ns hema elling ns r and ions
Module 1 Topics: XML doc – X-Files,Parsing 2 Databases in XML Module 2 Topics: Types of A analysis,Architectu Distributed archite orientation ,Service Module 3 Topics: Service De Exchange Patterns	Introduction to XML cument structure ,Well f XML – using DOM, SA Service Oriented Architecture rchitecture,Objectives re patterns and styles , ctures – Benefits of SO/ e Layers, Application de Web Services escriptions – WSDL – M – Orchestration – Chore	Assignment ormed and valid docur AX – XML Transform Assignment of Software architectu Characteristics of SOA A ,Security and implen evelopment process,SC Quiz Messaging with SOAP eography – WS Transa	Program nents ,Namesp nation and XS Architectural rre,SOA Plann , Comparing S nentation ,Pri DA methodolo Data p – Service Dis netions.	ming Task paces – D' L Format I study ing and GOA with (nciples of pgy for En- patterns covery – 1	Client- Servic terpris	08 Sessior Mode 10 Sessior Server ce se. 08 Sessi - Mes	ns hema elling r and ions ssage
Module 1 Topics: XML doc – X-Files,Parsing 2 Databases in XML Module 2 Topics: Types of A analysis,Architectu Distributed archite orientation ,Service Module 3 Topics: Service De Exchange Patterns Module 4	Introduction to XML cument structure ,Well f XML – using DOM, SA Service Oriented Architecture rchitecture,Objectives re patterns and styles , ctures – Benefits of SO/ e Layers, Application de Web Services escriptions – WSDL – M – Orchestration – Chord	Assignment ormed and valid docur AX – XML Transform Assignment of Software architectu Characteristics of SOA A ,Security and implen velopment process,SC Quiz Messaging with SOAP eography – WS Transa	Program nents ,Namesp nation and XS Architectural rre,SOA Plann , Comparing S nentation ,Pri DA methodolo Data p – Service Dis nections.	ming Task paces – D ² L Format I study ing and GOA with (nciples of pgy for En- patterns covery – 1 / aspects	Client- Servic terpris	08 Sessior ml Scl Mode 10 Sessior Server ce se. 08 Sessi Sessi - Mes	ns hema elling ns r and ions ssage
Module 1 Topics: XML doc – X-Files,Parsing 2 Databases in XML Module 2 Topics: Types of A analysis,Architectu Distributed archite orientation ,Service Module 3 Topics: Service De Exchange Patterns Module 4	Introduction to XML cument structure ,Well f XML – using DOM, SA Service Oriented Architecture rchitecture,Objectives re patterns and styles , ctures – Benefits of SO/ e Layers, Application de Web Services escriptions – WSDL – M – Orchestration – Chore Building SOA based Applications	Assignment ormed and valid docur AX – XML Transform Assignment of Software architectu Characteristics of SOA A ,Security and implen evelopment process,SC Quiz Messaging with SOAP eography – WS Transa	Program nents ,Namesp nation and XS Architectural rre,SOA Plann , Comparing S nentation ,Pri DA methodolo Data p – Service Dis actions.	ming Task Daces – D' L Format I study ing and GOA with (nciples of pay for En- patterns covery – 1 y aspects	Client-Servic	08 Sessior ml Scl Mode 10 Sessior Server ce se. 08 Sessi Sessi - Mes 11 Sessic	ns hema elling ns r and ions ssage
Module 1 Topics: XML doc – X-Files,Parsing 2 Databases in XML Module 2 Topics: Types of A analysis,Architectu Distributed archite orientation ,Service Module 3 Topics: Service De Exchange Patterns Module 4 Topics: Business I Analysis and Desig – WS-Coordinatior approach for enter Advances in SOA,	Introduction to XML cument structure ,Well f XML – using DOM, SA Service Oriented Architecture rchitecture,Objectives of re patterns and styles , ctures – Benefits of SO/ e Layers, Application de Web Services escriptions – WSDL – M – Orchestration – Chore Building SOA based Applications Process Design,Business gn – Service Modeling – n – WS-Policy – WS-See prise wide SOA implei SOA Support in J2EE.	Assignment ormed and valid docur AX – XML Transform Assignment of Software architectu Characteristics of SOA A ,Security and implen velopment process,SC Quiz Messaging with SOAP eography – WS Transa Quiz ss case for SOA, Stal Design standards and curity , Tools available mentation,Trends in S	Program nents ,Namesp nation and XS Architectural rre,SOA Plann , Comparing S nentation ,Pri DA methodolo Data p – Service Dis actions. Security ce holder obj guidelines – e for implemen OA,Technolo	ming Task Daces – D' L Format I study ing and GOA with (nciples of Datterns covery – 1 Atterns covery – 1 A spects composit nting SOA gies in R	Client- Service terpris	08 Session ml Scl Mode 10 Server ce se. 08 Sessi - Mes 11 Sessio VS-Bl Secur n to So	ns hema elling ns r and r and ions ssage ons nted PEL rity, OA,
Module 1 Topics: XML doc – X-Files,Parsing 2 Databases in XML Module 2 Topics: Types of A analysis,Architectu Distributed archite orientation ,Service Module 3 Topics: Service De Exchange Patterns Module 4 Topics: Business I Analysis and Desig – WS-Coordinatior approach for enter Advances in SOA, Targeted Applicati	Introduction to XML cument structure ,Well f XML – using DOM, SA Service Oriented Architecture rchitecture,Objectives of re patterns and styles , ctures – Benefits of SO/ e Layers, Application de Web Services escriptions – WSDL – M – Orchestration – Chord Building SOA based Applications Process Design,Busines gn – Service Modeling – n – WS-Policy – WS-Sec prise wide SOA implei SOA Support in J2EE.	Assignment ormed and valid docur AX – XML Transform Assignment of Software architectu Characteristics of SOA A ,Security and implen velopment process,SC Quiz Messaging with SOAP eography – WS Transa Quiz ss case for SOA, Stal Design standards and curity , Tools available mentation,Trends in S	Program nents ,Namesp nation and XS Architectura Irre,SOA Plann , Comparing S nentation ,Pri DA methodolo Data p – Service Dis actions. Security ke holder obj guidelines – for implemen OA,Technolo	ming Task Daces – D' L Format I study ing and GOA with (nciples of Datterns covery – 1 y aspects ectives, S Composit nting SOA ogies in R	Client- Service terpris	08 Session ml Scl Mode 10 Server ce se. 08 Sessi – Mes 11 Sessic VS-Bl Secun to Sc	ns hema elling ns r and r and ions ssage ons nted PEL rity, OA,

۲extbook(s):
 Thomas Erl, "Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2016. <u>http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=6532</u>
 Ron Schmelzer et al. "XML and Web Services", Pearson Education, 2013 http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=6645
References
 Frank P.Coyle, "XML, Web Services and the Data Revolution", Pearson Education, 2002 <u>http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=6647</u>
 Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education, 2005 <u>http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=6619</u>
3. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 2004. <u>http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=5906</u>
 James McGovern, Sameer Tyagi, Michael E.Stevens, Sunil Mathew, "Java Web Services Architecture", Morgan Kaufmann Publishers, 2003. <u>https://www.elsevier.com/books/java-web-services-architecture/mcgovern/978-1-55860-900-6</u> <u>Web Resources:</u>
 https;//presiuniv.knimbus.com/user#/home <u>https://www.coursera.org/learn/service-oriented-architecture</u> <u>https://nptel.ac.in/courses/soa</u>
opics relevant to "SKILL DEVELOPMENT": Based on an understanding of architectural styles, understanding web applications based on XML, review architectures for web applications, Service- Driented Architecture (SOA) in two approaches: Web Services (WS*) and Representational State Transfer REST) architecture for Skill Development through Participative Learning techniques. This is attained

(Development	tin o agii i	antioipative	Leann
through	the Presen	tation as r	mentioned in t	he assessm	nent compor	nent.

Course Code: CSE 3010	Course Title: Deep Learning Techniques Type of Course: Program Core Theory	L-T-P- C	3	0	0	3		
Version No.	2.0							
Course Pre- requisites Anti-requisites	 Data Mining and Machine Learning fundamentals Basic working knowledge of Statistics and Probability Familiarity with programming languages and hands on coding 							
Course Description	The course introduces the core intuitions behind Deep Learning, an advanced branch of Machine Learning involved in the development and application of Artificial Neural Networks that function by simulating the working principle of human brain. Deep learning algorithms extract layered high-level representations of data in a way that maximizes performance on a given task. The course emphasizes on understanding the implementation and application of deep neural networks in various							

	prominent problem domains like speech recognition, sentiment analysis, recommendations, and computer vision etc. The course facilitates the students to interpret and appreciate the successful application of deep neural nets in various prediction and classification tasks of ML.							
Course Objective	The objective of the course is to familiarize the learners with the concepts of Deep Learning Techniques and attain Skill Development through Participative Learning techniques.							
Course Out Comes	 On successful completion of the Apply basic concepts of models(Knowledge) Apply Supervised and U build effective models for pred Identify the deep learning various types of learning tasks Machine vision. (Comprehensi Analyze performance of models(Application) 	course the stud Deep Learning Insupervised De liction or classifing algorithms with in various dom on) implemented D	lents shall be able to to develop feed for eep Learning techni ication tasks(Comp hich are more appr ains of Machine Lea Deep Neural	o: ward iques to rehension) opriate for arning and				
Course Content:								
Module 1	Introduction to Deep Learning	Assignment	Programming	10 Sessions				
Neural Network Descent, Back-p Step by Step. Module 2	x, , Perceptron, MLP Structures, ropagation, Training Neural Ne Improving Deep Neural Networks	Activation Fund etworks, Buildir Assignment	Programming	8 Sessions				
Topics: Initialization, Ov Normalization, A	verfitting and Underfitting, Regul rtificial Neural network.	larization and C	ptimization, Dropo	ut, Batch				
Module 3	Deep Supervised Learning Models	Assignment	Programming	10 Sessions				
Topics: Convolutional ne in Pattern Recog	ural network, Deep learning in Seq nition.	uential Data, RNI	N & LSTM, GRU, Dee	p Models				
Module 4	Deep Unsupervised Learning	Assignment	Programming	10 Sessions				
Topics: Basics of Deep u Machine, Kohon Networks, Proba Targeted Applic Professionally u Text Book T1. Ian Goodfel	unsupervised learning, Auto encod en Networks, Deep Belief Netwo bilistic Neural Network. cation & Tools that can be used: used software : Anaconda, Spider. low, Yoshua Bengio, Aaron Cou	lers, Boltzman M ork, Hopfield Ne Google collab	lachine, Restricted B twork,Generative Ad	oltzmann dversarial ss, 2017				
References								

R 1. Duda, R.O., Hart, P.E., and Stork, D.G. Pattern Classification. Wiley-Inderscience, 2nd Edition. 2013

R2. Theodoridis, S. and Koutroumbas, K. Pattern Recognition. Edition 4, Academic Press, 2015

R3. Russell, S. and Norvig, N. Artificial Intelligence: A Modern Approach. Prentice Hall Series in Artificial Intelligence, 2013

R4. Bishop, C. M. Neural Networks for Pattern Recognition, Oxford University Press, 2008.

Weblinks:

W1: pu.informatics.global, https://sm-nitk.vlabs.ac.in/

Topics relevant to "SKILL DEVELOPMENT":Real time Data Analysis using Deep learning. Naming and coding convention for Data Science Project Development using ML/DL for Skill Development through Participative Learning techniques. This is attained through the **Presentation** as mentioned in the assessment component.

Course Code:	Course Title: Storage Area	Networks		L-T- P-	3	0	0	3
CSE 313	Type of Course: Theory On	ly Course		С				
Version No.	2.0							
Course Pre-	Basics of information stora	ge						
requisites								
Anti-								
requisites								
Course Description	The course aims to equip students with basic introduction to Storage Area Networks, including storage architectures, logical and physical components of a storage infrastructure, managing and monitoring the data center and basic Disaster Recovery principles.							
Course Objective	The objective of the course is to familiarize the learners with the concepts of Storage Area Networks and attain Employability through Participative Learning techniques.							
Course Out Comes	 On successful completion of the course the students shall be able to: CO1 Identify key challenges in managing information and analyze different storage networking technologies. [Understanding] CO2 Explain physical and logical components of a storage infrastructure of RAID, and intelligent storage systems. [Comprehension] CO3 Describe Object and Content addressed storage and storage virtualization. [Comprehension] CO4 Articulate business continuity solutions—backup and archive for managing fixed content. [Application] 							
Course Content:								
Module 1	Storage System: Introduction to Information Storage	Assignment	Data Collectio	n/Interpi	retat	ion	10 9	Sessions
Topics: Information S	torage, Evolution of Stora	ge Architectu	re, Data Cent	er Infras	truc	ture	, Virtua	alization

Information Storage, Evolution of Storage Architecture, Data Center Infrastructure, Virtualization and Cloud Computing. **Data Center Environment:** Application Database Management System (DBMS), Host (Compute), Connectivity, Storage, Disk Drive Components, Disk Drive Performance, Host Access to Data, Direct-Attached Storage, Data Proliferation

Module 2	Data Protection – RAID, Intelligent Storage Systems	Case studies / Case let	Case studies / Case let	08 Sessions
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Topics: RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID vs SSD, Types of RAID Storage for Databases in Public Cloud

Intelligent Storage Systems: Components of an Intelligent Storage System, Types of Intelligent Storage Systems, Optimal architectures for intelligent storage systems

Module 3	Object-Based and Unified Storage	Quiz	Case studies / Case let	08 Sessions

Topics: Object-Based Storage Architecture: Components of OSD, Object Storage and Retrieval in OSD, Benefits of Object-Based Storage, Content-Addressed Storage.

Virtualization in SAN: types of storage virtualization, Benefits of virtualization

Module 4 Backup and Archive, Replication	Case studies / Case let	10 Sessions
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Backup Purpose, Backup Considerations, Backup Granularity, Data Recovery Services, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments.

Local Replication: Replication Terminology, Uses of Local Replicas, Replica Consistency, Local Replication Technologies, Tracking Changes to Source and Replica, Restore and Restart Considerations, Creating Multiple Replicas.

Remote Replication: Modes of Remote Replication, Remote Replication Technologies.

Targeted Application & Tools that can be used:

Architecture based environment

Text Book

T1. G. Somasundaram, Alok Shrivastava. "*Information Storage and Management*", EMC Education Services, Wiley India. 2nd Edition.2012.

References

R1. Ulf Troppens, Rainer Erkens and Wolfgang Muller. "Storage Networks Explained", Wiley India. 2nd Edition.2015.

R2. Rebert Spalding. "Storage Networks The Complete Reference", Tata McGraw Hill, Indian Edition.2017.

R3. Richard Barker and Paul Massiglia. "Storage Area Networks Essentials A Complete Guide to Understanding and Implementing SANs", Wiley. 1stEdition.2008.

E-Resource:

1. https;//presiuniv.knimbus.com/user#/home

R3 Web resources: Students may find articles and significance of SAN at

https://www.ibm.com/topics/storage-area-network and EMC² and may refer an eBook on "Storage Area Network Essentials" A Complete Guide to Understanding and Implementing SANs by Richard Barker, Paul Massiglia

https://presiuniv.knimbus.com/user#/searchresult

Topics relevant to "EMPLOYABILITY SKILLS": Data Protection – RAID for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Information Retrieval									
CSE2051				c	3 () 0	3			
	Type of Course: Theory Only Course									
Version No.	1 Desig Knowledge in Data Structures and algorithms and use bability and statistics									
Course Pre-	basic knowledge in Data structures and algorithms and probability and statistics,									
Anti roquisitos										
Anti-requisites		NIL								
Course	The course studies the theory, design and implementation of Text- based information									
Description	systems. The information Retrieval core concepts of the course include statistical									
	ndiactensuits of text, representation of information needs and documents. Topics									
	Term Frequency/Inverse Document Frequency) Weighting Vector Model, Drobabilistic									
	Model, Latent Semantic Indexing Model, Neural Network Model), Retrieval Evaluation									
	Retrieval Metrics, Text Classificat	Retrieval Metrics Text Classification and Clustering algorithms. Web Retrieval and								
	Crawling. Recommender Systems:	: Basics of Content-l	based Re	, comme	ende	r Sys	tems,			
	Content-based Filtering, Collabor	rative Filtering, Mat	rix facto	rizatior	ו m	odels	and			
	neighborhood models.									
Course	The objective of the course is to fa	miliarize the learners	with the	concep	ots Ir	nform	ation			
Objective	Retrieval and attain Skill Develop	ment through Partic	ipative L	earnin	g te	chnic	jues.			
Course Out	On successful completion of the co	urse the students sha	ll be able	to:						
Comes	CO1: Define basic concepts of infor	mation Retrieval. [Kno	owledge]							
	CO2: Evaluate the effectiveness and	d efficiency of differer	nt informa	ation re	triev	/al				
	CO3: Explain different indexing met	thodology requirement	nts and th	e conce	ont c	fwel	n			
	retrieval and crawling. [Comprehe	nsion			.pt c	i wei	,			
	CO4: Classify different recommende	er system and its aspe	ect. [Com	orehens	sion	I				
Course		<i>·</i> · ·								
Content:										
Module 1	Introduction to Information Retrieval	Assignment	Data colle	ection	7	' Sess	ions			
Information Re	trieval – Early Developments – The	IR Problem – The Us	sers Task	– Infor	mati	on ve	ersus			
Data Retrieval -	- The IR System – The Software Arch	itecture of the IR Syste	em – The l	Retrieva	al an	d Rar	iking			
Processes	1	1								
Module 2	Modeling and Retrieval	Assignment	Problem	solving	1	0 Ses	sions			
	Evaluation				<u> </u>					
Basic IR Model	s – Boolean Model – TF-IDF (Term F	requency/Inverse Do	cument F	requen	cy) \	Neigh	iting			
- Vector Mode	el – Probabilistic Model – Latent Se	mantic indexing Moc	iei – Neu Ionco Col	ral Net	NOLK	(IVIOC	lei –			
Evaluation – Re	alion – Reineval Metrics – Precisio	oli aliu Recali – Refei ision – Explicit Releva	nce Feedb	nack	- 0	ser-b	aseu			
	Indexing & Web-	Term								
Module 3	Retrieval	paper/Assignment	Data ana	lysis	8	Sess	ions			
Indexing and S	earching – Inverted Indexes – Sequ	iential Searching – M	ulti-dime	nsional	Inde	exing.	The			
Web – Search I	Engine Architectures – Cluster base	d Architecture - Searc	h Engine	Rankin	g – L	ink b	ased			
Ranking – Simple Ranking Functions, Evaluations – Search Engine Ranking – Applications of a Web										
Crawler.										
Module 4	Recommender System	Term paper/Assignment	Problem	solving	8	Sess	ions			
Recommender Systems Functions – Data and Knowledge Sources – Recommendation Techniques – Basics										
of Content-based Recommender Systems – High Level Architecture – Advantages and Drawbacks of										
Content-based F	iltering – Collaborative Filtering – N	latrix factorization mo	odels.							
Targeted Applic	ation & Tools that can be used:	• • - • •	-		_					
Information Ret	rieval System, Collaborative Filteri	ng System, Feedback	System, E	valuati	on N	/letri	CS			
Assignment:										

Group assignment, Quiz

Text Book

T1 Ricardo Baeza-Yates and Berthier Ribeiro-Neto, —" Modern Information Retrieval: The Concepts and Technology behind Search", Third Edition, ACM Press Books, 2018. Link: https://people.ischool.berkeley.edu/~hearst/irbook/

T2 Ricci, F, Rokach, L. Shapira, B.Kantor, —"Recommender Systems Handbook", Fourth Edition, 2018. References

R1 Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, —"Information Retrieval: Implementing and Evaluating Search Engines", The MIT Press, 2017.

R2 Jian-Yun Nie Morgan & Claypool –" Cross-Language Information Retrieval", Publisher series 2011.

R3 Stefan M. Rüger Morgan & Claypool – "*Multimedia Information Retrieval*", Publisher series 2014.

R4 B. Liu, Springer, - "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data", Second Edition, 2013.

R5 C. Manning, P. Raghavan, and H. Schütze, —"Introduction to Information Retrieval", Cambridge University Press, 2015. Link: <u>https://nlp.stanford.edu/IR-book/</u>

Web Based Resources and E-books:

https://puniversity.informaticsglobal.com/login

• **Topics relevant to the development of SKILLS:** Recommendation Techniques, Content-based Filtering for **Skill Development** through **Participative Learning** techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Internet and Web Technologies			1 4		3		
Version No	1							
Course Pre-	nil							
requisites								
Anti-requisites	nil							
Anti-requisites	The nurness of the course is to provide a comprehensive introduction to scripting							
Course Description	languages that are use laboratory provides an op thinking and analytical ski The objective of the course	d for creating web-based oportunity to implement th lls e is to familiarize the learne	application e concepts a	ind enha	asso ance of Ir	critical		
Objective	and Web Technologies and attain Skill Development through Participative Learning techniques.							
Course Out Comes	On successful completion Implement web-ba Illustrate the use or [Application] Apply server-side scripting [Application]	of the course the students ised application using marking f various constructs to enhage g languages for web page	shall be able up languages nce the appea design and	to: . [Applic arance o link to a	a tior faw adat	ו] ebsite. abase.		
Course Content:	Module: 1: [20 Hrs - L Module: 2: Advanced CSS XML: Basics, demonstratio Module 3: PHP PHP: Introduction to serv Arrays, \$GET and \$ POS Reading/Writing Files, PHF Object Oriented Design, V MySQL Database. Accessin	 [10] + T[10]] [Application] [16 Hrs – L[8] + T[8]] [, n of applications using XML [20 Hrs – L[10] + er-side Development with T, Super global Arrays, \$ Classes and Objects, Objects, Objects, Objects, Objects, Objects, Se g MySQL in PHP 	Application] T[10]] [A PHP, Arrays, S_SERVER Ar ect, Classes a QL, Database	pplicatic , and Su ray, \$_I ind Obje e APIs, 1	on] iperg Files ects in Mana	iobals, Array, n PHP, nging a		
Module 1	Introduction to XHTML	Assignment	Data Collection/In tion	terpreta	Se	16 ssions		
Topics: Basics: Web, V XHTML: Origi Structure, Bas Differences be	WWW, Web browsers, Web ns and Evolution of HTM sic Text Markup, Images, etween HTML and XHTML	servers, Internet. L and XHTML: Basic Synta Hypertext Links, Lists, Ta	ix, Standard bles, Forms,	XHTML Frames	Doc s, Sy	ument ntactic		
Module 2	Advanced CSS	Experiment	let	s / Case	20	ns		
Topics: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks								
Module 3	РНР	Quiz	Case studies let	s / Case	20	Sessio ns		
Topics: Introduction to Super global A Object, Classes APIs, Managing List of Laborato 1. HTMI V	server-side Development w rrays, \$_SERVER Array, \$_F and Objects in PHP, Objec a MySQL Database. Access ory Tasks: with tables	vith PHP, Arrays, and Superg iles Array, Reading/Writing t Oriented Design, Working ing MySQL in PHP	lobals, Array Files, PHP C with Databa	s, \$GET a lasses a ases, SQI	and \$ nd O L, Da	POST, bjects, tabase		
2. HTML	with frames							

- 3. Html with form
- 4. Web site with links
- 5. Website with advanced CSS
- 6. WAMP installation & introduction
- 7. PHP for website
- 8. Form validation
- 9. PHP and MySQL for website

Targeted Application & Tools that can be used

- 1. Notepad++
- 2. WAMP

Project work/Assignment:

Assignment: Mini Project on development of a Website

Text Book

T1 Robert. W. Sebesta, "Programming the World Wide Web", Pearson Education, 8th Edition, 2015.

T2. CSS Notes for Professionals, ebook available at https://books.goalkicker.com/CSSBook/ (Retrieved

on Jan. 20, 2022)

T3. Deitel, Deitel, Goldberg, "Internet & World Wide Web How to Program", Fifth Edition, Pearson Education, 2021.

References

R1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", Pearson Education India, 1st. Edition.2016.

R2. Jeffrey C. Jackson,"Web Technologies: A Computer Science Perspective", Pearson Education, 1st Edition, 2016.

R3 Web resources:

W1. Journal resources

1. Pallavi Yadav, Paras Nath Barwal,"Designing Responsive Websites Using HTML And CSS" INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 3, ISSUE 11, NOVEMBER 2014, ISSN 2277-8616

2. Thomas H. Park, Brian Dorn, Andrea Forte," An Analysis of HTML and CSS Syntax Errors in a Web Development Course" ACM Transactions on Computing Education Volume 15Issue 1March 2015 Article No. 4pp 1–21,https://doi.org/10.1145/2700514

3. Thomas H. Park, Ankur Saxena, Swathi Jagannath, Susan Wiedenbeck, Andrea Forte, "Towards a taxonomy of errors in HTML and CSS" ACM Transactions on Computing Education, Pages 75–82, https://doi.org/10.1145/2493394.2493405

4. A. Veglis; M. Leclercq; V. Quema; J.-B. Stefani, "PHP and SQL made simple", Published in: IEEE Distributed Systems Online (Volume: 6, Issue: 8, August 2005) DOI: 10.1109/MDSO.2005.42

W2. Course NPTEL / Swayam Link : https://nptel.ac.in/courses/106105084

W3. Coursera Link : https://www.coursera.org/learn/html-css-javascript-for-web-developers W4. PU Library Link : https://puniversity.informaticsglobal.com/login

Or

: http://182.72.188.193/

Topics relevant to development of "Skill Development": Form Design and Validation for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE219	Course Title: Big [Data Analytics	L- T-P-	1	0	4	3		
	Type of Course: La	Type of Course: Laboratory Integrated							
Version No.	2.0								
Course Pre-requisites	DDL, DML of SQL (Queries and Creation of Class	& object, int	erface,	read	ing &			
	writing a file, cont	vriting a file, control statements in java programming.							
Anti-requisites	NIL	NIL							
Course Description	This course is desi	his course is designed to provide the fundamental knowledge to equip students							
	being able to hand	le real world big data probler	ns including	the thre	e key	reso	urces		
	of Big Data: people	e, organizations, and sensor. V	Nith the adv	anceme	ent of	IT sto	rage		
	processing, compu	itation and sensing technold	gies, big dat	ta has l	becor	me a r	nove		
	norm of life.	orm of life.							
Course Objective	The objective of the	The objective of the course is to familiarize the learners with the concepts of E							
	Data Analytics and	attain SKILL DEVELOPMENT	⁻ through EX	PERIEN	TIAL	LEAR	NINC		
	techniques								
Course Out Comes	On successful com	pletion of the course the stud	dents shall b	e able t	o:				
	1: Describe the fur	ndamental concepts of big da	ta analytics ((Knowle	edge)				
	2: Apply Map-Redu	uce programming on the give	n datasets to	o extrac	t req	uired			
	insights. (Applicati	on).							
	3: Employ appropr	iate Hadoop Ecosystem tools	such as Hive	e, Hbase	e to p	perform	n		
	data analytics for a	a given problem (Application)							
	4: Use Spark and n	osql tool to analyse the giver	n dataset for	a given	prob	olem.			
	(Application).								
Course Content:		1			_				
	Introduction to		Case study (n Real					
Module 1	Big data	Assignment	time annlica	ations	10	Sessi	ons		
	Analytics								
Introduction to Big D	Data: Basics of Dist	ributed File System, Four V	Vs, Drivers	for Big	data	, Big	data		
applications, Structure	ed, unstructured, se	mi-structured and quasi str	uctured data	a. Big d	ata (Challer	nges		
Traditional versus big o	data approach.								
The Hadoop: History	of Hadoop-Hadoo	op use cases, The Design	of HDFS, E	Blocks	and	replic	atior		
management, Rack aw	areness, HDFS arch	itecture, HDFS Federation, N	ame node ar	nd data	node	e, Ana	tomy		
of File write, Anatomy	of File read. Role of	Data Scientist - Role of Data	Analyst – Da	ata Ana	lytics	in Pro	oduc		
development - Busine	ss Intelligence vs Da	ita analytics - Real time Busi	ness Analytic	cal Proc	essCa	ase sti	udies		
related to big data app	lications	[-				
	Hadoop		Installation	of					
Module 2	MapReduce	Assignment	multimode	cluster	10	Sessi	ons		
	Framework		<u> </u>	<u> </u>		<u>,</u>			
MapReduce : Overview	w and Need of Distri	buted processing for big data	- Introductio	n to had	loop	frame	work		
and MapReduce progra	amming - HDFS designed	gn and its goals - Master-Slav	e Architectul multi nodov	re or na	aoop	- VVO	rking		
ManPeduce programm		oop single node cluster and		Justers	- 000	JIKIIIg	witi		
Module 3	Analytical tools	Term paper/Assignment	Hive joins		10	Sessi	ons		
Hive : Apache Hive wi	th Hive Installation,	Hive Data Types, Hive Table	partitioning	,, Hive [DDL c	comma	ands		
Hive DML commands,	and Hive sort by vs.	order by, Hive Joining tables,	, Hive bucket	ting.					
Hbase : Introduction to HBase and its working architecture- Commands for creation and listing of tables									
disabled and is disabled of table - enable and is enabled of table- describing and dropping of table-Put and									
Get command - delete	and delete all comr	nand-commands for scan, co	unt, truncate	e of tab	les.				
Module 4	Data Analytics with Spark	Term paper/Assignment	Spark RDD		10	Sessi	ons		
Spark: Spark: Apache S	Spark's Philosophy,	History of Spark, Running Spa	ark, A Gentle	Introd	uctio	n to S	park		
Spark's Basic Architec	ture, Spark Applicat	ions, DataFrames, Partitions	, Transforma	ations, I	Lazy I	Evalua	ition		

Actions, Spark UI, An End-to-End Example, Integration of Hive and spark. Nosql: Mongo DB: Introduction ,Features ,Data types , Mongo DB Query language , CRUD operations ,Arrays , Functions: Count ,Sort , Limit , Skip , Aggregate , Cursors – Indexes , Mongo Import , Mongo Export.

List of Laboratory Tasks

- 1. Introduction to Hadoop Ecosystem tools
- 2. Introduction to Hadoop distributed file System.
- 3. Installation of Hadoop single node cluster using Ubuntu operating system.
- 4. Working with Hadoop Commands
- 5. Introduction to Mapreduce framework
- 6. Word Count analysis using sample data set (MapReduce)
- 7. Stock analysis using sample data set (MapReduce)
- 8. Web log analysis using sample data set (MapReduce)
- 9. Temperature analysis using sample data set .(MapReduce)
- 10. Working on basic hive commands
- 11. Working on basic hbase commands
- 12. Install, Deploy & configure Apache Spark
- 13. Word count analysis using RDD and FlatMap
- 14. Working with MongoDB using restaurant data.

Targeted Application & Tools that can be used:

Apache Hadoop-

HDFS – for data storage

Map reduce – Mapping and reducing.

Hive – Structured data, HQI

Hbase, MongoDB – No SQL

Apache Spark – SCALA LANGUAGE

Text Book

- 1. Big Data and Analytics- Seema Acharya, Subhashini Chellappan-2019, 2nd Edition, Wiley Publication.
- 2. Analytics in a Big data world- Bart Baesens- 2nd Edition, Wiley Publication. 2018

Reference

1. Big data Analytics, Radha Shankarmani and vijayalakshmi second edition wiley publication 2016

2. Big Data, Anil Maheshwari , McGraw Hill education 2019

3. Hadoop: The Definitive Guide, Tom White , 3rd Edition, O'reilly. 2016

E-Resources

1.https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=1223875 &site=ehost-live&ebv=EB&ppid=pp_xiii

2.https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=e host-live

Topics relevant to SKILL DEVELOPMENT: Hadoop ecosystem tools, HDFS, Mapreduce, Hive, Hbase, MongoDB,NoSQL, Spark for **Skill Development** through **Experiential Learning** techniques. This is attained through the assessment component mentioned in the course handout.

Course	Course Title: Search Engine Optimization			0	0	
Code: CSE3123	Type of Course: Program Core & Theory Only	L-T-P- C	3			3
Version No.	1.0					
Course Pre- requisites	NIL					
Anti-requisites	NIL					

Course Description	Objective of this course is to make students learn the basics of Search Engine and develop ability to optimize the searching based on the key words so that the business can be improved. The search engine optimization is the skill of improving a website to upsurge its visibility when people search for products							
	or services. The more visible a w it is that brand captures busines of WWW to pursue the Course. students would acquire know Optimization algorithms, SEO too sites.	vebsite has on is. The studen After successfu vledge to cor ols and Report	search engines, the ts should have prio al completion of the mprehend the Se ing methods to ana	e more likely Ir knowledge e Course, the arch Engine lyze the web				
Course Objective	The objective of the course is to familiarize the learners with the concepts of Search Engine Optimization and attain Skill Development through Participative Learning techniques.							
Course Out Comes	On successful completion of the 1. Outline the basic concep 2. Discuss the content nec (Comprehension) 3. Illustrate Technical SEC 4. Analyse the Report of S Analysis)	 On successful completion of the course the students shall be able to: 1. Outline the basic concepts of SEO (Knowledge) 2. Discuss the content necessary for On-page & Off-Page SEO (Comprehension) 3. Illustrate Technical SEO (Application) 4. Analyse the Report of SEO to measure the performance (Analysis) 						
Course Content:	_							
Module 1	Introduction to SEO			10 Sessions				
Topics: Search Engine – worl technique-Search E Competition analysis		ks- Googlebot nm- Key word	(Google Crawler)- ⁻ search- Types of	Types of SEO key words-				
Module 2	On-Page and Off-Page SEO	Assignment		12 Sessions				
Topics: Introduction to On-P Tag, Title Tag, Image search and Analysis. Introduction to Off-P Building back links- grey hat and Black ha	age SEO, Basics of website designin Tag and H Tag Optimization- Link age optimization- Local marketing Type of links – Natural Link, manu at SEO- Social Media optimization t	ng/developme building- Opti of website as ally built link { echnique.	nt, HTML Basics for mizing SEO conten per the location- Pa & Self-created link-	r SEO, Meta t- Key word age ranking- White hat,				
Module 3	Technical SEO			10 Sessions				
Basics of Technical S protocol, Overcomir Redirects, Best Pract	L EO- Crawling and Indexing- HTML S Ig Error codes, Technical Analysis ices, Analysis of Crawl Errors	Gitemap vs. XN connected wi	I AL Sitemap, The rol th Redirection, Bro	bots.txt File oken Links -				
Module 4	SEO Reporting	Assignment		08 Sessions				
Website position an Google analytics- Go	alysis in various search engine- A als and conversion- Tracking and re	Analyzing perf	ormance of the w submission- Securi	ebsite using ng Ranks.				
Targeted Application Applications: Online I Professionally used s	& Tools that can be used: Business models such as e-Commen software – Google Analytics	rce, Digital Ma	rketing, Health Car	е				

Text Book

T1 - "Search engine optimization all-in-one for dummies", Clay, B ,3rd ed., John Wiley & Sons, Inc., 2015.

T2 -"Google AdWords: A beginner's guide to Google. Use Analytics, SEO, and AdWords. Become an influencer on social media", Wally Bax, Notion Press Media Pvt Ltd., 2022.

References

R1 – "Introduction to search engine optimization: A guide for absolute beginners", Kelsey, T, Apress. (2017).

R2 - "Step By Step Guide to SEO", Upendra Rana, Ocean Books Pvt Ltd.R-Tech Offset Printers, 2018.

R3 - *"Search Engine Optimization (SEO).Grow the Audience"*, Clark, Hack Book Works, 2022. **Weblinks:**

W1: <u>https://puniversity.informaticsglobal.com/login</u>

W2:<u>https://essentials.ebsco.com/search?query=Search+Engine+Optimization</u>

Topics relevant to "SKILL DEVELOPMENT": Development basic using HTML and Search engine optimization tools for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: PATTERN F	RECOGNITION		L-T- P-	2	0 2		3
CSA3052/CSE3122	Type of Course: Theory			С				
Version No.	1.0							
Course Pre-	linear algebra, probabilit	y, random pr	ocess, sta	tistics,	progi	ammir	ng e	xperience
requisites	(MATLAB/C/C++) will be h	elpful.						
Anti-requisites	-							
Course Description	'attern recognition techniques are used to design automated systems that improve their own performance through experience. This course covers the methodologies, technologies, and lgorithms of statistical pattern recognition from a variety of perspectives. Topics including Bayesian Decision Theory, Estimation Theory, Linear Discrimination Functions, Nonparametric Techniques, Support Vector Machines, Neural Networks, Decision Trees, and Clustering Algorithms etc. will be presented.							
Course Objective	The objective of the cours	e is to familiariz	e the learr	ners with	the	conce	pts of	f pattern
	re cognition and attain Ski l	ll Development	through E	xperient	ial Le	earnin	g tecł	nniques.
	On successful completion of	the course the stu	dents shall	be able to):			
Course Out Comes	CO1: Identify areas where solution.[knowledge] CO2: Describe the strength at Learning for classification, re CO3: Describe geneti techniques[Comprehensive] CO4: Describe and n classification[Comprehensive CO5: Implement learning alg	e Pattern Recog nd limitations of s egression and den c algorithms, nodel data to e] gorithms for super	gnition and some techni sity estimat validati o solve vised tasks	l Machir ques usec ion probl on me problem . [Applica	ne La construction la construc	earning omputa Compr s ar in re	g can ational ehensi nd egressi	offer a Machine ive] sampling on and
Course Content:								
Module 1		quiz	Case studie	s / Case l	et		8	Sessions
Importance of pattern supervised learning, Ir PDF and Bayesian Cla	recognition, Features, Featur atroduction to Bayes Decision assification for Normal Distrib	e Vectors, and Cl Theory, Discrimi putions. L1, L2	lassifiers, S nant Functi	upervised ons and I	l, Uns Decisi	supervi on Sur	ised, a faces,	nd Semi- Gaussian
Module 2		Assignment	Case st	udies / Ca	ase le	t	8	Sessions
Introduction, Basis Ve Component Analysis (ctors, The Karhunen Loeve (H Introduction only). Nonlinear	KL) Transformatic	on, Singular Reduction,	r Value D Kernel PO	ecom CA. L	npositic .1, L2	on, Ind	lependent
Module 3	Demonster Definition of	Quiz <mark>.</mark>	Case st	udies / Ca	ase le	t	10	Sessions
Maximum Likelihood Maximum Entropy Es	timation, Mixture Models, Na	num a Posteriori nive-Bayes Classi	fier, The Ne	earest Nei	ion, I ighbo	or Rule.	an Inte . L1, L	L2, L3
Module								
4 Introduction, Linear I Error Estimate, Stocha	Discriminant Functions and I astic Approximation of LMS	Decision Hyperpl Algorithm, Sum o	anes, The I of Error Esti	Perceptron mate. L1	n Alg , L2, 1	1 gorithm L3	2 Ses n, Mea	s <mark>sion</mark> an Square
Text Book 1. Pattern Recognitio Back), 4th edition. 2. Pattern Recognitio	n: Sergios Theodoridis, Kons n and Image Analysis Earl G	tantinos Koutrou	nbas, Elsev sonbaugh, s	ier India Steve Jos	Pvt. l t, ePu	Ltd (Pa	iper ok.	
References								
R1. The Elements of Statistical Learning: Trevor Hastie, Springer-Verlag New York, LLC (Paper Back), 2009.

R2. Pattern Classification: Richard O. Duda, Peter E. Hart, David G. Stork. John Wiley & Sons, 2012.

Topics relevant to SKILL DEVELOPMENT: Concepts of classification algorithms, regression models and linear models **for Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in the course handout.

Cou	Course Title: System Soft	ware		3 0						
rse	Type of Course: Theory O	Inly	L-T-P-C		0	3				
e:	Type of course. Theory c	, y								
CSE										
205										
0										
Version No.	1.1									
Course Pre- requisites	Students are expected to be familiar with the basics of DataStructure, Programming Language Java Basics, J2EE and should have a knowledge on DBMS.									
Anti-requisites	NIL									
Course Description	This course is introduced to have an understanding of foundations of design of assemblers, loaders, linkers, and macro processors, The design and implementation of various types of system software and relationship between machine architecture and system software. Us e andimplementation of assemblers, macros, loaders, compilers, and operating systems. To Introduce formal systems and their application to programming languages, including topics such as Different System Software– Assembler, Assembler design options, macro processors,									
Course Objective	The objective of the course System Software and attai techniques.	e is to familiarize the learr n SKILL DEVELOPMENTtł	ners with the o nrough Partic i	concep pative	ts of Learr	ning				
Course Out Comes	On successful completion	of the course the studen	ts shall be abl	e to:						
	 CO1 : Distinguish different software into different categories. CO2 : Design, analyze and implement one pass, two pass or multi pass assembler CO3 : Design, analyze and implement loader and linker. CO4 : Design, analyze and implement macro processors CO5 : Critique the features of modern editing /debugging tools 									
Course Content:										
Module 1	Introduction to System Software	Assignment	Analysis		10 Se s	ssion				

Course Code:	Course Title: Enter	prise Network I	Design	L-T- P- C	3	00		3		
CSE2053	Type of Course: The	eory Only Cour	se							
Version No.	1	1								
	Computer Network	S								
Course Pre-	1. OSI Reference M	odel and TCP/II	P Protocol Suite							
requisites	2. Routing IP Addre	sses								
	3. Internetworking	Devices								
Anti-requisites										
	In Enterprise Netwo	ork Design, stud	ents will investig	ate and desig	n a va	rietv	ofente	erprise		
	network configurat	ions. They will	enhance their co	nsulting skills	, s throu	ugh th	ne proc	cess of		
	customer requiren	nent analysis.	network design	. product si	pecific	ation	s and	price		
Course	quotation. Metho	dologies for s	ourcing. wiring	, hardware	instal	latior	ns. sof	tware		
Description	configurations and	thorough testi	ng and troubles	hooting will	compl	ete t	he des	ign to		
	installation proces	s. Modeling ar	nd simulating n	etworks. usi	ng the	e mo	st adv	anced		
	computer tools. wil	l be given speci	al emphasis.	,	0					
Course	The objective of the	e course is to fa	miliarize the lear	ners with the	conce	epts c	of Ente	rprise		
Objective	Network Design	and attain SI	kill Developme	nt through	Partic	cipati	ve Lea	arning		
objective	techniques							9		
	connucs.									
	On successful completion of the course the students shall be able to.									
Course Out	1. Understand		requirements an	iu Appiy a ivi	ethou	ology	to ne	lwork		
Course Out	Design. Structure and Modularize the Network.									
Comes	2. Design Basic Campus and Data Center Network, and Remote Connectivity.									
	3. Design IP Addressing and Select suitable Routing Protocols for the Network									
	4. Compare Op	DenFlow contro	liers and switche	s with other	enterp	orise i	networ	KS.		
Course										
Content:										
		•								
	Applying a									
Module 1	Methodology to	Assignment	Data Collection/	Interpretatio	n			10		
module 1	Network Design:	/ SSignificity		interpretatio			Ses	ssions		
Topics:						_				
The Cisco Servic	e Oriented Network	Architecture,	Network Design	Methodolog	y, Ide	ntifyi	ng Cus	tomer		
Requirements, C	haracterizing the Ex	isting Network	and Sites, Using	the Top-Dow	n App	roach	n to Ne	etwork		
Design, The Desi	gn Implementation	Process.								
Structuring and	Modularizing the N	etwork:								
Network Hierarc	hy, Using a Modula	r Approach to	Network Design,	Services Wit	thin N	lodula	ar Net	works,		
Network Manage	ement Protocols and	Features	I							
	Designing Basic	Case studies /								
Module 2	Campus and Data	Case let	Case st	udies / Case l	let		9 Ses	ssions		
	Center Networks	cuse let								
Topics:										
Campus Design (Considerations, Ente	rprise Campus	Design, Enterpris	se Data Cente	er Desi	gn				
Considerations.										
Designing Remo	te Connectivity									
Enterprise Edge	WAN Technologies,	WAN Design, U	sing WAN Techn	ologies, Ente	rprise	Edge	WAN	and		
MAN Architectu	re, Selecting Enterpr	ise Edge Comp	onents, Enterpris	e Branch and	l Telev	vorke	er Desig	gn.		
	Designing IP									
	Addressing in the									
Module 3	Network &	Quiz	Case st	udies / Case	let		9 Ses	ssions		
	Selecting Routing									
	Protocols									
Topics:										

Designing an IP Addressing Plan, Introduction to IPv6, Routing Protocol Features, Routing Protocols for the Enterprise, Routing Protocol Deployment, Route Redistribution, Route Filtering, Redistributing and Filtering with BGP, Route Summarization.

Module 4	Software Defined Network	Assignment	Data Collection/Interpretation	10 Sessions
Understanding SI	ON and Open Flow	w: SDN – SDN Bu	ilding Blocks, OpenFlow messa	ges – Controller to
Switch, Symmetri	c and Asynchrono	us messages, Imp	lementing OpenFlow Switch, Op	enFlow controllers,
POX and NOX, O	pen Flow in Clou	d Computing, Cas	se study: how SDN changed Tra	aditional Enterprise
network Design				
Targeted Applicat	tion & Tools that o	can be used:		
Knowing and und	lerstanding an app	plication as to how	w to design an enterprise netwo	ork for given
requirements.				
		Project work/	Assignment:	
Assignment:				
Students will have	e to do group assi	gnments for Modu	lles 1 & 4. As a part of their assi	gnments, they will
have to use some	emethodologies ar	nd approaches of i	network design for an enterprise	e network.
Design an enterp	rise network for gi	iven user requirem	nents in an application.	
Textbook				
T1 Authorized S	elf-Study Guide, D	Designing for Cisco	Internetwork Solutions (DESGN), Second
Edition, Cisco Pre	ss-Diane Teare.			
T 2. Network Ana	lysis, Architecture,	, and Design 3rd E	dition, Morgan Kaufman, James	D.
T3. CCDA Cisco of	ficial Guide			
T 4. Software Def	ined Networking w	vith Open Flow: PA	ACKT Publishing Siamak Azodoln	nolky
References				
R1 Top-Down Ne	twork Design (Net	working Technolo	gy) 3rd Edition, Priscilla Oppenh	eimer, Cisco Press
Book				
R2. Network Plan	ning and Design G	iuide Paperback –	2000, Shaun Hummel	
E book link		, . , .,		
R1: http://www.	teraits.com/pitag	oras/marcio/gpi/	b_POppenheimer_TopDownNe	tworkDesign_3rd_
ed.pdf				
	//			
E book link R2: h	ttps://archive.org	g/details/network	planningd0000humm/page/n1	/mode/2up
14 /-h				and a stars
web resources:	https://www.cisco	o.com/c/en/us/so	Diutions/design-zone/networki	<u>ng-aesign-</u>
guides.ntml			ing water all further is an autom	aniaa maturauli hetual
Topics release is		NATIONS/ enterpri	ise-rietworks/what-is-an-enterp	prise-network.ntml
i opics relevant to	5 SKILL DEVELOP		ment of various solutions by stu	dents in making the
network design	and tonowed by	y discussions and	u presentations for Skill Dev	elopment through
Participative Lear	ning techniques.	This is attained th	rough assessment component h	nentioned in course
nandout.				

Course Code:	Course Title: Operating System with Linux Internals			0		
CSE3120	Type of Course: Discipline Elective in Information		2			
	Science & Engineering Basket	L- T-P-			2	3
		С				
	Theory & Integrated Laboratory					
Version No.	1.0					

Course Pre-	[1] C Programming	[2] Unix shell pro	ogramming	[3] Data Structu	re					
requisites										
Anti-requisites	NIL									
Course Description	The purpose of this of systems and to develop memory management and features. The co- the process and ment programming and analytical skills on problem solving and The associated labor as enhances the ability	course is to enable the s lop the basic concepts on nt. The course will expo ourse is both conceptua mory and needs fair k data structures. The allocating and managi systems programming ratory provides an oppo ity to approach designing	students to un of process ma ose students ta al and analytic nowledge of course devel ng resources. a abilities thro rtunity to vali ng new OS le	derstand the need in nagement, synchro to Linux OS interna- cal in nature towar programming fun ops the critical The course also ugh assignments date the concepts to vel features with c	for Operating onization and als, its design rds managing damentals, C thinking and enhances the taught as well confidence.					
Course Objective	The objective of the	course is to familiarize	the learners	with the concepts	of Operating					
	System with Linux I	nternals and attain <u>S</u>	KILL DEVELOF	<u>MENT</u> through <u>E</u>	XPERIENTIAL					
	<u>LEARNING</u> techniqu	EARNING techniques.								
Course	On successful com	pletion of this course t	the students s	shall be able to:						
Outcomes	 (1) Explain the structure and functions of OS (2) Solve problems on various CPU Scheduling Algorithms (3) Apply different techniques to various synchronization problems (4) Discuss various memory management techniques (5) Apply appropriate Linux commands for memory management and directory management 									
Course Content:										
Module 1	Introduction	Ouiz	Programming		09 Classes					
Topics: Introducti	on to $OS - Compute$	r System Architecture	Operating Sy	vstem Structure C	Department -					
Overview of OS d Linux Operating S	esign and implement System: Introduction	ation. n to Linux OS, Basic	Commands	of Linux OS	, mikersj,					
Module 2	Process Management	Quizzes and	Pseudocode/F	rogramming	9 Classes					
Topics: Process C - Multithreading Algorithms: FCFS Linux Operating	Concept, Operations of Models, Process S, SJF, SRTF, RR, Pr System: Process Ma	on Processes, Inter Proc Scheduling– Basic c iority, Multilevel Queu nagement Command	cess Commun oncepts, Sch e, Multilevel s and Systen	ication, Introducti eduling Criteria, Feedback Queue. n Calls.	on to threads Scheduling					
Module 3	Process Synchronization and Deadlocks	Coding Assignment/Case Study	Pseudocode/F	rogramming	9 Classes					
Topics: The Critical-Section Classic Problems Methods for hand Recovery from Det Linux Operating List of Laboratory Experiment No. 1 Level 1: Linux co mkdir, rmdir, ls, c process utilities	on Problem - Peterso of Synchronization, dling deadlock: Dea eadlock System: P ipe, semaj / Tasks: : Basic UNIX Comma mmands- PATH, ma p, mv, rm, cat, more,	n's Solution, Synchron Monitors. Introduction adlock Prevention- De phore and message que ands n, echo, printf, script, p wc, lp, od, tar, file han	ization hardw n to Deadlock eadlock Avoi eue basswd, unam adling utilities	rare, Mutex locks, cs, Deadlock Cha dance- Deadlock e, who, date, stty, , security by file p	Semaphores, racterization, detection & pwd, cd, permissions,					
Level 2: Text Pro paste, join, tee, pg	cessing utilities and , comm, cmp, diff, tr	backup utilities , tail, h , awk, cpio	ead, sort, nl, ı	ıniq, grep, egrep, f	fgrep, cut,					

Experiment No. 2: Programs using system calls of UNIX operating system Level 1 Programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir **Level 2** Simulate UNIX commands like cp, ls, grep. **Experiment No. 3:** Programs to demonstrate process creation and termination Level 1: Program to demonstrate creating new processes and waiting for a process Level 2: Program to demonstrate creation of zombie processes and orphan process **Experiment No. 4**: Programs to demonstrate inter process communication using Pipe Level 1: Programs to illustrate execution of two commands concurrently with a command pipe and communication between two unrelated processes Level 2: Program to demonstrate inter process communication using mkfifo, open, read, write and close APIs **Experiment No. 5:** Programs to demonstrate inter process communication using message queues Level 1: Program to create a message queue with read and write permissions and to write messages with different priority numbers Level 2: Program to receive messages of different priorities from the message queue and display them Experiment No. 6: Programs to demonstrate process synchronization using Semaphores **Level 1: P**rogram that illustrates suspending and resuming processes using signals Level 2: Program that illustrates access of shared memory using counting semaphore **Experiment No. 7:** Programs to demonstrate the event of a deadlock and its avoidance Level 1: Using POSIX Semaphores demonstrate the scenario where in deadlock happens due to incorrect use of semaphores Level 2: Program to implement a solution to the Dining Philosopher problem using Monitors Targeted Application & Tools that can be used: **Targeted Application:** Real time Applications such as traffic management system, banking system, health care and many more systems where there are entities that use and manage the resources. Software Tools: Linux Environment **Project work/Assignment:** Each batch of students (self-selected batch mates) will identify projects and implement with the most suitable 2 or 3 antecedents. Textbook(s): 1. Silberschatz A, Galvin P B and Gagne G, "Operating System Concepts", 9th edition Wiley, 2013 2. Sumitabha Das, "Unix concept and Programming", McGraw Hill education, 4th Edition, 2015 References 1. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, Linux in a Nutshell, O'Reilly Media, Inc, 2009 2. Operating Systems | Internals and Design Principles | Ninth Edition | By Pearson Paperback -1March 2018. by William Stallings (Author) Topics relevant to " **SKILL DEVELOPMENT** ": Linux OS commands and programming for <u>SKILL</u> DEVELOPMENT through EXPERIENTIAL LEARNING techniques.. This is attained through assessment

component mentioned in the course handout.

Course Code: CSE2056	Course Ti	tle: WEB 2	2.0		2	0	2		3
	Type of Co Laborator	ourse: Prog y Integrate	ram Core d Course	L-T- P- C					
Version No.	1.0								
Course Pre-	Programm	ing fundame	entals (any	language).	Knov	wledg	e of RDB	MS. HTMI	. CSS. and
requisites	JavaScript		(unj				,• • • • • • • • •		, <i>coo</i> , and
Anti-	NIL								
requisites									
Course	The purp	ose of this c	ourse is to	introduce	the ne	ext le	vel of web	design usin	ng Web 2.0
Description	technolog	gies. Web 2.0) is the bus	iness revolu	ution	in the	e computer	industry ca	used by the
	evolution	of social n	etworking.	Students	will	be tra	ained in pl	lanning and	l designing
	effective web pages by writing code using current leading trends in the web domain,								
	enhancing	g web pages	with the u	se of JavaS	cript	frame	works. The	e major foc	us is on the
	key eleme	ents of web 2	.0 like Rich	n internet ap	plica	tions,	Service-or	iented archi	tecture, and
Course	A ftor the e	D. omplation of	f the course	atudanta al	oll b	o oblo	to		
Outcomes	After the C	emonstrate de	atabase_dri	ven web an	nlicat	ion w	ith the serv	er-side scri	nt using
Outcomes	PHP.			ven web ap	pnear	ion w	ini ne serv	er-side seri	prusing
	2. En	nploy JavaSc	cript frame	works to de	velop	rich	internet app	lications.	
	3. De	emonstrate w	eb applicat	tion using F	'lex ai	chite	cture deplo	yed to flash	player.
	4. De	escribe the co	oncept of w	eb applicat	ion te	rmino	ologies and	internet too	ols for
	develo	ping the soci	ial web.						
	T I I. ¹ I	(916 (b)		
Course	The object	ive of the co	urse is to f	amiliarize ti	ne lea	rners	with the c	oncepts of	WEB 2.0
Course Objectives	and attain	Skill Develo	pment thro	bugn Exper i	entia	I Lear	rning techn	iques.	
Objectives									
Course Content:									
Module 1		Assignment						9 Hours	
Topics:									
Overview of ir	nternet and	l its evolutio	on, Compa	rison of w	eb 1.0) and	web 2.0, o	characteris	tics of web
2.0, Introduc	tion to s	server-side	scripting-	PHP, PH	P ar	nd N	AySQL in	iteraction,	Web 2.0
technologies, (Overview	of JavaScrij	pt framew	orks-AJA2	K. PH	lP ex	ample, AJ	AX examp	ole
Module 2		Assignment						9 Hours	
Topics:	2					_	~ .		
Data interchan	ige format	s: XML, XI	ML basics	; XML Sc	hema	; Тур	pes, Sampl	e program	for XML,
Overview of J	Query, JQ	uery examp	ole, Overvi	ew Angul	ar JS				
Module 3		Assignment						9 Hours	
Topics:									
Overview of F	Flex archite	ecture: Face	ebook, An	gular JS e	xamp	le, D	oifferences	between H	HTML and
Flex application	ons, Angul	ar JS examp	ple, Flex e	xample, U	nders	tandi	ng Action	Script, Fle	x example,
Differentiating	g betweer	ı Flash pl	ayer and	Framewo	ork,	Flex	example,	Understa	anding UI
Components, I	Model Vie	w Controlle	er					-	
Module 4		Assignment						9 Hours	
Topics:	0 · 1 • • •	י יווי ת	1 4	י יווי ת			0 1	1.	.,
introduction to	Social Web	b, Building b	log-part 1,	Building bl	og-pa	art 2,	Social netw	orking or s	ocial media
sites wikis, blog, Youtube, Building blog-part 3, Building blog-part 4, Collaborative consumption									
Targeted Appl	ication &	Fools that ca	an be used	; part 5					
1.	To creatin	g a social we	b site						

List of Laboratory Task

Experiment No. 1: Learn to use a web server (Apache) and server-side scripting using PHP along with a

database.

Experiment No. 2: Learn to create rich internet applications using JavaScript frameworks

Experiment No. 3: Learn to create a web application using Flex architecture

Experiment No. 4: Learn how web2.0 websites facilitate interaction among users,

Eg: creating a social web site

Project work/Assignment:

Project Assignment: NIL

Text Books

1. P.J.Deitel and H.M. Deitel, "Internet and World Wide Web – How to Program", Pearson Education.

2. Programming Flex 2 – Chafic Kazoun, O'Reilly publications, 2007

References

- 1. Randy Connolly, "Fundamentals of Web Development", Pearson Education
- 2. Robert W Sebesta, "Programming the World Wide Web", Pearson Education
- 3. Gottfried Vossen, Stephan," Hagemann Unleashing Web 2.0: From Concepts to
- Creativity", Elsevier
- 4. Nicholas C Zakas," Professional AJAX", Wrox publications
- 5. Frank. P. Coyle, "XML, Web Services And The Data Revolution", Pearson Education.
- 6. James Snell, Doug Tidwell, Pavel Kulchenko, "Programming Web Services with SOAP",
- O'Reilly publishers.

Web Resources:

- 1. W3schools.com
- 2. Developer.mozilla.org/en-US/docs/Learn
- 3. docs.microsoft.com
- 4. informit.com/articles/ The Relationship Between Web 2.0 and Social Networking
- 5. <u>https://presiuniv.knimbus.com/user#/home</u>

Topics relevant to "SKILL DEVELOPMENT": Building blog, Social networking or social media sites for **Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Problem Solving Using Python											
CSE258		L-T-P- C	1	0	4	3						
	Type of Course: Theory & Integrated Laboratory											
Version No.	1.0	0										
Course Pre-	lil											
requisites												
Anti-requisites	NIL	JIL										
Course	This course provides the opportunity for the students of Computer Science engineering											
Description	to develop Python scripts using its powerful program	nming featu	ires li	ke lists,	lists, sets,							
	tuples, dictionaries and sets. Students will also be int	roduced to	o obje	ect orier	nted							
	programming concepts and packages for data visuali	zation.										
	Topics include: Basics of Python programming, op	erators an	d ex	pressior	ns, de	cision						
	statements, loop control statements, functions, strin	ngs, lists, lis	st pro	cessing	: sear	rching						
	and sorting, nested list, list comprehension, tuples a	and diction	aries,	sets, fil	le han	dling,						
	exception handling, object oriented programming co	oncepts, mo	odule	s and p	ackag	es for						
	data visualization											

Course Objective	The objective of the course is to familiarize the learners with the concepts of Problem Solving Using Python and attain Employability Skills through Experiential Learning								
Course Out Comes	On successful completi 1. Demonstrate p (Application) 2. Manipulate fur 3. Apply Tuple, Di time problems (Ap 4. Practice object 5. Produce data v	on of the course the roblem solving throu nctions and data struc ictionaries, File and E plication) -oriented programmi risualization using mo 1.	students shall be able to: gh understanding the basics ctures. (Application) xception Handling concepts ng (Application) dules and packages (Applica	of python to solve real tion)					
Course Content	::								
Module 1	Problem Solving Techniques and Basics of Python Programming	assignments	Quizzes form basics of python	15Sessions					
Basics of proble	em solving techniques, Ba	sics of Python progra	mming, operators and expre	essions,					
Module 2	Function, String and List	Quizzes and assignments	Comprehension based Quizzes and assignments	15 Sessions					
Functions, strin	gs, lists, list processing: s	earching and sorting,	nested list, list comprehens	ion					
Module 3	Data Structures, File and Exception handling	Term paper/Assignment	Quizzes form advanced python	15 Sessions					
Tuples and dicti	ionaries, sets, file handlir	ig, exception handling	д.						
Module 4	Object-Oriented Programming and Data Visualization	Term paper/Assignment	Application on data visualization	15 Sessions					
Object oriented List of Laborato Each Lab sheets	programming concepts, pry Tasks:	modules and packag	es for data visualization.						
Targeted Applic Any IDE – PyCh	cation & Tools that can b arm, VS Code, Python ID	e used: E, Spyder, jupyter no	te book, Google Colab						
Text Book T1. Ashok Nam Tata Mc Graw H T2. Charles Die T3. Reema Tha 2017.	dev Kamthane and Amit ill Edition, 2018. rbach, "Introduction to C reja, "Python Programmi	Ashok Kamthane, "Pr computer Science Usin ng Using Problem Sol	roblem Solving and Python P ng Python", Wiley India Editi ving Approach", Oxford Univ	rogramming", on, 2015. versity Press,					
References R1. Balagurusa 2016 R2. Y. Dar E-Resources: W1. <u>http://pyth</u> W2. <u>https://ww</u> W3. <u>https://n.c</u>	my, "Introduction to Con niel Liang, "Introduction t <u>nontutor.com/</u> /w.udemy.com/topic/pyt coursera.org/courses?que	nputing and Problem- to Programming Using <u>hon/</u> ery=python obal.com/login	Solving Using Python", Tata g Python", Pearson, 2017	McGraw-Hill,					

Topics relevant to the Employability SKILLS:

problem solving techniques — Function - Object oriented programming - data visualization for for <mark>Employability Skills through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.</mark>

Course Code:	Course Title: Fire	wall and Interne	t security	L-T- P- C	2	0	2	3
CSE 2058	Type of Course: In	itegrated						
Version No.	1							
Course Pre-	Computer Netwo	orks						
requisites								
Anti-requisites								
Course Description	methods to defend against them. A number of threats and vulnerabilities of the Internet will be covered, including various vulnerabilities of TCP/IP protocols, denial of service (DOS), attacks on routing, attacks on DNS servers, TCP session hijacking, and so on. This course will also cover defending mechanisms, including intrusion detection, firewalls, tracing the source of attacks, anonymous communication, IPsec, virtual private network, and PKI. To make it easy for students to understand these attacks, basics of the TCP/IP protocols will also be covered in the course.							
Course	The objective of tl	he course is to f	amiliarize th	e learners	s with	n the	e concepts	of Firewall
Objective	and Internet see	curity and atta	in Skill De	evelopme	nt th	nrou	gh Proble i	n Solving
	Methodologies.			<u> </u>				
Course Out Comes	 Course Out Comes To identify elements of firewall design, types of security threats and responses to security attacks. Examine security incident postmortem reporting and ongoing network security activities. Construct code for authentication algorithms. Develop a signature scheme using Digital signature standard. Demonstrate the network security system using open source tools 							
Course Content:								
Module 1	Firewall	Assignment	Data Collect	ion/Interp	oreta	tion	12	Sessions
Introduction of Fi Firewall location masks Packet filte	rewall in computer n and Configura ers Stateful firewal	r network,Catego ation,Firewall P Is Resources	ories of firew olicies,Firew	vall,How f /all Biasi	irewa ng,N	all w etwo	orks,Types ork Archit	of firewall, ecture,Net
	Computer	Case studies /						
Module 2	security	Case let	Case st	udies / Ca	ise le	t	12	Sessions
Topics: Attac Principles of Secu Sockets Layer, Tra	ks on Computers urity Types of Atta ansport Layer Secu	and Computer acks. Transport L rity, HTTPS, Secu	Security: N evel Securit re Shell (SSF	leed for S y: Web S H)	Secur ecuri	ity, ty C	Security Aponsideratio	oproaches, ns, Secure
Module 3	Network Security	Quiz	Case st	udies / Ca	ise le	t	10	Sessions
Topics: Overvi	ew of Network Se	ecurity:Elements	s of Networ	k Security	/ , Cla	assif	ication of I	Vetwork
Attacks ,Secu (DES),Advance Hellman Key- (SHA) , Digital	urity Methods , ed Encryption Sta Exchange Protoc Signatures.	Symmetric-Key ndard (AES) , P ol , Authentica	Cryptogr ublic-Key C tion :Hash	aphy :D ryptogra _l Function	ata phy : i , Se	Enc RSA ecur	ryption S Algorithm e Hash Al	tandard ι ,Diffie- gorithm
Module 4	Cyber laws and Compliance Standards	Quiz	Case studi	ies / Case	let		11	Sessions
Topics:								
Kerberos:Working	ASS,TGS,SS-Inte, ASS,TGS,SS	rnet security pr	otocols-AH,	ESP,Mode	ls-Tra	ansp	ort and tu	nnel-Email
security,Public Introduction,Hack defamation,Crime	key Infra king,Digital forger e against individual	isturcture,Certifi y,Cyber Stalking I,Government,Pr	cates,certific g,Identify th operty.	cates heft and	aut Frau	hori ıd,C	ty.Cyber yber terro	Crime: rism,Cyber

List of Laboratory Tasks:

- 1. Perform encryption, decryption using the following substitution techniques
- (i) Ceaser cipher, (ii) playfair cipher iii) Hill Cipher iv) Vigenere cipher
- 2. Perform encryption and decryption using following transposition techniques
- i) Rail fence ii) row & Column Transformation
- 3. Apply DES algorithm for practical applications.
- Apply AES algorithm for practical applications.
 Implement RSA Algorithm using HTML and JavaScript
- 6. Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
- 7. Calculate the message digest of a text using the SHA-1 algorithm.
- 8. Implement the SIGNATURE SCHEME Digital Signature Standard.
- 9. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.
- 10. Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool
- 11. Defeating Malware

i) Building Trojans ii) Rootkit Hunter

Targeted Application & Tools that can be used

Text Book

T1 : Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian Edition

T2: James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson, 2017

References

R1: Andrew S Tanenbaum, Computer Networks, fifth edition, Pearson Edition

R2: Nader F Mir, Computer and Communication Networks, 2nd Edition, Pearson, 2014.

Web resources:

- 1. https://networklessons.com/cisco/asa-firewall
- 2. https://www.udemy.com/course/cisco-asa-firewall-lab-guide
- 3. https://geekflare.com/learn-network-security

Topics relevant to development of "Skill Development": AES, Network Security for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: MOBILE NETWORKING	L- T-	2	0	2	3					
CSE 2059	Type of Course: Integrated	P- C									
Version No.	1.0										
Course Pre-	NIL										
requisites											
Anti-requisites	NIL	L									
	Objective of this course is to make students und	erstan	d ba	si	cs of various	techniques					
Course Description	in mobile Networks/Adhoc Networks and New	techn	olog	gγ	of Wireless	Broadband					
	Networks										
Course Objective	The objective of the course is to familiarize the le	arners	s wit	:h	the concepts	of MOBILE					
	NETWORKING and attain Skill Developmer	nt thr	oug	h	Experientia	l Learning					
	techniques.										
	On successful completion of the course the stu	dents	sha		be able to:						
	1] Understand basics of Routing and protocols in	n Adhc	oc ai	nd	Sensor Net	works.					
	2] Learn Wireless Broadband Networks Technol	ogy Ov	/erv	ie	w, Platforms	and					
Course Out Comes	Standards.										
	3] Learn management, testing and troubleshoot	ing in V	Nire	ele	ss Broadban	d Networks					
	working principles of wireless LAN, its standards.										
	Learn latest wireless networks.										

Course Content:							
Module 1	AD HOC NETWORKS	Quiz	Case studies / Case let	8 Sessions			
Topics: Characteristics and classifications, Table Protocols – Zone Rou Routing, Distance Ro	Applications of Ad hoc Driven Routing Protocols uting, Fisheye Routing, La uting Effects, Microdiscov	Networks, F , Source Initia ANMAR for M ery and Power	Routing – Need for ted On-Demand Rout ANET with group mol Aware Routing.	routing and routing ing Protocols,, Hybrid pility, Location Added			
Module 2	SENSOR NETWORKS	Quiz	Case studies / Case let	8 Sessions			
Topics: Wireless Sensor Netv Diffusion, SPIN, COGI APTEEN and Adapting	vorks, DARPA Efforts, Clas UR, Hierarchical Routing, (g to the dynamic nature o	sification, Fun Cluster base ro f Wireless Sen	damentals of MAC, Fla buting, Scalable Coordin sor Networks.	t routing – Directed nation, LEACH, TEEN,			
Module 3	WIRELESS BROADBAND NETWORKS TECHNOLOGY	Quiz	Case studies / Case let	8 Sessions			
Overview, Platforms and Standards Wireless broadband fundamentals and Fixed Wireless Broadband Systems, Platforms- Enhanced Copper, Fibre Optic and HFC, 3G Cellular, Satellites, ATM and Relay Technologies, HiperLAN2 Standard, Global 3G CDMA Standard, CDMA Harmonization G3G Proposal for Protocol Layers.							
Module 4	NETWORKS AND	Quiz	Case studies / Case I	et 8 Sessions			
Mininging Wheless Principles of operati Wireless Satellite Net Module 5 Wireless. Broadband	ons Management, LMDS tworks and Fixed Wireless ADVANCED WIRELES NETWORKS Network Applications: Te	Versus Other Broadband N SQuiz	Access technologies, etworks. Case studies / Case let del and Adaptive QoS I	Applications, Testing essions			
Broadband Satellite S CDMA, Smart Phones	Systems, Next Generations and 3G Evolution.	Wireless Broa	el, Residential High sp adband Networks – 30	G, Harmonized 3G, 3G			
List of Laboratory Ta • Test the different section and trans • Perform the • Transfer an in two devices and a • Configure Wi mobile phone to • Apply RFID te • Establish sea	sks: erent sections of mobile pl smitter section). process of call connection mage, audio and video file analyze the performance. i-Fi setting in mobile devic mobile phone, mobile pho echnology for real life app mless wireless connectivit	hone. (such as and call relea e using Bluetoc es using mobil one to laptop. lications using cy using multip	ringer section, dialer s se of cellular Mobile sy oth protocol with varyi le tethering to connect RFID kit. le access point	section, receiver ystem. ng distance between t two devices such as			
Targeted Application MATLAB and Simulin	a & Tools that can be used ak	ł					
Assignment:	Project	work/Assignn	nent:				
Text Book T1. Joh R. Vacca, "\ McGraw-Hill, 2001 (28)	Wireless Broadband Netv Unit III Chapter – 1, 2, 5;	vorks Handbo Unit IV Chap	ok 3G, LMDS and Wi ter 22, 23, 24, Unit V	reless Internet" Tata Chapter 25, 26 and			

T2. D.P. Agrawal and Qing-An zeng, "Introduction to Wireless and Mobile Systems" Thomson Learning, 2003. [Unit I, Chapter 13.1 to 13.7.7, Unit 2 13.7.8 to 13.9]

References

R1. Martyn Mallick, Mobile and Wireless Design Essentials, Wiley, 2003.

R2. Kavesh Pahlavan and Prashant Krishnamurty - "Principles of Wireless Networks – A unified Approach, Pearson Education, 2002.

E book link R1. https://www.youtube.com/watch?v=H7tGiGjL9bA

E book link R2. https://nptel.ac.in/courses/106106167 https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&A N=2233842&site=ehost-live

https://nptel.ac.in/courses/106102064

Topics relevant to "SKILL DEVELOPMET": Wireless and Cellular networks for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE 3132	Course Title: Netw Type of Course: Th	vork Management Sy eory Only Course	vstems	L- P- C	3)	3	
Version No.	1.0				I		-1	
Course Pre- requisites	NIL							
Anti-requisites	NIL							
Course Description	To understand the principles of network management, different standards and protocols used in managing complex networks and the Automation of network management operations and making use of readily available network management systems.							
Course Objective	The objective of the Management Syste techniques.	e course is to familiar e ms and attain Skill	ize the le Develop	earners with t ment throug	he conc h Partic i	epts o pative	f Network Learning	
Course Out Comes	On successful completion of the course the students shall be able to: 1]Acquire the knowledge about network management standards (OSI and TCP/IP). 2]Acquire the knowledge about various network management tools and the skill to use them in monitoring a network. 3]Analyze the challenges faced by Network managers. 4]Evaluate various commercial network management systems and open network management systems. 5]Analyze and interpret the data provided by an NMS and take suitable actions							
Course Content:								
Module 1	DATA COMMUNICATION AND NETWORK MANAGEMENT	Assignment	Data Col	lection/Inter	oretation	1 2	Sessions	
Topics:								
OVERVIEW : Analo	ogy of Telephone N	letwork Managemen	it, Comm	unications p	rotocols	and S	standards,	
Case Histories of	Networking and N	Management, Challe	nges of	Information	Techno	logy I	Managers,	
Network Managem	nent: Goals, Organiz	ation, and Functions	, Networ	k and System	Manag	ement	, Network	
Module 2	em Platform, Currer Simple Network Management Protocol	Case studies / Case let	Case	studies / Cas	se let	12	Sessions	

Topics:

SNMPV1 NETWORK MANAGEMENT MANAGED NETWORK: Organization and Information Models MANAGED NETWORK: Case Histories and Examples, The History of SNMP Management, The SNMP Model, The Organization Model, System Overview, The Information Model.

SNMPV1 NETWORK MANAGEMENT: Communication and Functional Models The SNMP Communication Model, Functional model. SNMP MANAGEMENT: SNMPv2 Major Changes in SNMPv2, SNMPv2 System architecture, SNMPv2 Structure of Management Information, The SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility with SNMPv1.

Monitoring Quiz Case studies / Case let 14 Sessions

Topics:

RMON : What is Remote Monitoring? ,RMON SMI and MIB, RMON1, RMON2, ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON TELECOMMUNICATIONS MANAGEMENT NETWORK: Why TMN?, Operations Systems, TMN Conceptual Model, TMN Standards, TMN Architecture, TMN Management Service Architecture, An Integrated View of TMN, Implementation Issues.

	NETWORK		Case studies / Case	
Module 4	MANAGEMENT	Quiz	Lase studies / Case	14 Sessions
	TOOLS AND SYSTEMS	5		

Network Management Tools, Network Statistics Measurement Systems, History of Enterprise Management, Network Management systems, Commercial Network management Systems, System Management, Enterprise Management Solutions.

Module 5 WEB-BASED MANAGEMENT Quiz Case studies / Case let Case	ıs
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NMS with Web Interface and Web-Based Management, Web Interface to SNMP Management, Embedded Web-Based Management, Desktop management Interface, Web-Based Enterprise Management, WBEM: Windows Management Instrumentation, Java management Extensions, Management of a Storage Area Network , Future Directions. Case Studies.

Targeted Application & Tools that can be used: Kiwi CatTools, SolarWinds Network Configuration Manager.

Project work/Assignment:

Assignment: Simulation of NMS using any of the tools mentioned above.

Text Book

T1. Mani Subrahmanian, "Network Management Principles and Practice", 2nd Edition, Pearson Education, 2010.

References

R1. Morris, "Network management", 1st Edition, Pearson Education, 2008.

R2. Mark Burges, "Principles of Network System Administration", 1st Edition, Wiley DreamTech, 2008.

E book link R1.

https://documentation.solarwinds.com/en/success_center/kct/content/kct_documentation.htm

E book link R2. <u>https://documentation.solarwinds.com/</u>

E book link R3. https://www.youtube.com/watch?v=liBB_Q7Go5k

NPTEL Course: <u>https://onlinecourses.nptel.ac.in/noc22_cs98/course</u>

Topics relevant to "SKILL DEVELOPMENT": Telephony network management and SNMPV1 for **Skill Development** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Internet of	Things			1	0	Λ	2	
CSLZZU	Type of Course: Integrat	ed		L- 1-P- C	1	0	4	5	
Version No.	2.0								
Course Pre-	1. Students should know	hasic python program	ming						
requisites	2. Students have basic	knowledge basic ele	ctronic co	mponen	ts suc	h as	sens	ors –	
	temperature, motion, pr	ressure. and actuators	etc.	mponen			50115	0.0	
	3. Students should have	basic idea about Cloud	and its us	ses.					
Anti-requisites	NIL								
Course	The Internet of Things (I	oT) is an emerging para	adigm con	nbining h	eterog	enec	ous de	vices	
Description	at an unprecedented s	cale, thereby enabling	g individu	als and	organi	zatio	ns to	gain	
	greater value from netw	orked connections am	ong peopl	le, proces	sses, d	ata, a	and th	nings.	
	The Internet of Things	(IoT) is a course of	objects i	nteractir	ig wit	h pe	ople,	with	
	information systems, an	d with other objects. T	he course	will focu	s on ci	eativ	e thir	nking,	
	IoT concepts & IoT techr	oT concepts & IoT technologies.							
Course	The objective of the cou	rse is to familiarize the	learners v	vith the c	oncep	ts of	Interr	net of	
Objective	Things and attain SKILL [DEVELOPMENT through	n EXPERIE	NTIAL LE	ARNIN	G teo	chniqu	Jes	
Course Out	On successful completio	n of the course the stu	dents shal	l be able	to:				
Comes	1. Identify the app	lication areas of IoT							
	2. Understand buil	ding blocks of Internet	of Things	and char	acteri	stics			
	3. Describe IoT Pro	tocols							
	4. Demonstrate us	e of IOI devices for sim	iple applic	ation					
Course Content:						1			
Module 1	INTERNET OF THINGS	Assignment	Simulatio	n/Data A	nalysi	5 18	Sessi	ons	
Introduction, De	finition & Characteristics	of IOT, Physical Design	of IoT- Thii	ngs in IoT	, IoT P	rotoc	ols, Lo	ogical	
design of IoT- Io	T functional blocks, IoT (Communication Model	s, IoT Con	nmunicat	ion AF	ls, lo	T Ena	bling	
Technologies- W	ireless sensor networks,	Cloud computing, Big c	lata Analy	tics		-			
	IOT COMMUNICATION		Numerica	l from F-					
Module 2	MODEL AND	Assignment	Resource	s		18	18 Sessions		
	PROTOCOLS			-					
Connectivity Pro	tocols: 6LoWPAN, IEEE	802.15.4, Zigbee, Wire	eless HAR	r, Z-Wav	e, ISA	100,	NFC,	RFID.	
Communication/	Iransport Protocols: Blu	etooth. Data Protocol	s: Messag	e Queue	leler	netry	l ran	sport	
(MQTT), Constra	ined Application Protocol	(COAP), Advanced Me	ssage Que	uing Prot	0001 (AIVIQ	P), XN	/146 –	
Extensible wess	aging and Presence Proto								
		Term	Cimulatia	n/Data A	nalvci	10	0 Coosiono		
would 5		paper/Assignment	Sinuatio	ny Data A	lialysi	. 19	36221	ons	
Communication	Transport Protocols: Blu	etooth Data Protocol	s. Messau		Tolor	notry	Tran	sport	
(MOTT), Constra	ined Application Protocol	(CoAP). Advanced Me	ssage Oue	uing Prot		AMO	P). XN	лрр —	
Extensible Messa	aging and Presence Proto	col. RFID: Introduction.	Principle o	of RFID. C	oamo	nents	ofan	RFID	
system.	0.0	,	•	,	•				
List of Laborator	y Tasks								
1 Installation of a	arduino IDE & Arduino pr	ogram to implement so	crolling LEI	D, to glov	v ever	/odd	LED		
2 Arduino progra	am to demonstrate usage	of push button to con	trol the LE	D					
3 Arduino progra	am to demonstrates traffi	c control system							
4 Arduino progra	am to demonstrates usag	e of servo motor with _l	potentio m	neter.					
5.Arduino progra	am to Control an LED usin	g Bluetooth.							
6.Arduino progra	am to implement RFID rea	ader for security access	5.						
7. Arduino Progr	am to detect obstacle usi	ng IR sensor.							
8.Arduino Progra	am to detect motion using	g PIR sensor.							
9.Installation of	Raspberry pi software								
10. Working basi	c commands on Raspber	ry pi & to demonstrate	remote lo	gging in	raspbe	erry p	i		
11.Raspberry pi	program to implement bl	inking LED							

12.	Raspberry	pi	program	to	implement	camera	module fo	r video

13. Raspberry pi program to obtain the temperature using DHT sensors

14. Using a Raspberry Pi with distance sensor (ultrasonic sensor HCSR04)

15. Raspberry pi program to implement Garage spot light

Targeted Application & Tools that can be used:

Interfacing of ARDUINO and Raspberry pi for developing smart CITIES Tools:

> Tinker cad Cooja simulator Contiki Thingspeak

Text Book

T1 Arshdeep Bagha, Vijay Madisetti, Internet of Things A hands on approach, First Edition, Universities Press, 2018

T2 Hakima Chaouchi, The internet of Things Connecting Objects to web Wiley 2017

References

R1 Vinit Kumar Gunjan, MohdDilshad Ansari,Mohammed Usman, ThiDieuLinh Nguyen Internet of Things Technology, Communications and Computing Springer January 2023

R2 Dr. Hassan Internet of Things A to Z: Technologies and Applications IEEE Press 2018

E-Resources

NPTEL course -

a) <u>https://onlinecourses.nptel.ac.in/noc22_cs53/preview</u>

b) https://www.udemy.com/course/complete-guide-to-build-iot-things-from-scratch-to-market/ c) https://puniversity.informaticsglobal.com:2229/login.aspx

Topics relevant to "SKILL DEVELOPMENT": Case studies of water supply projects – Design criteria through group discussion. Interpolation of sensors through group presentation for **Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Could computing and Virtualization	I - P- C	3	0	з				
CSE2057	Type of Course : Theory		3	Ũ					
Version No.	1.0								
Course Pre-	Basics of Distributed Computing, Service Oriented Arc	chitectur	e						
requisites	- 1								
Anti-requisites									
Course Description	omputing paradigm. Cloud Computing has emerged in recent years as a new aradigm for hosting and delivering services over the Internet. The students can applicate various Cloud Computing terminology, principles and applications. Inderstanding different views of the Cloud Computing such as theoretical, achnical and commercial aspects. opics include: Evolution of cloud computing and its services available today, atroduction, Architecture of cloud computing, Infrastructure, platform, offware, Types of cloud, Business models, cloud services, Collaborating using loud services, Virtualization for cloud, Security, Standards and Applications.								
Course Objective	The objective of the course is to familiarize the learn	ers with	the cor	ncepts o	of Could				
	computing and Virtualization and attain Emplo	yability	throug	h Part	icipative				
	Learning techniques.								
Course Out Comes	 Describe fundamentals of cloud computing, virtualization and cloud computing services. Discuss high-throughput and data-intensive computing. Explain security and standards in cloud computing. Demonstrate the installation and configuration of virtual machine. 								
Course Content:									
Module 1			10) Sessio	ons				
Introduction to Cloud Computi Environments, O Virtualized Envi Computing, Tech Clouds, Econom	Cloud and Virtualization ng at a Glance, Historical Developments, Computing Platforms and Technologies, Virtu ronments Taxonomy of Virtualization Techniqu nology Examples, Cloud Computing Architecture ics of Cloud	Building alization es, Virt e, IaaS,	g Clou n, Cha ualizati PaaS, S	d Cor racteris on and SaaS, T	mputing stics of d Cloud Types of				
Module 2			10) Sessi	ons				
High Throughput and Data Intensive Computing : Task computing, MPI applications, Task based programming, Introduction to DIC, Technologies for DIC, Aneka Map Reduce Programming									
Module 3			09	Sessi	ons				
Cloud Security Application stand	and Standards : Cloud Security Challenges, So dards, Client standards, Infrastructure and Service	oftware- standard	as-a-Se ls.	rvice S	Security,				
Module 4			09	Sessi	ons				
Cloud Platform to Google App I Media Clouds - Hybrid Cloud Text Book	s, Advances in cloud: introduction to Amazon Engine, Introduction to Microsoft Azure. Security Clouds - Computing Clouds - Mobile (Web S Clouds -	Services - Feder	s: Intro	oduction 2 louds –				

1. John Rittinghouse and James Ransome, "Cloud Computing, Implementation, Management and Security", CRC Press.

2. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education.

References

1. David E.Y. Sarna, "Implementing and Developing Cloud Applications", CRC Press.

2. Anthony T Velte, Toby J Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw-Hill.

Web resources: <u>https://presiuniv.knimbus.com/user#/home</u>

Topics relevant to "EMPLOYABILITY SKILLS":

Aws, Azure, APIs, Aneka Cloud Platform, EC2, Installation of VM Workstation, Infrastructure Security Challenges for developing **Employability Skills** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.

Course Codes	Course Titles Infractructure Management							
CSE2142	Type of Course : Theory	L- P- C	3	0	3			
CSE3145								
version No.								
Course Pre- requisites	Basic Knowledge on Linux and Information Manager	ment						
Anti-requisites	NIL							
Course Description	The course will employ a research, reporting and presentation approach using the latest ICT tools to examine and critically analyze a combination of the technical and management issues in contemporary infrastructure management, with a focus on business alignment. IT infrastructure Management evaluates new ICTs and case studies in the context of enterprise architecture. It is suitable for combinations of students in information technology, business administration and electronic commerce.							
Course Objective	ne objective of the course is to familiarize the learners with the concepts f Infrastructure Management and attain Employability through Participative							
	Learning techniques.							
Course Out	 On successful completion of the course the students shall be able to: Describe the business value and processes of ICT services in an organization and apply that knowledge and skill with initiative to a workplace scenario. Investigate, critically analyze and evaluate the impact of new and 							
Comes	 current ICT services to an organization. Describe how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organization 							
	• Demonstrate the technical and comm the operation of ICT services in an organization	nunications	s skills t	hat con	tribute to			
Course Content:								
wiodule 1			1() Sessi	ons			
Introduction to In Definitions, Infras Midrange-to-PCs- internet, current by Total cost of comp	nfrastructure management tructure, management activities, Evolutions of Syste to-Client-server computing-to-New age systems) and usiness demands and IT systems issues, complexity oblexity issues, Value of Systems management for busing	ems since nd their r f today's oness.	1960s (nanagen computir	(Mainfr nent, gr ng envi	ames-to- rowth of ronment,			
Module 2			1() Sessi	ions			
Managing Infrast Factors to conside Requirements, Ide their integration, F systems, Models, I	tructure r in designing IT organizations and IT infrastructure, or ntifying System Components to manage, Exist Proces Patterns for IT systems management, Introduction to the Information Technology Infrastructure Library (ITIL).	determinin sses, Data, ne design J	ng custor applicat process f	ner's ions, Te for info	ools and rmation			
Module 3			09	Sessi	ions			
Security Concern Introduction Secu security, LDAP fu- to Storage, Backup Hierarchical spac retention. Service management, Capa	s rity, Identity management, Single sign-on, Access indamentals, Intrusion detection, firewall, security infor & Restore, Archive & Retrieve, Space Management, e management, Database & Application protection e-level management, financial management and acity management, Availability management.	Managem rmation m , SAN & N n, Bare n costing,	ent, Ba anagemo NAS, Dis nachine IT serv	sics of ent. Intr saster R recove ices c	network oduction ecovery, ry, Data ontinuity			
Module 4			09	Sessi	ions			
Configuration Ma Configuration Ma management, Rele Text Book 1. Rich Schie	anagement anagement, Service desk, Incident management, ase management. esser, IT Systems Management.	Problem	manag	ement,	Change			

References

- 1. E Turban, E Mclean and James Wetherbe, —Information Technology for Management
- 2. Kenneth C Laudon, Jane P Laudon, -Management Information Systems
- 3. Roger S Pressman, —Software Engineering: A Practitioner 's Approach
- 4. James A O 'Brien, —Management Information Systems
- 5. Walker Royce, Software Project Management: A Unified Framework

Web resources:

- 1. <u>http://pu.informatics.global</u>
- 2. https://presiuniv.knimbus.com/user#/home

Topics relevant to "EMPLOYABILITY SKILLS": Identity management, Single sign-on, Access Management, Basics of network security, LDAP fundamentals, Intrusion detection, firewall, security information management for developing **Employability Skills** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout..

CSE334 Type of Course: Theory P C S V Version No. 1.0 Course Pre- trequisites Data Mining Anti-requisites NIL Course Pre- Description The course is an intermediary course and aims to provide students with an in- depth understanding of the design and implementation of data warehousing and data mining. The course will help students to enhance their understanding of various classification, clustering, and outlier analysis methods. An interest to understand the concepts of data warehousing, and data mining and a desire to be a successful data scientist are key to enabling students to complete the course successful data scientist are key to enabling students to complete the course successful data scientist are key to computation, materialized view selection, and OLAP query processing. Data mining-f-undamentals. Mining Techniques and Application: Classification, Clustering, Outlier Analysis. Course Out On successful completion of this course the students shall be able to: Course Out On successful completion of this course the students shall be able to: Comes 1. Describe data warehousing architecture and considerations to build data warehouse. [Knowledge] 2. Discuss different multidimensional data models for data warehouse. [Comprehension] 3. Apply various classification and clustering methods for mining information, from data. [Application] COURSE CONTENT Module 1: Introduction to Data Warehouse builts data warehouse administration and management, building a data warehousing. [107 Hrs]	Course Code:	Course Title: Data Warehousing and Mining										
Version No. 1.0 Course Pre- requisites Data Mining Course Mathematics NIL Course Pre- requisites The course is an intermediary course and aims to provide students with an in- depth understanding of the design and implementation of data warehousing and data mining. The course will help students to enhance their understanding of various classification, clustering, and outlier analysis methods. An interest to understand the concepts of data warehousing, and data mining and a desire to be a successfully. Topics include: Data Models for Data Warehouses, data extraction, cleansing, transformation and loading, data cube computation, materialized view selection, and OLAP query processing. Data mining-fundamentals. Mining Techniques and Application: Classification, Clustering, Outlier Analysis. Course Out Course Out Comes On successful completion of this course the students shall be able to: 1. Describe data warehousing architecture and considerations to build data warehouse. [Knowledge] Q: Discuss different multidimensional data models for data warehouse. [Comprehension] Gata warehousing numbers in data. [Apply different techniques to find outliers in data. [Application] COURSE CONTENT Module 1: Introduction to Data Warehousing. [SYILABUS]: [Knowledge] [Internetics, Data warehouse and find and warehouse administration and management, building a data warehousing. acquisition, cleanup and transformation, methadata, access tools, data marts, data warehouse administration and management, building a data warehouse consideration, integrated solutions, befits of data warehousing. [I21 Hrs]	CSE384	Type of Course: Theory										
Course Pre- requisites Data Mining Anti-requisites NIL Anti-requisites NIL Course The course is an intermediary course and aims to provide students with an in- depth understanding of the design and implementation of data warehousing and data mining. The course will help students to enhance their understanding of various classification, clustering, and outlier analysis methods. An interest to understand the concepts of data warehousing, and data mining and a desire to be a successfull data scientist are key to enabling students to complete the course successfull data scientist are key to enabling students to complete the course successfull. Topics include: Data Models for Data Warehouse, data extraction, cleansing, transformation and loading, data cube computation, materialized view selection, and OLAP query processing. Data mining-fundamentals. Mining Techniques and Application: Classification, Clustering, Outlier Analysis. Course Out Comes On successful completion of this course the students shall be able to: 1. Describe data warehousing architecture and considerations to build data warehouse. [Knowledge] 2. Discuss different multidimensional data models for data warehouse. [Comprehension] S. Apply different techniques to find outliers in data. [Application] COURSE CONTENT Module 1: Introduction to Data Warehousing. Module 4: [Application] COURSE CONTENT Module 2: Data Warehouse architecture, sourcing, acquisition, cleanup and transformation, metadata, access tools, data mars, data warchouse definition and characteristics, Data warehouse architecture, sourcing, acquisition, cleanup and tr	Version No.	1.0										
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Anti-requisites NIL Course Description The course is an intermediary course and aims to provide students with an in- depth understanding of the design and implementation of data warehousing and data mining. The course will help students to enhance their understanding of various classification, clustering, and outlier analysis methods. An interest to understand the concepts of data warehousing, and data mining and a desire to be a successful data scientist are key to enabling students to complete the course successful data scientist are key to enabling students to complete the course successful query processing. Data mining-fundamentals. Mining Techniques and Application: classification, clustering, Outlier Analysis. Course The objective of the course is to familiarize the learners with the concepts of Data Warehousing and Mining and attain Skill Development through Participative learning techniques. Course Out On successful completion of this course the students shall be able to: 1. Describe data warehousing architecture and considerations to build data warehouse. [Knowledge] 2. Discuss different multidimensional data models for data warehouse. [Comprehension] 3. Apply various classification and clustering methods for mining information from data. [Application] 4. Apply different techniques to find outliers in data. [Application] COURSE CONTENT Module 1: Introduction to Data Warchousing (SYLLABUS): Course outer of data warehousing, paradigm shift, data warehouse administration and maagement, building a data warehouse: business consideration, integrated solutions, benefits of data warehousing. Module 2: Data Warehouse modelling [Comprehension] [12 Hrs] Comprehension] Data cube: A multidimensional data model, stars, snowflakes, an	requisites											
Course The course is an intermediary course and aims to provide students with an in- depth understanding of the design and implementation of data warehousing and data mining. The course will help students to enhance their understanding of various classification, clustering, and outlier analysis methods. An interest to understand the concepts of data warehousing, and data mining and a desire to be a successful data scientist are key to enabling students to complete the course successfully. Topics include: Data Models for Data Warehouses, data extraction, cleansing, transformation and loading, data cube computation, materialized view selection, and OLAP query processing. Data mining-fundamentals. Mining Techniques and Application: Classification, Clustering, Outlier Analysis. Course The objective of the course is to familiarize the learners with the concepts of Data Warehousing and Mining and attain Skill Development through Participative learning techniques. Course Out On successful completion of this course the students shall be able to: 1. Describe data warehousing architecture and considerations to build data warehouse. [Knowledge] 2. Discuss different multidimensional data models for data warehouse. [Comprehension] 3. Apply various classification and clustering methods for mining information from data. [Application] 4. Apply different techniques to find outliers in data. [Application] 5. Knowledge] 7. Knowledge] 7. The need for data warehouse achitecture, sourcing, acquisition, cleanup and ransformation, metadata, access tools, data marts, data warehouse administration and management, building a data warehouse: business consideration, integrated solutions, benefits of data warehouse: business consideration, integrated solutions, schema for multidimensional data model, stars, snowflakes, and fact constellations: schemas for multid	Anti-requisites	NIL										
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[Comprehension] Data cube: A multidimensional data model, stars, snowflakes, and fact constellations: schemas for multidimensional data models, dimensions: the role of concept hierarchies, measures: their categorization and computation, typical OLAP operations, efficient data cube computation, the compute cube operator and the curse of dimensionality, partial materialization: selected computation of cuboids, indexing olap data: bitmap index and join index. Module 3: Classification & Clustering methods [14 Hrs] [Application] Bayesian Belief Networks, Support Vector Machines, Classification by Back propagation, Fuzzy clusters, Probabilistic Model-Based Clusters, Expectation- Maximization Algorithm. Module 4: Outlier detection [06 Hrs] [Application] 1. Outliers and Outlier Analysis, Types of Outliers, 2. Outlier Detection Methods: Detection of univariate Outliers Based on Normal Distribution, 3. Statistical Approaches, 4. Brovimity Based Approaches		Module 2: Data Warehouse modelling [12 H	[rs]									
DataCube:Amultidimensionaldatamodel,stars,snowflakes,andfactconstellations:schemasfor multidimensionaldatamodels,dimensions:the role ofconcept hierarchies,measures:their categorizationand computation,typicalOLAPoperations,efficientdatacubecomputation,typicalOLAPoperations,efficientdatacubecomputation,the curseoperatorand thecurse ofdimensionality,partialmaterialization:selectedcomputation ofcuboids,indexing olapdata:bitmap index and join index.Iften ofcuboids,indexingandModule3:Classification& Clusteringmethods[14Hrs][Application]BayesianBeliefNetworks,SupportVectorMachines,Classificationby Backpropagation,Fuzzyclusters,ProbabilisticModel-BasedClusters,Expectation-MaximizationMaximizationAlgorithm.[06Hrs][Application]1.OutlierAnalysis,Types of Outliers,2.OutlierAnalysis,Types of Outliers,2.OutlierDetectionMethods:Detection of univariateOutliersBased on NormalDistribution,3.StatisticalApproaches,Approaches,Approaches,4.Provimity BasedApproachesAp		[Comprehension]										
constellations: schemas for multidimensional data models, dimensions: the role of concept hierarchies, measures: their categorization and computation, typical OLAP operations, efficient data cube computation, the compute cube operator and the curse of dimensionality, partial materialization: selected computation of cuboids, indexing olap data: bitmap index and join index. Module 3: Classification & Clustering methods [14 Hrs] [Application] Bayesian Belief Networks, Support Vector Machines, Classification by Back propagation, Fuzzy clusters, Probabilistic Model-Based Clusters, Expectation- Maximization Algorithm. Module 4: Outlier detection [06 Hrs] [Application] 1. Outliers and Outlier Analysis, Types of Outliers, 2. Outlier Detection Methods: Detection of univariate Outliers Based on Normal Distribution, 3. Statistical Approaches, 4. Provimity Based Approaches		Data cube: A multidimensional data model, stars, snowflakes, and f	act									
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 Specialistic, efficient data cube computation, the compute cube operator and the curse of dimensionality, partial materialization: selected computation of cuboids, indexing olap data: bitmap index and join index. Module 3: Classification & Clustering methods [14 Hrs] [Application] Bayesian Belief Networks, Support Vector Machines, Classification by Back propagation, Fuzzy clusters, Probabilistic Model-Based Clusters, Expectation-Maximization Algorithm. Module 4: Outlier detection [06 Hrs] [Application] 1. Outliers and Outlier Analysis, Types of Outliers, 2. Outlier Detection Methods: Detection of univariate Outliers Based on Normal Distribution, 3. Statistical Approaches, 4. Provimity Based Approaches 		operations efficient data cube computation, the compute cube operator and t	лг the									
 indexing olap data: bitmap index and join index. Module 3: Classification & Clustering methods [14 Hrs] [Application] Bayesian Belief Networks, Support Vector Machines, Classification by Back propagation, Fuzzy clusters, Probabilistic Model-Based Clusters, Expectation-Maximization Algorithm. Module 4: Outlier detection [06 Hrs] [Application] 1. Outliers and Outlier Analysis, Types of Outliers, 2. Outlier Detection Methods: Detection of univariate Outliers Based on Normal Distribution, 3. Statistical Approaches, 4. Provimity Paced Approaches 		curse of dimensionality, partial materialization: selected computation of cuboi	ds.									
Module 3: Classification & Clustering methods[14 Hrs][Application]Bayesian Belief Networks, Support Vector Machines, Classification by Back propagation, Fuzzy clusters, Probabilistic Model-Based Clusters, Expectation- Maximization Algorithm.Module 4: Outlier detection[06 Hrs][Application]1. Outliers and Outlier Analysis, Types of Outliers, 2. Outlier Detection Methods: Detection of univariate Outliers Based on Normal Distribution, 3. Statistical Approaches, 4. Provimity Based Approaches		indexing olap data: bitmap index and join index.	,									
 [Application] Bayesian Belief Networks, Support Vector Machines, Classification by Back propagation, Fuzzy clusters, Probabilistic Model-Based Clusters, Expectation-Maximization Algorithm. Module 4: Outlier detection [06 Hrs] [Application] 1. Outliers and Outlier Analysis, Types of Outliers, 2. Outlier Detection Methods: Detection of univariate Outliers Based on Normal Distribution, 3. Statistical Approaches, 4. Provimity Based Approaches 		Module 3: Classification & Clustering methods [14 H	[rs]									
 Bayesian Belief Networks, Support Vector Machines, Classification by Back propagation, Fuzzy clusters, Probabilistic Model-Based Clusters, Expectation-Maximization Algorithm. Module 4: Outlier detection [06 Hrs] [Application] 1. Outliers and Outlier Analysis, Types of Outliers, 2. Outlier Detection Methods: Detection of univariate Outliers Based on Normal Distribution, 3. Statistical Approaches, 4. Provimity Based Approaches 		[Application]										
 propagation, Fuzzy clusters, Probabilistic Model-Based Clusters, Expectation-Maximization Algorithm. Module 4: Outlier detection [06 Hrs] [Application] 1. Outliers and Outlier Analysis, Types of Outliers, 2. Outlier Detection Methods: Detection of univariate Outliers Based on Normal Distribution, 3. Statistical Approaches, 4. Provimity Based Approaches 		Bayesian Belief Networks, Support Vector Machines, Classification by Ba	ıck									
Module 4: Outlier detection [06 Hrs] [Application] 1. Outliers and Outlier Analysis, Types of Outliers, 2. Outlier Detection Methods: Detection of univariate Outliers Based on Normal Distribution, 3. Statistical Approaches, 4. Provimity Based Approaches 4. Provimity Based Approaches		propagation, Fuzzy clusters, Probabilistic Model-Based Clusters, Expectation	on-									
[Application] 1. Outliers and Outlier Analysis, Types of Outliers, 2. Outlier Detection Methods: Detection of univariate Outliers Based on Normal Distribution, 3. Statistical Approaches, 4. Provimity Based Approaches		Module 4. Outlier detection [06 H	rel									
 Dutliers and Outlier Analysis, Types of Outliers, Outlier Detection Methods: Detection of univariate Outliers Based on Normal Distribution, Statistical Approaches, Provimity Based Approaches 		[Application]	۲٥]									
 2. Outlier Detection Methods: Detection of univariate Outliers Based on Normal Distribution, 3. Statistical Approaches, 4. Provimity Based Approaches 		1. Outliers and Outlier Analysis. Types of Outliers.										
Distribution, 3. Statistical Approaches, 4. Provimity Based Approaches		2. Outlier Detection Methods: Detection of univariate Outliers Based on Norma	al									
3. Statistical Approaches, 4. Provimity Based Approaches		Distribution.										
1 Provimity-Reced Approaches		3. Statistical Approaches,										
4. FIUXIIIIIY-DASEU APPIUALIES.		4. Proximity-Based Approaches.										

Re	eport and PPT for 2 topics
Th	hat means 2 PPTs and 2 reports.
1 st	topic should be from Module 4
$2^{ m nd}$	topics can be from module 4 or module 3.
D	ELIVERY PROCEDURE (PEDAGOGY):
Cl	assroom Lecture, PPT
Se	If-learning: Article review of journals on Data mining.
Pa	articipative Learning: Implementation of discussed algorithm with
gra	aphical visualization using any suitable language/platform.
RI	EFERENCE MATERIALS:
Te	ext Books:
T 1	L Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining &
Ol	LAP", McGraw Hill, 2016
T2	2. Jiawei Han, Micheline Kamber, Jian Pei, "Data-MiningConcepts-and-
Те	echniques ", The-Morgan-Kaufmann, 3rd-Edition-Morgan-Kaufmann,
20	12
Re	eference Books:
R	1. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World",
Pe	earson, 2016
R	2. Tan P. N, Steinbach M and Kumar V, "Introduction to Data Mining",
Pe	earson Education, 2016
W	eb Based Resources and E-books:
W	1. NPTEL Course on "Business Analytics & Data Mining Modeling Using
	R", Prof. Gaurav Dixit.
	https://onlinecourses.nptel.ac.in/noc22_mg67/preview_
W	2. NPTEL Course on "Data Mining", Mr. L. Abraham David
	https://onlinecourses.swayam2.ac.in/cec22_cs06/preview
W	3. Coursera course on "Data Warehousing for Business Intelligence
Sp	pecialization", Michael
	Mannino, Jahangir Karimi
	https://www.coursera.org/specializations/data-warehousing
W	4. Journal on "Data Mining and Knowledge Discovery"
	https://www.springer.com/journal/10618/
То	pics relevant to "SKILL DEVELOPMENT": Bayesian Belief Networks, Support
Ve	ector Machines, Classification by Back propagation, Fuzzy clusters for Skill
De	evelopment through Participative Learning techniques. This is attained through
ass	sessment component mentioned in the course handout.

Course	Course Title: Edge Computing		3	0	3
Code:					
CSE2034	Type of Course: Theory Only Course Discipline	L-I -C			
	Elective				
Version	1.0				
No.					
Course Pre-	Distributed Systems and Algorithms				
requisites					
Anti-	Nil				
requisites					
Course	In this course, we will study significant tools and a	pplications	s that com	prise to	oday's
Description	cloud computing platform, with a special focus of	on using the	he cloud	for big	data
_	applications. The course covers various topics such	h as the ev	volution o	f comp	outing
	industry, cloud computing basics and edge co	mputing.	The cour	se pro	vides

	information of edge compu (MEC)). The software serve computing. S	on the different types of te services (such as Cl e course also educates t vices, standard bodies ar Students will also create	edge compute deployments, difference ON Edge, IOT Edge, and Multi- the students on the different vend and open source communities avail a research project of their choosing	erent types of -access Edge or platforms, able for edge g.		
Course Objective	The objective Computing ar	e of the course is to fam nd attain Employability th	niliarize the learners with the conc rough Problem Solving Methodologi	epts of Edge es.		
Course Out Comes	On successfu CO1 Underst CO2 Descril CO3 Summa CO4 Descri	Il completion of the court tand the principles, archi be IoT Architecture and arize edge to Cloud Prot be Edge computing with	rse the students shall be able to: tectures of edge computing (Know Core IoT Modules (Comprehension) ocols (Comprehension) n RaspberryPi (Comprehension)	owledge) on)		
Course Contont:						
Module 1	IoT and Edge Computing Definition and Use Cases	Term paper/Assignment/Case Study	Programming/Simulation/Data Collection/any other such associated activity	9 Sessions		
Topics: Introduction definition, E Edge vs Fog	to Edge Co dge computir Computing, 0	omputing Scenario's and ng use cases, Edge comp Communication Models	d Use cases - Edge computing puting hardware architectures, Ed - Edge, Fog and M2M.	purpose and ge platforms,		
Module 2	IoT Architecture and Core IoT Modules	Term paper/Assignment/ Cas e Study	Programming/Simulation/Data Collection/any other such associated activity	9 Sessions		
Topics: A connetwork and Understandin Telemedicin	onnected ecos Metcalfe's a ng Implement e palliative ca	system,IoT versus maching nd Beckstrom's laws, Io tations with examples-E are, Requirements, Imple	ine-to-machine versus, SCADA, T oT and edge architecture, Role of xample use case and deployment, ementation, Use case retrospective	he value of a an architect, Case study –		
Module 3	RaspberryPi	Term paper/Assignment/Case Study	Programming/Simulation /Dat a Collection/any other such associated activity	10 Sessions		
Topics: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout and Pinouts, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi, Connecting Raspberry Pi via SSH, Remote access tools, Interfacing DHT Sensor with Pi, Pi as Webserver, Pi Camera, Image & Video Processing using Pi						
Module 4	Edge to Cloud Protocols	Term paper/Assignment/Case Study	Programming/Simulation/Data Collection/any other such associated activity	7 Sessions		
Topics: Imp Protocols- P transitions,M 3.1.1 workin	lementation c rotocols,MQ7 IQTT packet g example.	of Microcomputer Raspl TT, MQTT publish-subs structure, MQTT data	perryPi and device Interfacing, Education of the cribe, MQTT architecture details, types, MQTT communication for	dge to Cloud MQTT state mats, MQTT		

	Edge				
	computing	Term	Programming/Simulation/Data		
Module 5	with	paper/Assignment/Case	Collection/any other such	7	Sessions
	RaspberryPi	Study	associated activity		

Topics: Edge computing with RaspberryPi, Industrial and Commercial IoT and Edge, Edge computing and solutions.

Targeted Application & Tools that can be used:

• **Application** : Smart Surveillance Video Stream Processing at the Edge for Real-Time Human Objects Tracking.

• **Tools** :Eclipse ioFog : An integrated development environment built by the Eclipse Foundation, backed by IBM. Eclipse ioFog is the organization's open-source edge computing platform.

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Exploring topics such as developing scalable architectures, moving from closed systems to open systems, and ethical issues rising from data sensing, addresses both the challenges and opportunities of Edge computing presents. Students can harness federating Edge resources, middleware design issues, data management and predictive analysis, smart transportation and surveillance applications, and more. A coordinated and integrated solutions can be provided by thorough knowledge of the foundations, applications, and issues that are central to Edge computing.

Text Book

1. IoT and Edge Computing for Architects - Second Edition, by Perry Lea, Publisher: Packt

Publishing, 2020, ISBN: 9781839214806

2. Raspberry Pi Cookbook, 3rd Edition, by Simon Monk, Publisher: O'Reilly Media, Inc., 2019, ISBN: 978149204322.

Topics relevant to "EMPLOYABILITY SKILLS": Implementation of Microcomputer RaspberryPi and device Interfacing for developing **Employability Skills** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: 5G Netwo	orking		L- P- C	3	0	3
CSE 3090	Type of Course: Theory	Only Course					
Version No.							
Course Pre- requisites	e Pre- Digital communications, Mobile Communication Systems, Wireless Networks isites						
Anti-requisites	Nil						
Course Description	The aim of this course i most important elemer CDMA based, 4G was O 5G. While 4G brought ir low delay services, grea being made real), ultra energy efficient networ	is to let the stunts that different FDMA based; the adeluge of info at service in cro a-reliable and s ks.	dents unders ntiate betwee nis course rev otainment se owd, enhance secure conne	tand that n 2G, 3G, eals the c rvices, 5G d mobile ctivity, ul	air Inte 4G and ontents aims to broadb piquitou	rface is o 5G. Whil of air into provide e and (virtu s QoS, a	ne of the e 3G was erface for extremely al reality nd highly
Course Objective	The objective of the cou Networking and attain I	urse is to familia Employability t	arize the learn hrough Partic	ners with c ipative L o	the con earning	cepts of 5 techniqu	G es
Course Out Comes	 On successful completi Explain the cha Analyze use of I Understand dev Illustrate the in issues in 5G. 	on of the cours nnel models of MIMO in 5G and vice to device (I -depth functior	the studen 5G and the u d its techniqu D2D) commur hing of 5G rac	ts shall be se cases f les. hication a dio access	e able to or 5G. nd stand techno	o: dardizatio logies and	n. d security
Course Content:							
Module 1	5G channel modelling and use cases	Assignment	Data Collecti	on/Interp	retatior	n 10	Sessions
Topics: 5G chan requirements, Pr relaying, fundam Radio (SDR), Mu Motivation, Type multipath diversi	nel modelling and use opagation scenarios, Re nentals of relaying, Cogn ltiple-input multiple-out es of multi-antenna sys ty, Transmit diversity, Sp	cases, Modelir laying multi-ho nitive radio: Ar tput (MIMO) sy stems, MIMO y pace-time code	ng requireme p and cooper chitecture, sp /stems, Intro vs. multi-anto s.	ents and e rative com pectrum s oduction t enna syst	scenaric nmunica sensing, to Multi rems. D	os, Chann tions: Pri Software -antenna iversity, e	el model nciples of 2 Defined Systems, exploiting
Module 2	The 5G architecture	Case studies / Case let	Case stu	udies / Ca	se let	8	Sessions
Topics: Introduction, NFV and SDN, Basics about RAN architecture, High-level requirements for the 5G architecture, Functional architecture and 5G flexibility, Functional split criteria, Functional split alternatives, Functional optimization for specific applications, Integration of LTE and new air interface to fulfill 5G Requirements, Enhanced Multi-RAT coordination features, Physical architecture and 5G deployment.						or the 5G onal split erface to and 5G	
Module 3	Device-to-device (D2D) communications	Quiz	Case stu	idies / Ca	se let	10	Sessions
Topics: D2D: fro resource manage system design fo and emergency, discovery withou	m 4G to 5G, D2D stand ement for mobile broadk r D2D, 5G D2D RRM con services, National secur it and with network assis	lardization: 4G band D2D, RRM cept: an examp rity and public stance.	LTE D2D, D2 techniques fo le, Multi-hop safety requir	D in 5G: r or mobile D2D com ements ir	esearch broadb munica 3GPP a	challeng and D2D, tions for and METI	es, Radio RRM and proximity S, Device
Module 4	technologies	Quiz <mark>.</mark>	let	rthogonal	8 Se	ssions	cureto area
Spread spectrum multiple access (opics: Access design principles for multi-user communications, Orthogonal multiple-access systems, Spread spectrum multiple access systems, Capacity limits of multiple-access methods, Sparse code nultiple access (SCMA). Interleave division multiple access (IDMA). Radio access for dense deployments						

OFDM numerology for small-cell deployments, Small-cell sub-frame structure, Radio access for V2X communication, Medium access control for nodes on the move, Radio access for massive machine type communication.

Targeted Application & Tools that can be used:

Project work/Assignment:

Assignment: Quiz

Text Book

T1: Afif Osseiran, Jose F. Monserrat, Patrick Marsch, 5G Mobile and Wireless Communications Technology, Cambridge University Press Second Edition, 2015.

T2: Erik Dahlman, Stefan Parkvall, Johan Sko[°]ld, 5G NR: The Next Generation Wireless Access Technology, Elsevier First Edition, 2016.

References

R1 : Jonathan Rodriguez, Fundamentals of 5G Mobile Networks, Wiley First Edition 2015

E book link R1: https://www.wiley.com/en-in/Fundamentals+of+5G+Mobile+Networks-p-9781118867525

Web resources:

<u>https://nptel.ac.in/courses/108/105/108105134/</u> https://www.udemy.com/course/5g-mobile-networksmodern-wireless-communication-technology/ https://presiuniv.knimbus.com/user#/home

Topics relevant to "EMPLOYABILITY SKILLS": D2D: from 4G to 5G, D2D standardization: 4G LTE D2D for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

-					1		r
Course Code:	Course Title: Adv	vanced Computer					
CSE316/3083	Architecture			I-P-C	3	0	3
	Type of Course:	Program Core & The	eory				
	Only						
Version No.	1.0						
Course Pre-requisites	NIL						
Anti-requisites	NIL						
Course Description	The course aim architectures su concepts in uni performance pa such as memor proportional inc software suppor	is at familiarizing itable for high-perf processor and the rallel computers wil y technology and rease in performan t required for these	student formance issues II also b I/O sub ice will systems	s with in desi in desi e covere osystems be discu	advan uting. gning ed. Sys need ussed a	ced cor The adv & using tem res ed to a along wi	nputer /anced g high ources chieve ith the
Course Objective	The objective of of Advanced Co Participative Lea	the course is to fam mputer Architectur ming techniques .	iliarize t re and	he learno attain Er	ers wit nploy a	h the co ability tl	ncepts hrough
Course Out Comes	On successful co 1] Explain the co 2] Compare and 3] Illustrate para 4] Understand th parallel computer systems.	mpletion of the cou ncepts of parallel co contrast the paralle llel programming co ne organization and o systems, including i	rse the somputin l archite oncepts operation multipro	students g and ha ectures on of curr ocessor a	shall k rdware rent ge nd mu	e able t e techno eneratio ilticore	o: logies n
Course Content:							
Module 1	Theory of Parallelism	Assignment				10 Sess	ions
Topics: Theory of Parallelism: Par Multicomputer, Multivect Properties, Conditions of Mechanisms, System Inte	allel Computer Mo or and SIMD Comp Parallelism, Progra rconnect Architect	dels, The State of Co outers, PRAM and VL m Partitioning and S ures, Principles of So	omputin SI Mode Scheduli calable F	g, Multip els, Progi ng, Progr Performa	orocess ram ar ram Flo nce, P	sors and nd Netwo ow erforma	ork nce

Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches.

Course Code	Course Title: Advance	Database Mana	gement		2	2	3	
CSE2068	System			L- P- C				
C3E3008	Type of Course: Integr	rated						
Version No.	1.0							
Course Pre-	1. Basics about D	OBMS						
requisites	2. MYSQL softwa	are tool usage						
Anti-requisites	Nil							
	This course covers adv	anced aspects of	database ma	anagement	includir	ig norma	lization	
	and renormalizations,	query optimiza	tion, distribu [.]	ted databa	ases, dat	a wareh	ousing,	
	and big data. There is	extensive covera	age and hand	ls on work	with SQ	L, and d	atabase	
Course	nstance tuning. Course covers various modern database architectures including							
Description	relational, key value,	elational, key value, object relational and document store models as well as various						
	approaches to scale out, integrate and implement database systems through							
	replication and cloud based instances. Students learn about unstructured "big (ig data"	
	architectures and data	abases, and gain	hands-on exp	erience wi	th Spark	and Mo	ngoDB.	
Course Objective	I ne objective of the co	the objective of the course is to familiarize the learners with the concepts						
	Of Advance Database	ar Advance Database Ivianagement System and attain Employability through						
		tion of the second		ta ahall ha				
	1 Soloct the appropri	tion of the cours	e the studen mancal datab	ts snall be	able to:	and dict	ributod	
Course Out	database	late mgn-perion	mance uatau	ase like j	Jaraner	anu uist	Induted	
Comes	2 Infer and represent the real-world data using object-oriented database							
	3. Interpret rule set in the database to implement data warehousing of mining							
	· · · ·		•		0	0		
Course Content:								
	Review of Relational							
Modulo 1	Data Model and	Accignment	Data Callesti	on /Intornr	atation	15 6		
wodule 1	Relational Database	Assignment	Data Collectio	onyinterpr	etation	12.26	essions	
	Constraints:							
Relational model	concepts; Relational	model constrain	nts and relat	ional data	abase sc	hemas;	Update	
operations, anom	alies, dealing with cons	straint violations,	Types and vi	olations.				
Object and Object	CT-Relational Databas	es: Overview of	Object Data	abase Con	cepts, C	bject Da	atabase	
Extensions to SQI	L, The ODIVIG Object M		niow of the (n Languag	e ODL, (go Bindi	ng in the		
Standard	II, The Object Query Lai	iguage OQL, Ove	i view of the t	L++ Laligue	ige billui	ing in the	UDIVIG	
	Disk Storage Basic							
	File Structures							
Module 2	Hashing, and Modern	Assignment	Case st	udies / Cas	e let	15 Sc	essions	
	Storage			,				
	Architectures:							
Introduction, Seco	ondary Storage Devices	, Buffering of Blo	ocks, Placing I	File Record	ls on Dis	k Operat	ions on	
Files, Files of Uno	rdered Records (Heap F	iles), Files of Orde	ered Records	(Sorted Fil	es), Hash	ing Tech	niques,	
Other Primary Fi	le Organizations, Para	llelizing Disk Ac	cess Using R	AID Techn	ology, N	/lodern	Storage	
Architectures.								
Distributed Data	base Concepts: Distrib	uted Database C	oncepts, Dat	a Fragmer	itation, I	Replication	on, and	
Allocation Technic	ques for Distributed Dat	tabase Design, O	verview of Co	ncurrency	Control	and Reco	overy in	
Distributed Datab	ases, Overview of Tran	saction Manager	nent in Distri	buted Data	abases,Q	uery Pro	otobasing	
		es, Types of Distr	indred Databa	ase System	is , Distri	buted Da	atabase	
Architectures, DIS		lagement						
Module 2	Big Data Storage	Assignment	Caca ct	udies / Car	e let	15 64	accione	
	Systems					10.00	23310113	

Introduction to NOSQL Systems, The CAP Theorem, Document-Based NOSQL Systems and MongoDB, NOSQL Key-Value Stores, Column-Based or Wide Column NOSQL Systems, NOSQL Graph Databases and Neo4j. Big Data Technologies Based on MapReduce and Hadoop: What Is Big Data? Introduction to MapReduce and Hadoop, Hadoop Distributed File System (HDFS), MapReduce: Additional Details Hadoop v2 alias YARN, General Discussion List of Laboratory Tasks: Lab sheet -1 [2 Practical Sessions] Experiment No 1: Level 1 – Study and Configure Hadoop for Big Data Lab sheet – 2 [2Practical Sessions] Experiment No. 2: Level 1– Study of NoSQL Databases such as Hive/Hbase/Cassendra/DynamoD Level 2 - Design Data Model using NoSQL Databases such as Hive/Hbase/Cassendra/DynamoDB Lab sheet – 3 [2 Practical Sessions] Experiment No. 1: Level 1 - Implement any one Partitioning technique in Parallel Databases Level 2 – Implement Two Phase commit protocol in Distributed Databases Lab sheet – 4 [2 Practical Sessions] Experiment No. 1: Level 1 - Design Persistent Objects using JDO and implement min 10 queries on objects using JDOQL in ObjectDB NOSQL DATABASE Level 2 - Design database schemas and implement min 10 queries using Hive/ Hbase/ Cassendra column based databases Lab sheet -5 [2 Practical Sessions] Experiment No. 1: Level 1 - Design database schemas and implement min 10 queries using DynamoDBkeyValue based databases Level 2 – Design and Implement social web mining application using NoSQL databases, machine learning algorithm, Hadoop and Java/.Net Targeted Application & Tools that can be used MangoDB **Project work/Assignment: Assignment:** CASE STUDY OF TRADITIONAL RDBMS AND NOSQL DATABASE SYSTEM and submit the report Text Book 1. Elmasri R and Navathe S B, "Fundamentals of Database System", 7th Edition, Pearson Publication, 2017. References 1. Hector Garcia Molina, Jeffery D Ullman, JennifferWidom, "Database systems: The Complete Book", 2nd edition, Pearson Publication, 2013. 2.AviSilberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", 7th Edition, McGraw-Hill, 2019. a. https://www.classcentral.com/course/youtube-sql-tutorial-for-beginners-in-hindi-dbmstutorial-sql-full-course-in-hindi-great-learning-99143/classroom b. https://www.udemy.com/course/sql-for-beginners-course/

- c. https://onlinecourses.nptel.ac.in/noc22_cs51/preview
- d. <u>https://www.coursera.org/learn/database-management</u>
- e. <u>https://www.youtube.com/watch?v=HXV3zeQKqGY</u>

PU Library Link :

https://presiuniv.knimbus.com/user#/searchresult?searchId=eBook&curPage=0&layout=grid&s orFieldId=none&topresult=false&content=*cloud*

Topics relevant to "EMPLOYABILITY SKILLS": Distributed Database for developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: ADVANCED N	NATURAL LANG	GUAGE		2	2	3	
Course Code:	PROCESSING			L- P- C				
CSE 3015	Type of Course: Integrated	l						
Version No.	1.0					•		
Course Pre-	CSE 3014 – Fundamentals of Natural Language Processing							
requisites								
Anti requisites								
Anti-requisites						-		
	This course is an advanced course for Natural Language Processing. As a part of the							
	course, students will be introduced to solving multiple problems in natural language							
Course	processing, such as sentiment analysis, machine translation, cognitive natural language							
Description	nocessing, etc.							
	Topics include: Machine	translation,	lext summ	arization	i, Sent	iment	analysis,	
	Cognitive NLP, Gaze behavi	iour, Evaluatio	n Metrics, etc					
Course Objective	ne objective of the course is to familiarize the learners with the concepts of Advanced							
	Natural Language Processi	Vatural Language Processingand attain Employability through Experiential Learning						
	techniques.							
	On successful completion of	of the course t	he students s	shall be	able to:			
	Understand how te	o solve differe	nt problems	in natur	al langı	lage pro	ocessing.	
	[Comprehension]							
Course Out	Solve natural langu	uage generatio	n problems s	such as n	nachine	transla	ition and	
Comes	text summarization. [Appl	ication]						
comes	• Perform sentiment analysis on reviews to discern the stance of the writer.							
	[Application]							
	• Use public gaze behaviour data to improve the performance of different NLP							
	systems. [Application]							
Course Content:		1				n		
Module 1	Pre-trained Language Models					4 :	Sessions	
Tonics: Introduction	n to Pre-Trained Language	Models BERT	Multi-lingua	al variant	s of BF	RT Intr	oduction	
to NLTK and Huggi	ingface Transformers.	Models. DEM	. Water inigat	ar variari	.5 01 02		oudectori	
	Machine Translation and							
Module 2	Text Summarization					7 :	Sessions	
Topics: Introduct	ion to machine translation	n – source a	nd target la	nguages	. Pivot	-based	machine	
translation. Using	Transformers for machine	translation.	Monolingual	machine	transl	ation e	xamples.	
Machine translatio	on evaluation metrics – BLE	U. Implementa	ation of BLEU	score ca	alculatio	on using	z NLTK in	
Pvthon. Other MT	metrics – METEOR, TER, etc	. Text summar	rization – defi	nition. T	vpes of	summa	, irizations	
– Extractive and A	bstractive Summarization. S	Summarization	evaluation m	netrics –	ROUGE	score.		
Module 3	Sentiment Analysis					6	Sessions	
Topics: Introductio	on to Sentiment Analysis. Sc	lving sentimer	nt analysis us	ing text o	classific	ation.		
Classification of se	ntiment analysis based on c	different levels	– polarity-ba	ased and	intensi	tv-base	d.	
Challenges in sent	iment analysis – sarcasm. th	warting, nega	tions. Case st	udies in	sentime	, ent ana	vsis –	
Reviewer rating pr	ediction. short-text classific	ations. etc.					,	
	Cognitive NLP Using Gaze							
Module 4	Behaviour					7 9	Sessions	
Topics: Eye-Mind	Hypothesis and gaze behave	viour terminol	ogy. Using g	aze beha	aviour f	or pred	liction of	
translation comple	exity, sentiment analysis co	mplexity, sarc	asm understa	andabilit	y, text	comple	xity, text	
quality prediction	, etc. Challenges with rec	ording gaze b	ehaviour at	run time	e. Com	parison	of gaze	
behaviour across	different people – normaliz	ation and bini	ning. Gaze be	ehaviour	datase	ts. Miti	gation of	
recording gaze bel	haviour at run time using ty	pe aggregatior	ı.				-	
	3 /							
List of Laboratorv	Tasks:							
1. Familiariza	ation with Python. Using Pyt	thon to read te	ext files, basic	tokeniza	ation ar	nd other	r l	
preprocessing								
2. Introduction to NLTK and Huggingface Transformers in Python.								

- 3. Using Huggingface Transformers to create a simple MT application.
- 4. Implementation of pivot-based machine translation using Huggingface Transformers.
- 5. Calculation of BLEU using NLTK difference between sentence_bleu and corpus_bleu methods.
- 6. Implementation of extractive summarization.
- 7. Polarity classification of text using VADER.
- 8. Intensity prediction of text using Weighted Normalized Polarity Intensity.
- 9. Estimating gaze behaviour for a user using normalization and binning
- 10. Calculating gaze behaviour for a text based on type aggregation in multiple languages.
- 11. Complex word identification using gaze behaviour.

Targeted Application & Tools that can be used:

- 1. Google Colab
- 2. Python IDE (Eg. PyCharm)
- 3. Huggingface Transformers
- 4. **NLTK**

Project work/Assignment:

Assignment: Students will have to do a **course group assignment** over the course of the semester. The assignment topics can be taken from Modules 2 or 3 as per the instructor-in-charge.

Text Books

T1 Daniel Jurafsky, and James Martin. "*Speech and Language Processing*" (3rd edition draft, 2022).

T2 Abhijit Mishra, and Pushpak Bhattacharyya. *"Cognitively Inspired Natural Language Processing: An Investigation Based on Eye Tracking"*. Springer, Singapore. 2018.

References

R1 Steven Bird, Ewan Klein, and Edward Loper. "*Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit*". O'Reilly Publishers. 2009.

R2 Chris Manning, and Heinrich Schutze. "Foundations of Statistical Natural Language Processing". MIT Press. 1999.

E book link R1: https://www.nltk.org/book/

E book link R2: https://nlp.stanford.edu/fsnlp/

Web resources: http://pu.informatics.global

Topics relevant to "EMPLOYABILITY SKILLS": Calculation of BLEU and ROUGE scores using NLTK, Estimating gaze behaviour through type aggregation, Using Hugging face Transformers for machine translation for developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE3038	Course Title: Applied Data Science with Python Type of Course: Program Core	L-P-C	2	2	3
Version No.	1.0		1		
Course Pre- requisites	Fundamentals of Python concepts				
Anti-requisites	NIL				
Course Description	The aim of the course is to give complete over tools and techniques. Learning python is a cru roles, and this course helps to understand an With a blended learning approach, Python for like data wrangling, mathematical computing,	rview of l ucial skill nd develo data scier and more	Python for m p feat ice alc e can l	n's data a nany data ture engi ong with oe learnt.	analytics a science neering. concepts
Course Objectives	The objective of the course is to familiarize of Applied Data Science and attain Em Learning techniques.	the lear ployabilit	ners v y thro	vith the ough E xp	concepts periential

Course Out	On successful comp	letion of this	cours	e the students shall be a	ble to:
Comes	1. Understand	Numpy and I	Matrix	Operations [Knowledge]
	2. Analyze the r	need for data	prepr	ocessing and visualization	on techniques.
	[Comprehensive]]			
	3. Demonstrate	the perform	ance o	f different supervised le	arning
	algorithms like d	ecision Tree,	Rando	om Forest, Linear Regres	ssion, Logistic
	Regression etc. [A	Application]			
	4. Apply unsup	ervised learn	ing alg	orithms like K-Means, K	K-Medoids etc
	for grouping the	given data. [/	Applica	aion]	
Course Content:					
	Introduction to	Quiz		Knowledge based	No. of
	Data Science,			quiz	sessions:8
Module 1	Python Data				
	Structures, Python				
	Numpy Package				
Data Science - No	eed, Applications, Dif	ference betw	een da	ita analysis and data ana	lytics. Python-
Variables, data ty	pes, control structur	es, Operators	s, Simp	le operations, Array and	its operations,
Numpy operatio	ns, Matrix and its ope	erations			
	Data preparation	Assignment		Data Visualization	No. of
	and preprocessing				sessions:10
	using Pandas				
Module 2	dataframe,				
	Exploratory Data				
	Analysis, Data				
	Visualization				
Dealing missing	values, Normalization	n, statistical o	lescrip	ption about the data, Acc	essing the
data, Summary o	of the data, Relationsh	nip between t	the dat	a, Data Visualization usi	ng matplotlib
	C				
	Supervisea	Design	an		No. of
Module 3	Learning	algorithm	an using	Random Forest	No. of sessions:10
Module 3	Supervised Learning Algorithms	Design algorithm Example	an using	Random Forest	No. of sessions:10
Module 3 Decision Tree Al	Supervised Learning Algorithms gorithm, ID3 Classifie	Design algorithm Example er, Random F	an using orest,	Random Forest Classifier Accuracy, Line	No. of sessions:10 ear Prediction,
Module 3 Decision Tree Al Logistic Regress	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study	Design algorithm Example er, Random F	an using orest,	Random Forest Classifier Accuracy, Line	No. of sessions:10
Module 3 Decision Tree Al Logistic Regress	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised	Design algorithm Example er, Random F Case Study	an using orest,	Random Forest Classifier Accuracy, Line Conduct a case study	No. of sessions:10 ear Prediction, No. of
Module 3 Decision Tree Al Logistic Regress	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning	Design algorithm Example er, Random F Case Study	an using orest,	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can	No. of sessions:10 ear Prediction, No. of sessions:10
Module 3 Decision Tree Al Logistic Regress Module 4	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms	Design algorithm Example er, Random F Case Study	an using orest,	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and	No. of sessions:10 ear Prediction, No. of sessions:10
Module 3 Decision Tree Al Logistic Regress Module 4	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms	Design algorithm Example er, Random F Case Study	an using orest,	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real	No. of sessions:10 ear Prediction, No. of sessions:10
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms	Design algorithm Example er, Random F Case Study	an using orest,	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application.	No. of sessions:10 ear Prediction, No. of sessions:10
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K Modoids Algo	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms	Design algorithm Example er, Random F Case Study ity between f	an using orest,	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. xed types of data, K-Mea	No. of sessions:10 ear Prediction, No. of sessions:10 ns Algorithm,
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K- Medoids Algo	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms Function, Dissimilar rithm -Case Study	Design algorithm Example er, Random F Case Study ity between f	an using orest,	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. Ked types of data, K-Mea	No. of sessions:10 ear Prediction, No. of sessions:10 ns Algorithm,
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K- Medoids Algo List of Laborato	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms Function, Dissimilar rithm -Case Study ry Tasks:	Design algorithm Example er, Random F Case Study ity between t	an using orest,	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. xed types of data, K-Mea	No. of sessions:10 ear Prediction, No. of sessions:10 ns Algorithm,
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K- Medoids Algo List of Laborato 1. Introducti 2. Basic Stat	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms Function, Dissimilar rithm -Case Study ry Tasks: ion to R tool for data	Design algorithm Example er, Random F Case Study ity between t analytics scie	an using orest, the miz	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. Ked types of data, K-Mea	No. of sessions:10 ear Prediction, No. of sessions:10 ns Algorithm,
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K- Medoids Algo List of Laborato 1. Introducti 2. Basic Stat 3. K-means (Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms Function, Dissimilar rithm -Case Study ry Tasks: ion to R tool for data istics and Visualizatio	algorithm Example er, Random F Case Study ity between t analytics scie	an using orest, the miz	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. Ked types of data, K-Mea	No. of sessions:10 ear Prediction, No. of sessions:10 ns Algorithm,
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K- Medoids Algo List of Laborato 1. Introducti 2. Basic Stat 3. K-means (4. Associatio	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms Function, Dissimilar rithm -Case Study ry Tasks: ion to R tool for data istics and Visualizatio Clustering on Rules	Design algorithm Example er, Random F Case Study ity between t analytics scie	an using orest,	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. xed types of data, K-Mea	No. of sessions:10 ar Prediction, No. of sessions:10 ns Algorithm,
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K- Medoids Algo List of Laborato 1. Introducti 2. Basic Stat 3. K-means (4. Associatio 5. Linear Reg	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms Function, Dissimilar rithm -Case Study ry Tasks: ion to R tool for data istics and Visualizatio Clustering on Rules	Design algorithm Example er, Random F Case Study ity between t analytics scie	an using orest,	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. xed types of data, K-Mea	No. of sessions:10 ear Prediction, No. of sessions:10 ns Algorithm,
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K- Medoids Algo List of Laborato 1. Introducti 2. Basic Stat 3. K-means (4. Associatio 5. Linear Rej 6. Logistic R	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms Function, Dissimilar rithm -Case Study ry Tasks: ion to R tool for data istics and Visualizatio Clustering on Rules gression egression	Design algorithm Example er, Random F Case Study ity between t analytics scie	an using orest, 	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. Ked types of data, K-Mea	No. of sessions:10 ear Prediction, No. of sessions:10 ns Algorithm,
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K- Medoids Algo List of Laborato 1. Introducti 2. Basic Stat 3. K-means (4. Associatic 5. Linear Reg 6. Logistic R 7. Naive Bay	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms Function, Dissimilar rithm -Case Study ry Tasks: ion to R tool for data istics and Visualizatio Clustering on Rules gression egression egression resian Classifier	Design algorithm Example er, Random F Case Study ity between t analytics scie on in R	an using orest,	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. Ked types of data, K-Mea	No. of sessions:10 ar Prediction, No. of sessions:10
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K- Medoids Algo List of Laborato 1. Introducti 2. Basic Stat 3. K-means (4. Associatio 5. Linear Rej 6. Logistic R 7. Naive Bay 8. Decision 7	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms Function, Dissimilar rithm -Case Study ry Tasks: ion to R tool for data istics and Visualizatio Clustering on Rules gression egression resian Classifier	Design algorithm Example er, Random F Case Study ity between t analytics scie	an using orest,	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. xed types of data, K-Mea	No. of sessions:10 ar Prediction, No. of sessions:10 ns Algorithm,
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K- Medoids Algo List of Laborato 1. Introducti 2. Basic Stat 3. K-means (4. Associatio 5. Linear Reg 6. Logistic R 7. Naive Bay 8. Decision 7 9. Simulate I	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms Function, Dissimilar rithm -Case Study ry Tasks: ion to R tool for data istics and Visualizatio Clustering on Rules gression egression egression resian Classifier Frees Principal component	Design algorithm Example er, Random F Case Study ity between t analytics scie on in R	an using orest, the miz	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. Ked types of data, K-Mea	No. of sessions:10 ear Prediction, No. of sessions:10 ns Algorithm,
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K- Medoids Algo List of Laborato 1. Introducti 2. Basic Stat 3. K-means 0 4. Associatio 5. Linear Rej 6. Logistic R 7. Naive Bay 8. Decision 7 9. Simulate 1 10. Simulate 5	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms Function, Dissimilar rithm -Case Study ry Tasks: ion to R tool for data istics and Visualizatio Clustering on Rules gression egression resian Classifier Crees Principal component Singular Value Decom	algorithm Example er, Random F Case Study ity between t analytics scie on in R	an using orest, che miz	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. xed types of data, K-Mea	No. of sessions:10 ear Prediction, No. of sessions:10 ns Algorithm,
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Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K- Medoids Algo List of Laborato 1. Introducti 2. Basic Stat 3. K-means (4. Associatio 5. Linear Reg 6. Logistic R 7. Naive Bay 8. Decision 7 9. Simulate I 10. Simulate S Targeted Applic • IBM SPSS	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms Function, Dissimilar rithm -Case Study ry Tasks: ion to R tool for data istics and Visualizatio Clustering on Rules gression egression egression resian Classifier Frees Principal component Singular Value Decom	algorithm Example er, Random F Case Study ity between t analytics scie on in R analysis position an be used:	an using orest,	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. xed types of data, K-Mea	No. of sessions:10 ear Prediction, No. of sessions:10 ns Algorithm,
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K- Medoids Algo List of Laborato 1. Introducti 2. Basic Stat 3. K-means (4. Associatio 5. Linear Reg 6. Logistic R 7. Naive Bay 8. Decision 7 9. Simulate I 10. Simulate S Targeted Applic • IBM SPSS • Julia and I	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms Function, Dissimilar rithm -Case Study ry Tasks: ion to R tool for data istics and Visualizatio Clustering on Rules gression egression egression resian Classifier Frees Principal component Singular Value Decom ation & Tools that case upyter Notebook	Design algorithm Example er, Random F Case Study ity between to analytics scie on in R analysis aposition an be used:	an using orest, the mix	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. Ked types of data, K-Mea	No. of sessions:10 ear Prediction, No. of sessions:10 ns Algorithm,
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K- Medoids Algo List of Laborato 1. Introducti 2. Basic Stat 3. K-means 0 4. Associatio 5. Linear Reg 6. Logistic R 7. Naive Bay 8. Decision 7 9. Simulate I 10. Simulate S Targeted Applic • IBM SPSS • Julia and J • Matplotlik	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms Function, Dissimilar rithm -Case Study ry Tasks: ion to R tool for data istics and Visualizatio Clustering on Rules gression egression egression resian Classifier Frees Principal component Singular Value Decom ation & Tools that case upyter Notebook	Design algorithm Example er, Random F Case Study ity between t analytics scie on in R analysis position an be used:	an using orest, che miz	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. xed types of data, K-Mea	No. of sessions:10 ar Prediction, No. of sessions:10
Module 3 Decision Tree Al Logistic Regress Module 4 Various distance K- Medoids Algo List of Laborato 1. Introducti 2. Basic Stat 3. K-means (4. Associatic 5. Linear Reg 6. Logistic R 7. Naive Bay 8. Decision 7 9. Simulate I 10. Simulate S Targeted Applic • IBM SPSS • Julia and J • Matplotlik Project work/As	Supervised Learning Algorithms gorithm, ID3 Classifie ion – Case study Unsupervised Learning Algorithms Function, Dissimilar rithm -Case Study ry Tasks: ion to R tool for data istics and Visualizatio Clustering on Rules gression egression esian Classifier Frees Principal component Singular Value Decom ation & Tools that case upyter Notebook	Design algorithm Example er, Random F Case Study ity between the analytics scie on in R analysis aposition an be used:	an using orest,	Random Forest Classifier Accuracy, Line Conduct a case study on how data sets can be gathered and implemented in real time application. xed types of data, K-Mea	No. of sessions:10 ar Prediction, No. of sessions:10 ns Algorithm,

- 1. Design forest fire and wildfire prediction system.
- 2. Driver Drowsiness Detection System with OpenCV & Keras
- 3. Credit Card Fraud Detection using Python.

Textbook(s):

1. Applied Data Science with Python and Jupyter-Alex Galea, Packt Publishing, October 2018

2. Data Visualization in Python with Pandas and Matplotlib Paperback –DavidLandup, June 16, 2021

References:

1.Data Science with Python and Dask- Jesse Daniel,1st Edition,July30,2019 Weblinks:

- Udemy: https://www.udemy.com/course/applied-data-science-with-python-specialization-mhm/
- NPTEL online course : <u>https://nptel.ac.in/courses/106106179</u>
- <u>https://presiuniv.knimbus.com/user#/home</u>

Topics relevant to "EMPLOYABILITY SKILLS": Data Science, Decision Tree Algorithm **for developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.**

Course Code: CSE3017	Course Title: Autonomous Navigation and Vehicles Type of Course: Theory	L-P-C	3	0	3
Version No.	1				
Course Pre- requisites	Real-time embedded programmingOptimal estimation and controlLinear algebra				
Anti-requisites	NIL				
Course Description	Overview of technologies vehicles includin machine learning, localization, mapping, communication and security. Hands-on impler navigation algorithms on both simulated and course covers the mathematical foundations and of algorithms for vision-based navigation of au robots, self-driving cars, drones). It culminate advances in the field and a team project aimed a Topics include: Autonomous driving to Recognition and Tracking, Localization w Perceptions In Autonomous driving, Deep le	g sensors object nentation o physical n l state-of-th atonomous es in a cri at advancir echnologie vith GNSS earning in lanning and	, sensin detection of robor nobile pre-art in vehicle tical re ng the st s over S, Visu Autono d contro	ng alg ion, t tic sent blatforn npleme es (e.g. view c cate-of- cview, nal Oc omous bl	orithms, tracking, sing and ms. This entations , mobile of recent the-art. Object lometry, Driving
Course Objective	The objective of the course is to familiarize	the learne	ers with	n the	concepts
	of Autonomous Navigation and Vehicles	and attain	Employ	ability	through
Course Out Comes	On successful completion of the course the st CO1. Understand the Autonomous system's algorithm, sensing, object recognition and trac [Understand] CO2. Do the error analysis of Localization techniques [Application] CO3. Explain, plan and control the traffic beha level routing and create simple algorithms [Unc CO4. Explain Plan and control motion, ch	s and its f cking of an systems a wior, and s derstand]	all be a requirer n Autor and use shall be er clier	ble to: nents. nomous the to able to nt syst	Explain s system ools and o do lane ems for

Module 1		12 Sessions
driving algorithn client system, d learning Model T based augmentat Visual Odometr Odometry, Dead	autonomous driving: Autonomous driving technologies overvins: Sensing, Perception. Object Recognition and Tracking: Autonomous cloud platform, Robot Operating System, HD Map Fraining, Localization with GNSS: GNSS overview, GNSS error for systems, real time kinematic and differential GPS, precise y: Stereo Visual Odometry, Monocular Visual Odometry Reckoning and Wheel Odometry.	tonomous driving Production, Deep r analysis, satellito point positioning
Module 2		8 Sessions
Perceptions In Optical flow and Neural Networks	Autonomous driving: Introduction, Datasets, Detection, Seg Scene flow. Deep learning in Autonomous Driving Perception, Detection, Semantic segmentation, Stereo and optical flow.	mentation, Sterio on: Convolutiona
Module 3		10 Sessions
Prediction and I as classification, directed graph fo	Routing: Planning and control overview, Traffic prediction: Bel Vehicle trajectory generation, Lane level routing: Constru r routing, typical routing algorithms, routing graph cost.	haviour predictior cting a weighted
Module 4		08 Sessions
Decision plann Reinforcement L Operating system infrastructure, sin Text Book T1: Shaoshan Li Systems Morgan T2: Ronald K. Ju 2013	ng and control: Behavioral decisions, Motion planning, earning Based Planning and Control, Client systems for Auto is and computing platform Cloud platform for Autonomous driv nulation. u, Liyun Li, Jie Tang, Shuang Wu, Jean-Luc, Creating Autonom & Claypool Publishers 1st Edition, 2018 irgen Autonomous Vehicles for Safer Driving SAE Internation	Feedback contro- onomous Driving ving: Introduction mous Vehicle al Edition,
References R1. Hod Lipson, Edition, 2016 R2. Markus Mau and Social Aspec R3. Hannah Yee ,Edward Elgar Po	Melba Kurman Driverless: Intelligent Cars and the Road ahe arer, J. Christian Gerdes, Barbara Lenz Autonomous Driving: ets 1st Edition, 2016 Fen Lim, Autonomous Vehicles and the Law: Technology, Algo ablishing. 1st Edition, 2018	ad MIT Press. 1s Technical, Lega prithms and Ethic
Web resources:	http://pu.informatics.global	
	to "EMPLOYABILITY SKILLS": Autonomous driving	g for developing

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Course Code:	Course Title: Image Pro	cessing						
CSE 395				L- T-P- C	3	0	0	3
	Type of Course: Theory (Only						
Version No.	2.0							
Course Pre-	In order to pursue this	course student shoul	d have pr	ior know	ledge	on E	ngine	ering
requisites	Mathematics concepts a	nd Digital Signal proce	ssing.					
Anti-requisites	NIL							
Course	This Course is an introdu	uction to image proces	ssing and	image ar	nalysis	tech	nique	s and
Description	concepts. Image process	sing has found much w	wider app	lications	not o	nly in	the s	space
	program, but also in th	he areas such as me	edicine, b	iology, i	ndust	rial a	utoma	ation,
	astronomy, law enforce	ement, defense, inte	elligence.	With th	e pro	ogress	ma	de in
	multimedia these days, o	digital image processi	ng has be	come an	indis	pensa	ble p	art of
	our digital age.							
	Topics include: Funda	mentals, Application	s, Huma	n Visua	l Per	ceptio	on, I	mage
	Formation, Sampling ar	nd Quantization, Bina	ary Image	, Three-	Dimer	nsiona	il Ima	aging,
	Image file formats. C	Color and Color Im	agery: P	erceptio	n of	Colo	rs, I	mage
	Transformation: Fourier	Transforms, Enhancer	ment Usin	g Arithm	etic/L	ogic C	Opera	tions,
	Basics of Spatial Filter	ing, Smoothing Spat	tial Filter	s, Sharp	ening	Spat	ial F	ilters,
	Combining Spatial Enha	ancement Methods ,	Smoothi	ng Frequ	lency	-Doma	ain F	ilters,
	Sharpening Frequency Do	omain Filters, Homom	orphic Filt	ering, Im	age Ei	nhanc	emen	it and
	Restoration, Image Re	estoration, image i	Reconstru	ction, li	mage	Seg	menta	ation,
0	Recognition of image Pat	tterns.						
Course	The objective of the cou	Irse is to familiarize t	ne learne	rs with t	ne co	ncept	S OT <mark>I</mark>	mage
			ougn Part		Learn	ing te		jues.
Course Out	COURSE OUTCOIVIES: On	successful completion	n of the co	ourse the	stude	ents sr	iali be	e able
comes	1 Describe the Eurodemo	ntals and Applications	ofImago	Drocossi	na			
	2. Discuss the major Imag	a Transformation Tec	soniques	FIOCESSI	ng.			
	2. Discuss the major mag	ge fransformation rec	octoratio	n and d	arad	ation	nroc	
	4 Classify the Image Seg	mentation and Color P	Processing	Models	-8100	ation	proc	
Course Content:			1000000000	modeloi				
Module 1	Introduction	Ouiz	Image file			10 5	Sessio	ns
Topics: Flem	ents of Visual Percenti	on light and the F	lectroma	gnetic S	nectr	um	Imag	ρ
Sensing and	Acquisition Image Same	oling and Quantization	n Classi	fication	of im	ages	Som	e
Basic Relation	nshins hetween Pivels Ti	inear and Nonlinear	Oneratio	nc		uges,	50110	C
			operatio	13.				
Module 2	Transformation	Quiz	Spatial filt	ers		9	Sessio	ons
Tonics: Some h	hasic gray level transforma	tions Histogram proc	essing Sm	oothing :	and Sh	arner	ning s	natial
filters 1D FFT	2D FFT Smoothing and Sh	arnening frequency do	omain filte	ers		iai pei	1119 3	patiai
Module 3	Image Restoration	Assignment	Exponenti	al		10	Sessi	ons
Topics: A model	of the image restoration a	and degradation proce	ess, Noise	models –	spati	al and	frequ	uency
properties of noi	se, some important proba	bility density functions	s- Gaussia	n noise, R	layleig	gh noi:	se, Ga	mma
noise, exponenti	al, uniform, impulse noise	, Periodic noise Restor	ration in th	ne Presen	ice of	Noise	Only	using
Spatial Filtering a	and Frequency Domain Fil	tering.						
Module 4	Image Segmentation	Assignment	Morpholo	gical		9 Se	ession	IS
Topics: Point, Li	ne, and Edge Detection, Tl	hresholding, Region gr	rowing, sp	lit and m	erge a	algorit	hms,	Color
Image Processin	g: Color Fundamentals, C	color Models, Pseudo	color Ima	age Proc	essing	g. Moi	rphole	ogical
Image Processing	g: Preliminaries, Erosion a	nd Dilation, Opening a	and Closin	5.				
Professionally us	ation & Tools that can be and software – Matlab per	used: mits quick prototyping	g leading t	o its usa	ze in r	esear	ch. Th	nis
tool is used in ma	aking the application of In	nage Processing.			50	cocur		
	U	5 0.						

Text Book

T1. Tinku Acharya and Ajoy K. Ray, "*Image Processing Principles and Applications*", John Wiley and Sons publishers.

References

R1. Maria Petrou and Costas Petrou, "*Image Processing the Fundamentals*", John-Wiley and Sons Publishers.

R2. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "*Digital Image Processing Using MATLAB*", Gatesmark Publishing

Weblinks:

Computer Vision and Image Processing - Fundamentals and Applications - Course (nptel.ac.in) Image Processing for Engineering and Science | Coursera

Topics relevant to "ENTREPRENEURIAL SKILLS": Region-Based Segmentation, Morphological Image Processing, Biomedical Imaging for developing **Entrepreneurship Skills** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.

Course Code: CSE3021	Course Title: BLOCK PUBLIC SECTOR	CHAIN FOR	L-P-C	3	0	3
	Type of Course: Theory					
Version No.	1.0					<u> </u>
Course Pre- requisites	Foundations of Blockchain	Technology				
Anti-requisites	NIL					
Course Description	Blockchain Technology is sector, specifically where the This course discusses about applications, emerging technologies in particularly in Smart City, I Certificates. It also analys implementation of blockchologies.	being increasin rustworthiness an it the blockchain nologies and their the digital gove Electronic Health ses effects, impa nain technologies	gly employed ad security are o technology and role in the impl rnment and the Care monitorin cts, and outcor in the public	in the f imp l its p emen publi ng and nes f secto	e pu porta poter tatic ic se d Dig rom r in	iblic nce. ntial on of ector gital the the
	The objective of the course	is to familiarize t	he learners with	the	conc	epts
Course Objective	of Blockchain For Pub	lic Sector and	attain Employa	bility	thro	ough
	On guession ful completion	ques	atudanta ahall	haak	la t	
Course Out Comes	 Understand the Standa management in the public so Apply Artificial intelligiting implementation of Smatematic Statematics [APPLICATION] Discuss about Electron Blockchain Technology [C Describe the Blockchain Countries [KNOWLEDGE] 	ards and Protoco ector [COMPRE] gence and mach art cities usin onic Healthcare OMPREHENSIC n Technology use	ols of Blockch HENSION] ine learning ap g blockchain Records Mon DN] e cases in Indiar	ain a oproad arcl itorin n and	nd ches hitec g u For	data for ture sing eign
Course Content:						
Module 1	Blockchain in Government and the Public Sector	Quiz	Data Collection	9 Se	essio	ns
Blockchain in Govern of Blockchain - data Understanding and ad Governance.	ment and the Public Sector u management in the public s dressing risks and challeng	use cases – Benet sector - Building ses. Blockchain A	fits – Standards networked pub Applications to	and F olic se Publi	Proto ervic c Se	cols ces - ctor
Case Study – Keyless	Signature Infrastructure (KS	I)				
Module 2	Blockchain in Smart City Applications	Assignment	Data Collection	9 Se	essio	ns
The Application of Bl and machine learning architecture - Blockch Blockchain-based ener using blockchain - Clo	ockchain Technology to Sm g approaches for smart tran ain architecture for intellige rgy-efficient smart green cit pud/edge computing for smar	nart City Infrastrunsportation in su nsportation in su ent water manage y in IoT environ t cities.	acture - Artificia mart cities usin ment system in ments - Citizen	al inte g blo smar e-gov	ellige ockcl t citi verna	ence hain ies - ance
Module 3	Blockchain in Healthcare	Case Study	Data Collection	9 Se	essio	ns
Blockchain in Healthc Medical Records - He	are Applications – Use cases ealthcare Blockchain Use C	s - Blockchain an ase: Supply Cha	d Data Security in Transparency	-Blo	ockc lectr	hain onic

Health Records, A novel Blockchain-based Access Control Manager to Electronic Health Records.

Case Study – Avaneer Health, MEDICALCHAIN, BurstIQ, Guardtime

Module 4 Imple Blockc Systen	mentation of hain in Indian 1 and Foreign ountries	Case Study	Data Collection	9 Sessions
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Implementation of Blockchain in India - land registration - Blockchain Fit Assessment: Digital certificates, SuperCert: Anti certificates fraud identity intelligence blockchain solution for educational certificates.

Case study- Implementation of Blockchain in Foreign Countries - Vehicle Wallet – BenBen – Project Ubin

Targeted Application & Tools that can be used:Remix IDE - Solidity Programming

Project Work / Assignment / Case Study

Assignment 1: Blockchain architecture for intelligent water management system in smart cities.

Case Study: Blockchain-based health care monitoring for privacy preservation of COVID-19 medical records.

Case Study: Implementation of Blockchain in Government of Estonia - Digital Certification by DNV GL.

Text Books

1. Saravanan Krishnan, Valentina Emilia Balas, Raghvendra Kumar, "Blockchain for Smart Cities", Elsevier, 2021.

https://doi.org/10.1016/C2020-0-01958-4

2. Christopher G. Reddick, Manuel Pedro Rodríguez-Bolívar, Hans Jochen Scholl, *"Blockchain and the Public Sector Theories, Reforms, and Case Studies"*, Stanford University Press, 2021.

Blockchain and the Public Sector: Theories, Reforms, and Case Studies (Public Administration and Information Technology Book 36) eBook : Reddick, Christopher G., Rodríguez-Bolívar, Manuel Pedro, Scholl, Hans Jochen: Amazon.in: Kindle Store

References

1. Sheikh Mohammad Idrees, Parul Agarwal, M. Afshar Alam, "Blockchain for Healthcare Systems: Challenges, Privacy, and Securing of Data", CRC Press, 2021.

https://books.google.co.in/books/about/Blockchain_for_Healthcare_Systems.html?id=hi U7EAAAQBAJ&redir_esc=y

Web Resources:

- 1. https://link.springer.com/book/10.1007/978-3-030-55746-1
- 2. https://consensys.net/blockchain-use-cases/government-and-the-public-sector/

3. <u>https://www.oecd.org/gov/innovative-government/oecd-guide-to-blockchain-technology-</u> and-its-use-in-the-public-sector.htm

4. <u>https://www2.deloitte.com/in/en/pages/public-sector/articles/blockchain-in-public-sector.html</u>

5. <u>https://www.ibm.com/in-en/blockchain/industries/government</u>

 $6. \ \underline{https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/using-blockchain-in$

to-improve-data-management-in-the-public-sector

- 7. https://www.frontiersin.org/articles/10.3389/fbloc.2022.869665/full
- 8. <u>https://www.settlemint.com/government-blockchain-use-cases/</u>

9. https://stlpartners.com/articles/digital-health/5-blockchain-healthcare-use-cases/

10. https://www.oecd.org/finance/Opportunities-and-Challenges-of-Blockchain-

Technologies-in-Health-Care.pdf

11. https://builtin.com/blockchain/blockchain-healthcare-applications-companies

12. https://www.hhs.gov/sites/default/files/blockchain-for-healthcare-tlpwhite.pdf

13. https://healthitanalytics.com/features/3-use-cases-for-blockchain-in-healthcare

14. <u>https://www2.deloitte.com/us/en/pages/public-sector/articles/blockchain-opportunities-</u>for-health-care.html

15. <u>https://www.niti.gov.in/sites/default/files/2020-01/Blockchain_The_India_</u> <u>Strategy_Part_I.pdf</u>

16. <u>https://www.bigchaindb.com/usecases/government/benben/</u>

Topics relevant to "EMPLOYABILITY SKILLS": Keyless Signature Infrastructure **for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.**

Course Code:	Course Title: BUILD ANI	D RELEASE MAN	IAGEMENT	L- P- C	3	о	3
CSE 3044	Type of Course: Theory	Only Course					
Version No.	1.0						
Course Pre-	CSE 2014 – Software Eng	gineering					
requisites							
Anti-requisites	-						
Course Description Course Objective	Build and Release mana planning to deployment The benefits of Build and and delivery. Build and environments, gathering continuously. In this con management process to course covers the key co as common consideration The objective of the cou Release Management techniques. On successful completion • Learn about the availability • Understand the	gement course , resulting in be d release is esse d release enha g valuable feed urse, Students manage and im ncepts and potention rse is to familian and attain E on of the course common Infras	e guides the tter custome ential to high nced by saf back and rel will learn ab prove the de ciples that a al challenges rize the learn mployability e the studen structure bui	software of er satisfact a-performi ely testing leasing ne bout the b evelopmen oply to rele to be awa rers with the y through ts shall be ld servers,	develop tion with ng softw g featu w and i enefits nt of a so ease ma are of. he conco are of. able to scalabi	ment eff the enc vare deve res in pr mproved of using oftware k inagement epts Of cipative : lity and	orts from l product. elopment roduction l features a release puild. This nt, as well Build And Learning
Course Content:	Implement Auto	omated, build, li		and deploy	ments a	and relea	ise
		Γ					
Module 1	ONDERSTANDING COMMON AGILE PRACTICES IN DEVOPS	Assignment	Data Collect	ion/Interp	retatior	12	Sessions
Introduction to Challenges, UX Traditional Soft Development, A Kanban - What is Classes of Servic Meetings in Kan	Product Management, Design, Product Develop ware Development Met gile Manifesto, Scrum M s Kanban, Understanding te in Kanban, Sample Ka ban System, Extreme Pro	Product Design pment Method hodologies, Pr odel, Agile Esti g the Principle o mban Boards (ogramming.	n and Requi ologies, Pro oblem/issue mations and of Kanban, V Proto Kanba	rement ga duct Mar s with tra Planning, alue Syste n) , How	athering keting a aditiona Soft sk m of Ka to read	g, Produc and Pres Il approa ills in agi inban, W a Kanba	ct Design entation, ich, Agile ile IP Limits, in Board,
Module 2	CODE DESIGN	Case studies / Case let	Case stu	udies / Cas	e let	12	Sessions
Topics: Good design is modular, loosely are designed to Fundamental OC Recursive design	good design regardless / coupled, etc., Using de support good code desig D principle: Interface an n, Design Patterns: reusir	of paradigm, esign to simplif gn, best practic d implementat ng best practice	Fundament y code struc es of design ion design, S s., SOLID De	al charac ture, how in OO pro Second Fu sign Princ	teristics progra ogram d ndame iples	of good mming la evelopm ntal OO	d design: anguages ent, First Principle:
Module 3	TESTING AND DEBUGGING	Quiz	Case stu	udies / Cas	e let	14	Sessions
Topics: TESTING AND DE Planning for er improves the qu errors. REFACTORING: I	BUGGING rors and exceptions, B uality of the resulting c MPROVING STRUCTURE	asic test-drive	n developm ng testing: ι	ent: writi Ising Juni	ng test t, etc, A	s first, H Avoiding	low TDD creeping
		Page 113 of 527					

Code smells: symptoms of poorly designed code, Refactoring: changing code structure without changing functionality, Using TDD for controlled code changes, the refactoring process, using refactoring to make better code faster, Collective Code Ownership

Targeted Application & Tools that can be used:

Common frameworks and code architectures: Spring, Hibernate, Microservices, Spring Boot. IDEs: Eclipse, Visual Studio, IntelliJ

Project work/Assignment:

Assignment:

Each student have to submit assignment as 4 to 5 pages report on Agile Frameworks and tools

Text Book

T1.Eric Breachner, "Agile Project Management with Kanban", 1st Edition, 2019, MSPress Publishers. T2. Peter Measey and Radtac, "Agile Foundations: Principles, Practices and Frameworks", Whitshire publishers, 2015.

References

R1. Dave Howard, "IT Release Management: Hands on Guide", CRC Press, 2016.

R2. Lyssa Adkins, "Coaching Agile teams", Addison-wesley publications, 2012.

E book link R1: <u>https://download.manageengine.com/academy/it-release-management-e-book.pdf</u> E book link R2: <u>https://www.smartsheet.com/release-management-process</u>

R3 Web resources:

https://presiuniv.knimbus.com/user#/home

- https://www.youtube.com/watch?v=dvFQrsY_tKg
- https://www.youtube.com/watch?v=vlsLxaY4P7M

Topics relevant to "EMPLOYABILITY SKILLS": Build and release management Process, Frameworks and tools for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code	Course Title: Business Continuity and Risk				
CSF2025	Analysis	L- P- C	3	0	3
C5E2025	Type of Course: Theory				
Version No.	1.0				
Course Pre-	NIL				
requisites					
Anti-requisites	NIL				
	Through the study of incident response and co	ntingency	plannin	ig, incl	luding
Course	incident response plans, disaster recovery plans,	and busine	ess cont	inuity	plans,
Description	this course aims to help students comprehend the	principles of	of risk m	nanage	ment.
Course	The objective of the course is to familiarize the learne	rs with the c	oncepts	of Bu	siness
Objective	Continuity and Risk Analysis and attain Em	olovability t	through	Partici	pative
	Learning techniques.	,,			
	On successful completion of the course the stu	dents shal	l be abl	e to:	
	1. Describe concepts of risk management [K	(nowledge)			
	2. Define and be able to discuss incident res	ponse optio	ons		
	[Comprehension]	I I I I I I			
Course Out	3. Design an incident response plan for sust	ained organ	nization	al	
Comes	operations [Comprehension]	-			
	4. Discuss and recommend contingency stra	tegies, incl	uding d	lata bad	ckup
	and recovery and alternate site selection for busin	ness resumj	ption pl	anning	
	[Knowledge]				
Course					
Content:					
			<u> </u>		
Module 1 Sourc	es of disaster and types of disasters		10 8	Session	IS
Disaster Recover	v Operational cycle of disaster recovery disaster	er recoverv	cost i	ncident	s that
requires disaster	recovery plans, evaluating disaster recover	rv - meth	ods. te	am. p	hases.
objectives, checl	klist. Best practices for disaster recovery - Bu	isiness coi	atinuity	v - Bu	siness
continuity vs. dis	aster recovery		Ũ		
Module 2 Busin	ess continuity management:		10	Sessio	ns
Introduction - Ele	ements of business continuity management. Busin	ess continu	ity pla	n – Bu	siness
continuity plan	ning and strategies - BCP standards and	guideline	es - B	CP P	roject
Organization -	Crisis communication plan - Emergency re	esponse pl	lan - (Contin	gency
planning					
Module 3 Mana	ging, assessing and evaluating risks:		09	Sessio	ns
Importance of r	isk management - Risk management method	ology - A	ttack r	nethod	s and
Countermeasures	- Cost benefits analysis of risk management - F	Risk assessi	ment res	sponsit	oilities
- Responsibilitie	s of security professional - Information system	m auditing	; and n	nonitor	ring –
Verification too	s and techniques.				
Module 4 Risk o	ontrol policies and Counter measures		09	Sessio	ns
Introduction - C	ounter measures - Risk control policy develop	ment facto	ors-Dev	elopm	ent of
information assu	rance principles and practices - Laws and procee	dures in in	formation	on assi	irance
policy implement	tation, Security test and evaluation, Automate	d security	tools,	Cost b	enefit
analysis, Develo	pping a risk assessment methodology, Securi	ty require	ments,	Inform	nation
categorization, R	isk management methodologies to develop life c	ycle mana	gement	policie	es and
procedures, Educ	ation, training and awareness. Policy developme	nt Informa	tion sec	urity p	olicy,
change control p	olicies, system acquisition policies and procedur	res, Risk a	nalysis	policie	es and
General risk cont	rol policies.				

Text Book

1. John W. Rittinghouse and James F. Ransome, Business Continuity and Disaster Recovery for Info Sec Managers. Elsevier: Elsevier Digital Press, 2005. (ISBN: 978-0-52-119019-0)

2. EC Council Press. Disaster Recovery, 1st Ed. Course Technology, 2011. (ISBN: 978-1-55558-339-2)

References

- 1. ISO 27001:2013 A specification for an information security management system
- 2. David Alexander, Amanda Finch, David Sutton, Andy Taylor. Information Security Management Principles, 2nd Ed. BCS Shop, 2013. (ISBN: 9781780171753)
- 3. Mark Talabis, Jason Martin. Information Security Risk Assessment Toolkit Practical Assessments through Data Collection and Data Analysis. Syngress Imprint, 2013. (ISBN: 978-1-59-749735-0).

Web resources: <u>http://pu.informatics.global</u>

Topics relevant to "EMPLOYABILITY SKILLS": Business continuity vs. disaster recovery, risk management, Storage disaster recovery services tools, Verification tools and techniques for **developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.**

Course Code:	Course Title: Bu	siness Intelligence a	nd			1
CSE3088	Analytics	C	I_P	C 3	0	3
	Type of Course	: Theory	L-1	·C		
Version No.	1.1					
Course Pre-	NIL					
requisites						
Anti-requisites	NIL					
Course Description	Business Intellig for the collect information. The decision making and the applicati	gence (BI) refers to ion, integration, a purpose of business to This course provid on of BI to an organ	technologies, nalysis, and s intelligence i les an overvie ization's strate	application presentat s to support w of the egies and p	ns, and p ion of b ort better b technolog goals.	ractices usiness usiness y of BI
Course Objective	The objective of t of Business Intell Problem Solving M	he course is to famil ligence and Analytic Methodologies.	iarize the lear s and attain E	ners with mployabi	the conce lity throug	pts ;h
Course Out Comes	On successful co 1. Introduce (BI) [Knowledge 2. Evaluate OLAP) [COMPF 3. Define h helpful [COMPF 4. Identify [COMPREHENS	ompletion of the course the concepts and and the technologies the technologies the technologies of the technologies of the technological and	rse the student components hat make up l organization rchitecture th	s shall be of Busing BI (data v and whe at makes	able to: ess Intelli varehousi ther it wi up BI sy	gence ing, ll stems
Course Content:						
Module 1	Basics of Insights	Assignment	Programming	Task	10 Sess	sions
Topics: The importance of dat	a in the information	n age – the data valu	e chain – tools	for gener	ating insig	ghts –

job roles available in the data insights market

Module 2	Basics Statistics:	Assignment		12
	Foundation of	-		Sessions
	Quantitative			
	Insights			
Topics:	·	•		
Basic statistics -	Variables - Measures of	f central tendency -	Measures of dispersion	- Normal
distribution and h	nistograms - The empiric	al rule - Covariance	e and correlation	
		1	1	1
Module 3	Data	Assignment		10
	Visualization			Sessions
Topics:				
Data visualisation	n and Anscombe's Quart	tet - Data cleaning u	using SAS Data Studio -	- Bar and Pie
Charts				
Module 4	Advanced charts			13 Sessions
	and dashboards			
Topics:				
Multi variation co	orrelation matrix and bar	r and line chart - SA	S Visual Analytics filte	ring and
controls - KPIs a	and targeted bar charts -	Dashboard theory –	Demand forecasting - I	Linear
regression analys	is - Forecasting - Foreca	asting and smoothin	g methods	

Targeted Application & Tools that can be used: Professionally used software

Project work/Assignment:

Text Book

1. Business Intelligence Guidebook: From Data Integration to Analytics 1st Edition, Kindle Edition.

2. Business Intelligence Roadmap: The Complete Project Lifecycle for Decision-Support Applications (Addison-Wesley Information Technology Series) 1st Edition, Kindle Edition

References

1. Successful Business Intelligence, Second Edition: Unlock the Value of BI & Big Data 2nd Edition, Kindle Edition

Weblinks:

W1: <u>https://www.coursera.org/learn/business-intelligence-data-analytics#</u> W2: <u>https://onlinecourses.nptel.ac.in/noc20_mg11/preview</u>

Topics relevant to "EMPLOYABILITY SKILLS": information age, data value chain for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Course Code: CSE 3127	Course Title: Cloud Ap	plication Development	t	L-P-C	3	0	3
	Type of Course: Theory	^v Only					
Version No.	1.0						
Course Pre-	Cloud Computing Basi	CS					
requisites							
Anti-requisites	NIL						
Course	The Cloud Application	on Development Found	ations Spe	ecializati	on pro	gram wi	ll teach
Description	students the tools build, deploy, test, r advantageous positi will provide the concepts, cloud services, Cloud a cloud, virtualization Scheduling, Cloud S	and technologies that un, and manage Cloud I on to begin a new caree students' knowledge services, application rchitecture and prog n, applying virtualizatio ecurity issues.	successfu Native app er in a high on clo ns develo gramming on, Cloud	I softwa olicatior Ily in-der ud con opments model I Resou	are dev ns – put mand a nputing s of , maj rce Ma	velopers tting the nrea. The g and Amazor p reduc anageme	use to m in an course related n web cing in ent and
Course Objective	The objective of the c Application Developm techniques.	ourse is to familiarize t nent and attain Emplo	the learne yability th	rs with nrough	the cor Partici	ncepts o pative Lo	f Cloud earning
Course Out	On successful completion	on of this course the stu	udents sha	all be ab	le to:		
Comes	 Understand the the Cloud architect Identify compu- the Cloud Resource Understand the cloud services and Understand the virtualization, apply Understand con [Comprehension] 	Define cloud computi ure and programming n te intensive model and Management and Sche Cloud Security issues a virtualization. [Applicati e cloud resource virtu ving virtualization. [App npliance for the cloud p	ng and re nodel. [Co d date inte eduling. [Co and Identif ion] ualization lication] provider ve	lated co omprehe ensive n Compreh fy the hc and Ide	ncepts nodel a nensior ow stan entify ance fo	and Me and Unde dards de the app or the cus	erstand eal with lication stomer.
Course Content:							
Module 1	INTRODUCTION AND CLOUD APPLICATION DEVELOPMENT	Assignment K	(nowledge	e, Quizz	es	ا Clas	No. of ses:8
Topics:							
Introduction: De	finition, Characteristic	s, Benefits, challenge	es of clou	d comp	uting,	cloud n	nodels:
service laaS(infr	astructure as service)	PaaS(platform as a s	service),S	aaS(soi	ttware	as a se	rvice),

service IaaS(infrastructure as service),PaaS(platform as a service),SaaS(software as a service), deployment models-public, private, hybrid, community; Types of cloud computing: Grid computing utility computing, cluster; computing Cloud services: Amazon, Google, Azure, online services, open source private clouds, SLA; Applications of cloud computing: Healthcare, energy systems, transportation, manufacturing, education, government, mobile communication, application development.

Assignment: Types of cloud and their comparisons.

Module 2	CLOUD ARCHITECTURE, PROGRAMMING MODEL	Assignment	Knowledge, Quizzes	No. of Classes:
Module 2	PROGRAMMING			0.00000
	MODEL			

Topics:

Cloud Architecture, programming model: NIST reference architecture, architectural styles of cloud applications, single, multi, hybrid cloud site, redundant, non-redundant, 3 tier, multi-tier architectures; Programming model: Compute and data intensive.

Assignment: Cloud Architecture, architectural styles of cloud applications.

Madula 2	CLOUD RESOURCE			No. of
wodule 3	VIRTUALIZATION	Case Study	Application, Quizzes	Classes:8

Topics:

Cloud resource virtualization: Basics of virtualization, types of virtualization techniques, merits and demerits of virtualization, Full vs Para - virtualization, virtual machine monitor/hypervisor. Virtual machine basics, taxonomy of virtual machines, process vs system virtual machines.

Case Study: Cloud resource virtualization: Basics of virtualization, types of virtualization techniques.

	CLOUD RESOURCE	Case study	Application, Quizzes	No. of
Module 4	MANAGEMENT AND			Classes:9
	SCHEDULING			

Topics:

Cloud Resource Management and Scheduling: Policies and mechanisms for resource management, resource bundling, combinatorial, fair queuing, start time fair queuing, borrowed virtual time, cloud scheduling subject to deadlines, scheduling map reduce applications subject to deadlines, resource management and application scaling.

Case Study: Cloud Resource Management and Scheduling.

Module 5 MANAGEMENT AND Classes: SCHEDULING	CLOUD RESOURCE Case study Application, Quizzes
--	--

Topics:

Cloud Security: Risks, privacy and privacy impacts assessments; Multi-tenancy issues, security in VM, OS, virtualization system security issues and vulnerabilities; Virtualization system-specific attacks: Technologies for virtualization-based security enhancement, legal. **Case Study:** Cloud Security: Risks, privacy and privacy impacts assessments.

Targeted Application & Tools that can be used:

Public cloud platforms like AWS, GCP and Azure.

Project work/Assignment:

1. Create an Amazon EC2 Instance (Linux) or use equivalent other cloud platform such as Google Cloud or Azure to create a virtual machine service.

2. Create an Amazon S3 Bucket or use equivalent other cloud platform such as Google Cloud or Azure to create a storage service.

3. Create a static website in AWS using S3 and cloud front.

Textbook(s):

1. Dan Marinescu, "Cloud Computing: Theory and Practice||", M K Publishers, 1st Edition, 2013,

2. Kai Hwang, Jack Dongarra, Geoffrey Fox," Distributed and Cloud Computing, From Parallel Processing to the Internet of Things||", M K Publishers, 1st Edition, 2011.

References

1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", McGraw Hill, 1st Edition, 2009.

2. Arshdeep Bahga, "Cloud Computing: A Hands on Approach", Vijay Madisetti Universities Publications, 1 st Edition, 2013.

Web Resources and Research Articles:

- 1. https://www.oracle.com/in/cloud/application-development
- 2. http://computingcareers.acm.org/?page_id=12
- 3. http://en.wikibooks.org/wiki/cloud application
- 4. http://www.acadmix.com/eBooks_Download
- 5. <u>http://www.ibm.com</u>
- 6. pu.informatics.global, <u>https://sm-nitk.vlabs.ac.in/</u>

Topics relevant to "EMPLOYABILITY SKILLS": EC2 for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Cloud Security		ТР					
CSE3095	Type of Course:	Theory	C	3 0		3		
Version No.	1.0			I				
Course Pre- requisites	Cloud Computing and Servic	ees (CSE322)						
Anti-requisites	NIL							
Course	This course provides ground-up	o coverage on the high-le	vel concep	ts of clou	ld lanc	lscape,		
Description	architectural principles, and tec explores the guiding security fo	explores the guiding security for Infrastructure and Softwares.						
Course	The objective of the course is t	he objective of the course is to familiarize the learners with the concepts of Cloud						
Objective	Security and attain Employab	Security and attain Employability through Participative Learning techniques.						
Course	On successful completion of th	is course the students sh	all be able	to:				
Outcomes	1. Describe fundamenta	als of cloud computing	g [Knowlee	lge].				
	2. Explain cloud comp	uting security architect	ture and as	sociated	l chal	lenges		
	[Comprehension].							
	3. Discuss cloud computi	ng software security ess	entials [Co	mpreher	nsion]	•		
	4. Apply infrastructure se	ecurity and data security	in cloud co	omputing	envir	oment.		
	[Application].							
Course Content:								
Module 1:	Fundamentals of Cloud Computing	Quiz	Knowledg Ouiz	ge based	Ses	10 sions		
Topics: Cloud Co	omputing at a Glance. Building	Cloud Computing Envi	ronments.	Computi	ng Pla	atforms		
and Technologies	, Cloud Computing Architectur	e: Cloud Delivery Mod	els, The SF	PI Frame	work,	Cloud		
Software as a Ser	vice (SaaS), Cloud Platform as a	Service (PaaS), Cloud I	nfrastructu	re as a Se	rvice	(IaaS),		
Cloud Deploymer	nt Models, Expected Benefits.							
Module 2:	Cloud Security Challenges	Quiz	Comprehe	ension		10		
	and Cloud Security Architecture		based Qui	Z	Ses	sions		
Topics: Security	Policy Implementation, Comp	outer Security Incident	Response	Team, V	<i>'</i> irtual	ization		
Security Manager Security.	nent. Architectural Consideration	ns, Identity Management	and Acces	s Control	, Auto	onomic		
Module 3	Cloud Computing Software Security Essentials	Assignment	Batch-wis Assignme	e nts	9 Se	ssions		
Topics: Cloud 1	Information Security Objective	es, Cloud Security Ser	vices, Sec	ure Clou	ud Sc	oftware		
Requirements, Cl and Business Con	oud Security Policy Implementa atinuity Planning/Disaster Recov	ttion, Secure Cloud Soft ery.	ware Testin	ng, Cloud	l Com	puting		
Module 4:	Infrastructure Security and	Assignment and	Batch-wis	e				
	Data Security	Presentation	Assignme	nt and	9 Se	ssions		
			Presentati	ons				
Topics: Infrastru Data Security :	Icture Security: The Network I Aspects of Data Security, Data S	Level, The Host Level, T Security Mitigation, Prov	he Applica ider Data a	tion Leve and its Se	el. curity	<i>.</i>		
Targeted Applic	ation & Tools that can be used	: Use of CloudSim sim	ulator.					
Project work/As	signment:							
Survey on Cloud	Service Providers							
Text Book								
1. Rajkuma	r Buyya, Christian Vecchiola	, and Thamarai Selvi,	"Masterin	g Cloud				
Computing",	Computing", McGraw Hill Education, July 2017.							
2. Roland L	•							
	Krutz and Russell Dean Vines,	"Cloud Security - A Con	mprehensiv	e Guide	to Sec	rure		

References

1. Sushil Jajodia, Krishna Kant, Pierangela Samarati, Anoop Singhal, Vipin Swarup, Cliff Wang, *"Secure Cloud Computing"*, Springer, ISBN 978-1-4614-9278-8 (eBook).

2. John Rittinghouse and James Ransome, "Cloud Computing, Implementation, Management and Security", CRC Press, 2010.

3. Tim Mather, Subra Kumaraswamy and Shahed Latif', "Cloud Security and Privacy – An Enterprise Perspective on Risks and Compliance", Oreily Publication, 2009.

WEB RESOURCES:

https://presiuniv.knimbus.com/user#/home

Topics relevant to "EMPLOYABILITY SKILLS": Cloud computing architecture, Security policy implementation, Infrastructure security and Data security **for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.**

	1						r	
Course	Course Title:	Cognitive Science	e &					
Code:	Analytics		L	-P-C	3	0	3	
CSE3103	Type of Cour	se:						
Version No.	1.1							
Course Pre-	NIL	NIL						
requisites	NUT							
Anti-requisites	NIL							
Course Description	This course is	an introduction to	o computa	ationa	l theo	ories of	human	
	cognition. D	rawing on form	nal mod	lels	from	classi	c and	
	contemporary	artificial intellige	ence, it w	vill e	xplore	e funda	mental	
	issues in hum	an knowledge rep	esentatio	n, inc	luctiv	e learni	ng and	
	reasoning. W	hat are the forms	that our	know	ledge	e of the	world	
	takes? What	are the inductive p	principles	that	allow	us to a	acquire	
	new knowled	ge from the inte	raction o	t pri	or kn	owledg	e with	
	observed data	What kinds of	data mus	t be	availa	ible to	human	
	learners, and	what kinds of inn	ate know	ledge	e (11 a	ny) mu	st they	
Course Ohio sting	have?							
Course Objective	The objective	of the course is t	o familia	rize t	he le	arners s	with the	
	concepts of	Cognitive Scie	$\frac{1}{2}$	Δn	alvtice	and and	attain	
	Employability	through Particin	ative Lea	rnin	tech	niques	attain	
Course Out Comes	On successful	completion of the	course th	ne stu	dents	shall b	e able	
	to:	completion of the	course u	10 510	aento	Siluir O	e uore	
	Introdu	ce the concepts an	d compor	nents	of Co	gnitive		
	Science	L L L L L L L L L L L L L L L L L L L	I I			0		
	Evaluat	e the technologies	that mak	e up	Cogni	tive Sc	ience .	
	• Define	how CS will help	an organi	zatio	n and	whethe	r it will	
	helpful	-	-					
	 Identify 	the technological	architect	ure tł	nat ma	ikes up	this	
	systems							
Course Content:								
	Introduction							
Module 1		Assignment	Program	nming	g Task	12		
						Ses	sions	
Topics:								
Cognition Process, C	Cognitive Psychol	ogy, Cognitive Sci	ience; Fou	undat	ions c	of Cogn	itive	
Science, Cognitive S	cience and Multi	-disciplinary; Mac	hines and	Min	ds; La	ws tho	ughts to	
binary logic; Classic	al Cognitive Scie	nce; Connectionist	Cognitiv	ve Sci	ence;	Mind b	ody	
Problem; Turing Res	sponse to Mind B	ody Problem; Pink	er, Pener	ose a	nd Sea	arle"s		
Responses to Mind I	Body Problem; Re	presentational The	eory of M	lind; '	Theor	ies of N	Aental	
Representation: Min	imal Analysis of	mental representat	ion, Rese	mblai	nce th	eories o	DÍ	
mental representation	n, Casual covaria	tion theories of me	ntal repre	esenta	ition,	internal	roles	
theories of mental re	presentation	A · · · ·					10	
Module 2	Precursors of	Assignment				Sa	10	
	Cognitive					Ses	SIONS	
Topics	Science							
Behaviorism. Theor	v of Computation	and Algorithms.	Igorithm	c and	Turis	ng Maa	hines	
Marr's Three Level	of Computation	inquistics and Eq	mgoriuiii rmal Land	13 allu 119 ac	· · unfo	rmatio	nncs,	
Processing Models in	n Psychology	Linguistics and FO		guage	, init	111at10	11	
Module 3	Psycological	Assignment					10	
	Perspective of	1 1001211110111				So	sione	
	Cognition					50	510113	
	Cognition							

•	
Topics:	
i opico.	

Cognitive Models of Memory, Atkinson-Shiffrin"s Model, Tulving"s Model, Mental Imagery, Kosslyn"s View, Moyer"s View, Peterson"s View, Cognitive Maps, Problem Understanding, States of Cognition, Cognition in AI

Module 4	Cognitive		13
Wibuule 4	Cognitive		15
	System and		Sessions
	analytics		

Topics:

Cognitive System; Architecture for intelligent agents; Modularity of Mind; Modularity Hypothesis; The ACT-R/PM architecture

Data Analytics overview, Importance of DA, Types of DA, Descriptive Analytics,

Diagnostic Analytics, Predictive Analytics, Prescriptive Analytics, Benefits of DA, Data Visualization for Decision Making, Data types, Measure of central tendency, Measures of Dispersion

Targeted Application & Tools that can be used: Professionally used software

Project work/Assignment:

Text Book

1. José Luis Bermúdez, Cognitive Science: An Introduction to the Science of the Mind, Cambridge University Press

2. Michael R. W. Dawson, Mind, Body, World: Foundations of Cognitive Science, UBC Press

References

1. Daniel Kolak, William Hirstein, Peter Mandik, Jonathan Waskan, Cognitive Science, An Introduction to Mind and Brain, Routledge Taylor and Francis Group

2. Amit Konar – Artificial Intelligence and Soft computing: Behavioral and Cognitive Modeling of the Human Brain, CRC Press

Weblinks:

W1: Top Cognitive Science Courses - Learn Cognitive Science Online | Coursera

W2: Introduction to Cognitive Psychology - Course (nptel.ac.in)

Topics relevant to "EMPLOYABILITY SKILLS": Cognitive System for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE3022	Course Title: Cryptocurrency Technology Type of Course: Theory Only Course	L-P-C	3	0	3
Version No.	1		•	•	
Course Pre-	Basics of cryptography and Blockchain				
requisites					
Anti-requisites					
Course Description	The course is designed to provide an introductory of currencies (cryptocurrencies) such as bitcoin, a bitcoin, a bitcoin of the such as bitcoin, a bitcoin of the such as the potential to disrupt a number of ind In particular, the course will survey the theory and operate, practical examples of basic cryptocurrence of cryptocurrencies with the banking, financial, le cryptocurrencies could be viewed within a framew	understanding pasic understa movative tech lustries in the i principles by cy transaction egal and regula vork of innova	of dece nding of nology immedi which of s, the li atory sy ation an	entralized of its un is so in ate near cryptocu ikely in vstems, d devel	ed digital derlying nportant, future. urrencies teraction and how opment.
Course Objective					
	The objective of the course is to familiariz	the learne	rs with	n the	concepts
	of Cryptocurrency Technology and attain Er	nployability	through	h Part i	icipative
	Learning techniques.				

	On successful completion	of the course t	he students shall be able to:					
	1. Understand the tec	1. Understand the technology components of blockchain-based digital currencies.						
Course Out	[Comprehensive]		-					
Course Out	2. Explain the transac	ctions from a dig	gital currency wallet. [Compre-	hensive]				
Comes	3. Understand alterna	atives to bitcoir	n, such as alt-coins, Ethereum	n and Bitcoin				
	Cash. [Comprehensive]						
	4. Use cryptocurrence	4. Use cryptocurrencies in the context of disruptive innovations [Application]						
Course Content:								
M 1111	Introduction to							
Module 1	Cryptography	Assignment	Data Interpretation	8 Sessions				
Topics: Cryptogr	aphy Digital Signatures Ci	vptographic Ha	sh Functions					
Cryptographic Da	ta Structures: Hash Pointe	ers, Append-On	ly Ledgers (BlockChains), Me	rkle Trees.				
Module 2	Bitcoin's Protocol	Assignment	Data Interpretation	10 Sessions				
Topics: Bitcoin's	Protocol Keys as Identi	ties Simple (ryptocurrencies Decentralize	ation through				
Distributed Conser	nsus Incentives Proof of	Work (Mining	application-Specific Integration	grated Circuit				
(ASIC) Mining and	ASIC-resistant Mining Vi	irtual Mining (P	eer coin)	grated Circuit				
Modulo 3	Ditagin Engingering		Questions Set	10 Sessions				
Module 5	Blicom Engineering	Quiz	Questions Set	TO Sessions				
Topics: Engineerin	lg Details, Bitcoin Blocks,	Hot and Cold Si	torage, Splitting and Sharing F	Leys, Proof of				
Reserve Proof of L	ladilities.	Statistical Attack	be (Transaction Creath Analy	aia) Nataraala				
Anonymity, Pseud	ionymity, Uninkability: S	statistical Attac	ks (Transaction Graph Analys	SIS), Network-				
Tayer De-anonymiz	ation, Chaum's Blind Sign	atures, Single N	fix and Mix Chains, Decentra	ilized Mixing,				
Zelo-Kilowieuge F	Cryptocurrences.	_						
Module 4	Technologies	Quiz	Questions Set	10 Sessions				
Topics: Cryptocur	rency Technologies. Smart	Property, Effici	ent micro-payments. Coupling	² Transactions				
and Payment (Inte	rdependent Transactions.)	Public Randon	nness Source. Prediction Ma	rkets. Escrow				
transactions, Green	addresses, Auctions and M	larkets, Multi-pa	arty Lotteries.	,				
Targeted Applicat	tion & Tools that can be u	sed:	2					
A cryptocurrency is	s a digital or virtual currenc	y, it is secured b	by cryptography which makes	it impossible				
to simulate or doub	le-spend. Many cryptocurre	encies are decen	tralized networks based on blo	ockchain				
technology. Crypto	currency caters to the prom	ise of making th	ne easier transaction of funds of	lirectly				
between two group	s or parties without the need	d for any third p	arty like bank or credit card co	ompany.				
Applications are M	oney transfer, Smart contra	cts, Internet of	Things (IoT), Personal identity	security,				
Healthcare, Logisti	cs.							
Tools: Messari, Gla	ass node, Lunar Crush, Coin	n Metrics, Coin	Market Cal.					
	Project	t work/Assignm	ient:					
Assignment:								
<i>1</i> . Beyond a r	nethod for payment, what a	re other function	ns of cryptocurrencies?					
2. How are cr	yptocurrency transactions r	recorded?						
<i>3</i> . What are the	ne top cryptocurrencies?							
4. What is the	4. What is the market capitalization of all cryptocurrencies and which ones make up largest % of							
that capitalizati	that capitalization?							
5. Explain bri	efly efficient micro-payme	nts						
Text Books:								
I '1. Narayanan, Ar	vınd, Joseph Bonneau, Edv	ward Felten, An	drew Miller, and Steven Gold	Iteder. Bitcoin				
and cryptocurrency	technologies: a comprehen	sive introductio	n. Princeton University Press,	2016.				
12. Schar, Fabian,	and Aleksander Berentsen	. Bitcoin, Block	chain, and Cryptoassets: A C	omprehensive				
Introduction. MIT	press, 2020.	D'/ ' 171	11					
T3. Karame, Ghass	an O., and Elli Androulaki.	Bitcoin and blo	ockchain security. Artech Hous	se,				
2016.								

References:

R1. Antonopoulos, Andreas M., and Gavin Wood. Mastering ethereum: building smart contracts and dapps. O'reilly Media, 2018.

R2. Antonopoulos, Andreas M. Mastering Bitcoin: unlocking digital cryptocurrencies. "O'Reilly Media, Inc.", 2014.

R3. Day, Mark Stuart. Bits to bitcoin: how our digital stuff works. MIT Press, 2018.

E book link R1: <u>http://fincen.gov/statutes_regs/guidance/html/FIN-2013-G001.html</u>

E book link R2: <u>http://www.scribd.com/doc/212058352/Bit-Coin</u> Web resources:

W1. http://www.usv.com/posts/bitcoin-as-protocol

W2. http://startupboy.com/2013/11/07/bitcoin-the-internet-of-money/

W3. http://startupboy.com/2014/03/09/the-bitcoin-model-for-crowdfunding/

W3. http://www.hmrc.gov.uk/briefs/vat/brief0914.html

Topics relevant to "EMPLOYABILITY SKILLS": Cryptography, Digital Signatures, Hash Pointers, BlockChains, ASIC-resistant Mining, Hot and Cold Storage, Transaction Graph Analysis, Zero-Knowledge Proof Cryptocurrencies, Escrow transactions, Multi-party Lotteries. for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE3096	Course Title: Cyber Digital Type of Course: Theory On	Twin ly Course	L- P-	c ³	0	3
Version No.	1.0					
Course Pre-	CSE2013					
requisites						
Anti-requisites	NIL					
Course Description	This course is designed to improve the learners 'Skill Development' by using modeling, optimizing, and risk management approach. The course objective is to get familiar with the Cyber digital twin-working principal, Development considerations, Data-Modelling Environment, Digital Twin Optimization, Risk Management and Applications.					
Course	The objective of the course	e is to familiarize t	the learners with	n the conc	epts of	Cyber
Objective	Digital Twin and attain Emp	oloyability through	n Participative L e	earning teo	chniques	5.
Course Out Comes	 On successful completion of the course the students shall be able to: 1. Understand the basic concepts of Cyber Digital twin, and its working principle. [KNOWLEDGE] 2. Explain Data modeling and development consideration in digital twin model for cloud and IoT technology.[COMPREHENSION] 3. Observe digital twin-human behavior modeling in digital twin-optimization [COMPREHENSION] 4. Show Risk Assessment-Digital twin reference model-Implementation. [APPLICATION] 5. Apply Digital twin in various area like Manufacturing, Automotive and Healthcare.[APPLICATION] 					
Course Content:		I	Γ			
Module 1	Introduction	Assignment	Theory	No. c	of Class	ses:09
Introduction- Cyber Digital twin-definition-uses and benefits-need for digital twin-working principal Technology Digital thread-digital shadow-building blocks of digital twin-digital twin technology drivers and enablers						orking 11 twin
Module 2	Data Modelling Environment	Assignment	Theory	No. o	of Class	ses:10

Types of digital twin-Based on Product and Process-Based on Functionality-Based on Maturity. Development considerations-Overview of Data-Modelling Environment. Modelling-model and data management-Managing data-implementing the model- Cloud and IOT technologies.

Module 3	Digital Twin Optimization	Assignment	Theory	No. of Classes:10
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Cyber range vs digital twin-human behavior modeling in digital twin-optimization using digital twin-digital twin and cyber security-Techniques. Technologies-Industrial IOT and Digital Twin-simulation and digital twin-Machine learning and digital twin-virtual reality and digital twin-cloud technology and digital twin.

Module 4RiskManagementApplications	and Assignment	Case Study	No. of Classes:10
------------------------------------	----------------	------------	-------------------

Digital twin and Risk Assessment-Digital twin reference model-Implementation-Development of risk assessment plan-Development of communication and control system-Development of digital twin tools-Integration-platform validation-Difficulties-Practical implications. Applications: Digital Twin in Manufacturing-Digital Twin in Automotive-Digital Twin in Healthcare-Digital Twin in Utilities-Digital Twin in Construction

Targeted Application & Tools that can be used:

Ansys Twin Builder is a powerful solution for building, validation and deploying simulationbased systems and digital twins: Build, validate, and deploy digital twins. Digital twin models integrate real-world data. Increase efficiency with digital twins.

Project work/Assignment:

Project Assignment:

Text Book

1. Clint Bodungen, Bryan Singer, Aaron Shbeeb, Kyle Wilhoit, and Stephen Hilt," Hacking Exposed Industrial Control Systems: ICS and SCADA Security Secrets & Solutions",1st Edition, ISBN: 978-1259589713.

2. Eric D. Knapp and Raj Samani," Applied Cyber Security and the Smart Grid: Implementing Security Controls into the Modern Power Infrastructure ",1st Edition. Kevin Mitnick," The Art of Invisibility",2017.

References

1. Michael E. AuerKalyan Ram B. Digital," Cyber-physical System and Digital Twins -Part of the Lecture Notes in Networks and Systems book series".

2. Nassim Khaed, Bibin Pattel and Affan Siddiqui," Development and Deployment on the Cloud", Elsevier, 2020.

Weblinks:

3. <u>https://puniversity.informaticsglobal.com/login?qurl=https://search.ebscohost.com%2flog</u> <u>in.aspx%3fdirect%3dtrue%26db%3dnlebk%26AN%3d1223875%26site%3dehost-</u> live%26ebv%3dEB%26ppid%3dpp_xiii

4. https://www.udemy.com/course/digital-twin-a-comprehensive-overview/

Topics relevant to "EMPLOYABILITY SKILLS":Digital thread-digital shadow-building blocks of digital twin, Digital Twin in Manufacturing-Digital Twin in Automotive, Cyber range vs digital twin-human behavior modeling in digital twin-optimization for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title:	Cyber Secur	rity					
CSE3094	Type of Cour	rse:1] Discipl	line	L- P- C		3	0	3
	LIECTIVE	21 Theory	v Only					
Version No.	1.1	2] 11001	y only					<u> </u>
Course Pre-	Fundamenta	l knowledge	in Informat	tion Security	and Netw	orks		
requisites	i unuunicitu	in knowledge		lion security		01103		
Anti-	NIL							
requisites								
Course	This is a fou	Indation pro	ogram gea	red toward	ls generat	ing and en	hancing a	wareness
Description	ription about cyber security challenges and the concept of Cyber Security and Cyber Ethics among the stakeholders to help them become responsible Cyber Citizens and participate safely and securely in the rapidly evolving information-age society. The important topics include: Network Security model, attacks, malware, firewall,					per Ethics zens and iety. , firewall,		
Course Objectives	The objective Security and	e of the cour attain Empl	se is to fam oyability th	iliarize the l rough Parti	earners wi cipative Le	th the conc arning tech	epts of Cy niques.	ber
Course Out	On successfu	l completior	n of the cou	rse the stud	lents shall l	be able to:		
Comes	1) Describe	the basic co	oncept of (Cyber Secu	rity [Know	ledge]		
	2)Classify di	ifferent type	es of attac	, ks for a sce	nario [Co i	mprehensi	ion]	
	3) Prepare a	a mitigation	policy for	security th	reat [Com	Iprehensic	n]	
	4) Demonst	rate Cyber S	Security to	ols [Applic	ation]	•	-	
Course	,	,	,		•			
Content:								
Module 1	Introduction to Cybei Security	ı Quiz r	Knowledge				10	Sessions
Topics		I						
History of Int to choose we Secure passw Techniques	ernet, Cyber (eb browsers, vord , Cyber S	Crime, Inforn Securing we Security Thre	nation Secu b browser, eat Landsca	irity, Compu Antivirus, I ipe, Emergi	iter Ethics : Email secui ng Cyber S	and Securit rity, Guidel Security Thr	y Policies, (ines for se eats, Cybe	Guidelines tting up a r Security
Module 2	Sec Net	urity in works	Assignmer	ot Comp	prehensio	n	10 Ses	sions
Topics: Security in Networks – Concepts, threats in Network, website vulnerabilities, man in the middle attack, denial of Service attack, distributed denial of service attack, Firewalls – introduction and design, types of firewalls, personal firewalls, Program Security – non malicious program errors, malicious program flaws, virus and other malicious code, prevention of virus infection. Assignment: Program Security – non malicious program errors.								
Module 3	S	martphone	Assignme	ent Com	prehensio	n	12	Sessions
	S	ecurity			-			
Tonics								
Introduction Exercise, Cybe	to mobile pr er Security Inc	nones, Smart cident Handli	tphone Sec ng, Cyber S	curity, Andreecurity Assu	oid Securit Irance, Gui	y, IOS Seco delines for s	urity, Cybe social medi	r Security a security,
lips and best	practices for	sater Social N	vetworking	Basic Secu	rity for Wir	idows, User	Account P	assword

Assignment: Social Media Security

Module 4	Ethical Issues i	nAssignment	Programming/Data	9 Sessions
	Cyber Security		analysis task	

Legal and ethical issues in Cyber Security – protecting program and data, copyright, patents and trade secrets, IT Act, EDP audit, Overview of CISA, Privacy in computing, Cyber Forensic Tools – types and categories, Cyber forensic suite. Forensic tools: types, categories, open source proprietary **Assignment:** Cyber Forensic Tools

Textbooks

T1. Charles P. Pfleeger and Shari Lawrence Pfleeger, "Security in Computing", Pearson Education, 5[™] Edition,2012

T2. Brooks, Charles J., Christopher Grow, Philip Craig, and Donald Short. Cybersecurity essentials. John Wiley & Sons, 2018.

T3. Dejey and Murugan, "Cyber Forensics", Oxford University Press, 2018.

References

R1. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, Security in Computing, 5th Ed, Pearson Education, 2015.

R2. Behrouz A Forouzan and Debdeep Mukhopadhyay, Cryptography and Network Security, 3^{,,,} Edition, Mc Graw Hill Publication, ISBN 13: 978-93-392-2094-5.2008.

Web links:

W1. <u>https://www.youtube.com/watch?v=RYB4cG8G2xo</u> W2. <u>https://www.coursera.org/lecture/detecting-cyber-attacks/Cyber Security-</u> <u>UeDqJ ,https://presiuniv.knimbus.com/user#/home</u>

Topics relevant to "EMPLOYABILITY SKILLS": Mobile Security for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Machine Learning			
CSE319				
	Type of Course: Theory Only			
Version No.	2.0			
Course Pre-	Mathematical Logic, Algebra, probability and Statistics, Vectors, Matrices.			
requisites				
Anti-requisites	NIL			
Course	This Course aims to introduce student's concepts and techniques on Machine Learning			
Description	and to study various probability based learning techniques, graphical models of Machine			
	This course encompasses various theoretical spectrum of Machine Learning concept.			
	behind several Machine Learning algorithms without going deep into the mathematics			
	gaining practical experience by applying them. Covering Correlations, Regressions and			
	to have a thorough understanding of the Supervised and Unsupervised learning			
	techniques, and limitations on Predictive Models.			
Course	The objective of the course is to familiarize the learners with the concepts of Machine			
Objective	Learning and attain EMPLOYABILITY SKILLS through PARTICIPATIVE LEARNING			
	techniques			
Course Out	On successful completion of the course the students shall be able to:			
Comes	CO 1: Explain the basic concepts on Machine Learning. [Comprehension]			
	CO 2: Apply Supervised Machine Learning algorithms on real time Applications.			
	[Application]			

	CO 3: Apply Un-Supervised Machine Learning algorithm for real time problems.							
	[Application]							
	CO 4: Illustrate adva	anced concepts in mach	nine learning [Application]					
Course Content:								
Module 1	Introduction	Assignment	Simulation/Data Analysis	6 Sessions				
Introduction to N	Achine learning- What V	Why and How? Types of	of Machine Learning Applic	ations Models				
selection Machin	ne learning concept wor	k flow issues types of	variables/features used in I	MI algorithms				
One-hot encodin	lg	(1000,1550c5, type5 01	variables, reatares asea in i	vie digoritimio,				
			Numerical from F-					
Module 2	Supervised learning	Assignment	Resources	13 Sessions				
Types of superv	ised learning: linear reg	ression, Simple Linear	Regression, Multiple Line	ar Regression,				
Model Evaluation	n, Validation and Accura	acy measures for Regre	ssion models. Classification	: logistic-KNN-				
Decision tree-SV	M-Naïve Bayes, Metrics	for supervised learning	<u>.</u>	U				
	Unsupervised	Term						
Module 3	learning	paper/Assignment	Simulation/Data Analysis	11 Sessions				
Types of Unsupe	ervised Learning: K-mea	ans clustering. Hierarch	nical clustering. Association	n Rule Mining.				
Collaborative Fi	iltering – User hased	I and item hased s	similarityApplications of	unsupervised				
learning cluster	validity measures Com	nonents of Time Series	data	unsupervised				
icuring, cluster	valially measures, com	ponents of fine series						
	Introduction to Neural	Term						
Module 4	Network	naner/Assignment	Simulation/Data Analysis	8 Sessions				
Overview of neur	ral networks- What and V	Why? Real and artifici	al neurons. Threshold logic	unit algorithm				
	ai iletworks- what and	tion to Learning Dules i		unit algorithm,				
Linear separabili	ty and vectors, introduc	tion to Learning Rules i	n Neural Network.					
Targeted Applica	ation & Tools that can b	e used:						
Jupyter noteboo	k							
Colab notebook								
Toxt Book								
1 Ethom A	Inaudia "Introduction to	Machina Laarnina" T	hird Edition					
1. Ethenn A	Marsland "Machina L	parnina: An Algorithm	nin Eultion.	2014 Second				
Z. Stephen	Ividi Sidilu, Iviucilile Lo	eurning. An Aigonthin	inc Perspective, springer,	2014, Second				
Eultion.								
Deferences								
References								
1 Taux M								
1. Tom IVI.	Witchell, <i>Wachine Lear</i>	ning , wicGraw Hill Edu		hlinking Thind				
Z. Sepastia	n Raschka and Vanid N	wirjaim , Python widch	ine Learning , PACKT Pu	blisning, Thira				
Edition.	(Lease (Dellass (See Della							
3. Wes Mich	Kinney ,"Python for Data	a Analysis" ,O'Reilly Me	dia, Inc., Second Edition.					
4. Simon H	aykın ,"Neural Network	s: A Comprehensive Fo	<i>bundation"</i> , Prentice Hall, S	econd Edition,				
1998.								
Web Based Resources and E-books:								
W1 . pu.i	nformatics.global, https	://sm-nitk.vlabs.ac.in/						
W2 . Uc	lemy course on "Ma	achine learning A-Z:	Hands-on Python and	R in Data				
Science"	, <u>https://www.ude</u>	<u>my.com/course/machi</u>	<u>nelearning/</u>					
W3. Cou	rsera course on "Machin	ne learning specializati	i on ", Andrew Ng					
https:	<pre>//www.coursera.org/sp</pre>	ecializations/machine-	learning-introduction					
Topics relevant t	o "EMPLOYABILITY SKII	LLS: linear regression,	Classification: logistic-KNN-	Decision tree-				
SVM-Naïve Baye	s ,K-means clustering, H	ierarchical clustering, A	Association Rule Mining for	developing				
Employability Sk	i lls through Participativ	e Learning techniques	. This is attained through as	sessment				
component men	tioned in course handou	ıt						
-								

Course Code:	Course Title: Data Warehousing and its Applications							
CSE2023	Type of Course:			L-P-C	3	0	3	
	Theory			210				
Varsian No.	1.0						L	
Course Dro	1.0 NII							
course Pre- requisites	INIL							
Anti-requisites	Basics of data mining &	Python						
Course	The Objective of this cour	se is to create a trove of h	istorical data tha	t can be retrie	ved a	ind an	nalyzed	
Description	to provide useful insight in	to the organization's ope	rations. A data v	warehouse is a	a vita	l com	ponent	
	architecture, design princ	ciples, building data wa	arehouse, data 1	ncepts of da nining techn	ita wiques	arend	major	
Course Objective	The objective of the cours	varenouse. e is to familiarize the lear	rners with the co	ncents of D a	ta W	areh	ousing	
course objective	and its Applications and	and its Applications and attain Employability through Participative Learning techniques.						
Course	On completion of this cou	rse, the students will be	able to					
Outcomes	• Describe data w	arehousing architecture	and considerati	ons to build	data	ware	ehouse.	
	[Knowledge]			1 50				
	Discuss different	multidimensional data r	nodels for data v	varehouse. [C	omp	rehen	sion	
	Apply various ter Apply different c	lata mining techniques to	arenouse [Applic mine insights [Application]				
Course Content:		iata mining teeninques to	J mille margines [Application				
Module 1	Introduction To Data Warehousing	Assignment/Quiz	Benefits of data	a warehousing	g	8 Sessi	ion	
	warehousing					0035	IUII	
consideration, impl Architecture: Two a Assignment: Benef	ementation consideration, and Three tier Data Wareh its of data warehousing	integrated solutions, be ouse architecture.	nefits of data w	arehousing.	Data	War	ehouse	
Module 2	Data Warehouse	Assignment/Quiz	Data cube			12 Sess	2 sion	
Topics:	6							
Data cube: A multi	dimensional data model, st	tars, snowflakes, and fac	t constellations:	schemas for 1	nulti	dimeı	nsional	
data models, dimer	sions: the role of concep	t hierarchies, measures:	their categoriza	tion and con	iputa	tion,	typical	
materialization: sele	ected computation of cubo	ids indexing olan data.	bitman index and	l ioin index	IISIOII	anty,	partial	
Assignment: Data c	ube	ius, maaning onep aana		· join moon				
Module 3	8	Case Study	Data Wareh principles	iouse desi	gn	12 Sess	2 sion	
Topics:								
Building a data wa Warehouse-The da Backup and Recov	arehouse: Introduction, Cu ta Warehouse design stag erv. Establish the data qu	ritical Success Factors, e, Building and implem ality framework. Opera	Requirement An enting data mar ating the Wareho	nalysis, Planr ts. Building o ouse, Recipe	ning data for a	for the warely a suc	ie data iouses, cessful	
warehouse, Data wa	arehouse pitfalls.	, <u> </u>	0	, I				
Assignment: Data V	Varehouse design principle	es						
Module 4	Introduction to Data Mining	Case Study	Data Mining T	echniques	S	8 essior	1	
Topics: Introduction to Data mining, KDD versus data mining, data mining techniques, tools and applications. Mining complex data objects, Spatial databases, Multimedia databases, Time series and Sequence data; mining Text Databases and mining Word Wide Web. Applications of data warehousing across different industries- Retail industry, Manufacturing and distribution, Bank, insurance company, Government agencies etc								
Assignment: Data M Targeted Applicat	ion & Tools that can be u	ised:						
Application Area i etc	ncludes Ecommerce, reta	il, manufacturing indu	stry, governmer	ıt agencies, F	'inan	ce, ba	anking	

Professionally Used Software: Microsoft Azure Synapse SQL, IBM DB2 warehouse, Terradata vantage, SAP data warehouse cloud, Google Bigtable, google sheets, BigQuery, MongoDB, MarkLogic, Talend, Informatica, Arm Treasure data, Micro focus vertica, Cloudera Enterprise data platform.

Assignment:

1. Book/Article review: At the end of each module a book reference or an article topic will be given to an individual or a group of students. They need to refer the library resources and write a report on their understanding about the assigned article in appropriate format. <u>Presidency University Library Link</u>.

2. Presentation: Group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same.

Text Book(s):

T1. Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", McGraw Hill, 2016

T2. Jiawei Han, Micheline Kamber, Jian Pei, "Data-Mining.-Concepts-and-Techniques", The-Morgan-Kaufmann, 3rd-Edition-Morgan-Kaufmann, 2015

Reference(s):

R1. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World", Pearson, 2016

- **R2.** Tan P. N, Steinbach M and Kumar V, "Introduction to Data Mining", Pearson Education, 2016 **Web Based Resources and E-books:**
- W1. NPTEL Course on "Business Analytics & Data Mining Modeling Using R", Prof. Gaurav Dixit. https://onlinecourses.nptel.ac.in/noc22 mg67/preview
- W2. NPTEL Course on "Data Mining", Mr. L. Abraham David https://onlinecourses.swayam2.ac.in/cec22_cs06/preview
- W3. Coursera course on "Data Warehousing for Business Intelligence Specialization", Michael Mannino, Jahangir Karimi

https://www.coursera.org/specializations/data-warehousing

W4. Journal on "Data Mining and Knowledge Discovery"

https://www.springer.com/journal/10618/

https://presiuniv.knimbus.com/user#/home

Topics relevant to "EMPLOYABILITY SKILLS": Building a data warehouse, data mining tools, for developing Employability Skills through Participative Learning Techniques. This is attained through assessment components mentioned in course handout.

Course Code:	Course Title: Digita	Course Title: Digital Health and Imaging					2		
CSE3018	Type of Course: Pro	gram Core& Theory O	nlv	L- P- C	5	U	5		
Version No.	1.0		,						
Course Pre-	CSE3008: Machine	Learning Techniques							
requisites									
Anti-requisites	-								
Course	This course will give	an overview of digital	health and	its impa	ict on h	ealthca	re.		
Description	Image enhancement	t techniques, filtering,	and restora	ation. M	edical Ir	naging,	e, health		
	informatics, Health	data analytics and prec	lictive mod	eling.		0 0,			
Course	The objective of th	ne course is to familia	arize the le	earners	with th	ne conc	epts of		
Objectives	: Digital Health an	d Imaging and attain	Employab	i lity thro	ough Pr	oblem	Solving		
	Methodologies.								
Course Out	On successful comp	On successful completion of the course the students shall be able to:							
Comes	1.Understand the ro	ole of digital health's in	npact in eth	nical and	legal co	onsidera	ations.		
	[Understand]								
	2. Apply Machine le	earning techniques for	medical in	nage ana	alysis. [/ maging	Applicat	tion		
	Apply Computer-		agnosis in r	neuicari	maging	•			
	4 Application	analytics and predictiv	ve modelin	σ [Δnnli	ication				
Course			ve modelin	8. [7.66]	leation				
Content:									
	Introduction to								
Modulo 1	Digital Health and	Assignment	Theony				. 0		
wodule 1	Digital Image	Assignment	Theory			L L	. 0		
Introduction to	Digital Health								
Overview of dig	ital health and its imp	bact on healthcare, Intr	oduction to	o teleme	dicine,	wearabl	es, and		
Digital Imago Pr	ng devices, Ethical and	a legal considerations i	n digital ne	eaith.					
Digital image re	presentation and pro	ais. onerties Image enhar	ncement te	chnique	s Imao	e filteri	ng and		
restoration. Ima	ge segmentation and	feature extraction		ennque	5, mag				
			Case studi	es can b	e				
	Medical Imaging	Assignment	assigned t	o studer	nts,				
Module 2	Modalities		where the	y analyz	e real-	L: 10			
			world scei	narios ar					
			propose A	I-based	solutior	าร			
Medical Imagin	g Modalities: Principle	es and applications of v	various me	dical ima	aging m	odalitie	s. X-ray		
imaging, compu	ted tomography (CT),	, and magnetic resonar	ice imaging	g (IVIRI) , vro doma	Ultraso	una ima	aging		
and nuclear med	uicine iniaging, iniagi	ig mouanties for speci		ire uoma	anis (e.g	g., Taulo	logy,		
caralology			Researchi	ng and r	wiewin	σ			
	Image Analysis in		academic	naners c	or	5			
Module 3	Healthcare	Assignment /Quiz	industry p	ublicatio	ons on	L	:12		
			specific Al	applicat	ions				
Image registrati	on and fusion techniq	ues, Quantitative imag	ge analysis	for disea	se diag	nosis ar	ıd		
treatment planr	ning, Computer-aided	detection and diagnos	is in medic	al imagiı	ng, Mac	hine lea	arning		
in medical imag	e analysis.								
Health Informat	ics and Electronic Hea	alth Records, Introduc	tion to hea	lth infor	matics a	and elec	tronic		
health records (EHR), EHR systems an	nd interoperability, Dat	a privacy, s	ecurity,	and reg	gulatory			
considerations i	n nealth informatics.								
Module 4	Digital Health	Assignment	Students r	nay wor	k with		10		
would 4	Applications and	Assignment	and he ac	iuiateu (ked to ev	nlore) L :	TO		

	1					
		an	d analyze the data	,		
		ex	tract meaningful ir	nsights,		
		an	d visualize the res	ults		
		usi	ing appropriate to	ols.		
Mobile health (n	nHealth) applications	and remote patient moni	toring, Health data	a analyti	ics and	
predictive mode	ling. Artificial intellige	ence and machine learnin	g in digital health.	Emergin	ng	
technologies and	d trends in digital hea	lth.				
Targeted Applica	ation & Tools that ca	n be used:				
Applications: Q	uantitative image an	alysis for disease diagnosi	s, Mobile health (r	nHealth		
Tools: TensorFlo	ow, PyTorch, Comput	er-aided detection				
Project work/As	signment: Mention t	he Type of Project /Assig	nment proposed f	for this o	course	
Assignments car specific AI appl implement AI alg scenarios and pr be asked to expl appropriate tool	n involve researching ications in engineer gorithms / Case stud opose AI-based solut ore and analyze the o s.	g and reviewing academi ing / Students may be ies can be assigned to stu tions / Students may wou data, extract meaningful in	c papers or indus given programmi idents, where they k with real or sim nsights, and visual	stry pub ing assig y analyze ulated d ize the r	lications gnments e real-we latasets results u	i on i to orld and sing
Text Book						
1. "Digital I	Health: Scaling Health	ncare to the World" by Pa	ul Sonnier-2020			
2. Digital Ir	nage Processing" by I	Rafael C. Gonzalez and Ric	hard E. Woods			
3. "Biomed	lical Signal and Image	Processing" by Kayvan N	ajarian and Robert	: Splinte	r	
References 1. Lavika G 2. "Introdu 3. <u>https://t</u> 4. https://v	oel, Artificial Intellige ction to Health Inforr calentsprint.com/cour www.udemy.com/top	nce: Concepts and Applic natics" by Mark S. Brauns r <u>se/ai-digital-health</u> pic/medical-imaging/	ations, Wiley, 202 tein	21		
Topics relevant	to "EMPLOYABILITY S	SKILLS": Health data analy	tics and predictive	e modeli	ng. Artif	icial
intelligence and	machine learning in	n digital health for dev	eloping Employab	oility Ski	ills thro	ugh
Problem Solving	g methodologies. Th	is is attained through as	ssessment compo	nent me	entione	d in
course handout.						
Course Code:	Course Title: Digita	I Watermarking and				1

Course Code:	Course Title: Digital Watermarking and							
CSE 3101	Steganography	L-P-C	3	0	3			
	Type of Course: Theory Only							
Version No.	1.1							
Course Pre-	Fundamental knowledge in Operating System	ns, Cryptography &	Network	< Securit	y and			
requisites	Computer Networks	Computer Networks						
Anti-requisites	NIL							
Course	The purpose of this course is to enable th	e students to Cor	nprehen	d the n	eed for			
Description	Digital Watermarking and Steganography a	nd to develop the	basic ab	ilities of	design			
	and use Digital Watermarking and Steganog	graphy- informatio	n hiding	techniq	ue. The			
	course is both conceptual in nature and ne	eds fair knowledg	e of Ma	themati	cal and			
	computing. The course develops critical thin	nking and analytica	al skills. T	The cou	rse also			
	enhances the abilities through assignments	5.						
Course	The objective of the course is to familiarize the	ne learners with the	e concep	ts of Di	gital			
Objectives	Watermarking and Steganography and atta	ain Employability t	hrough P	articipa	tive			
	Learning techniques.							

Course Out Comes	On successf Disc Clas Exp Sun	ul completio cuss the Intro ssify the vari lain the Fund marize the S	n of the co oduction o ous Digita damentals Steganogra	ourse t f Digit al Wate of Ste aphic T	he students sha al Watermarking ermarking techni ganography. `echniques.	ll be at g ques.	ole to:
Course Content:							
Module 1	Introduction digital watermarki	n to <mark>Assig</mark> i ng	nment	Progra	imming Task		7 Sessions
Topics Introduction to Applications, C based on Appli	Digital Wate lassification in cations.	rmarking, D Digital Wate	igital Steg er Marking	ganogra g- Class	aphy difference ification based o	s, briet on Char	f History, Watermarking racteristics, Classification
Module 2	Types an digital wa	d tools of termarking	Assignme	nt	Programming T	ask	14 Sessions
Digital Waterm Discrete Cosine Error Detection Watermark, Ro Mark (software	harking Fundar e Transform, D n Code. Spatial bbust Water M e Analysis).	nentals, Leas iscrete Wave domain wat ark, Waterm	st Significa elet Transi ermarking arking att	ant bit : form, F g, frequ cacks a	substitution, Dis Random Sequen Jency Domain w nd Tools, Image	crete F ce Gen vaterma proces	ourier Transform, eration, Chaotic Map, arking, Fragile sing techniques, Water
Module 3	Intro Steg	duction to anography	Assignme	ent	Programming/D analysis task	Data	8 Sessions
Topics: Steganograph Steganograph Steganograph (S-tools, Stego	iy, Watermar iy, Methods c iy Approache oDos, EzStezc	king vs Steg of Hiding, pr s, Mathema o, JSteg,Jpeg	anograpl operties atical Not g,).	hy, Ne of Ste ation	ed for Stegano ganography, Pa and Terminolo	graph erform gy, Ste	y, Application of ance measure of ganography Software
Module 4	Techniques Steganograp	ofAssig ohy	gnment		Programming/I analysis task	Data	7 Sessions
Substitution Sy Permutations, Embedding of	vstems and Bit Image Downg a secret Messa	-plane Tools rading and C age.	- Least Sig overt Cha	nifican nnels,	t Bit Substitutio Practical Approa	n, Pseu ach tow	dorandom /ards Steganography,
Textbooks T1. Frank Y S 2017, CRC Pi	Shih. Digital ' ress, second e	Water mark	ing and S	Stegan	ography Funda	menta	ls and Techniques,

T2. Jsjit. S. Suri Shivendra Shivani, Suneeth Agarwal, Handbook on Image based Security Techniques, CRC Press, 2018.

References

R1. Abid Yahya, Steganography Techniques for Digital Images, Springer, 2019.

Weblinks:

W1. Digital Watermarking | ScienceDirect (informaticsglobal.com)W2. Digital Watermarking and Steganography | ScienceDirect (informaticsglobal.com)

Topics relevant to "EMPLOYABILITY SKILLS": Building a data warehouse, data mining tools, for developing Employability Skills through Participative Learning Techniques. This is attained through assessment components mentioned in course handout.

Course Code:	Course Title:E – Busin	ness and Marketing		3	0	3			
CSE3136	Analytics		I - P- C						
			L-1-C						
	Type of Course: Disc	Type of Course: Discipline Theory							
Version No.	1.0 Pagia Commu	nightion skills							
Course Pre-requisites	Basic Collinu General Know	lifeation skills	nology						
	Basic knowled	lge about online business	mology						
Anti-requisites	Nil	Nil							
Course Description	The course intended	a provide the basis of	alastronia h	inaa	annliga	tiona			
Course Description	The course intends t	o provide the dasis of	electronic D	usiness	s applicat	linoad			
	and domonstrate the	d demonstrate the ability to identify describe and apply the essential							
	current practices in	In demonstrate the ability to identify, describe and apply the essential							
	understanding of hor	w marketing decisions	are aided by	analyt	ics	piùai			
Course Out Comes	At the end of the cou	urse the student shall h	e able to:	anaryt	.105.				
	CO 1: Describe the	fundamentals of $E - B_1$	isiness(Kno	wledg	e)				
	CO 2: Discuss the v	arious E – Business mo	odels (Com r	rehen	sion)				
	CO 3: Identify how	to manage E – Busines	s (Comprei	iensio	n)				
	CO4: Describe the	basics of marketing	analytics f	or dec	ision ma	aking			
	(Knowledge)								
Course Obiective:	The objective of the	course is to familiariz	e the learne	rs with	the con	cepts			
·····	of \mathbf{E} – Business a	nd Marketing Analy	tics and a	ttain F	Employa	bility			
	through Participativ	ve Learning techniques	s.		i j	y			
		8 1							
	Introduction to		Case study o	n Typ	es				
Module 1	Flactronic Business	Case study	of Networkir	ig for E	2- 6 Sessi	ons			
	Electronic Dusiness		Business						
Electronic Business: C	Overview, Definitions,	Advantages & Disadvan	ntages of E -	Busin	ess, Histo	ry of			
Electronic Business, 1	nreats of $E - Business$, Types of Networking f.	I ypes of E – Business a	and related in	dustrie	S, E - Bus	siness			
of the Internet Adva	ntages of Internet F.	Business Infrastructure:	An Overvie	w Ha	s, Develop rdware S	Server			
Operating System, Soft	tware. Network Websit	e. Roadmap of E – Busir	ess in India	, 11 a	iuwaie, c				
		Ca	Case study o	n One-					
Module 2	E-DUSINESS Markets	Case study	to-One Mark	eting	7 Sess	ions			
-			and E – Gov	ernanc	e				
E-business Markets and	d Models: Introduction	, E-business Environmen	t, E – Market	places,	E - Busin	iess			
Markets, Types of $E -$	Business Models: Mod	el based on Transaction	Fype, Model	based o	on Transac	tion			
Party – B2B, B2C, C2I Introduction The Scon	3, C2C, E-commerce S	ales Life Cycle (ESLC) I	Model, $E - M$	arketin	g: Key Iss	sues,			
Marketing Mix Brandi	ing Online Advertising	Targeting Online Custo	$D_{\text{mers}} = Man$	-One N	Aarketing	F –			
Governance	ing, Olimie / Revertising	,, rargeting Onnie Custo	iners, one to	one n	iaiketiiig,	L			
			Group Discus	ssion					
Module 3	The Management of	Group Discussion	on E – Paym	ent	10 Ses	sions			
	E – Business:	•	, Mechanism						
Managing Knowledge,	, Managing Applicatio	ns Systems for E – Bus	siness, Manag	gement	Skills fo	r E –			
Business, Comparison	between Conventional	Design and E – Organi	sation, Suppl	ly Chai	n Manage	ement			
(SCM), Customer Rela	tionship Management,	E - Payment Mechanism	n: Payment th	rough (Card Syste	em, E			
– Cheque, E – Cash, E	– Payment Threats & F	Protections.	[
	Introduction to		_	-					
Module 4	Marketing	Assignment	E-resource]	Review	v 8 Sess	ions			
	Analytics								
Marketing analytics-	data for marketing an	alytics-Exploratory dat	a analysis-d	escript.	ive analy	/sis-			
predictiveanalytics-p	rescriptive analytics-	Customer analytics-ber	nefits-Segme	entation	n analytic	CS-			
applications of cluste	r analysis								

DELIVERY PROCEDURE (PEDAGOGY):

Self-learning: An Overview, Hardware, Server Operating System, Software, Network Website, Roadmap of E – Business in India

Experiential Learning: Case Studies on E-business

Participative learning: Group discussion on E-Payment Mechanism

Textbook

T1- Colin Combe, Introduction to E-business Management and Strategy, Elsevier Ltd,1st edition,2006

T2- Gupta, Seema. Marketing Analytics,1st Edition,Wiley,1st October 2021.

References

R1: Tokuro Matsuo and Ricardo Colomo-Palacios, Electronic Business and Marketing: NewTrends on its Process and Applications, Springer,2015.

R2: Joseph, P.T, E-COMMERCE AN INDIAN PERSPECTIVE (2e), New Delhi Prentice-Hall of India,2019

R3: Chaffey, E-Business and E-Commerce Management: Strategy, Implementation and Practice, 5e, Pearson Education India,2013

R4: Kenneth C. Laudon and Carol Guercio Traver, E-Commerce, Pearson Education,2017

R5. Winston, Wayne, Marketing Analytics: Data –driven techniques with Microsoft Excel, Wiley, 2014.

R6. Grigsby, Mike, Marketing analytics: A practical guide to improving consumer insights using data techniques. Kogan Page, 2022.

Project /Assignment : Case study on Legal and Regulatory Environment for E - Business

PU E-Resource Links:

1. Ng, E. (2005), "An empirical framework developed for selecting B2B e-business models: the case of Australian agribusiness firms", *Journal of Business & Industrial Marketing*, Vol. 20 No. 4/5, pp. 218-225.

Link:https://www-emerald-com-

presiuniv.knimbus.com/insight/content/doi/10.1108/08858620510603891/full/html PU1:: https://www-emerald-com-

presiuniv.knimbus.com/insight/content/doi/10.1108/17505930710734125/full/htm

PU2:<u>https://www-emerald-com-presiuniv.knimbus.com/insight/content/doi/10.1108/JCM-02-</u>2019-3080/full/pdf?title=the-internet-of-everything-implications-of-marketing-analytics-from-a-consumer-policy-perspective

NPTEL Videos:

- 1. https://www.digimat.in/nptel/courses/video/110105083/L01.html
- 2. https://www.digimat.in/nptel/courses/video/110105083/L60.html
- 3. http://www.digimat.in/nptel/courses/video/110105083/L22.html
- 4. https://onlinecourses.nptel.ac.in/noc20_mg30/preview (Sessions on Marketing Analytics)

Web Based Resources:

W1. https://hbr.org/2018/05/why-marketing-analytics-hasnt-lived-up-to-its-promise

W2. https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Deloitte-

Analytics/dttl-analytics-us-da-pricinganalytics3minguide.pdf

W3. https://hbr.org/2010/11/using-customer-journey-maps-to improve customer satisfaction

W4. https://www.zoho.com/subscriptions/guides/what-is-customer-lifetime-val

W5. https://www.mediassociates.com/wp-content/uploads/2018/12/Mediassociates-

whitepaper-Predictive-Analytics_2018.pdf

Topics relevant to "EMPLOYABILITY SKILLS": Managing Knowledge, Managing Applications Systems for E – Business, Management Skills for E – Business, Comparison between Conventional Design and E – Organisation, for developing Employability Skills through Participative learning Techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Emergi	ing Areas in		3	0	3	
CSE3024	Blockchain		L- P- C				
	Type of Course: Theo	ory Only Course					
Version No.							
	Basic concept	ts in networking.					
Course Pre-	Cryptography	Techniques					
requisites	Data Structure	es and Algorithm	IS				
	Introduction t	o Programming					
Anti-requisites							
Course Description	This course will be on the fundamentals of Blockchain and Blockchain Technology. The most well-known example of Blockchain Technology in wide use today is as the storage and transaction mechanism for the cryptocurrency Bitcoin. We will use historical examples, key concepts, key challenges, and their proposed (and implemented) solutions to help explain Blockchain Fundamentals. A key focus for the class will be on the decisions between challenge and implementation. This 'design' process can take a very long time, and the design and research process that ultimately led to a 'successful' implementation for a cryptocurrency took decades. Bitcoin represents an elegant technical solution to a series of long posed problems and partial solutions.						
Course Objective	The objective of the of Emerging Areas i	course is to far n Blockchain and	miliarize the lea lattain Employal	orners Dility th	with the rough Par	concepts r ticipative	
	Learning techniques.						
Course Out Comes	On successful completion of the course the students shall be able to: CO1: To understand the mechanism of Blockchain and Cryptocurrency. CO2: To understand the functionality of current implementation of blockchain technology. CO3: To explore the applications of Blockchain to cryptocurrencies and understanding limitations of current Blockchain						
Course Content:							
Module 1	Blockchain: A new perspective in cyber technology	Assignment	Data Interpretati	on	8	Sessions	
Topics: 1. Introduct	ion, Blockchain archited	cture, Blockchain c	concepts ,Consen	sus algo	orithms, B	lockchain	
Module 2	Blockchain-enabled cyber-physical systems	Assignment	Data Interpre	tation	10 Sess	sions	
Topics: Background of CPS, Background of blockchain, Blockchain-enabled cyber-physical systems, Characteristics of blockchain-enabled CPS systems, Challenges in blockchain-enabled CPS systems							
Module 3	Blockchain for intrusion detection systems	Quiz	Questions	Set	10 Sess	sions	
Topics: . Intrusion d Blockchain-based in Snort, Limitations C	etection system, About trusion detection, Colla omparison with firewal	blockchain, Host-l borative intrusion o ls	based intrusion detection system.	etectior Applic	n system, cations of	IDS:	
Module 4	Blockchain for digital rights management	Quiz	Questions	Set	10 S	essions	
Fopics: Introduction, Illustrations, DRM requirement, Parts of a traditional DRM, Compatibility of blockchain for DRM, Various cryptographic hash functions in blockchain, Methodologies and							

technology in use, Effects and applications of using blockchain in DRM, Methodologies for coupling DRM with blockchain, Advantages of integrating blockchain with digital content, Limitation of blockchain in DRM,

Targeted Application & Tools that can be used:

Blockchain has so many applications in every sector you can imagine such as healthcare, finance, government, identity, etc. And that's not including its most popular application which is Bitcoin. Tools: Geth, Solc, Remix IDE, Truffle

Project work/Assignment:

Assignment:

1. **T1.**Blockchain Technology for Emerging Applications, A Comprehensive Approach 1st Edition - May 21, 2022, SK Hafizul Islam, Arup Kumar Pal, Debabrata Samanta, Siddhartha Bhattacharyya

References

R1. Applications of Blockchain Technology in Business Challenges and Opportunities, Mohsen Attaran, Angappa Gunasekaran · <u>Springer International Publishing</u> 2019 **E book link R1:** https://www.blockchain-council.org/e-books/

E book link R2: <u>https://101blockchains.com/ebooks/blockchain-for-enterprise/</u>

Web resources:

W1. https://www.coursera.org/specializations/blockchain.

W2. https://nptel.ac.in/courses/106105184/

W3. <u>https://swayam.gov.in/nd1_noc20_cs01/preview</u>

Topics relevant to development of "EMPLOYABILITY SKILLS": Byzantine Generals, Public-Key Cryptography, Bitcoin Blockchain, Incentive Model, Ethereum Structure, Ethereum Blockchain, for developing Employability Skills through Participative learning techniques. This is attained through assessment components mentioned in course handout.

Course Code: CSE 3108	Course Title: Expert Systems Course type : Theory Only			C 3	}	0	3		
Version No.	1.0								
Course Pre- requisites	"CSE 3108 – Ex	pert systems" c	ourse						
Anti-requisites	NIL								
Course Description	The purpose of t searching, knowl to study the idea representing kno uncertain world, to study the cond	he purpose of this course is to present the concepts of intelligent agents, earching, knowledge and reasoning, planning, learning and expert systems, o study the idea of intelligent agents and search methods, to study about epresenting knowledge, to study the reasoning and decision making in ncertain world, to construct plans and methods for generating knowledge, o study the concepts of expert systems.							
Course Objective	The objective of th Systems and attain	The objective of the course is to familiarize the learners with the concepts of Expert systems and attain Employability through Participative Learning techniques .							
Course Out Comes	On successful co 1. CO1: Des receive percepts 2. CO2: Der methods. 3. CO3: Exp planning and uno 4. CO4: Dev methods.	 On successful completion of this course the students shall be able to: 1. CO1: Describe the modern view of AI as the study of agents that receive percepts from the Environment and perform actions. 2. CO2: Demonstrate awareness of informed search and exploration methods. 3. CO3: Explain about AI techniques for knowledge representation, planning and uncertainty Management. 4. CO4: Develop knowledge of decision making and learning methods. 							
Course Content:									
Module 1	Introduction	Assignment	Theory			9	Hours		
Topics: Introduction to AI: Natural language search strategies –	Intelligent agents processing – Pro Informed search s	- Perception – blem – Solving ag strategies.	gents – Sear	ching for	solutic	ons: Uni	formed		
Module 2	Knowledge and Reasoning	Assignment	Theory			9	Hours		
Adversarial searcl Propositional logic - in first order logic.	n – Optimal and in - First order logic	nperfect decisions – Syntax and sem	s – Alpha, B nantics – Us	eta prunin ng first or	ig – Lo der log	ogical a gic – Inf	igents: erence		
Module 3	Uncertain knowledge and Reasoning	Assignment	Theory			8	Hours		
Uncertainty – Acting under uncertainty – Basic probability notation – Axioms of probability – Baye's rule – Probabilistic reasoning – Making simple decisions.									
Module 4	Planning and Learning	Assignment	Theory			9	Hours		
Planning: Planning problem – Partial order planning – Planning and acting in non-deterministic domains –									
Learning: Learning decision trees – Knowledge in learning – Neural networks – Reinfollearning – Passive and active.	orcement								
--	----------------------------------								
Module 5	Expert								
Systems Assignment Theory									
10hrs									
Definition – Features of an expert system – Organization – Characteristics – Pros Knowledge Representation in expert systems – Expert system tools – MYCIN – EMYCI	spector – N.								
Targeted Application & Tools that can be used:									
Project work/Assignment: Mention the Type of Project /Assignment proposed for course	this								
 Text Book Stuart Russel and Peter Norvig, 'Artificial Intelligence A Modern Approach', Edition, Pearson Education, 2003 / PHI. 2. 2. Donald A.Waterman, 'A Guide to Expert Systems', Pearson Education. 	Second								
 References 1. 1. George F.Luger, 'Artificial Intelligence – Structures and Strategies for OProblem Solving', Fourth Edition, Pearson Education, 2002. 2. 2. Elain Rich and Kevin Knight, 'Artificial Intelligence', Second Edition Tat McGraw Hill, 1995. 3. 3. Janakiraman, K.Sarukesi, 'Foundations of Artificial Intelligence and Exposed Systems', Macmillan Series in Computer Science. 4. 4. W. Patterson, 'Introduction to Artificial Intelligence and Expert S Prentice Hall of India, 2003. 	Complex a pert ystems',								
Links : pu.informatics.global, https://sm-nitk.vlabs.ac.in/									
Topics relevant to "EMPLOYABILITY SKILLS": Optimal and imperfect decisions agents, for developing Employability Skills through Participative Learning Technique attained through Review of digital/e resource as mentioned in course handout.	, Logical s. This is								

Course Code:	Course Title: Game	design and Develo	pment	L-P-C	2	2	3
CSA3073							
Version No	1 0	ram Core					
Course Pre-	Nil						
requisites							
Anti-requisites	NIL						
Course Description	The Game Design an	d development cou	urse is a h	ands-on l	earning	experie	nce that
	focuses on teaching Students will learn mechanics, and gam programming. Throug refine their game pro and their peers. Topic the creation of simpl final project where s	sudents will learn game design concepts such as player engagement, game rechanics, and game balance, as well as the basics of game art, sound, and rogramming. Throughout the course, students will work in teams to develop and effine their game prototypes, receiving feedback and guidance from the instructor and their peers. Topics covered include prototyping tools, sample game engines, and he creation of simple 2D and 3D game prototypes. The course will culminate in a hal project where students will present and demonstrate their completed game prototypes to the class.					
Course Objective	The objective of the construction of the const	the objective of the course is to familiarize the learners with the concepts of Game esign and Development and attain Employability through Participative Learning echniques.					
Course Out Comes	At the end of the course the student should be able to:						
	CO1 Recognize the e CO2 Distinguish bety CO3 Apply concepts	CO1 Recognize the elements of Game Mechanics. [Knowledge] CO2 Distinguish between various types of prototypes. [Comprehension] CO3 Apply concepts to create prototypes of games. [Application]					
Course Content:	Game mechanics, structures. Uses prototypes, stages prototypes.	Game mechanics, emergence and progression, resource mechanics, feedback structures. Uses and importance of prototyping, different types of prototypes, stages of prototyping, identifying key features, create functioning prototypes.					
Version No.	1.0						
Module 1	Game Mechanics	Assignment	Evolutio	on of prot	otyping	Clas	No. of ses:12
Topics: Introduction to Gar emergence and pro levels, feedback st	me Mechanics, differe ogression, Resource a ructures and semiotic	ent types of game mechanics and eco	mechanic onomies,	s and ap level des	plicatio ign and	ns, cond l progre	cepts of
Module 2	Designing	Case Study	Importa prototy	ince of ping		Cla	No. of asses:13
Topics: Introduction to prot paper, physical, play game and complete	otyping, uses and importable, art and sound pr game prototypes.	ortance of prototyp ototypes, interface	ing. Differ , low fideli	ent types ty and hi	of prot gh fideli	otypes s ty code,	such as core
Module 3	Creating and Testing Prototypes	Assignment	Prepare prototy game	physical pe of a po	opular	No Class	o. of ses:20
Topics:							
Documentation, ide different prototypin code, low fidelity an	ntifying key features, g techniques such as _l d high fidelity prototy	stages of prototy paper, physical, pla ping techniques to o	ping, testi yable, art create fun	ng and f and soun ctioning p	eedbac d proto prototyp	k, applic itypes, ir ies.	ation of nterface,

Targeted Application & Tools that can be used: Algodoo

Project work/Assignment:

- 1. 2D Platformer Design
- 2. Game Development
- 3. UI/UX Design

Textbook(s):

1 Jeremy G. Bond, "Introduction to Game Design, Prototyping, and Development", 2nd Edition, Addison-Wesley Professional, 2017.

References

 Ennio De Nucci, Adam Kramarzewski, "Practical Game Design : Learn the Art of Game Design Through Applicable Skills and Cutting-edge Insights", Packt Publishing, 2018.
 Ernest Adams, "Fundamentals of Game Design", Pearson Education, 2012.
 Weblinks:

https://learn.unity.com/

<u>https://starloopstudios.com/rapid-game-prototyping-why-is-it-important-in-game-development/</u>

Topics relevant to "EMPLOYABILITY SKILLS": Progression, prototyping, for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE 3025	Course Title: Indust Blockchain	ry Use Cases usin	g L-P-C	3	0	3
Version No.	Type of Course: The	ory Only				
Version No.	1.0 Dete structures Di	stributed System	a Cruntagraphy			
course Pre-requisites	Data structures, Di	suituled System	s, Cryptography			
Anti-requisites	NIL					
Course Description	The widespread popularity of digital cryptocurrencies has led the foundation of Blockchain, which is fundamentally a public digital ledger to share information in a trustworthy and secure way. The concept and applications of Blockchain have now spread from cryptocurrencies to various other domains, including business process management, smart contracts, IoT and so on. This course is a joint venture from academia and industry, where the target is to cover both the conceptual as well as application aspects of Blockchain. This includes the fundamental design and architectural primitives of Blockchain, the system and the security aspects, along with various use cases from different application domains.					
Course Objective	The objective of the course is to familiarize the learners with the concept of : Industry Use Cases using Blockchain and attain Employability throug Participative Learning techniques.					
Course Out Comes	 Describe what the Blockchain does Evaluate if Blockchains are useful for a particular application Demonstrate the application of hashing and public key cryptography in protecting the blockchain Explain the elements of trust in a Blockchain: validation, verification, and consensus. Develop smart contracts in Ethereum framework. 					
Course Content:						
Version No.	1.0					
Module 1	Introduction to Blockchain	Assignment	Knowledge, Quizzes	Cl	No. asses	. of :9
Topics:						
Basic ideas behind block - peer permission less net structure, Merkle tree a Structures, Mining : targ	chain, how it is changin work addresses in bitco and validation, Cryp get/difficulty, hash rates	ng the landscape of pin. Transactions : tographic Hash s, consensus, forkir	digitalization, Bitcoin ecos syntax, structures, and vali Functions, Hash Poin ng.	system idation ters a	, pee , Blo and I	r - to cks - Data
Assignment. Diockell						
	Luers of Blockchain	Assignment	Application, Ouizzes	1	NO.	. ot

Blockchain 1.0, Blockchain 2.0, Blockchain 3.0, Types of Blockchain: Public Blockchain, Private Blockchain, Semi-Private Blockchain, Sidechains. Hashing, public key cryptosystems, private vs public blockchain and use cases, Hash Puzzles, Introduction to Bitcoin Blockchain, task of Bitcoin miners, Mining Hardware, Bitcoin network, Limitations and improvements.

Assignment: Bitcoin Blockchain and use cases.

Module 3	Cryptographic Applications in Blockchain	Case Study	Application, Quizzes	No. of Classes:10

Topics:

Wallets - hash functions - public key cryptography - elliptic curve cryptography - digital signatures Introduction to Aneka, Framework overview, Anatomy of the Aneka container, Building Aneka clouds, Cloud programming, and management.

Case Study: Use of Cryptography in Blockchain.

Algorithms Classe	Module 4	Types of Consensus	Case study	Application, Quizzes	No. of
0		Algorithms			Classes:10

Topics:

Proof of Stake, Proof of Work, Delegated Proof of Stake, Proof Elapsed Time, Deposite-Based Consensus, Proof of Importance, Federated Consensus or Federated Byzantine Consensus, Practical Byzantine Fault Tolerance. Smart Contracts- Objectives and principles for the design of Blockchain systems, Understanding Ethereum, Ethereum Basics, Writing smart contracts using Ethereum, issues and Needs of Blockchain, Benefits and Challenges of Blockchain Implementation **Case Study:** Blockchain Use Case: Supply Chain Management, Smart Health Care, Transportation

Targeted Application & Tools that can be used:

Private Blockchain, Health sector, Finance, Supply Chain Management Ethereum, Hyper ledger

Project work/Assignment:

1. Defend your blockchain analysis of real world systems and present relevant findings and arguments in a structured logical and compelling manner.

2. 9. Determine real world challenges that blockchain technologies may assist (or explain why not) in solving.

Textbook(s):

1. Blockchain and Distributed Ledger Technology Use Cases: Applications and Lessons Learned Treiblmaier, Horst, and Trevor Clohessy ,1st ed. 2020 Edition, Kindle Edition

2. Ritesh Modi, Solidity Programming Essentials : A beginner's guide to build smart contracts for Ethereum and blockchain, Packt Publishing Limited, 2018.

References:

R1. Bitcoin and Cryptocurrency Technologies, Arvind Narayanan, Joseph Bonneau, Edward Felten,

2016.

- R2. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Daniel Drescher, Apress, First Edition, 2017.
- R3: Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andreas M. Antonopoulos, O'Reilly Media, First Edition, 2014

Web Resources and Research Articles:

1.	https://www.coursera.org/specializations/blockchain.
2.	https://nptel.ac.in/courses/106105184/
3.	Introduction to Blockchain Technology and Applications:
	https://swayam.gov.in/nd1_noc20_cs01/preview
4.	https://www.edx.org/course/blockchain-and-fintech-basics-applications-
<u>andli</u>	i <u>mitations</u>

Topics relevant to "EMPLOYABILITY SKILLS": Hashing , public key cryptography, public and private blockchain, for development of Employability Skills through Participative Learning Techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE2060	Course Title: Informatio Type of Course: Theory C	n Security and Only Course	Management	L- P- C	3)	3
Version No.	1						
Course Pre- requisites	Data Communication an Management Systems a	d Computer Ne nd Concepts of	etworks, Info cryptography	rmation [,] .	Security	', Data	base
Anti-requisites		·	,, , ,				
	The course explores inform	mation security	through som	e introdu	ictory ma	aterial	and helps
Course Description	ntroduction to cryptography, security management, network and computer security. It allows a student to begin a fascinating journey into the study of information security and develop an appreciation of some key security concepts. The course concludes with a discussion of a simple model of the information security in industry and explores skills, knowledge and roles required for employability. A student will be						
Course Objective	The objective of the constraints of the constraint of the constraints of the constraint of the constra	The objective of the course is to familiarize the learners with the concepts of Information Security and Management and attain Employability through Participative Learning techniques.					
Course Out Comes	Course Out ComesOn successful completion of the course the students shall be able to:• Describe the basic concept of information security. (Knowledge)• Explain the concepts and methods of cryptography. (Comprehension)• Demonstrate the aspects of risk management. (Application))	
Course Content:							
Module 1	Information Security Management:	Assignment	Data Collectio	on/Interp	pretation	10	Sessions
Topics: Information Security Overview, Threat and Attack Vectors, Types of Attacks, Common Vulnerabilities and Exposure (CVE), Security Attacks, Fundamentals of Information Security, Computer Security Concerns, Information Security Measures.							
Module 2	Fundamentals of Information Security and Data Leakage	Case studies / Case let	Case stud	dies / Cas	e let	13	Sessions
Topics: Key Elements of Networks, Logical Elements of Networks, Critical Information Characteristics, Information States. What is Data Leakage and Statistics, Data Leakage Threats, Reducing the Risk of Data Loss, Key Performance Indicators (KPI), Database Security.							
Module 3	Information Security Policies and Management	Case studies / Case let	Case stud	dies / Cas	se let	14	Sessions
Topics: Information Security Policies-Necessity-Key Elements and Characteristics, Security Policy Implementation, Configuration, Security Standards-Guidelines and Frameworks, Security Roles and Responsibilities, Accountability, Roles and Responsibilities of Information Security Management, Team Responding to Emergency Situation- Risk Analysis Process.							
Targeted Applicat An ISMS is a syst remains secure. process. It can help small	ion & Tools that can be u cematic approach to ma It includes people, proc	sed: naging sensiti esses and IT s inesses in any	ve company ystems by aj	informa oplying a informa	ition so a risk m	that it anage	: ment
norp sman	, out and large bus		neep				

The ISO 27000 family of standards helps organizations keep information assets secure.

Using this family of standards will help your organization manage the security of assets such as financial information, intellectual property, employee details or information entrusted to you by third parties.

ISO/IEC 27001 is the best-known standard in the family providing requirements for an information security management system (ISMS).

Project work/Assignment:

Assignment:

Text Book

T1 Management of Information Security by Michael E.Whilman and Herbert J.Mattord
 T2 Information Security: The Complete Reference, Second Edition, 2nd Edition. by
 Mark Rhodes-Ousley. Released April 2013. Publisher(s): McGraw-Hill.

References

R1 Title, Cryptography & Network Security (Sie) 2E. Author, Forouzan. Publisher, McGraw-Hill Education (India) Pvt Limited.

R2 Information Systems Security, 2ed: Security Management, Metrics, Frameworks and Best Practices. Nina Godbole.

E book link R1: <u>http://www.iso.org/iso/home/standards/management-</u> standards/iso27001.html

E book link R2: <u>http://csrc.nist.gov/publications/nistpubs/800-55-Rev1/SP800-55-rev1.pdf</u> BLINKS: pu.informatics.global , https://sm-nitk.vlabs.ac.in.

Topics relevant to development of "SKILL DEVELOPMENT": Security Policy Implementation, Security Roles, for development of Skill Development through Participative Learning Techniques. This is attained through assessment component mentioned in course handout.

Course	Course Title: Information Theory and					
Code:	Coding	I-P-C	3	0	0	
CSE3086		L-1-C				
	Type of Course: Theory Only					
Version No.	1.1					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	and estimation metry is the science for measuring, preserving, transmitting and estimating <i>information</i> in random data. It was initially proposed be Shannon as a mathematical theory of communication more than five decades ago. It provides the fundamental limits of performance for transmission of messages generated by a random source over a noise communication channel. On the one hand, Information Theory has been the driving force behind the revolution in digital communication and has led to various practical data compression and error correcting codes that meet the fundamental theoretical limits of performance. On the other hand over the years, techniques and concepts from Information Theory hav found applications well beyond communication theory. In this course, w will introduce the basic notions and results of Information Theory, keepir in mind both its fundamental role in communication theory and its varies					

advanced courses to be offered in the future, will be of interest to students					
	from various backgrounds.				
Course Objective	The objective of the course is to familiarize the learners with t	he concepts of			
	Information Theory and Coding and attain Employability thr	ough Problem			
	Solving Methodologies.	0			
Course Out Comes	On successful completion of the course the students shall be a	ble to:			
	1. Calculate the entropy of Zero memory; An	alyze Markov			
	sources and Apply the properties of Entropy for a given sour	ce statistic.			
	2. For the given source message, Determine the c	ode words and			
	Calculate coding efficiency using Shannon, Shannon-Fano,	Huffman and			
	Arithmetic coding algorithm for memoryless sources giv	en the source			
	statistics and LZ algorithm for sources with memory.				
	3. Determine and Analyze the channel entr	opies, mutual			
	information and the channel capacities for Discrete Memory	yless Channels			
	for the given channel diagram or channel matrix and to Di-	scuss Shannon			
	Hartley Law and Shannon's limit. A East the given (n, k) Linger Plack Codes and	Dinamy Cycelia			
	4. For the given (II, K) Linear Block Codes and	Billary Cyclic			
	capability of the code and the corrected received vector:	esign a single			
	error correcting Linear Block Code for the given message let	ngth.			
	5. Evaluate the code words for a given (n. k. n	n) convolution			
	encoder and Use Sequential search and Viterbi algorithm	to decode the			
	information from the given received vector and Discuss BC	H, RS, Golay,			
	shortened cyclic, burst error correcting, Burst and Random e	rror correcting			
	codes and Turbo codes.				
Course Content:					
Module 1	Information Theory	8 Sessions			
Topics:					
Introduction, Measure of	f information, Average information content (entropy) of symbol	ols in long			
independent sequences, I	nformation rate, Properties of entropy, Extension of discrete me	emory less			
(zero-memory) sources,	Average information content (entropy) of symbols in long	dependent			
sequences, Mark off stati	stical model for information source, Entropy and information ra	te of Mark			
off sources.		0.0			
Module 2	Source Coding	8 Sessions			
Topics:		1			
Properties of codes- Block codes, on-singular codes, Uniquely decodable codes. Instantaneous codes					
and Optimal codes, Prenz	aft's inequality Source coding theorem (Shannon's Noisel	antaneous			
theorem) Shannon's enco	and s inequality, Source county incorein (Shannon's Noisek	edundancy			
code (binary ternary and	auaternary) Code efficiency and redundancy Extended Huffman	an Coding			
Arithmetic Codes, Lemp	el – Ziv Algorithm.	in counig,			
Module 3	Channels and Mutual Information	8 Sessions			
Topics:					
Introduction, Discrete c	communication channels, Representation of a channel, Pro	bability			
relations- Apriori, Poste	riori antrony Equivacation Mutual information Proparties				
. .	for encopy, Equivocation, Mutual information, Properties,	Rate of			
information transmission	over a discrete channel, Capacity of a discrete memoryless of	Rate of channel,			

Symmetric, Binary symmetric, Binary erasure, Noiseless, Deterministic and cascaded channels, Estimation of channel capacity by Muroga"s method, Continuous channels, Shannon-Hartley theorem and its implications, Shannon"s limit, Rate Distortion Theory.

Module 4	Linear Block Codes	8 Sessions

Topics:

Introduction to Fields and Vector Spaces, Types of errors, Examples, Methods of controlling errors, Types of codes, Linear Block Codes- Matrix description, Encoding circuit, Syndrome and error detection, Syndrome circuit, hamming weight, hamming distance, Minimum distance of a block code error detection and correction capabilities of a linear block code, Single error-correcting Hamming codes, Table lookup decoding using standard array, General decoder for a linear block code. Binary cyclic codes: Algebraic structures of cyclic codes, Encoding using (n-k) bit shift register, Syndrome calculation.

Text Book

T1- K. Sam Shanmugham, "Digital and Analog Communication Systems", John Wiley Publications, 1996.

T2- Simon Haykin, "Digital Communications", John Wiley Publications, 2003.

T3-. Shu Lin, Daniel J. Costello, "Error Control Coding", Pearson / Prentice Hall, 2ndEdition, 2004.

References

R1-Muralidhar Kulkarni and K. S. Shivaprakasha, "Information Theory and Coding", Wiley (India), 2015.

R2-Glover and Grant, "Digital Communications", Pearson 2nd Edition, 2008.

R3-Abramson, "Information Theory &Coding", McGraw-Hill, 1963.

Weblinks: pu.informatics.global.

Topics relevant to development of "EMPLOYABILITY SKILL": Algebraic structures of cyclic codes, Encoding using (n-k) bit shift register, Syndrome calculation, for developing Employability Skills through Problem Solving Techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE305	Course Title: Parallel C Type of Course: Theory	omputing Only		L- P- C	3	0	3
Version No.	2.0					•	
Course Pre- requisites	Computer Organization a Systems, Some Networkir	and Architecture	, Algorithm	ns and C)pera	ting	
Anti-requisites	NIL						
Course Description	This is an introductory course to Parallel Computing. The purpose of this Course is to understand the motivation for Parallel Computing and the concept of Parallel Computing. It also exposes the various Models of Parallel Computers and their interconnections and how computations can be performed using Parallel Algorithms and Parallel Programming Models like OpenMP and MPI.						
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Parallel Computing and attain Employability through Problem Solving techniques						
Course Out Comes	 On successful completion of this course the students shall be able to: Classify Parallel Systems Employ a Parallel Algorithm for the given Problem Demonstrate the usage of Parallel Programming Tools 						
Course Content:		0	0				
Module 1	Motivation, History & Scope of Parallel Computing, Concurrency	Assignment	Write abou computing areas	ut paralle applicat	el ion	7 S	essions
Topics:	1	1	1				

The significance of parallel computing, Motivating parallelism, scope and applications, types of computing – concurrent, parallel and distributed computing; Types of Parallel Systems: Shared Memory Systems and Distributed Memory Systems; Parallelism in uniprocessor systems – Implicit parallelism - pipelining and superscalar execution, Parallel processing mechanisms, Parallel Computer structures – pipeline computers, array processors, multiprocessor systems

Vodule 2 Parallel Hardware	Assignment	Programming activity using OpenMP	10 Sessions
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Flynn's Classification – SIMD, MIMD, interconnection networks, Performance evaluation criteria, The Effect of Granularity on Performance, Message-Passing Programming, Send and Receive Operations, Interconnection networks, Shared memory interconnects: Bus, Crossbar; Distributed Memory Model, Basic communication operations-One to all Broadcast and All to one Reductions, Ring, Mesh, Hypercube

Introduction to Decomposition, tasks and dependency graphs; granularity, concurrency and task interaction; Processes and mapping; processes versus processors; Decomposition techniques – recursive decomposition, data decomposition, exploratory decomposition, speculative decomposition, hybrid decomposition; Characteristics of tasks and interactions; Parallel algorithm models – data parallel, task graph, work pool, master slave, producer-consumer, hybrid models

Modelling parallel computation: Multiprocessor Models- Random-Access Machine, The Local-Memory Machine, The Memory-Module Machine, **Parallel Programming Models**: Shared Memory Model, Shared programming model with OpenMP, Message Passing Models, Message passing interface, MPI_init, MPI_Comm_rank, MPI_finalize, Running MPI Programs, collective Communication

Targeted Application & Tools that can be used: OpenMP programming

Text Book

 T. Ananth Grama, Anshul Gupta, George Karypis and Vipin Kumar, "Introduction to Parallel Computing", 2nd edition. Noida, India: Pearson Education, Ltd., 2003.
 Web Links:

1. Technology Enabled Learning - NPTEL offers as Course on "Introduction to Parallel Programming in OpenMP" by Yogish Sabharwal, IIT, Delhi.

2. https://swayam.gov.in/nd1_noc19_cs45/preview Students can enroll for the course that starts on 26th Aug – 20th Sep, 2019.

3. https://nptel.ac.in/courses/105105157

4. https://puniversity.informaticsglobal.com:2229/login.aspx

References

1. Michael J Quinn, "Parallel computing: Theory and Practice", 2nd edition. New Delhi, India: Tata MacGraw Hill Education Private Limited, 2002.

2. Michael J Quinn, "Parallel Programming in C with MPI and OPENMP", Indian edition. Chennai, India: Tata MacGraw Hill Education (India) Private Limited, 2004.

3. Kai Hwang, Faye A. Briggs, "Computer Architecture and Parallel Processing", Indian edition, New Delhi, India: MacGraw Hill Education (India) Private Limited, 2012

4. Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan Kaufmann, Burlington, USA, 2011.

5. V.Rajaraman, C. Siva Ram Murthy, "Parallel Computers: Architecture and Programming", 2nd edition, PHI Learning Private Limited, Delhi, India, 2016.

Topics relevant to "EMPLOYABILITY SKILLS": Shared Memory Systems and Distributed Memory Systems, Data Parallelism, Functional Parallelism, Pipelining,Flynn's Classification, SIMD systems, MIMD systems, for developing **Employability Skills** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: INFORM	MATION		2	2	3					
CSE3033			L- P- C								
	I ype of Course: Integ	grated									
Version No.	1.0										
Course Pre- requisites	Basic Programming C	oncepts.									
Anti-requisites	NIL										
Course Description	This course offers fou enable creation of eff discovery. Covers the representations of da interactivity principle	his course offers foundational principles, methods, and techniques of visualization to mable creation of effective information representations suitable for exploration and liscovery. Covers the design and evaluation process of visualization creation, visual epresentations of data, relevant principles of human vision and perception, and basic interactivity principles.									
Course Objective	The objective of the course is to familiarize the learners with the concepts Of Information Visualization and attain Employability through Experiential Learning techniques.										
Course Out Comes	On successful completion of the course the students shall be able to CO 1: Choose appropriate visualization methods for a given data type.Course Out ComesCO 2: Implement interactive visualization interface for different types of data such as time oriented, textual, and spatial. CO 3: Design an effective visualization using design and human perception principles.										
Course Content:	t:										
Module 1	Data Visualization & Techniques	Quiz	Data Colle	a ection/Interp	retation	08 Sessions					
Topics: Data Abstractio Perception, Sca visualization, V	n - Task Abstraction - Ilar and point techniq isualization Technique	Analysis: Fou ues – vector v es for Trees, (r Levels fo visualizatio Graphs, an	or Validation, on technique d Networks,	Human Visu s – matrix Multidimen	ual Isional data.					
Module 2	Visual Analysis of data from various domains	Assignment	Prog	gramming		09 Sessions					
Topics:											
Time-oriented o	lata visualization – Sp	atial data visi	ualization	and case stud	dies, Text da	ata visualization –					
Multivariate da	ta visualization, and c	ase studies,									
Module 3	Designing Effective Dashboard and Visual Story Telling	Assignment	Prog	gramming		09 Sessions					
Topics: Guidelines for designing successful visualizations, Data visualization dos and don'ts, Dashboard Design principles, Effective Dashboard Display Media, Dashboard creation using visualization tools for the use											
cases: Finance-	marketing-insurance-	neaitricare et	.C.								

Targeted Application & Tools that can be used Targeted application: Business intelligence tools.

Targeteu application: Business intelligence tools.

Tools: Tableau, Google data studio, Openheatmap

Project work/Assignment:

Assignment: Programming

Text Book

T1 Tamara Munzer, "Visualization Analysis and Design", CRC Press, 2018.

T2 Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations,

Techniques, and Applications", CRC Press, Second Edition, 2015.

References

R1 Stephen Few, "Now You See It", Analytics Press, 2019. .

R2 Stephen Few, "Information Dashboard Design: the effective visual communication of data", Oreilly,

2016.

Web resources: <u>https://www.coursera.org/specializations/information-visualization</u>,

https://presiuniv.knimbus.com

Topics relevant to development of "EMPLOYABILITY SKILLS": Human Visual Perception, Effective Dashboard Display, for development of Employability Skills through Experiential Learning techniques. This is attained through assessment component as mentioned in course handout.

Course Code: CSE3102	Course Title: M Type of Course Basket	falware Analysis Discipline Electiv	ve in Cyber Se	curity	L- P- C	3	0	3		
Version No.	1.0									
Course Pre- requisites	Should Have the	hould Have the knowledge of Cryptography and Network Security								
Anti-requisites	NIL									
Course Description	iption The purpose of the course is to explore malware analysis tools and techniques in depth. Understanding the capabilities of malware is critical to an organization's ability to derive threat intelligence, respond to information security incidents, and fortify defenses. This course builds a strong foundation for reverse-engineering malicious software using a variety of system and network monitoring utilities, a disassembler, a debugger, and other tools useful for turning malware inside-out.									
Course Objective	The objective of the course is to familiarize the learners with the concepts of Malware Analysis and attain Employability through Participative Learning techniques.									
Course OutComes	 e OutComes On successful completion of this course the students shall be able to: Understanding the nature of malware, its capabilities, and how it is combated through detection and classification. Apply the methodologies and tools to perform static and dynamic analysis on unknown executables. Analyze scientific and logical limitations on society's ability to combat malware Apply techniques and concepts to unpack, extract, decrypt, or bypass new anti analysis techniques in future malware samples. 									
Course Content:										
Module 1	Introduction to MALWARE ANALYSISAssignmentProgramming activity12 Hours									
Topics: Introduction to malv typesviruses, worms, malware analysis, dy Assignment: Brief st	vare, OS security rootkits, Trojan namic malware a udy on types of s	y concepts, malw s, bots, spyware, a analysis. pyware	are threats, e adware, logic l	volutio oombs,	n of malv malware	vare, analy	, ma ysis,	lware static		

Module 2	Static Analysis	Ass	signment	Programming activity	11 Hours
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X86 Architecture- Main Memory, Instructions, Opcodes and Endianness, Operands, Registers, Simple Instructions, The Stack, Conditionals, Branching, Rep Instructions, C Main Method and Offsets. Antivirus Scanning, Fingerprint for Malware, Portable Executable File Format, The PE File Headers and Sections, The Structure of a Virtual Machine, ReverseEngineering- x86 Architecture **Assignment:** Static analysis on malware (PeStudio & ProcMon)

Analysis Assignment activity	Module 3 Dynamic Analysis	Assignment Programming activity	11 Hours
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Topics:

Live malware analysis, dead malware analysis, analyzing traces of malware- system-calls, api-calls, registries, network activities. Anti-dynamic analysis techniques anti-vm, runtime-evasion techniques, , Malware Sandbox, Monitoring with Process Monitor, Packet Sniffing with Wireshark **Assignment:** Demonstration of wireshark

Module 4	Malware Functionality and Detection Techniques		Assignment	Programming activity	12 Hours
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Downloader, Backdoors, Credential Stealers, Persistence Mechanisms, Privilege Escalation, Covert malware launching- Launchers, Process Injection, Process Replacement, Hook Injection, Detours, APC injection.

Signature-based techniques: malware signatures, packed malware signature, metamorphic and polymorphic malware signature Non-signature based techniques: similarity-based techniques, machine-learning methods, invariant inferences

Assignment: Packet malware signature

Targeted Application & Tools that can be used: eCMAP (Certified Malware Analysis Professional)

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Any appropriate tool can be given to demonstrate.

Text Book

1. Michael Sikorski and Andrew Honig, 2012: " Practical Malware Analysis", No Starch Press.

E-Resources

W1. <u>https://www.geeksforgeeks.org/introduction-to-malware-analysis/</u>

W2. <u>https://ine.com/learning/courses/malware-analysis</u>

W3: <u>https://sm-nitk.vlabs.ac.in/</u>

References

1. Jamie Butler and Greg Hoglund, 2005: "Rootkits: Subverting the Windows Kernel", Addison-Wesley.

2. Dang, Gazet and Bachaalany, 2014: "Practical Reverse Engineering", Wiley.

3. Reverend Bill Blunden, 2012: "The Rootkit Arsenal: Escape and Evasion in the Dark Corners of the System" Second Edition, Jones & Bartlett.

Topics relevant to "EMPLOYABILITY SKILLS": X86 Architecture, Packet Sniffing, Wireshark, for development of Employability Skills through Participative Learning Techniques. This is attained through assessment components mentioned in course handout.

Course Code: CSE3129	Course Title: Middleware Technologies			3	0	3	
	Type of Course: Program CoreL- P- CTheory Based CourseC						
Version No.	1.0						
Course Pro requisites	e-Familiarity with basics of Internet technologies w	ould b	e es	sential.	•		
Anti-requisites	NIL						
Course Description	The main objective of the course is to create a pra on Middleware Technologies to help students u they can pick out the real issues from the imag complex distributed systems with confidence.	ctical, nderst inary	wic and issu	de-rang what what	ging di is goin l start	scussion 1g on so building	
Course Objective	The objective of the course is to familiarize the Middleware Technologies and attain Employabili techniques.	learn ty thro	ers ough	with t Partic i	he con i pative	cepts of Learning	

Course	At the end of the course the student will h	be able to
Outcomes	1 Learn how to use Middleware to l	Build Distributed Applications
	2 Implement Business Processes	Build Distributed Applications
	3 Learn about Middleware Technol	ogies
	4 Implement Business Processes	ogies
	4. Implement Dusiness Frocesses	rchitecture
Course Content:	5. Learn application design and 11 a	Ichitecture
Course Content.		
Module 1	Case studies	9 Hours
Topics:		
Moving to e-busi	ness, what is IT architecture? Why is this	is different from what we did before?
Rewrite or evolve	e? Who develops the architecture? Early of	lays, Preliminaries, Remote procedure
calls. Remote dat	abase. Distributed transaction processing	. Message queuing. Message queuing
versus distributed	transaction processing, what happened	d to all this technology? OBJECTS.
COMPONENTS.	AND THE WEB: Using object mi	iddleware. Transactional component
middleware. CON	M EIB Final comments on TCM. Inte	rnet Applications. WEB SERVICES:
Service concepts	Web services, and Using Web services: A	A pragmatic approach
Module 2	Case studies	9 Hours
Topics:		
Middleware elem	pents the communications link the mid	ddleware protocol the programmatic
interface Data n	resentation Server control Naming and	directory services Security System
management Cor	nments on Web services Vendor archite	ctures Vendor platform architectures
Vendor distribute	architectures Using vendor architect	ures Positioning Strawman for user
target architecture	Marketing Implicit architectures Midd	leware interoperability
Modulo 3		0 Hours
Topics:	Quiz	9 11001 S
What is middlew	are for? Support for business processes	Information retrieval Collaboration
Tiors The present	tation tion. The processing tion. The data to	ior Services versus tiers. Architectural
choices Middley	vera bus probitactures. Hub probitactures	Web services versus tiers, Architectural
coupled versus tic	whether coupled	, web services are intectures, Loosery
Module 4	Case studies	0 Hours
Topics:		5 Hours
What is a process	? Business processes Information and pr	ocesses Architecture process patterns
Clarification and	analysis Error Handling Timing Migrati	ion Elevibility
Targeted Applicat	tion & Tools that can be used:	ion, Mexiointy.
Targeteu Applicat	ion & Tools that can be used.	
To design and deve	lop distributed application	
	top distributed approaction.	
Project work/Assi	gnment:	
Project Assignment	t' NIL	
i roject i issigninen		
Assignment 1: Pap	er Review of distributed application using we	eb services
Text Books		
1. Chris Brit	ton and Peter Eye, "IT Architectures and	d Middleware: Strategies for Building
Large, Integra	ted Systems", 2nd Edition, Pearson Educ	ation, 2004.
References	- · · · · · · · · · · · · · · · · · · ·	,
1. Qusay H. Ma	ahmoud, "Middleware for Communicat	ions", 1st Edition, John Wiley and
Sons,2004. 2. M	ichah Lerner, "Middleware Networks: (Concept, Design and Deployment of
Internet Infrastruc	ture", 1st Edition, Kluwer Academic Pub	olishers, 2000.
	•	

Topics relevant to "EMPLOYABILITY SKILLS": Middleware Protocol, Architecture process patterns, for developing Employability Skills through Participative Learning Techniques. This is attained through assessment components mentioned in course handout.

Course Code: CSE 3030	Course Title: Mining Massive Datase Type of Course: Progra Theory and Lab Integra	rts m Core ted Course		L- P- C	2	2	3
Version No.	1.0						
Course Pre- requisites	CSE2021- Data Mining						
Anti-requisites	NIL						
Course Description	The purpose of the c emphasize the impor- analyzing massive dat The student should have appropriate mining too The associated labora and enhance critical the data mining technol implementing them, e for applications that in	he purpose of the course is to provide knowledge of data mining, and to nphasize the importance of choosing suitable tools for processing and halyzing massive datasets to gain insights. he student should have the knowledge and skill to select and use the most opropriate mining tools to solve business problems. he associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills. With a good knowledge of ata mining technology, the student can gain practical experience in nplementing them, enabling the student to be an effective solution provider or applications that involve huge volumes of data					
Course	be objective of the course is to familiarize the learners with the concents of Mining						
Objective	Massive Datasets and techniques.	lassive Datasets and attain Skill Development through Experiential Learning echniques.					
Course	On successful comple	tion of the course th	ne students s	shall be	able to	0:	
Outcomes	 Identify the right machine learning/mining algorithm for handling massive data Apply classification and regression models with Spark and Mahout Implement clustering models using Spark and Mahout Apply semi-supervised learning for clustering and classification 						
Course Content:				, 			
Module 1	MapReduce Based Machine Learning	Programming Assignment	Data Colle Analysis	ection	and (09 Cl	asses
MapReduce B	ased Machine Learn	ing					
K-Means, PLA	NET, Parallel SVM, A	Association Rule M	ining in Ma	pReduc	e, Inv	erted	Index,
Page Ranking,	Expectation Maximiza	ation, Bayesian Net	works	•			
Module 2	Classification and Regression models with Spark and Mahout	Programming Assignment	Data Colle Analysis	ection	and	10 Cl	asses
Classification	and Regression mode	els with Spark and	Mahout	_	_		
Linear support	t vector machines -	Naive Bayes mod	el- Decision	n Trees	5 – L	east	square
regression. Dec	cision trees for regress	ion			1		
Module 3	Clustering in Spark and Mahout	Programming Assignment	Data analys	is]	10 CI	asses
Clustering in Hierarchical Cl Fayyad, and R CURE algorith	Spark and Mahout lustering in a Euclidea eina - A variant of K m - Clustering models	n and Non-Euclidea -means algorithm - with Spark - Spect	n Space - T Processing ral clusterin	he Algo Data ii g using	orithm 1 BFR Maho	of B Algout	radley, orithm
	Mining Social-			<u>a</u>			
Module 4	Network Graphs and Semi-Supervised Learning	Programming Assignment	Data Colle Analysis	ection	and 1	11 Cl	asses

Mining Social-Network Graphs Clustering of Social-Network Graphs - Direct Discovery of Communities - Partitioning of Graphs Finding Overlapping Communities - Counting Triangles using MapReduce Neighbourhood Properties of Graphs

Semi-Supervised Learning Introduction to Semi-Supervised Learning, Semi-Supervised Clustering, Transductive Support Vector Machines

Targeted Application & Tools that can be used:

- Business Analytical Applications
- Social media Data Analysis
- Predictive Analytics

Tools: Data analytical tools like Spark, Mahout, map reduce.

Project work/Assignment:

After completion of each module, student will be asked to develop a mini project for Data mining.

Text Book

1. Jure Leskovec, Anand Rajaraman, Jeffrey Ullman, "Mining of Massive Datasets", Standford Press, 2016.

- 2. Nick Pentreath, "Machine Learning with Spark", Packt Publishing, 2017
- 3. Olivier Chapelle, Bernhard Scholkopf, Alexander Zien "Semi-Supervised Learning",

The MIT Press, 2016.

References

- 1. Ron Bekkerman, Mikhail Bilenko, John Langford "Scaling Up Machine Learning: Parallel and Distributed Approaches", Cambridge University Press, 2016.
- 2. Jimmy Lin, Chris Dyer, "Data-Intensive Text Processing with MapReduce", Morgan Claypool Publishers, 2017.
- 3. Hennessy, J.L. and Patterson, D.A., 2016. Computer architecture: a quantitative approach. Elsevier.
- 4. Chandramani Tiwary "Learning Apache Mahout", Packt Publishing, 2015.
- 5. Fuchen Sun, Kar-Ann Toh, Manuel Grana Romay, KezhiMao,"Extreme Learning Machines 2013: Algorithms and Applications", Springer, 2014.

E-resources

https://online.stanford.edu/courses/soe-ycs0007-mining-massive-data-sets

https://www.edx.org/course/mining-massive-datasets

https://www.my-mooc.com/en/mooc/mmds/

http://infolab.stanford.edu/~ullman/mmds/book.pdf

Topics relevant to "SKILL DEVELOPMENT": Hierarchical Clustering in a Euclidean and Non-Euclidean Space for **Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE3009	Course Title: Optimization Techniques for Machine LearningL- P- 33Type of Course: Discipline Elective in Artificial Intelligence and Machine Learning Basket
Version No.	1.0
Course Pre- requisites	CSE3008 Machine Learning Techniques
Anti-requisites	NIL
Course Description	This course introduces a range of machine learning models and optimization tools that are used to apply these models in practice. Course will introduce what lies behind the optimization tools often used as a black box as well as an understanding of the trade-offer of numerical accuracy and theoretical and empirical complexity.

	For the students with some opt of applications arising in mach methods targeting these applica	imization backgrou nine learning and s ations.	and this course will introduce the transformation of trans	ce a variety
Course Objective	The objective of the course of Optimization Techniques f	e is to familiariz or Machine Learni	e the learners with th ng and attain Employabi	e concepts lity through
Course	On successful completion of th	es. vis course the stude	nts shall be able to:	
Outcomes	1 Describe fundament	als of Machine lea	rning [Knowledge]	
	2. Explain Machine lea	rning models [Co	omprehension].	
	3. Discuss Convex optim	ization models [Co	omprehension].	
	4. Apply Methods for co	nvex optimization	[Application].	
Course Content:				
Module 1:	Fundamentals of Machine learning	Quiz	Knowledge based Quiz	8 Sessions
Topics: Machine	e learning paradigm, empirical r	risk minimization,	structural risk minimizati	on, learning
guarantees, introc	luction of VC-dimension.	L		T
Module 2:	Machine learning models	Quiz	Comprehension based Quiz	10 Sessions
Topics: logistic i	regression, support vector machi	ines, sparse regress	ion, low dimensional emb	edding, low
rank matrix factor	rization, sparse PCA, multiple k	ernel learning.		
Module 3	Convex optimization models	Assignment	Batch-wise Assignments	9 Sessions
Topics: linear opposition of the linear opposition of the linear opposite the linear	otimization, convex quadratic op vex composite optimization	timization, second	order cone optimization,	semidefinite
Module 4:	Methods for convex optimization	Assignment and Presentation	Batch-wise Assignment and Presentations	11 Sessions
Topics: gradient	descent, Newton method, interi	or point methods,	active set, prox methods,	accelerated
gradient methods	, coordinate descent, cutting plan	nces, stochastic gra	dient.	
Targeted Applic	ation & Tools that can be used	: Use of Matlab	tool	
Project work/As	signment:			
Survey on Meth	ods for convex optimization			
Text Book T1. Charu C. A T2. Sra Suvr	Aggarwal, " <i>Linear Algebra and</i> it, Nowozin Sebastian, and W	<i>Optimization for M</i> right Stephen J, '	Aachine Learning", Spring 'Optimization for Machi	;er, 2020. ine
Learning, The	MIT Press,2012.			
References R1 Guanghui	I on "First order and Stochasti	ic Optimization Ma	thods for Machina Laarni	na"
Springer Ch	2020 am 2020		mous jor machine Learni	ng,
Web References	uni, 2020.			
W1 https://	sm-nitk vlabs ac in/			
W2 https://	/nptel.ac.in/courses/			
Topics related to	b) development of "EMPLOYA	BILITY SKILL"	: Convex optimization	models and
Methods for conv	ex optimization, for development	nt of Employability	Skills through Participati	ve Learning
Techniques. This	is attained through assessment c	components mentio	oned in course handout.	U

Version No. 1.0 Course Pre- requisites 1.1 The primary prerequisite is a working knowledge of basic algebraic number theory, which includes number fields, rings of integers, factorization of ideals into primes 21 A working knowledge of basic algebraic number theory. 13 Basic concepts of cryptography like encryption decryption, Signature generation and verifications. Anti-requisites NIL Course Null Course The purpose of this course is to enable the students to appreciate the need for cryptography and to identify the applications of cryptography in Internet of Things [107]. The course is both conceptual and analytical in nature and needs fai knowledge of mathematics and computing. The course develops the critica thinking and analytical skills. The course also enhances the programming abilities through assignments. Course On successful completion of this course the students shall be able to: Outcomes I. Explain benefits of modern cryptographic algorithms Course Content: Quiz Comprehension based Quizzes and assignments; 15 Classes Module 1 Introduction to Elliptic Curve Signath in Finite Fields, Elliptic Curve on a finite set of Integers, Definition of Elliptic Curve Cryptosystems (ECC): Introduction to ECC, Method of Diophantus, Elliptic curve in Cryptography, Discrete Logarithms in Finite Fields, Elliptic Curve on a finite set of Integers, Definition of Elliptic Curve Cryptosystems (ECC): Public-Key Cryptography, Generic Procedures of Ellipt	<mark>Course Code:</mark> CSE3063	Course Title: Pr Type of Course: only	ivacy and Security in Program Core & The	loT ory	L- P- C	3	0	3
Course Pre- requisites [1] The primary prerequisite is a working knowledge of basic algebraic number theory, which includes number fields, rings of integers, factorization of ideals into primes [2] A working knowledge of basic algebraic number theory. [3] Basic concepts of cryptography like encryption decryption, Signature generation and verifications. Anti-requisites NIL Course The purpose of this course is to enable the students to appreciate the need for cryptography and to identify the applications of cryptography in Internet of Things (lofT). The course is both conceptual and analytical in nature and needs fail knowledge of mathematics and computing. The course develops the critical thinking and analytical skills. The course also enhances the programming abilities through assignments. Course The objective of the course is to familiarize the learners with the concepts of Privacy and Security in IoT and attain Skill Development through Problem Solving Methodologies. Course On successful completion of this course the students shall be able to: 1. Explain benefits of modern cryptographic algorithms 2. Apply the Elliptic curve Diffie Hellman and digital signature algorithms to encrypt-decrypt, generate and verify the signatures 3. Estimate the performance of ECC with other traditional cryptography algorithms. 15 Classes Course Content: Introduction to Elliptic Curve Cryptosystems (ECC): Introduction to ECC, Method of Diophantus, Elliptic curve Sin Cryptography. Discret Logarithms in Finte Fields, Elliptic Curve on a finite set of Integers, Definition for Elliptic Curve Cryptosystems (ECC): Public-Key Cryptography, Generic Procedures of Cryptog	Version No.	1.0						<u> </u>
Anti-requisites NLL Course The purpose of his course is to enable the students to appreciate the need for cryptography and to identify the applications of cryptography in Internet of Things (IoT). The course is both conceptual and analytical in nature and needs fair knowledge of mathematics and computing. The course develops the critica thinking and analytical skills. The course also enhances the programming abilities through assignments. Course The objective of the course is to familiarize the learners with the concepts of Privacy objective and Security in IoT and attain Skill Development through Problem Solving Methodologies. Course On successful completion of this course the students shall be able to: 1. Explain benefits of modern cryptographic algorithms 2. Apply the Elliptic curve Diffe Hellman and digital signature algorithms to encrypt-decrypt, generate and verify the signatures 3. Estimate the performance of ECC with other traditional cryptography algorithms. Course Content: Introduction to Elliptic Curve Cryptosystems (ECC): Introduction to ECC, Method of Diophantus, Elliptic curves in Cryptography. Discrete Logarithms in Finite Fields, Elliptic Curve on a finite set of Integers, Definition of Elliptic curves, General form of a EC, Weierstrass Equation, Points on the Elliptic curves (EC). Fubilic-Key Cryptosystems, Public-Key Cryptography, What Is Elliptic Curve Cryptosystems (ECC): Public-Key Cryptosystems, Public-Key Cryptography, What Is Elliptic Curve Cryptosystems (ECC): Public Kurves In Cryptography, Generic Procedures of CC, Example – Elliptic Curve Diffie-Hellman Exchange, Elliptic Curve Digita Signature Algorithm (ECDSA) Why use ECC?, Security of ECC, Applications of ECC, Benefits of ECC. Benefits of ECC.	Course Pre- requisites	 The primary p theory, which incl primes A working kn Basic concepts generation and vertices 	prerequisite is a worki ludes number fields, r owledge of basic alget s of cryptography like erifications.	ng knowledg ngs of integ praic number encryption c	ge of bas ers, facto r theory lecryptic	ic algeb orizatio on, Sign	oraic nu n of ide ature	mber als into
Course Description The purpose of this course is to enable the students to appreciate the need for cryptography and to identify the applications of cryptography in Internet of Things (IoT). The course is both conceptual and analytical in nature and needs fait knowledge of mathematics and computing. The course develops the critica through assignments. Course The objective of the course is to familiarize the learners with the concepts of Privacy and Security in IoT and attain Skill Development through Problem Solving Methodologies. Course On successful completion of this course the students shall be able to: Outcomes 1. Explain benefits of modern cryptographic algorithms 2. Apply the Elliptic curve Diffie Hellman and digital signature algorithms to encrypt-decrypt, generate and verify the signatures 3. Estimate the performance of ECC with other traditional cryptography algorithms. 15 Classes Course Content: Introduction to Elliptic Curve Cryptosystems (ECC): Introduction to ECC, Method of Diophantus, Elliptic curves in Cryptography, Discrete Logarithms in Finite Fields, Elliptic Curve on a finite set of Integers, Definition of Elliptic curves, General form of a E.C. Weierstrass Equation, Points on the Elliptic Curve (EC), The Abelian Group, Operations on ECC- Point addition, Point doubling. 15 Classes Module 2 Elliptic Curve Cryptosystems (ECC): Public-Key Cryptosystems, Public-Key Cryptography, What Is Elliptic Curve Cryptosystems (ECC): Public-Key Cryptosystems, Public-Key Cryptography, What Is Elliptic Curve Cryptosystems (ECC): Public-Key Cryptosystems, of	Anti-requisites	NIL						
Introduct assignments. Objective The objective of the course is to familiarize the learners with the concepts of Privacy and Security in IoT and attain Skill Development through Problem Solving Methodologies. Course On successful completion of this course the students shall be able to: Outcomes 1. Explain benefits of modern cryptographic algorithms 2. Apply the Elliptic curve Diffie Hellman and digital signature algorithms to encrypt-decrypt, generate and verify the signatures 3. 3. Estimate the performance of ECC with other traditional cryptography algorithms. Comprehension based Quizzes and assignments; 15 Classes Course Content: Introduction to Elliptic Curves Quiz Comprehension based Quizzes and assignments; 15 Classes Topics: Elliptic Curve Cryptosystems (ECC): Introduction to ECC, Method of Diophantus, Elliptic curves in Cryptography, Discrete Logarithms in Finite Fields, Elliptic Curve on a finite set of Integers, Definition of Elliptic curves, General form of a EC. Weierstrass Equation, Points on the Elliptic Curve (EC), The Abelian Group, Operations on ECC- Point addition, Point doubling. 15 Classes Module 2 Elliptic Curve Cryptosystems (ECC): Public-Key Cryptosystems, Public-Key Cryptography, What Is Elliptic Curve Cryptosystems (ECC): Public-Key Cryptography, Generic Procedures of ECC, Example – Elliptic Curve Diffie-Hellman Exchange, Elliptic Curve Digital Signature Algorithm (ECDSA) Why use ECC?, Security of ECC, Applications	Course Description	The purpose of the cryptography and (IoT). The course knowledge of m thinking and anal	his course is to enabl to identify the applica e is both conceptual athematics and comp ytical skills. The cours	e the studer tions of cryp and analytiouting. The e also enhar	nts to ap ptograph cal in r course nces the	opreciat ny in Int nature a develo progran	te the n ernet of and neo ps the nming a	eed for f Things eds fair critical abilities
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	Communication/	Гransport Protoc	ols: Bluetooth. Data	Protocols:	Messa	ge Que	eue Te	lemetry

Transport (MQTT), Constrained Application Protocol (COAP), Advanced Message Queuing Protocol (AMQP), Extensible Messaging and Presence Protocol (XMPP), Introduction, Principle of RFID, Components of an RFID system.

Targeted Application & Tools that can be used:

Application areas are to secure crypto currency- Bitcoin, Ethereum and Ripple using ECC in key agreement, digital signatures.

Professionally Used Software: elliptic2

: https://www.graui.de/code/elliptic2/

Project work/Assignment:

Each batch of students (self-selected batch mates) will identify projects from searching on Google, and implement with the most suitable 2 or 3 NIST /SECP curves Project Assignment:

Assignment: 1] Collect the running time of ECC on different standard NIST curves.

Assignment 2: Prepare a compressive report on the efficiency of NIST Vs SECP curves. Textbook(s):

1. I. Blake, G. Seroussi, N. Smart, Elliptic Curves in Cryptography, Cambridge University 2020

2. Arshdeep Bagha, Vijay Madisetti, "Internet of Things - A hands on approach", Universities Press, 2021.

References

1. Joseph H Silver man The Arithmetic of Elliptic Curves: Springer; 2nd Edition April 2016

2. Darrel Hankerson, Scott Vanstone, Alfred J. Menezes Guide to Elliptic Curve Cryptography Springer 2018

Topics related to development of **"SKILL DEVELOPMENT":** IOT Protocols, Elliptic Curve Cryptosystem, for **Skill Development through Participative Learning Techniques.** This is attained through assessment components as mentioned in the course handout.

Course Code: CSE2038	Course Title: Privacy and Online Social Media Type of Course: Program Theory Only	Security in Core &	L-P-C	3		0	3
Version No.	1.0						
Course Pre- requisites	Basic of Network securit	y and cryp	tograp	hy.			
Anti-requisites	NIL						
Course Description	Objective of this course is to make students learn the basics of privacy and security in online social media and develop ability to understand the importance of privacy in anyone's life and their consequences if it is in peril. This course is both conceptual and analytical in nature that would help the student to predict the effects of any activity on Social Media. The students should have prior knowledge of some Social media platforms. After successful completion of the Course, the students would acquire knowledge to protect themselves from the online data theft on social media from attacker.						
Course Objective	The objective of the cour of Privacy and Security in through Participative Le s	rse is to fan in Online So arning tech	niliarize ocial N iniques	e the learr ledia and	ners with t attain Em l	he cono ployabi	cepts i lity
Course Out Comes	It On successful completion of the course the students shall be able to: 1] Recognize the significance of the Privacy and how to protect it [Knowledge] 2] Summarize the privacy and security Encryption for Peer to Peer Social Networks. [Comprehension] 3] Understand the function of stealing Reality and K-Anonymity. [Knowledge] 4]Use the Link Reconstruction attack in privacy Social Networks.						
Course Content:							
Module 1	ANALYSIS OF PRIVACY IN SOCIAL NETWORKS	Assignmen	it	Knowledg	ge	8 Ses	sions
Topics: Three-Layered Framework-Characteristics Used to Analyze Social Web Privacy-Privacy Issues Related to Social Web Users-Privacy Issues Related to Service Providers-Security and Privacy for Digital Facets-Identifiable Facets-Private Facets. Assignment: Find real world problems and suggest solutions.							

Module 2	ENCRYPTION FOR PEER-TO- PEER SOCIAL NETWORKS	Assignment	Comprehension	8 Sessions
Topics: Essential Crite Encryption Sc Assignment:	eria for the P2P Encryption S hemes Based on Our Criteria - Survey of Unethical Behavi	ystems-Existing P2P OSN a-Broadcast Encryption-P for and Influencing factor	Architectures-Evaluat Predicate Encryption. rs.	ions of Existing
Module 3	STEALING REALITY AND K- ANONYMITY	Quiz	Comprehension	11 Sessions

Stealing Reality- Social Attack Model- Social Learnability- k-Anonymity- k-Degree Anonymity- k-Neighborhood

Anonymity- k- Automorphism- k-Isomorphism-L-diversity- Attack Model and Privacy Guarantee- Insights from an &-Diversified Graph.

	PRIVACY IN SOCIAL		Application	
Module 4	RECONSTRUCTION	Assignment/Case study		11 Sessions
	АТТАСК			

Privacy in Social Networks- Link Prediction- Feature Extraction- Communities Datasets- Electronic Currencies- Anonymity- The Bit coin System- The Transaction Network- The User Network- Anonymity Analysis- Integrating Off-Network Information. Use Case and the Threat Model- Use Case for Private Record Linkage- Use Case for Privacy-Preserving Record Linkage-

Assignment: - The Bit coin Faucet- Voluntary Disclosures- TCP/IP Layer Information- Context Discovery-Flow and Temporal Analyses.

Text Book / References

T1. Yaniv Altshuler, Yuval Elovici, Armin B. Cremers Nadav Aharony, Alex Pentland," Security and Privacy in Social Networks", Springer Publisher,2012,1st Edition

Online Resources: -

W1:

https://presiuniv.knimbus.com/user#/searchresult?searchId=Privacy%20and%20Security%20in%20Onli ne%20

Social%20Media%20&curPage=0&layout=list&sortFieldId=none&topresult=false

W2: https://onlinecourses.nptel.ac.in/noc21_cs28/preview

Topics relevant to "EMPLOYABILITY SKILLS": Link Prediction, features extraction, for developing Employability Skills through Participative Learning Techniques. This is attained through the assessment component mentioned in the course handout.

course coue.	Course Title: Software Proj	ject Management	L- P-	3	0	3
CSE 2028	Type of Course: Theory On	ly Course	С			
Version No.	1					
Course Pre-	Basics of Programming					
requisites						
Anti-requisites						
-	Effective software project	management is o	crucial to th		ess of any	software
	development or maintenar	nce project. The r	oles and res	ponsił	pilities of th	ne project
	manager is numerous and w	aried. However, a	t the broad l	evel ti	nese can be	classified
	in to the project planning	and monitoring	and control	activit	ies. Proiect	nlanning
Course	involves making cost effort	t and duration es	timation and	nrena	ring variou	s types of
Description	nlans such as schedule	configuration ma	nagement	rick m	nanagemen	t quality
	management Staffing plan	etc The monit	oring and co	ntrol	activities e	ncomnass
	keening track of progress a	and removing hott	lenecks usin	o tech	niques such	n as PFRT
	GANTT and also effective r	isk management	team buildin	o etc	inques suei	rus renr,
Course Objective	The objective of the course	is to familiarize the	e learners wit	h the d	concents of	Software
	Project Management and	l attain Employa	bility throu	gh Pa	rticinative	Learning
	techniques			511 14	in cicipative	Leaning
	0	. 				
	On successful completion of	of the course the s	students sna	i be ai		
	• Understand the di	nerent project co	Shlexis and	appro	opriate ma	nagement
	Strategy.	www.foosiowol.othic			اميده مامييما	- 10 100 - 10 t
Course Out Comes	Practice the role of	professional ethic	s in successi	ui soit	ware devel	opment.
	Identify the key pha	ases of project ma	nagement.		www.aaab th	wavingh an
	Determine an ap	propriate project	manageme	ent ap	proach th	rougn an
	evaluation of the busine	ess context and sc	ope of the p	roject.		
Course Content:						
Course Content:						
Course Content:	Conventional & Modern					
Course Content: Module 1	Conventional & Modern Software Management	Assignment	Case studies		9	Sessions
Course Content: Module 1 Topics:	Conventional & Modern Software Management	Assignment	Case studies		9	Sessions
Course Content: Module 1 Topics: Waterfall Model, Co	Conventional & Modern Software Management onventional Software Mana	Assignment gement Performa	Case studies nce; Evolutio	on of S	9 Software Ec	Sessions
Course Content: Module 1 Topics: Waterfall Model, Co Software economic	Conventional & Modern Software Management onventional Software Mana cs, Pragmatic software cost	Assignment gement Performa s estimation, Redu	Case studies nce; Evolutio ucing softwa	on of S re pro	9 Software Ec duct size,	• Sessions onomics - Improving
Course Content: Module 1 Topics: Waterfall Model, Co Software economic software processes	Conventional & Modern Software Management onventional Software Mana cs, Pragmatic software cost c. Principles of Conventiona	Assignment gement Performa : estimation, Redu al Software Engin	Case studies nce; Evolutio ucing softwa eering, Princ	on of S re pro ciples o	9 Software Ec duct size, 1 of Modern	OSessions Onomics - Improving Software
Course Content: Module 1 Topics: Waterfall Model, Co Software economic software processes Management, Trans	Conventional & Modern Software Management onventional Software Mana s, Pragmatic software cost . Principles of Conventiona sitioning to an interactive Pr	Assignment gement Performa c estimation, Redu al Software Engin rocess.	Case studies nce; Evolutio ucing softwa eering, Princ	on of S re pro ciples o	9 Software Ec duct size, 1 of Modern	onomics - Improving Software
Course Content: Module 1 Topics: Waterfall Model, Co Software economic software processes Management, Trans	Conventional & Modern Software Management onventional Software Mana s, Pragmatic software cost . Principles of Conventiona sitioning to an interactive Pr Software Management	Assignment gement Performa estimation, Redu al Software Engin rocess. Case studies /	Case studies ince; Evolutio ucing softwa eering, Princ	on of S re pro ciples o	9 Software Ec duct size, I of Modern	• Sessions onomics - Improving Software
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Course Content: Module 1 Topics: Waterfall Model, Co Software economic software processes Management, Trans Module 2 Topics:	Conventional & Modern Software Management onventional Software Mana s, Pragmatic software cost . Principles of Conventiona sitioning to an interactive Pr Software Management Process Framework	Assignment gement Performa estimation, Redu al Software Engin rocess. Case studies / Case let	Case studies ince; Evolutio ucing softwa eering, Princ Case stud	on of S re pro ciples dies	software Ec duct size, I of Modern 9	• Sessions onomics - Improving Software Sessions
Course Content: Module 1 Topics: Waterfall Model, Co Software economic software processes Management, Trans Module 2 Topics: Life cycle phases, Th	Conventional & Modern Software Management onventional Software Mana cs, Pragmatic software cost c. Principles of Conventiona sitioning to an interactive Pr Software Management Process Framework me artifact sets, Managemer	Assignment gement Performa e estimation, Redu al Software Engin rocess. Case studies / Case let nt artifacts, Engine	Case studies ince; Evolutio ucing softwa eering, Princ Case stud	on of S re pro ciples dies	9 Software Ec duct size, 1 of Modern 9 gmatic artif	• Sessions onomics - Improving Software Sessions
Course Content: Module 1 Topics: Waterfall Model, Co Software economic software processes Management, Trans Module 2 Topics: Life cycle phases, Tl ModelBased Software	Conventional & Modern Software Management onventional Software Mana s, Pragmatic software cost . Principles of Conventiona sitioning to an interactive Pr Software Management Process Framework ne artifact sets, Managemer are Architectures - A managemer	Assignment gement Performa e estimation, Redu al Software Engin rocess. Case studies / Case let nt artifacts, Engine ement perspective	Case studies ince; Evolutio ucing softwa eering, Princ Case stud eering artifact e and A techr	on of S re pro ciples dies ts, Prag	gmatic artiferspective.	Sessions onomics - Improving Software Sessions
Course Content: Module 1 Topics: Waterfall Model, Co Software economic software processes Management, Trans Module 2 Topics: Life cycle phases, Th ModelBased Software Module 2	Conventional & Modern Software Management onventional Software Mana s, Pragmatic software cost s. Principles of Conventiona sitioning to an interactive Pr Software Management Process Framework me artifact sets, Managemer are Architectures - A manage Project Organization and	Assignment gement Performa estimation, Redu al Software Engin rocess. Case studies / Case let nt artifacts, Engine ement perspective	Case studies ince; Evolutio ucing softwa eering, Princ Case stud eering artifact and A techr	on of S re pro ciples dies ts, Pra _i	software Ec duct size, I of Modern 9 gmatic artif erspective.	• Sessions onomics - Improving Software Sessions facts;
Course Content: Module 1 Topics: Waterfall Model, Co Software economic software processes Management, Trans Module 2 Topics: Life cycle phases, Th ModelBased Softwar Module 3	Conventional & Modern Software Management onventional Software Mana as, Pragmatic software cost s. Principles of Conventiona sitioning to an interactive Pr Software Management Process Framework me artifact sets, Managemer are Architectures - A manage Project Organization and Planning	Assignment gement Performa e estimation, Redu al Software Engin cocess. Case studies / Case let nt artifacts, Engine ement perspective Quiz	Case studies ince; Evolutio ucing softwa eering, Princ Case stud eering artifact e and A techr Case stud	on of S re pro ciples dies ts, Prag nical pe	9 Software Ec duct size, 1 of Modern 9 gmatic artif erspective. 10	Sessions onomics - Improving Software Sessions
Course Content: Module 1 Topics: Waterfall Model, Co Software economic software processes Management, Trans Module 2 Topics: Life cycle phases, Tl ModelBased Softwar Module 3 Topics:	Conventional & Modern Software Management onventional Software Mana s, Pragmatic software cost . Principles of Conventiona sitioning to an interactive Pr Software Management Process Framework ne artifact sets, Managemer are Architectures - A manage Project Organization and Planning	Assignment gement Performa e estimation, Redu al Software Engin rocess. Case studies / Case let nt artifacts, Engine ement perspective Quiz	Case studies ince; Evolutio ucing softwa eering, Princ Case stud eering artifact e and A techr Case stud	on of S re pro ciples dies ts, Prag nical pe	9 Software Ec duct size, I of Modern 9 gmatic artif erspective. 10	Sessions onomics - Improving Software Sessions facts; Sessions
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Course Content: Module 1 Topics: Waterfall Model, Co Software economic software processes Management, Trans Module 2 Topics: Life cycle phases, Th ModelBased Softwar Module 3 Topics: Work breakdown st planning process, P	Conventional & Modern Software Management onventional Software Mana s, Pragmatic software cost is. Principles of Conventiona sitioning to an interactive Pr Software Management Process Framework ne artifact sets, Managemer are Architectures - A manage Project Organization and Planning	Assignment gement Performa estimation, Redu al Software Engin rocess. Case studies / Case let nt artifacts, Engine ement perspective Quiz es, The cost and sc Business organizat	Case studies ince; Evolutio ucing softwa eering, Princ Case stud eering artifact case stud case stud hedule estim ions, Project	on of S re pro ciples o dies ts, Prag nical pe dies dies ating p organ	9 Software Ec duct size, I of Modern 9 gmatic artif erspective. 10 process, The izations, Ev	Sessions onomics - Improving Software Sessions facts; Sessions e iteration rolution of
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Course Content: Module 1 Topics: Waterfall Model, Co Software economic software processes Management, Trans Module 2 Topics: Life cycle phases, Tl ModelBased Softwar Module 3 Topics: Work breakdown st planning process, P organizations; Proce	Conventional & Modern Software Management onventional Software Mana cs, Pragmatic software cost s: Principles of Conventiona sitioning to an interactive Pr Software Management Process Framework the artifact sets, Managemer are Architectures - A manage Project Organization and Planning tructures, Planning guideline ragmatic planning, Line-of-E ess automation - Automatio Project Control and	Assignment gement Performa estimation, Redu al Software Engin rocess. Case studies / Case let nt artifacts, Engine ement perspective Quiz es, The cost and sc Business organizat in building blocks,	Case studies ince; Evolutio ucing softwa eering, Princ Case stud eering artifact and A techr Case stud hedule estim ions, Project The project of	on of S re pro ciples dies dies dies ating p organ environ	9 Software Ec duct size, 1 of Modern 9 gmatic artif erspective. 10 process, The izations, Ev nment.	Sessions onomics - Improving Software Sessions facts; Sessions e iteration olution of
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Course Content: Module 1 Topics: Waterfall Model, Co Software economic software processes Management, Trans Module 2 Topics: Life cycle phases, Tl ModelBased Softwar Module 3 Topics: Work breakdown st planning process, P organizations; Proce Module 4 Topics: PROJECT CONTROL	Conventional & Modern Software Management onventional Software Mana s, Pragmatic software cost a Principles of Conventiona sitioning to an interactive Pr Software Management Process Framework the artifact sets, Managemer are Architectures - A manage Project Organization and Planning tructures, Planning guideline ragmatic planning, Line-of-E ess automation - Automatio Project Control and Process Instrumentation AND PROCESS INSTRUMEN	Assignment gement Performa estimation, Redu al Software Engin rocess. Case studies / Case let nt artifacts, Engine ement perspective Quiz es, The cost and sc Business organizat in building blocks, Quiz	Case studies ince; Evolutio ucing softwa eering, Prince Case stud eering artifact and A techr Case stud hedule estim ions, Project The project of Case stud	on of S re pro ciples dies dies ating p organ environ dies	9 Software Ec duct size, I of Modern 9 gmatic artif erspective. 10 process, The izations, Ev nment. 10 nagement i	Sessions onomics - Improving Software Sessions facts; Sessions e iteration folution of Sessions ndicators,
Course Content: Module 1 Topics: Waterfall Model, Cu Software economic software processes Management, Trans Module 2 Topics: Life cycle phases, Tl ModelBased Softwa Module 3 Topics: Work breakdown st planning process, P organizations; Proce Module 4 Topics: PROJECT CONTROL Quality indicators,	Conventional & Modern Software Management onventional Software Mana s, Pragmatic software cost s. Principles of Conventiona sitioning to an interactive Pr Software Management Process Framework the artifact sets, Management Project Organization and Planning cructures, Planning guideline ragmatic planning, Line-of-E ess automation - Automatio Project Control and Process Instrumentation AND PROCESS INSTRUMENT Life-Cycle expectations, Pr	Assignment gement Performa estimation, Redu al Software Engin rocess. Case studies / Case let nt artifacts, Engine ement perspective Quiz es, The cost and sc Business organizat in building blocks, Quiz TATION :The Sever agmatic software	Case studies ince; Evolutio ucing softwa eering, Prince Case stud eering artifact and A techr Case stud hedule estim ions, Project The project of Case stud n-Core metric metrics, Me	on of S re pro ciples dies dies ating p organ environ dies cs, Ma etrics a	9 Goftware Ec duct size, I of Modern 9 gmatic artif erspective. 10 process, The izations, Ev ment. 10 nagement i automation	Sessions onomics - Improving Software Sessions acts; Sessions e iteration olution of Sessions ndicators, Modern
Course Content: Module 1 Topics: Waterfall Model, Co Software economic software processes Management, Trans Module 2 Topics: Life cycle phases, Th ModelBased Softwar Module 3 Topics: Work breakdown st planning process, P organizations; Proce Module 4 Topics: PROJECT CONTROL Quality indicators, project profiles, Net	Conventional & Modern Software Management onventional Software Mana s, Pragmatic software cost a Principles of Conventiona sitioning to an interactive Pr Software Management Process Framework the artifact sets, Management are Architectures - A manage Project Organization and Planning cructures, Planning guideline ragmatic planning, Line-of-E ess automation - Automatio Project Control and Project Control and Process Instrumentation AND PROCESS INSTRUMENT Life-Cycle expectations, Pr ext generation software ecor	Assignment egement Performa estimation, Redu al Software Engin rocess. Case studies / Case let at artifacts, Engine ement perspective Quiz es, The cost and sc Business organizat in building blocks, Quiz TATION :The Sever agmatic software nomics, Modern pr	Case studies ince; Evolutio ucing softwa eering, Prince Case stud eering artifact case stud case stud hedule estim ions, Project The project of Case stud n-Core metric metrics, Me rocess transit	on of S re pro ciples dies dies ating p organ environ dies cs, Ma etrics a cions.	9 Software Ec duct size, I of Modern 9 gmatic artif erspective. 10 process, The izations, Ev nment. 10 nagement i automation	Sessions onomics - Improving Software Sessions acts; Sessions e iteration folution of Sessions ndicators, , Modern

Project work/Assignment:

Assignment:

Text Book

T1. Walker Royce, "Software Project Management : A unified Framework", 1st Edition, Pearson Education, 2021

References

R1. Bob Hughes and Mike Cotterell, "Software Project Management", 3rd Edition, Tata McGraw Hill Edition, 2005.

R2. Joel Henry, "Software Project Management", 1st Edition, Pearson Education, 2006.

E book link T1:

https://www.edutechlearners.com/download/Software%20Project%20Management.pdf

Web resources: https://onlinecourses.nptel.ac.in/noc19_cs70/preview

brary

resources: <u>https://presiuniv.knimbus.com/user#/searchresult?searchId=eBook&curPage=0&layout=gri</u> d&sortFieldId=doc_title_str&topresult=false&content=*software%20project%20management*&sub_ca tegory_name=Computer%20Science%20and%20IT

Topics relevant to development of "EMPLOYABILITY SKILLS": Life cycle Phases, Seven Core Metrics, for development of Employability Skills through the Participative Learning Techniques. This is attained through the assessment components mentioned in the course handout.

Course Code: CSE250	Course Title: Sys Infrastructure Type of Course:	tem Administration and	IT				
	i ype or course.			L-P-C	2	4	4
	-	Theory & Integrated			-		
	Laboratory						
Version No.	1.0						·
Course Pre-							
requisites	[1] Preliminar	y knowledge on cloud	computi	ng and	servic	es-CSE	233
Anti-requisites	Nil						
Course	The main goal	of this course is	to study	the fu	ndame	ntals o	f system
Description	administration a	nd infrastructure servio	ces such a	s Mana	iging C) peratin	g system,
	Upgrading, inst	alling, and configurin	ng applica	ation s	oftwar	e and	computer
	hardware, Crea	ting and managing s	ystem per	rmissio	ns and	l user	accounts,
	performing regu	lar security tests and se	curity mo	nitoring	g, Main	taining	networks
	and network fil	e systems. The cours	e aims to	intro	luce th	e popu	lar cloud
	infrastructure se	rvices such as managin	g cloud re	source	s, virtu	al mach	ine usage
	and storage ma	nagement. The stude	nt will als	so lear	n how	to ma	nage and
	configure server	s and way of using in	dustry too	ols to r	nanage	compu	ters, user
	information, and	l user productivity. Fina	ally, the st	udent v	vill lear	m how t	o recover
	vour organizatio	n's IT infrastructure in	the event	of a di	saster.		
Course Objective	The objective of	of the course is to far	niliarize t	he lear	ners w	vith the	concepts
	of System Ad	ministration and IT I	nfrastruct	ure an	d attai	n Emp	lovability
	through Experi	ential Learning tech	niques .			r	
Course Out	On successful o	completion of the cours	se the stud	ents sh	all be a	ble to	
Comes	1 Demons	trate the knowledge of	of different	t direct	orv sei	vices a	nd how a
	centralized s	vstem admin can supp	ort differe	nt narte	of IT	Infrastr	ucture
	2 A nnly th	e concepts of system a	dministra	tion to	real life	e scena	ios
	3 Underst	and the working of	of user	Manao	ement	and	Directory
	management	commands	JI 4301	Manag	ement	and	Directory
		trate the knowledge of	f cloud inf	rastruc	ture ce	wices	
	5 Idontify	appropriate methods of	f system r		u and b	ack un	
Course Content:	5. Identify	appropriate methods of	1 System 1	ecover	y and t	ack-up	
	Introduction to						
MODULE 1	System	Quiz	Programmi	ng/ Pro	blem So	olving	05 Hours
	Administration						
Topics:							
Define System Adr	ministration, Basic	s of system administration	on, organiz	ational	policies	s, IT infr	astructure
services, user and	hardware provisio	ning, routine maintenand	ce, troubles	shootin	g, and n	nanagin	g potential
issues. [Blooms 'le	vel selected: Comp	prehension]					
	Network and						
Module 2	Infrastructure	Lab evaluation	Programmi	ng/ Pro	blem So	olving <mark>0</mark>	6 Hours
	Services						
Topics:							
Introduction to ne	etwork and infrasti	ructure services, what IT	infrastruc	ture se	rvices a	re and	what their
role is in system a	dministration, serv	er operating systems, vi	rtualizatior	n, netw	ork serv	ices, DN	IS for web
services, and how	1 to troubleshoot	network services, intro	duction to	systen	n admir	nistratio	n tasks. [
Blooms 'level selec	cted: Comprehens i	ion]					
	Software and					T	
Module 3	Platform	Lab evaluation	Programmi	ng/Pro	blem Sc	olving O	7 Hours
	Services						
	·	·					

Topics:				
Explore software a	nd platform servic	es, types of software ar	d platform services such as con	figure email
services, security s	services, file serv	ices, print services, an	d platform services. Explore t	he ways to
troubleshoot platfo	orm services and	common issues to lo	ok out for. To setup and mai	nage the IT
infrastructure serv	vices to help a b	ousiness stay productiv	ve, keep information secure,	and deliver
applications to its u	isers. [Blooms 'lev	el selected: Application]	
	Directory	Lab evaluation/	-	
Module 4	, Services	Assignment	Programming/Problem Solving	07 Hours
Topics:				
Learn about direc	tory services -tw	o of the most popula	r directory services. Active Di	rectory and
OpenI DAP, work in	action. Explore th	e concept of centralized	d management and support in S	vsAdmins to
maintain and sunno	ort all the different	t narts of an IT infrastru	ture how to add users passwo	rds and use
group policies in A	ctive Directory an	d OpenI DAP Introduct	ion to BAID storage. Need of B	AID storage
Types of Raid Stora	ge in the cloud [F	looms 'level selected: L	Application]	ab storage,
	Data Recovery &			
Modulo E	Dala Recovery &	Assignment	Programming /Problem Solving	05 HOUIS
	васкирз			
Topics:				
Data recovery and	backups, Backup	and recovery of data,	explore common corporate p	ractices like
designing a disaster	recovery plan and	l writing post-mortem d	ocumentation. Study the trade-c	offs between
on-site and off-site	backups, understa	and the value and impor	tance of backup and recovery te	esting, know
different options fo	or data backup and	d understand the purpo	se and contents of a disaster re-	covery plan.
An introductio	n to edg	e computing-	A new revolution i	n cloud
computing.		[Blooms 'lev	vel selected: Comprehension]	
Experiment No 1: E Administration. [6 Level 1: Demonstra Experiment No. 2: and directories, usi Level 1: Work with Experiment No. 3: Start-up & Shutdow Application Level] Level 1: Understan Experiment No. 4: LINUX Services. [4 Level 1: Understan Experiment No. 5: Level 1: Working w Experiment No. 6: as Google Cloud or Level 1: Explore cloud	Demonstrate basic hours: Application ate Linux basic co Demonstrate the ng simple Filters, a basic file permiss Demonstrate the vn scripts, Process d use of User Mar Demonstrate the hours: Application of use of Firewall Practicing of som with shell script pro- Create an Amazo Azure to create a bud infrastructure	Commands, Visual Inten Level] mmands. use of permissions, acc advanced Filters. [4 hou sions, access control list working of User Manag management command agement, Directory ma working of Firewall con n Level] configuration in Linux, S e sample Shell Script pr ograms. n EC2 Instance (Linux) o virtual machine service. service.	rface (Vi Editor), User and Group ess control list, change ownersh ins: Application Level] ement, Directory management of ds and their execution. [4 hours inagement commands. figuration in Linux, Study of Imp Study of Important LINUX Service ograms. [6 hours: Application I r use equivalent other cloud pla [8 hours: Application Level]	o ip of files commands, : ortant ces. _evel] tform such
Experiment No. 7: Cloud or Azure to c Level 1: Explore clo Experiment No.8: Level 1: Explore cl Experiment No.9: Permissions. [8 hor Level 1: Explore clo Experiment No.10: Level 1: Explore clo	Create an Amazon reate a storage se oud infrastructure Configuring a Stati loud infrastructure Demonstrate the urs: Application Le oud infrastructure Working with Av	S3 Bucket or use equivarvice. [8 hours: Applica e service. c Website with S3 and C e service. use of S3 Bucket Policie evel] e service. VS Backup Services. [6 e service.	alent other cloud platform such tion Level] CloudFront. [6 hours: Application s and Conditions to Restrict Spec hours: Application Level]	as Google on Level] cific
Targeted Application	on & Tools that ca	n be used:		

Application Area is to understand and apply concept of system administration and infrastructure services.

Tools/Simulator used: Linux operating system, AWS cloud service subscription or equivalent cloud platform subscription.

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

- 1. Problem Solving: Understanding different system administration services.
- 2. Programming: Implementation of different cloud infrastructure services.

Text Book

1. AEleen Frisch, "Essential System Administration", Published by O'Reilly Media, 3rd Edition, 2014.

2. Donald Coffelt, Chris Hendrickson, "Fundamentals of Infrastructure Management", Donald Coffelt and Chris Hendrickson, 2017.

References:

 Thomas A. Limoncelli, Christina J. Hogan, Strata R. Chalup, "The Practice of System and Network Administration", McGraw Hill Education, Pearson Education, Second Edition, 2022.
 IBM Information Infrastructure Solutions Handbook, June 2010, © Copyright International Business Machines Corporation.

3. Hideo Nakamura, Kotaro Nagasawa, Kazuaki Hiraishi, Atsushi Hasegawa, KE Seetha Ram, Chul Ju Kim, and Kai Xu, "PRINCIPLES OF INFRASTRUCTURE-Case Studies and Best Practices", Mitsubishi Research Institute, Inc., 2019.

Topics relevant to "EMPLOYABILITY SKILLS": Demonstrate the use of permissions, access control list, change ownership of files and directories, using simple Filters for developing **Employability Skills** through **Experiential Learning techniques**. This is attained through the assessment component as mentioned in the course handout.

Course Code:	Course Title: Network Programming		0	4	2
CSE257	Type of Course: Laboratory only	L-P-C	0	4	2
Version No.	2.0				
Course Pre-requisites	C language				
Anti-requisites	NIL				
Course Description	Network Programming intends to exp developing, maintaining and supporting applications. The Course covers the basic designing and implementing networks.	lore th g distr cs of co	ne op ibutec omput	portuni d and i ter netv	ties for network vorks to
Course Objective	The objective of the course is to familiarize th Network Programming and attain SKI EXPERIENTIAL LEARNING techniques	e learne ILL DE	ers wit VELOF	h the cor MENT	ncepts of through
Course Outcomes	 On successful completion of this laborator be able to: Outline the basic network twindows/Linux. Configure various network tool. Demonstrate the working or programming. Demonstrate the u networking. 	y based troubles as using f client sage o	course shooti g cisc -serve f Wi	e the stud ng comm co packe r TCP/II reshark	dents will nands in et tracer P socket tool in

	5. Simulate networking scenarios using NS2
	simulator.
Course Content:	
List of Laboratory Task	s
Task 1: Troubleshoot u	sing network DOS command
Task 2: Demonstration	of Cisco Packet Tracer Tool
2.1: Introduction	on to Cisco Packet Tracer
2.2: User interf	ace and simulation view
2.3: Configure	user name and password for the three modes in router
2.4: Configure the DHC	P Server using 2 wireless router
2.5: Configure the TELN	IET Service for 2 different network
2.6: Demonstrate the s	tatic routing with multiple networks using serial port and interface
2.7: Demonstrate the R	IP routing with multiple networks using serial port and interface
2.8: Configure the Stati	c and dynamic NAT for private network
Task 3: Demonstrate th	e working of client-server TCP/IP socket programming
Task 4: Demonstrate th	e Wireshark tool Usage
Task 5: Demonstration	of Network Simulator Version 2
Targeted Application 8	Tools that can be used:
Simulate networking sc	enarios using Cisco Packet Tracer.
Demonstrate the usage	of Wireshark tool in networking.
Practice the simulation-	based network performance evaluation techniques using NS2.
Textbooks:	
1. Behrouz A. Forouz	an, Data Communications and Networking 5E, 5th Edition, Tata
McGraw-Hill, 2017.	
References	
R1. "Network Simulat	ion Lab Manual" Presidency University.
E-Resource	
18 Most Popular Ne	twork Simulation Software Tools in 2022 (networkstraining.com)
VIRTUAL LADS (VIAD.C	<u>o.in)</u>
NPTEL course- Cor	nputer Networks and Internet Protocol - Course (nptel.ac.in)
By Prof. Soum	ya Kanti Ghosh, Prof. Sandip Chakraborty IIT Kharagpur
, https://puniversity	y.informaticsglobal.com/login Or http://182.72.188.193/
Topics relevant to "SKI	LL DEVELOPMENT": Troubleshoot using network DOS command,
Demonstration of Cis	co Packet Tracer Tool for Skill Development through Experiential
Learning techniques.	This is attained through assessment component mentioned in course
handout.	

Course Code:	Course Title: Reinforcement Le	arning							
CSE465	Type of Course: Theory Only		L-P-C	3	0	3			
Version No.	1.0								
Course Pre- requisites	Knowledge of programming in Python is required. Knowledge of probabilities/statistics, calculus and linear algebra is required. Machine learning background, as provided for example by COMP-551 or COMP-652 is required.								
Anti-requisites	NIL								
Course Description	The goal of this class is to provide an introduction to reinforcement learning, a very active research sub-field of machine learning. Reinforcement learning is concerned with building programs that learn how to predict and act in a stochastic environment, based on past experience. Applications of reinforcement learning range from classical control problems, such as power plant optimization or dynamical system control, to game playing, inventory control, and many other fields. Notably, reinforcement learning has also produced very compelling models of animal and human learning. During this course, we will study theoretical properties and practical applications of reinforcement learning. We will follow the second edition of the classic textbook by Sutton & Barto (available online for free, or from MIT Press), and supplement it as needed with papers and other materials								
Course Objective	The objective of the course is to Reinforcement Learning and at Methodologies.	o familiarize the ttain Skill Develop	ment thro	with ti ough P	roblem	solving			
Course Out Comes	 On successful completion of the 1. Knowledge of basic an techniques. 2. Identification of suitable techniques can be applied. 3. Appreciation of some clearning techniques. 4. Formulation of decision experiments, evaluation of responsible techniques. 	course the stude d advanced reir e learning tasks of the current lim n problems, set esults from expe	nts shall the forcements which to which initations up and rements.	e able ent lea n thes of reir un co	e to: urning e learn nforcer mputat	iing nent tional			
Course Content:									
Module 1	Introduction	Assignment	Programm	ning	Cla	No. of sses:10			
Lopics: Course logistics and overview. Origin and history of Reinforcement Learning research. Its connections with other related fields and with different branches of machine learning. Probability Primer Brush up of Probability concepts - Axioms of probability, concepts of random variables, PMF, PDFs, CDFs, Expectation. Concepts of joint and multiple random variables, joint, conditional and marginal distributions. Correlation and independence.									
Module 2	Markov Decision Process	Assignment	Programm	ning	Cla	No. of sses:10			

Introduction to RL terminology, Markov property, Markov chains, Markov reward process (MRP). Introduction to and proof of Bellman equations for MRPs along with proof of existence of solution to Bellman equations in MRP. Introduction to Markov decision process (MDP), state and action value functions, Bellman expectation equations, optimality of value functions and policies, Bellman optimality equations.

Module 3	Prediction and Control by	Assignment	Programming	No. of
Topics:				C105565.10
Overview of dyn	namic programing for MDP def	finition and form	ulation of planni	ng in MDPs
principle of optin	nality iterative policy evaluation	n policy iteration	value iteration	Banach fived
principle of optim	roof of contraction manning pr	concerts of Bollm	n, value iteration,	d optimality
point meorem, p	of convergence of policy ov	operty of Delling	all expectation all	arithma DD
operators, proor	of convergence of policy eva	aluation and va	inde meranom ang	onums, Dr
extensions	the de Cen Me del Ene e Due distin	n en l Centrel		
Monte Carlo Me	ethods for Model Free Predictio	n and Control	1	
Overview of Mor	the Carlo methods for model free	e KL, First visit ai	nd every visit Moi	nte Carlo,
Monte Carlo cont	trol, On policy and off policy lea	rning, Importanc	e sampling.	
Module 4	TD Methods and Policy	Assignment	Programming	No. of
	Gradients	1.1001611110111	1.08.00000	Classes:10
<u>Topics:</u>				
Incremental Mon	te Carlo Methods for Model Free	e Prediction, Ove	erview TD(0), TD(2	1) and TD(λ),
k-step estimators	, unified view of DP, MC and T	ΓD evaluation m	ethods, TD Contr	ol methods -
SARSA, Q-Learni	ing and their variants.			
Getting started	with policy gradient method	ls, Log-derivativ	ve trick, Naive	REINFORCE
algorithm, bias a	nd variance in Reinforcement L	earning, Reducin	ng variance in po	licv gradient
estimates, baselin	es, advantage function, actor-cr	itic methods.	0	- / 8
Targeted Applic	ation & Tools that can be used:			
While Convolutio	on Neural Network (CNN) and B	Recurrent Neural	Network (RNN) a	are becoming
more important f	for businesses due to their appl	ications in Comr	network (RNN) c	and Natural
I anguaga Process	wing (NILP) Poinforcomont Loo	ming (PI) as a	fromowork for a	and Natural
Language Floces	sing (NLF), Remotenent Lea	ming (KL) as a	maniework for co	there coord
neuroscience to i	nodel decision making process	seems to be und	ervalued. Desides,	inere seems
to be very little re	sources detailing now KL is appl	ied in different in	laustries. Despite	the criticisms
about KL s weaki	hesses, KL should never be negle	ected in the space	of corporate resea	arch given its
huge potentials in	n assisting decision making.	NT - 1 1		
Tools: Torch, Goo	ogle Colaboratory, Spider, Jupite	er Notebook		
Project work/Ass	signment:			
This part is writt	en for general readers. At the sa	ame time, it will	be of greater valu	e for readers
with some knowl	edge about RL.			
Resources	s management in computer clus	sters		
Designing algorit	thms to allocate limited resource	es to different tas	sks is challenging	and requires
human-generated	l heuristics. The paper "Reso	urce Manageme	nt with Deep Re	einforcement
Learning" [2] sho	wed how to use RL to automat	ically learn to al	locate and schedu	ile computer
resources to wait	ing jobs, with the objective to mi	inimize the avera	ige job slowdown.	
State space was f	ormulated as the current resour	ces allocation an	d the resources p	rofile of jobs.
For action space.	they used a trick to allow the ag	ent to choose mo	re than one action	at each time
step Reward way	s the sum of $(-1/duration of the$	iob) over all the	iobs in the system	n Then they
combined REINE	ORCE algorithm and baseline x	value to calculate	the policy gradie	ents and find
the best policy r	parameters that give the proba	bility distribution	n of actions to r	ninimizo tho
abiactiva	balanielers that give the proba	bility distributio	on or actions to n	illillillize the
Traffic Li	abt Control			
• <u>Iramic Li</u>	gnt Control			T (- 1 1
Researchers tried	to design a traffic light controlle	er to solve the co	ngestion problem	. Tested only
on simulated en	vironment though, their metho	ods showed sup	perior results that	n traditional
methods and she	d a light on the potential uses of	multi-agent KL	in designing traffi	c system.
Five agents were	e put in the five-intersection tr	affic network, w	with a RL agent a	t the central
intersection to co	ntrol trattic signalling. The state	e was defined as	eight-dimensiona	I vector with
each element rep	resenting the relative traffic flow	w of each lane. E	light choices were	e available to
the agent, each	representing a phase combinat	ion, and the rev	vard function wa	s defined as
reduction in delay	y compared with previous time s	step. The authors	used DQN to learn	n the Q value
of the {state, actio	on} pairs.			
Robotics				

There are tremendous works on applying RL in Robotics. Readers are referred to for a survey of RL in Robotics. In particular, trained a robot to learn policies to map raw video images to robot's actions. The RGB images were fed to a CNN and outputs were the motor torques. The RL component was the guided policy search to generate training data that came from its own state distribution.

• <u>Web System Configuration</u>

There are more than 100 configurable parameters in a web system and the process of tuning the parameters requires a skilled operator and numerous trail-and-error tests. The paper "A Reinforcement Learning Approach to Online Web System Auto-configuration" showed the first attempt in the domain on how to do autonomic reconfiguration of parameters in multi-tier web systems in VM-based dynamic environments.

The reconfiguration process can be formulated as a finite MDP. The state space was the system configuration, action space was {increase, decrease, keep} for each parameter, and reward was defined as the difference between the given targeted response time and measured response time. The authors used the model-free Q-learning algorithm to do the task.

Text Book

1. "Reinforcement Learning: An Introduction", Richard S. Sutton and Andrew G. Barto, 2nd Edition

2. "Probability, Statistics, and Random Processes for Electrical Engineering", 3rd Edition, Alberto Leon-Garcia

3. "Machine Learning: A Probabilistic Perspective", Kevin P. Murphy

References

1. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", Second Edition, MIT Press, 2019.

2. Li, Yuxi. "Deep reinforcement learning." arXiv preprint arXiv:1810.06339 (2018).

3. Wiering, Marco, and Martijn Van Otterlo. "Reinforcement learning." Adaptation, learning, and optimization 12 (2012):

E-Resources

NPTEL course – https://onlinecourses.nptel.ac.in/noc19_cs55/preview

https://archive.nptel.ac.in/courses/106/106/106106143/

https://www.digimat.in/nptel/courses/video/106106143/L35.html

Topics relevant to "SKILL DEVELOPMENT": Real time Data Analysis using Reinforcement learning **for Skill Development through Problem Solving techniques. This is attained through assessment component mentioned in course handout.**

Course Code: PIP103	Course Title: Professional Practice– II Type of Course: NTCC	L- T-P- C	-	-	-	15	
Version No.	1.0						
Course Pre- requisites	Knowledge and Skills related to all the cosemesters.	ourses studie	d in j	orevi	ous		
Anti-requisites	NIL						
Course Description	NIL Students observe science and technology in action, develop an awareness of the method of scientific experimentation, and often get an opportunity to see, study and operate sophisticated and costly equipment. They also learn about the implementation of the principles of management they have learnt in class, when they observe multidisciplinary teams of experts from engineering, science, economics, operations research, and management deal with techno- economic problems at the micro and macro levels. Finally, it enables them to develop and refine their language, communication and inter-personal skills, both by its very nature, and by the various evaluation components, such as seminar, group discussion, project report preparation, etc. The broad-based core education, strong in mathematics and science and rich in analytical tools, provides the foundation necessary for the student to understand properly the nature of real-life problems. The students have options to pursue this course as either Project Work and Dissertation at the university, or Project Work in an Industry/ Company/ Research Laboratory, or Internship Program in an Industry/Company.						
Course Objectives	The objective of the course is to familiar of Professional Practice and a through Experiential Learning techniqu	ize the learn ttain En les.	ners y nploy	with abil i	the co i ty	oncepts Skills	
Course Outcomes	 On successful completion of this course the Identify the engineering problems reglobal needs. Apply appropriate techniques or morproblem. Design the experiments as per the state Interpret the events and results for morphical for morphical project findings and communications. 	students shal elated to loca odern tools fo ndards and sp eaningful con unicate effect	l be a al, reg or sol pecific clusic tively	ble to giona ving cation ons. thro	o: 1, natio the in ns. ugh sci	onal or tended	

Course Code: CSE 208	Course Title: Theory of Computation Type of Course: Theory Only	L- T-P- C	3	1	0	4			
Version No.	2.0								
Course Pre- requisites	The students should have the Knowledge on Set Theory								
Anti-requisites	Nil								
Course Description	The course deals with introduction of formal languages and the correspondence between language classes and the automata that recognize them. Topics include: Formal definitions of grammars and acceptors, Deterministic and Nondeterministic systems, Grammar ambiguity, finite state and push-down automata; normal forms; Turing machines and its relations with algorithms.								

Course Objective	The objective of the course is to familiarize the learners with the concepts of Theory of Computation as mentioned above and attain Skill Development through Problem					
Course Out Comes	On successful completion of the course the students shall be able to:					
	1. Describe various co	omponents of	Automata. (Knowledge)			
	2. Illustrate Finite Au	tomata for the	e given Language. (Applicati	on)		
	3. Distinguish betwo	een Regular	grammar and Context	free grammar.		
	(Comprehension)					
	4. Construct Push down Automata. (Application)					
	5. Construct Turing m	hachine for a L	anguage. (Application)			
Course Content:						
Module 1	Introduction to automata theory	Assignment	Problems on Strings and Language operations	06 Sessions		
Topics:						
Introduction to Aut	omata Theory, Application	ns of Automat	ta Theory, Alphabets, Strin	gs, Languages &		
operations on lang	uages, Representation of	automata, La	nguage recognizers <mark>,</mark> Finite	State Machines		
(FSM):		Deterministic		FSM,		
Regular languages, I	Designing FSM, Nondeterm	inistic FSMs	1			
Module 2	Finite Automata	Assignment	Problems on DFA, NFA's	13 Sessions		
Topics:						
Basic concepts of Finite automata, DFA- definitions of DFA, Deterministic Accepters Transition Graphs and Languages and DFA's, Regular Languages, NFA- Definition of a Nondeterministic Accepter, Languages and NFA's Why Non-determinism? Equivalence of Deterministic and Nondeterministic Finite Accepters, Reduction of the Number of States in Finite Automata						
	Regular Expressions &		Problems on RE. CFG. PT.			
Module 3	Context Free Grammar	Assignment	PL and Ambiguity	12 Sessions		
Regular Languages (RL) and Non-regular Languages: Closure properties of RLs, to show some languages are not RLs, Closure Properties of Regular Context Free Grammars-Examples of Context-Free Languages, Leftmost and Rightmost Derivations, Derivation Trees, Relation Between Sentential Forms and Derivation Trees, Ambiguity in Grammars and Languages: Ambiguous Grammars, Removing Ambiguity, Chomsky						
Module 4	Push down Automata	Assignment	Problems on pushdown Automaton	08 Sessions		
Topics:						
Definition of a Pushdown Automaton, Language Accepted by a Pushdown Automaton, Acceptance by Final State, Acceptance by Empty Stack, From Empty Stack to Final State, From Final State to Empty Stack Equivalence of PDA's and CFG's: From Grammars to Pushdown Automata.						
Module 5	Turing Machine	Assignment	Problems on Turning Machine	07 Sessions		
Topics : Definition of a Turin Turing machine, Tur	g Machine, Turing Machine ing Machines as Transduce	es as Language rs, Halting Pro	Accepters, Example Langua ogramming Techniques for	ages to construct Turing Machines		
Targeted Applicatio	n & Tools that can be used	l:				
Targeted Application:						
1. Text Processing						
2. Compilers						
3. Text Editors						
4. Robotics Applications						
5. Artificial Int	5. Artificial Intelligence					
Tools:	-					
1. JFLAP (Java	1. JFLAP (Java Formal Language and Automata Package) Software simulation tool. It's interactive					
educational soft	ware written in Java to exp	periment topic	s in automata theory.			
2. Turing machine Online simulators.						

Text Book

1. Peter Linz, "An introduction to Formal Languages and Automata", Jones and Bartlett Publications 6th Ed, 2018.

References

- 1. Aho, Ullman and Hopcroft, "Theory of Computation", Pearson India 3rd Edition 2008.
- 2. Michael Sipser, "Theory of Computation", Cengage India 3rd Ed, 2014.

E-Resources

NPTEL course – <u>https://onlinecourses.nptel.ac.in/noc21_cs83/preview</u>

Topics relevant to "SKILL DEVELOPMENT": Deterministic and Non-Deterministic Automaton, Regular Expressions, CFGs, Turning Machine and Pushdown automaton for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Course Code: CSE310	Mobile Applications and	d Development & CSE 3	310	L- T-P- C	1	0	4	3
Version No.	1.0			L				
Course Pre-	The student needs to have fundamental understanding of object-oriented programming							
requisites	concepts with Java/C#, XML, usage of any integrated development environment.							
Anti-requisites								
Course	The course deals with the basics of android platform and application life cycle. The goal							
Description	of the course is to develop mobile applications with Android containing at least one of							
	the following phone material components: GPS, accelerometer or phone camera, use							
	simple GUI applications and work with database to store data locally or in a server.							
	Topics include user interface design: user interface building input methods data							
	handling; network techniques and URL loading; GPS and motion sensing. Android							
	application framework and deployment. Power management, Screen resolution, Touch							
	interface, Store data on the device.							
Co	The chiestive of the co						-f N/	a hila
Course	Ine objective of the course is to familiarize the learners with the concepts of Mobile							
Objective	Applications and Development as mentioned above and attain Employability Skills							
Course Out	On successful completion of the course the students shall be able to:							
Comes	1. Discuss the fundamentals of mobile application development and its architecture.							
	2 Illustrate mobile applications with appropriate android view (Application)							
	3. Demonstrate the use of services, broadcast receiver Notifications and content							
	provider.(Application)							
	4. Apply data persistence	e techniques, to perform	m CRUD o	operation	s. (Ap	plicat	ion)	
	5. Use advanced concepts for mobile application development. (Application)							
Course Content:		Γ						
	Introduction and							
Module 1	Architecture of	Assignment	Simulatio	n/Data Ai	nalysis	10	Sessi	ons
	Android							
Android: History cycle.	and features, Architectu	re, Development Tools	s, Android	Debug B	ridge	(ADB	s), and	l Life
Modulo 2	User Interfaces, Intent	Assignment	Numerical from E-			1E Socion		0.000
ivioaule 2	and Fragments	Assignment	Resources	sources			12 262210112	
Views, Layout, Menu, Intent and Fragments.								
	Components of	Term	Cimulation (Data Analysis	15 Cossions				
---------------------	-------------------------------	----------------------------	----------------------------------	-----------------	--	--	--	--
wodule 5	Android	paper/Assignment	Simulation/ Data Analysis	15 Sessions				
Activities, Servic	es, Broadcast receivers,	Content providers, Use	er Navigation					
Modulo 4	Notifications and Data	Term	Simulation/Data Analysis	1E Sossions				
Woulle 4	Persistence	paper/Assignment	Simulation, Data Analysis	15 565510115				
Notification, Sha	red Preferences, SQLite	database, Android Roo	om with a View, Firebase					
Module 5	Advance App	Term	Simulation/Data Analysis	15 Sessions				
Q 1: 14	Development	paper/Assignment						
Graphics and An	imation, App Widgets, S	Sensors, Performance, L	ocation, Places, Mapping, O	Custom Views,				
Canvas.								
List of Laborator	y Tasks							
1.a. Desi	, gn an app to read user i	nputs using edit text an	d display the result of arith	nmetic				
operatio	ns using toast message.							
1.b. Crea	te an android app to cal	culate the current age	of yourself, select your DO	B using date				
picker.								
2.a. Desi	gn an app to input your	personal information. I	Jse autocomplete text viev	v to select				
your plac	ce of birth.							
2.b. Desi	gn an app to select elect	tive course using spinne	er view and on click of the o	display button,				
toast you	ur ID and selected electiv	ve course.						
3. Design	a restaurant menu app	to print the total amou	unt of orders.					
4. Develo	pp an android app that ι	ises intent to maintain	the following scenario.					
Check th	e eligibility criteria for v	oting. Input the Aadhar	no., Name & age in the fir	st activity. If				
the age i	s above 18, display the v	oter's detail in the seco	ond activity. Else, display, "	You are not				
eligible t	o vote " In the second Ad	CTIVITY.						
5. Demo	huttane the appropriate	ent with list of buttons	representing various color	s, and on click				
Create a	n Android application to	input the vitals of a ne	rson (temperature BD) If t	the vitals are				
abnorma	Il give proper potificatio	on to the user						
6. Create	an android app to for n	novie ticket booking. Sa	ave the user name of the cu	ustomer using				
shared p	references. After compl	etion of booking. retrie	ve the username from the	shared				
preferen	ces and print the ticket	details.						
7. Create	an android application	to manage the details of	of students' database using	sQLite.Use				
necessar	y UI components, which	perform the operation	ns such as insertion, modified	cation,				
removal	and view.Presidency Un	iversity needs an APP f	or Admission eligibility che	cking for				
students	, for that you need to ta	ke the following inform	nation from the Student: re	gistration ID,				
physics,	chemistry and mathema	itics marks (PCM), fees	is allotted as below criteria	1.				
PCM (To	tal marks %) Fee cond	cession						
90 above	e 80 %							
70 to 89	60 %							
Below 69	no con	cession		6011				
On click of	on the button "Registrat	tion" details should be s	stored in the database usin	ig SQLite.				
Create b	utton DISPLAY ALL (full s	students list) on click or	i the button it should displa	ay the				
students 8 A com	hist per the ree concession	ion.	ic automatically in the bac	karound				
6. A COIII	pany need to design an	app that plays soft mus	action action and any in the bac	kgrounu.				
9 Create	an android application	such that your view of	iect in the Activity can be A	nimated with				
fade-in e	ffect. Create an annron	riate XMI file named fa	de-in and write the annlice	ation to				
perform	the property animation							
10. Demo	onstrate how to send SN	/IS and email.						
11. Crea	te an android applicatio	n to transfer a file using	g WiFi. Create an android a	pplication				
"Where am I" wi	th an Activity that uses t	the GPS Location provid	ler to find the device's last	known				
location.		•						
Targeted Applica	tion & Tools that can b	e used:						

Text Book

- T1. Pradeep kothari "Android Application Development Black Book", dreamtechpress
- T2. Barry Burd (Author), "Android Application Development" ALL IN ONE FOR Dummies
- T3. Jeff Mcherter (Author), Scott Gowell (Author), "Professional mobile Application Development" paperback, Wrox - Wiley India Private Limited
- T4. Wei-Meng Lee (Author) "Beginning Android Application Development" Wrox Wiley India Private Limited

References

1. Bill Phillips, Chris Stewart, and Kristin Marsicano (Author) "Android Programming" 3rd edition, 2017. The Big Nerd Ranch Guide, Big Nerd Ranch LLC, 5. The Big Nerd Ranch Guide, by"

2. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd, 2014.

3. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O'Reilly SPD Publishers, 2015.

4. J F DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126565580

5. Anubhav Pradhan, Anil V Deshpande, "Composing Mobile Apps" using Android, Wiley 2014, ISBN: 978-81-265-4660-2

6. Reto Meier "Professional Android Application Development"

E-Resources: <u>https://puniversity.informaticsglobal.com/login</u>Or <u>http://182.72.188.193/</u>

Topics relevant to the development of SKILLS: Graphics and Animation, App Widgets Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE202	Course Title: DIGITAL DESIGN Type of Course: Theory Only	L- T-P- C	3	0	0	3
Version No.	2.0					
Course Pre-	Basics of Electronics: AC & DC Circuits, Boole	an Algebra, Nu	mbei	r Syste	ems, I	Logic
requisites	Gates					
Anti-requisites						

Course Description	This Course will p understand how of Students will gain logic circuits to pr Topics include: circuits and mini Programmable Lo and shift registers	provide the fundame digital systems work a experience with sec rogrammable logic d Number systems mization, Combinat ogic devices, State t s, Arithmetic operation	ental background neede and how to design digiveral digital systems, fr levices. and codes, Boolean a tional and sequential le cable and state diagram ions and algorithms, fa	d to ital circuits. om simple lgebra, logic ogic circuits, ns, Counters ult diagnosis		
	and tolerance.					
Course Objective	The objective of th Digital design PARTICIPATIVE LE	e course is to familia and attain ARNING techniques	SKILL DEVELOPMEN	e concepts of T through		
Course	On successful comp	letion of the course t	he students shall be able	to:		
Outcomes	 Apply minimization techniques to Boolean equations to drawing digital circuits Select the appropriate combinational circuits for simple applications Apply the knowledge of state table and state diagram to draw sequential circuits 					
Course Content:						
Module 1	Introduction to Digital Systems	Application		10 Sessions		
Fundamentals of Dig Minimization, Hardwa	ital Systems, Numb are Description Lang	er System and Code uage(HDL) using Com	s, Boolean algebra, Logi puter design tools.	c Circuits and		
Module 2	Fundamentals of Digital System Design	Comprehension		14 Sessions		
Minimization using K Design of arithmetic/I Multiplexers, 1:8 Dem	-Map and QM Met ogic and control uni uux, 1:16 Demux 1-B	thod, Combinational ts-Half Adders and Ful it Comparator, 2-bit c	Circuits, Programmable I II , Half Subtractors and Fu comparator Decoders, etc	Logic Devices, Ill subtractors,		
Module 3	Sequential Circuits and its Applications	Application	Simulation/Data Analysis	15 Sessions		
Sequential Vs Combin	ational Ckts, Seque	ntial Logic Circuits, Sta	ate Tables and State Trans	sition		
Diagrams, Shift Regist	ers and Counters, Fa	ault Diagnosis and Tol	erance			
Targeted Application	& Tools that can be	used: Xylinx Tool				
Text Book						
1. Mano, M. Morris ar	nd Ciletti Michael D.	, "Digital Design", 5th	Edition 2017, Pearson Ed	ucation		
References						
1. Donald P Leach, Alk Edition 2010, McGraw	pert Paul Malvino ar / Hill Education.	nd Gautam Saha, "Digi	ital Principles and its appl	ications", 7th		
NPTEL course – http:	s·//nntel.ac.in/cours	ses/106105185				
Topics relevant to "SI Combinational Circuit attained through asse	KILL DEVELOPMENT s for Skill Developm ssment component	": Boolean Equations eent through Participa mentioned in course	s Simplifications, HDL, Seq ative Learning techniques handout.	juential and . This is		

Course	Course Title: I	Mic	roprocessor	* & z					
Code:	Microcontr	olle	ers			3	0	3	
ECE3111					L-P-C				
	Type of Cours	e: T	heory Only						
Version No.	2.0								
Course Pre-	Number Syst	ems	s, basics of Dig	gital Eleo	ctronics, b	asics	of		
requisites	Computers.								
Anti-requisites	NIL								
Course Description	n This course i	ntro	oduces the as	sembly	level lang	uage	prograr	nming	
	of 8086. The	cou	rse introduce	s the co	re concept	t of m	icropro	cessor	
	and develop	s ir	n students th	e assen	nbly langı	Jage	prograr	nming	
	skills along w	vith	real time app	lications	s of microp	oroce	ssor. It g	gives a	
	practical trai	inin	g to students	s to pe	rform inte	erfaci	ng peri	pheral	
	devices with	80	86 microproc	essors.	This lab f	ocuss	ses mai	nly on	
	software and	l fev	v interfacing p	orogram	is with mid	cropr	ocessor		
Course Objective	The objective	of t	he course is to) familia	arize the le	arner	s with the	he	
	concepts of M	concepts of Microprocessor & Microcontrollers and attain SKILL							
	DEVELOPMI	DEVELOPMENT through PARTICIPATIVE LEARNING							
	techniques								
Course Out Comes	S On successfu	On successful completion of the course the students shall be able							
	to:	to:							
	1. Describe the fundamental principles of 8086 Microprocessor								
	and 8051 I	Mic	rocontroller.						
	2. Apply t	the	programming	knowle	dge of 808	36 an	d 8051 t	o write	
	Assembly	lang	guage Progran	ns.					
	3. Explore	e iı	nterfacing of	8086	to I/O c	levice	es using	g 8255	
	Programm	abl	e Peripheral II	nterface	2.			-	
			•						
Course Content:									
					<u> </u>				
	Fundamenta	IS	Introduction	Kno	owledge				
Module 1	of 8086						12		
	Microproces	sor					Sess	sions	
Topics:									
Organization of (Computer System	s, a	rchitecture of	comput	ters, RISC	and C	ISC,		
microprocessor e	evolution. 8086 M	licro	oprocessor are	chitectu	re: main f	eatur	es of 80	86,	
Modular Prograr	nming, 8086 inter	rnal	architecture,	asseml	oly langua	ge pr	ogram		
development too	ols.								
Module 2	Programming	A	plication	Progra	mming			16	
	the 8086	'			Ŭ		Ses	sions	
	Microprocessor							-	
Topics:		1		1			I		
1									

8086 Instructions set, addressing modes, simple sequence programs, Jumps, flags, and conditional jumps, unconditional jumps, Multiprocessor configurations — Coprocessor, Closely coupled and loosely Coupled configurations, repeated until programs, strings, procedure and macros

Module 3	Basic of I/O	Application	Programming	10
	Interfacing and			Sessions
	Introduction to			
	Microcontroller			

Topics:

Basic I/O interface, programmable peripheral interface and programming. I/O Pins Ports and Circuits — Instruction set, overview of 8051 family, 8051 assembly language programming.

Targeted Application & Tools that can be used: Microsoft Assembler (MASM), TASM and KELL

Text Book

T1: Microprocessors and Interfacing (SIE), 3rd ed. by Douglas V. Hall & S.S.S.P. Rao, 3rd edition, Mc Graw Hill, 2012.

T2: Barry B Brey, "The Intel Microprocessors", 8th edition, Pearson, 2014.

References

R1: Muhammad Ali Mazidi, "Microprocessors and Microcontrollers", First Impression, Pearson Education.

R2: Ramesh S. Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 4e, Prentice Hall, 1998

Web resources:

https://nptel.ac.in/courses/108107029

https://puniversity.informaticsglobal.com:2229/login.aspx

Topics relevant to development of "SKILL": Engineering Mechanics and its relevance. Force and its Characteristic, Laws of Motion. 8 bit microprocessors vs 16 bit microprocessors, Memory Read and Memory Write Cycle of 8086, Simple Program to interface 8255 and 8086, Simple programs to understand instruction set of 8051 for Skill Development through Participative Learning techniques. This is attained through the assessment component mentioned in the course handout.

Course Code:	Course Title: Problem	n Solving Using Pythor	n						
CSE258				L-T-P- C	1	0	4	3	
	Type of Course: Labo	ratory Integrated							
Version No.	2.0								
Course Pre-	Nil								
requisites									
Anti-requisites	NIL								
Course	This course provides t	This course provides the opportunity for the students of Computer Science							
Description	engineering to develo	p Python scripts using	g its power	ful prog	ramm	ning fe	ature	s like	
	lists, sets, tuples, dicti	onaries and sets. Stud	lents will a	also be i	ntrod	uced to	o obje	ect	
	oriented programming	g concepts and packag	ges for dat	ta visual	izatio	n.			
	Topics include: Basics	of Python programmi	ing, opera	tors and	l expr	ression	s, deo	cision	
	statements, loop cor	statements, loop control statements, functions, strings, lists, list processing :							
	searching and sorting,	searching and sorting, nested list, list comprehension, tuples and dictionaries, sets,							
	file handling, exception	file handling, exception handling, object oriented programming concepts, modules							
	and packages for data	visualization							
Course	The objective of the	course is to familiar	rize the le	earners	with	the co	oncep	ots of	
Objective	PROBLEM SOLVING	USING PYTHON and	attain S	KILL DE	VELO	PMEN	T thr	ough	
Course Out	EXPERIENTIAL LEARN	ling techniques							
Course Out	On successful complet	tion of the course the	students	snall be	ablet	.0: 	- f	مرما	
comes	1. Demonstrate	problem solving throu	ign unders	standing	, the t	Dasics (эг рус	non.	
		Nictionaries File and F	clures.	Handling		conts t			
	real time problems								
	4 Practice object	t-oriented programmi	ing						
	5. Produce data	visualization using mo	ndules and	l nackag	es				
		1.		puonab	23.				
Course	-								
Content:									
	Problem Solving								
Modulo 1	Techniques and	assignments	Quizzes f	orm bas	sics of	15	Socc	ions	
Would I	Basics of Python	assignments	python			15	3633	10113	
	Programming								
Basics of probler	n solving techniques, B	Basics of Python progra	amming, c	perator	's and	expre	ssions	5,	
decision stateme	ents, loop control state	ments.							
Module 2	Function, String and	Quizzes and	Compreh	nension	based	15	Sess	ions	
	List	assignments	Quizzes a	and assig	gnmei	nts 🗖	0000		
Functions, string	s, lists, list processing:	searching and sorting,	, nested li	st, list co	ompre	ehensio	วท		
	Data Structures. File								
Module 3	and Data	Term	Quizzes f	orm adv	/ance	d 15	Sess	ions	
	Visualization	paper/Assignment	python						
Tuples and diction	onaries, Introduction To	o NumPy and pandas,	DataFram	Serie, serie	S	•			
						<u> </u>			
	Data wrangling and	Term	Applicati	on on d	ata	1			
Wodule 4	Diject-Oriented Brogramming	paper/Assignment	visualizat	tion		13	5622	ions	
Data Transforma	Figraning	l	oriented n	rogram	ming	concer)tc		
	and visu		onenteu p	ografill	unig (concep	113		
List of Laborator	nu Tooko								
LIST OF LADORATO	y idsks:	and by lovel 0 and lov	al 1 made						
	experiments are prepa			116 11136.					

Targeted Application & Tools that can be used:

Any IDE – PyCharm, VS Code, Python IDE, Spyder, jupyter note book, Google Colab

Text Book

T1. Ashok Namdev Kamthane and Amit Ashok Kamthane, "Problem Solving and Python Programming", Tata

Mc Graw Hill Edition, 2018.

T2. Charles Dierbach, "Introduction to Computer Science Using Python", Wiley India Edition, 2015. T3. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press, 2017.

References

R1. Balagurusamy, "Introduction to Computing and Problem-Solving Using Python", Tata McGraw-Hill, 2016 R2. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, 2017 E-Resources:

W1. http://pythontutor.com/

W2. https://www.udemy.com/topic/python/

W3. <u>https://in.coursera.org/courses?query=python</u>

W4. https://puniversity.informaticsglobal.com:2229/login.aspx

Topics relevant to the development of SKILLS:

Problem solving techniques – Function - Object oriented programming - data visualization for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Operating	Systems	L- P- C	30		3		
CSE 2010	Type of Course: Theory C	Dnly						
Version No.	2.0		<u>()</u>					
Course Pre-	Basic knowledge on computers, computer software & hardware, and Computer							
requisites								
Anti-requisites	VII							
Course Description	understanding of the functions and functional modules of operating systems. The design and implementation of Operating systems is also covered.							
Course Objective	The objective of the co Operating Systems PARTICIPATIVE LEARNING	he objective of the course is to familiarize the learners with the concepts of Operating Systems and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques						
Course Out Comes On successful completion of the course the students shall be able to: CO1: Describe the fundamental concepts of operating Systems [Knowledge Level] CO2: Demonstrate various CPU scheduling algorithms. [Application Level] CO3: Apply synchronization tools to a given problem. [Application Level] CO4: Discuss various memory management techniques.[Comprehension Level] 								
Course Content:								
Module 1	Introduction	Assignment	Data Analysis tas	k	7 9	Sessions		
Topics: Overview Structure, Operation and OS interface, commands: Syster	of OS and design, Introd ons, Computing environm System Calls and its t n Programs[CLI/SHELL, loa	luction- Computer ients, OS impleme cypes, System Pro aders, linkers]	System Archited ntation, Operatir ograms [loaders	cture, Op ng Syster s, linkers	oerating n Servic s], UNI	g System ces, User IX/LINUX		
Module 2	Process Management	Assignments	Analysis, D Collectior	ata า	10 Sess	ions		
Topics: Process Col - Multithreading M FCFS, SJF, RR, Prior	ncept, Operations on Proc odels, Process Scheduling ity, Multilevel Queue, Linu	esses, Inter Proces – Basic concepts, S ux Scheduler, CASI	s Communicatior cheduling Criteria E STUDY: Linux Sc	i, Introdu a, Schedu heduler	iction to Iling Alg	o threads orithms:		
Module 3	Process Synchronization and Deadlocks	Quiz	Case studies / Ca	se let	10 Sess	ions		
Topics: The Critical locks, Semaphores Introduction to D Prevention and In Recovery from Dea	Topics: The Critical-Section Problem- Peterson's Solution, Synchronization hardware, Test and Set, Mutex locks, Semaphores, Advanced Synchronization Problems-IBM Quality and implementation, Monitors. Introduction to Deadlocks, Deadlock Characterization, Methods for handling deadlock: Deadlock Prevention and Implementation, Deadlock Avoidance and Implementation Deadlock detection & Recovery from Deadlock							
Module 4	Memory Management and File Systems	Assignment	Case Studies / C	ase let	11 9	Sessions		
Topics: Introduction to Memory Management, Swapping, Contiguous and Non-Contiguous Memory Allocation, Segmentation, Paging - Structure of the Page Table – Demand Paging – Page Replacement, Allocation of Frames – Thrashing. RAID Structures: Disk Scheduling, RAID LEVELS Targeted Application & Tools that can be used: UNIX								
 Project work/Assignment: Mini Project: Demonstration of File Handling techniques/Memory and Disk Management. 								
Project work/Assig Mini Projec	gnment: at: Demonstration of File H	andling techniques	Memory and Dis	k Manag	ement.			

T1: Silberschatz A, Galvin P B and Gagne G, *"Operating System Concepts"*, 9th edition Wiley, 2013.

References

R1. William Stallings, "Operating systems", Prentice Hall, 7th Edition, Pearson, 2013. **R2.** Andrew S Tanenbaum and Albert S Woodhull, "Operating Systems Design and Implementation", 3rd Edition, Pearson, 2015.

E book link R1: <u>Details for: Operating systems : internals and design principles > Koha online catalog</u>

E book link R2: Details for: Operating systems : design and implementation > Koha online catalog

Web resources:

ttps://www.youtube.com/watch?v=vBURTt97EkA&list=PLBlnK6fEyqRiVhbXDGLXDk_OQA euVcp2O

ttps://www.youtube.com/watch?v=3-ITLMMeeXY&list=PL3pGy4HtqwD0n7bQfHjPnsWzkeRn6mkO

ttps://www.youtube.com/watch?v=HW2Wcx-ktsc

ttps://www.youtube.com/watch?v=MYgmmJJfdBg

https://puniversity.informaticsglobal.com:2229/login.aspx

Topics relevant to "Skill Development":

Page replacement algorithms, Scheduling policies, Deadlocks **for Skill Development through Participative** Learning techniques. This is attained through the assessment component mentioned in the course handout.

Course Code:	Course Title: DISTRI	BUTED SYSTEM		L- P- C	3	0	3		
CSE2052	Type of Course: Theo	bry based							
Version No.	2.0								
Course Pre-	Operating systems								
requisites									
Anti-requisites	NIL								
Course	This course is design	ed to provide th	e knowled	lge of tl	ne con	cepts r	elated to		
Description	distributed system. The	he course is aim	ed at und	erstandi	ing the	e founda	ations of		
	distributed systems. It	also deals with	Peer to pe	er servi	ces an	id to un	derstand		
	about the system leve	I and support rec	quired for	distribu	ted sy	stem. Fi	urther, it		
	focuses on Synchroniza	ation, Process and	Resource	Manager	ment. S	students	will also		
C	learn the overview of L	Distributed system	1. Part a dha	1		11			
Course	The objective of the o	course is to fami	liarize the	learners	s with	the cor	icepts of		
Objective	DISTRIBUTED SYSTEMS	and attain EMP	LOYABILITY	r throug	h usin	g PARII	CIPATIVE		
2	LEARNING techniques.	6.1.1							
Course	On successful completi	on of this course	the studen	ts shall t	be able	e to:			
Outcomes	CO1: Describe the func	tional characteris	tics and ch	allenges	in ais	tributed	system		
	(Knowledge level)	achanian of inter		n dimo at a		niaction			
	CO2: Summarize the m		process, in	nairect	ommu	inication	1		
	CO2. Discuss the feature	cos of poor to poor	corrigos	nd file e	uctom	G			
	(Comprehensive level)	les of peer to peer	services a	inu me s	ystem	5.			
	COA: Apply synchroniz	omprenensive level)							
	CO5. Explain the differ	74: Apply synchronization techniques. (Application level)							
	(Comprehensive level)	ent process and r		anageme	int app	noaches			
Course Content:									
	INTRODUCTION TO								
Module 1	DISTRIBUTED	Ouiz	Knowled	ge based	Quizz	es 6 s	essions		
	SYSTEM	Z	and assig	nments;					
Topics:	•	•	1						
Introduction - Tree	nds in Distributed Syster	ns – Focus on reso	ource sharin	ng- Distr	ibuted	l System	model –		
Challenges-Examp	oles of Distributed System	ns -Case study: Wo	orld Wide V	Web.					
	COMMUNICATION IN	-							
Madula 2		Ouizzes and Compre		ension b	ased	0			
Module 2	DISTRIBUTED Svstem	assignments	Quizzes a	nd assig	nment	ts 8	essions		
Touisa	SISIEM	_							
Topics:	Models of Communicat	tion notworks. In	tor propos	Comm	unicati	on the	ADI for		
internet protocols	External data represent	totion and Multic	ast commu	nicotion	Notw	ork virtu	alization:		
Overlay networks	Indirect Communication	: Group communic	ast commu	lich_cube	cribe s	vstems _	Message		
overlay networks: oueues – Shared m	emory approaches.	. Group commune	ation 1 do	11511 5005		y stems	wiessuge		
	PEER TO PEER								
Module 3	SERVICES AND FILE	Quizzes and	Compreh	ension b	ased	9 9	essions		
	SYSTEM	assignments	Quizzes a	nd assig	nment	ts 🥤	00010110		
Topics:									
Peer-to-peer Syste	ems – Introduction – Pee	er-to-peer – Middl	eware – R	outing o	verlays	s. Distrib	uted File		
Systems –Introduc	tion – File service archite	ecture – Andrew F	ile system-	Tapestr	v. File	System:	Features-		
File model -File ac	ccessing models.			1 .	/	5			
Module 4	SYNCHRONIZATION	Quizzes and	Applicatior	n based	Quizz	es <mark>7 ses</mark>	sions		
		assignments a	and assigni	ments					
Introduction – Clo	cks, events and process s	tates – Synchroniz	ing physica	al clocks-	· Logic	al time a	nd		
logical clocks – Sn	apshot algorithm for Fl	FO channels -Glo	bal states –	Coordin	ation a	and Agree	ement-		
Distributed mutual	exclusion – Shared men	mory mutual excl	usion -Elec	ctions					

Module 5	PROCESS AND RESOURCE	Quizzes and	Comprehension 6 sessions based Quizzes and	
	MANAGEMENT	assignments	assignments	

Process Management: Process Migration, Resource Management: Introduction- Load Balancing Approach – Load Sharing Approach-Deadlocks-Models of Deadlock-Deadlock Detection in distributed systems.

Targeted Application & Tools that can be used: LINUX

Textbook(s):

1. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.

References

1. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Ninth edition, Prentice Hall of India, 2007.

2. Tanenbaum A.S., Van Steen M., "Distributed Systems: Principles and Paradigms", Second Edition, Pearson Education, 2007.

3. Liu M.L., "Distributed Computing, Principles and Applications", First Edition, Pearson Education, 2004.

4. Nancy A Lynch, "Distributed Algorithms", Second Edition, Morgan Kaufman Publishers, USA, 2003.

Web Resources:

W1. NPTEL Videos- https://nptel.ac.in/courses/106/106/106106107/

- W2. <u>https://www.youtube.com/watch?v=2L7jnaXuOc8</u>
- W3. <u>https://onlinecourses.nptel.ac.in/noc21_cs87</u>

W4. https://presiuniv.knimbus.com/user#/home

Topics relevant to "EMPLOYABILITY SKILLS": Synchronization, Resource Management, Deadlocks for developing **Employability Skills** through **Participative Learning** techniques for Skill Development through **Participative Learning** techniques. This is attained through assessment component mentioned in course handout

Course	Course Title: Socia	l Network Analyti	cs	L-P-C	3	0	3			
Code: CSE-404	Type of Course: Pro	gram Core								
Version No.	2.0									
Course Pre-	Data Mining, Machin	e Learning, Graph	Theory	and Co	ombina	atorics,	Working			
requisites	knowledge of Python s									
Anti-requisites	NIL									
Course	The Course So	cial Network Analys	sis is to pr	ovide s	tudent	ts with e	ssential			
Description	knowledge of network	analysis applicable	to real w	orld dat	a, witł	ı exampl	es from			
	today's most popula	r social networks.	The Co	urse pr	esent	s mathe	matical			
	methods and computa	tional tools for Soci	al Networ	k Analy	vsis (Sl	NA).				
	Students learn	how to identify	key indiv	iduals	and g	roups ir	1 SOCIAL			
	growth and diffusion r	rocesses in networ	ks The co	irse als	o inclu	ides the r	nonular			
	algorithms behind Red	lgorithms behind Recommender systems and Search Engine Optimization.								
				8-	P					
Course	The objective of the	course is to familia	arize the	learner	s with	the con	cepts of			
Objective	Social Network An	Social Network Analysis and attain ENTREPRENEURIAL SKILLS through								
	PROBLEM SOLVING t	echniques								
Course Out	On successful comple	etion of this course t	the studer	its shall	be ab	le to:				
Comes										
	1. Describe netw	vork structure and	l various	types	of ne	twork c	entrality			
	measures. (Compren	lension)	uce' and '	homoni	nilv' ir	, social	notwork			
	communities (Appli	communities (Application)								
	3. Interpret the	popular algorithm	is behind	Recon	nmend	ler svste	ems and			
	Search Engine Optim	ization. (Applicatio	n)			5				
Course Content:										
		ſ								
	Introduction to	Quiz	Knowlee	lge bas	ed qu	izNo. of	0			
	Network Science		on Net	work	Densi	ty, Sessic	ons:9			
Module 1	allu Measules		Distance		hetwe	s, en				
			nodes. w	alks. tr	ails ai	nd				
			paths	, -						
Topics:						-				
Introduction to a	network science, Relati	onal Data, Nodes, eo	dges and b	oundar	ries, Ty	pes of R	elations,			
Types of Netwo	orks, Representation c	of Network data, N	letwork [ensity,	Desci	ribing N	etworks,			
Distance betwee	en nodes, walks, trail	s and paths, Cent	rality, De	gree ce	entrali	ty, Betw	/eenness			
Figenvector cent	trality Group contrality	7								
	Community	Assignment	Node (Centric		No. of	,			
	Analysis		Comm	unity D	etectio	on Sessio	ons:10			
Module 2			& Netv	vork Ce	ntric					
			Comm	unity						
			Detect	ion						
Topics:			_							
Introduction to (Community, Communit	ies in Social Media,	Taxonom	y of Cor	nmun	ity Criter	ia, Node			
Centric Commu	nity Detection, Netw	ork Centric Comr	nunity D	etection	1, Eag	ge Betw	eenness,			
Evaluation with	and without ground tru	th Evaluation mea	sures		.0111110	LINU LV	aluatioli,			
			Assortati	ivity for						
Module 3	Influence and	Quiz	Nominal	and Or	dinal	No. of				
	Homophily		Attribute	es		Sessio	ons:8			
Topics:										
Measuring Asso	rtativity, Homophily,	Test of Homophily	y, Mechar	nisms U	Jnderl	ying Ho	mophily,			
Selection and So	<u>cial Influence, Modellin</u>	ig Influence and Sch	elling Mo	del.						

Module 4	Recommendation	Case Study	How Long Does It TakeNo. of
	systems and SEO	-	to Rank for A KeywordSessions:10
			– Bloggers Passion SEO
			Case Study

Topics:

Recommendation in Social Media, Recommender System,

Content-Based Methods, Collaborative Filtering(CF), Evaluating Recommendations, Search Engine Optimization, Google PageRank algorithm, Citation Analysis, Dangling Links, IBM HITS algorithm, Limitations of HITS.

List of Laboratory Tasks: NA

Project work/Assignment:

Textbook(s):

1. "Social Media Mining: An Introduction", Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, Cambridge University Press, 2018.

2. "Social Network Analysis, Methods and Applications." Stanley Wasserman and Katherine Faust, Cambridge University Press, 2019

References:

1. "Web Mining and Social Networking: Techniques and Applications", Guandong Xu, Yanchun Zhang, Lin Li, Springer, 2016

Web References :

1. <u>https://presiuniv.knimbus.com/user</u>

Topics relevant to "ENTREPRENEURIAL SKILL": Content-Based Methods, Collaborative Filtering(CF),Evaluating Recommendations, Search Engine Optimization, Google PageRank algorithm ENTREPRENEURIAL SKILLS through PROBLEM SOLVING techniques the assessment is mentioned in the course handout

Course Code: CSE301	Course Title: Pro JAVA Type of Co Laboratory inte	ogram ourse: grate	nming in Adv Program Co d	vanceo ore	d	L-P-C	1	4	3
		8	-						
Version No.	2.0								
Course Pre-requisite	es NIL								
Anti-requisites	NIL								
Course Description	This intensive, ha Students will lear JDBC connection This Course pro- concepts in java database connect	Students will learn Multi-threaded applications, client server programming and IDBC connection. This Course provide in-depth knowledge in JAVA programming - advanced concepts in java , packages and applets, GUI concepts in java-swing, java latabase connectivity, servlets, J2EE framework, java script and XML.							
Course Objective	The objective of Advanced Java P	the co Progra	ourse is to fa mming and	miliar attair	ize the n Emplo	learners yability	s with throu	the conc ugh Expe	epts of riential
Course Out Comes	COURSE OUTCOI shall be able to: Impleme Develop Develop Impleme Integrate	 COURSE OUTCOMES: On successful completion of the course the students shall be able to: Implement communication of GUI with DBMS Develop application using Swing MVC Develop Server side Application using Servlets and JSP Implement Inversion of Control and Dependency Injection Integrate different technology using spring Framework Practice Enterprise Application 							
Course Content:									
Module 1	Database Connectivity		Assignmer	nt	t Programming Task		10 Sessi	ons	
Topics: SQL basic, Introductic data from multiple ta with PostgreSQL.	on to JDBC, JDBC Drive bles: Joining, Manipul	ers & A lating	Architecture database wi	, CRUE th JDB) opera SC, Invo	tions usi king Sto	ng JD red Pi	BC, Merg ocedure,	ing JDBC
Module 2	Swings	Assi	gnment	Prog	rammi	ng Task		1 Soco	LO Sions
Topics: Introduction to Swing JLabel, JTextField, JCo Event Handling. Module 3	s and MVC, Swing M omboBox, JLiJLists, JTa Web Programming with Servlets & JSP	/C Arc able a	hitecture, C nd JTree. La ment	ompor yout N Prog	nent Cla Ianagei rammii	asses : JE rs, Datak ng Task	Buttor base C) peration 12 Session	using
Topics: Servlets Introduction, Life Cyc compile servlet sourc Handling HTTP Reque Session Tracking.	cle of a Servlet, using ce code, start tomcat ests and Responses: H	Tomc :, star andlin	at for servle t a web bro g HTTP GET	et deve wser a reque	elopme and rec sts and	nt, simp quest th POST re	le ser e serv eques	vlet: crea vlet, servi t, Using C	ate and let API, ookies,

Introduction to JSP, Creating simple JSP Programs, How JSP is processed, JSP Scripting Constructs, Predefined Variables, JSP Directives, JSTL (Core Tags, Function Tags, Formatting Tags, SQL Tags). Module 4 Introduction to Assignment Programming/Data 10 analysis task Sessions Spring Frameworks **Topics: Hibernate and Java Web Frameworks(Spring):** Spring JPA, JPA Specification, Classes and Interfaces, Object Relational Mapping using JPA, JPA implementation with Hibernate, Simple JPA-Hibernate program to Create Database schemas. Spring CORE, Overview of Spring, Spring Architecture, bean life cycle, XML Configuration on Spring, Managing Database **Targeted Application & Tools that can be used:** IDE, Eclipse, Application server, Version control system. **Text Book** Cay S Horstmann and Gary Cornell, "CORE JAVA volume II-Advanced Features". Prentice 1. Hall. 2. Nicholas S. Williams, Professional Java for Web Applications, Wrox Press, 2014. References R1.Herbert Schildt, "Java 2: The Complete Reference", Tata McGraw-Hill Education. R2.Y. Daniel Liang, "Introduction to Java Programming Comprehensive Version", Pearson Education. R3.Paul Deitel Harvey Deitel, "Java How to Program", Pearson Education. **R4.Core and Advanced Java Black Book, Dream Tech Press** Weblinks: https://nptel.ac.in/courses/106105191- IIT Kharagpur, Prof. Debasis Samanta Case study link: https://www.researchgate.net/publication/215893899 Mashing up JavaScript -Advanced techniques for modern web applications E book link R1: https://edube.org/study/jse1?gclid=Cj0KCQiAmaibBhCAARIsAKUlaKT0G0zv7oo_9r 4QIX0DS2e-EKkfDcz o7s2E 9salVSOrP5zxXKRhEaAhNpEALw wcB E book link R2: https://www.packtpub.com/product/advanced-javascript/9781789800104

Topics relevant to development of "Employability": JDBC Drivers & Architecture, Life Cycle of a Servlet, using Tomcat for servlet development for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: We	eb Services		I - P- C	1	Д	3		
CSE311	Type of Course: L	aboratory integrated			-	-	5		
Version No.	2.0								
Course Pre- requisites	Web Services	Neb Services							
Anti-requisites	NIL	NIL							
Course Description	The course incl components and technology, unde students will also form the basic bu Topics include: fundamentals, Wa framework, Servi	The course includes the basic principles of service-oriented architecture, its components and techniques. It provides an understanding of the architecture, eechnology, underlying service design and development aspects of web services. The students will also gain knowledge on the operational aspects of cloud services, which form the basic building blocks of cloud computing. Fopics include: Introduction to Service Oriented Architecture, Web Service fundamentals, WS-* extensions, Building Service Oriented Architecture, Web Services framework, Service Descriptions (WSDL), Messaging (SOAP & RESTful). Web Service							
	Transactions, Orc	hestration and Chored	graphy, Polici	es, Secur	ity.				
Course Objectives	The objective of t Services and attai	The objective of the course is to familiarize the learners with the concepts of Web Services and attain Employability Skills through Experiential Learning techniques.							
Course Out	On successful con	npletion of this course	the students	shall be a	ble to:				
Comes	 Describe the concepts of web services and service oriented architecture.[Knowledge] Develop a SOAP based Web Services for a given scenarios. [Application] Develop a RESTful architecture based Web Services for a given scenario.[Application] Demonstrate the cloud based micro services [Comprehension] 								
Course Content:									
Module 1	Fundamentals of SOA and Web Services (Knowledge)	Assignment	Programming	; activity		13 S	essions		
Evolution and Emergence of Web Services – Evolution of distributed computing. Core distributed computing technologies – client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Challenges in Distributed Computing, Introduction to Web Services – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services									
Module 2	Sorrices (Application)	Assignment	Programming	activity		10 S	essions		
Overview of SOA language basics, applications of SC	AP protocol, SOAF Creating Web Se DAP based Web ser	P Messaging Format, prvices using SOAP, vices.	WSDL, WSD Deployment	L related of SOAI	XML S Servio	Schema, ces, Rea	WSDL al-world		
Module 3	RESTful Web Services (Application)	Assignment	Programming	g activity		10 S	essions		
Overview of RES Development and Services.	ST architectural sty I Deployment of I	le, URIs and Resourc RESTful Web Service	es, REST Prin es, Real-world	ciples, R applicat	EST M ions of	lethods, FRESTf	Design, ful Web		

Module 4	Advances in Wo services (Knowldge)	e b Assignment	Programming activity	8 Sessions
Cloud Services o	verview, Design, Deve	elopment and Deployr	nent of cloud service	es; Concept of Micro
Services, Archited	cture and Development			
Text book(s):				
Thomas Erl <i>, "Serv</i>	ice-Oriented Architectu	re: Concepts, Technolo	ogy, and Design", Pea	rson Education. 2005
Reference Book(s):			
1. Heather Williar	nson, "XML, The Comp	lete Reference", McGra	aw Hill Education.200)1
	"XMI Web Services A	nd The Data Revolutio	n" Pearson Educatio	- 2002
2. Frank. P. Coyle,	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		, realson Luucatio	n.2002
2. Frank. P. Coyle 3. James Snell, I	Doug Tidwell, Pavel K	ulchenko, <i>"Programm</i>	ning Web Services	n.2002 <i>with SOAP",</i> O'Reilly
2. Frank. P. Coyle, 3. James Snell, I publishers. 2002	Doug Tidwell, Pavel K	ulchenko, <i>"Programm</i>	ning Web Services	n.2002 with SOAP", O'Reilly
2. Frank. P. Coyle 3. James Snell, I publishers. 2002 E-References	Doug Tidwell, Pavel K	ulchenko, <i>"Programm</i>	ning Web Services	n.2002 with SOAP", O'Reilly
 Frank. P. Coyle James Snell, I publishers. 2002 E-References https://puniversit 	Doug Tidwell, Pavel K	ulchenko, <i>"Programm</i> m:2229/login.aspx	ning Web Services	n.2002 with SOAP", O'Reilly
2. Frank. P. Coyle 3. James Snell, I publishers. 2002 E-References https://puniversit Topics relevant to	o "SKILL DEVELOPMEN	n:2229/login.aspx	sign and developme	n.2002 with SOAP", O'Reilly nt of web services for
 Frank. P. Coyle James Snell, I publishers. 2002 E-References https://puniversit Topics relevant t Skill Development 	Doug Tidwell, Pavel K ty.informaticsglobal.com o "SKILL DEVELOPMEN nt through Experienti	m:2229/login.aspx T": Case studies of de al Learning technique	sign and developme sign This is attained	n.2002 with SOAP", O'Reilly nt of web services for through assessment

Course Code:	Course Title: Cloud Computing		3	0	3			
CSE233/CSE306	Type of Course: Theory	L-P-C	5	0	J			
Version No.	1							
Course Pre-	Basics of Distributed Computing, Service Oriented Architecture							
requisites								
Anti-requisites	il l							
Course Description	his Course is designed to impart the knowledge of Cloud Computing as a new omputing paradigm. The course explores various Cloud Computing erminology, principles and applications. The course also demonstrates the ifferent views of the Cloud Computing such as theoretical, technical and ommercial aspects.							
Course Objective	Computing and attain Employability through Participative Learning techniques.							
Course Out Comes	 On successful completion of the course the students shall be able to: Describe fundamentals of cloud computing, virtualization and cloud computing services. Explain security and standards in cloud computing. Discuss Cloud mechanisms to optimize the QoS parameters. Develop applications using Cloud services and VM instances. 							
Course Content:	Course Content:							
Module 1			10	Sessio	ons			
Introduction to Cloud Computi Environments, C Architecture, Iaa	Cloud ng at a Glance, Historical Developments, omputing Platforms and Technologies, Technolog S, PaaS, SaaS, Types of Clouds, Economics of Cl	Buildin y Examj oud	g Clou ples, Clo	id Co oud Co	mputing mputing			
Module 2			10	Sessi	ons			
Virtualization Tech	niques							
Basics of Virtualiza Implementation Le	ation - Types of Virtualizations, Taxonomy of Virtualiza evels of Virtualization.	ition Tecl	nniques,					
Module 3			09	Sessi	ons			
Cloud QoS and Ma	inagement							
Cloud Infrastructu Mechanisms, Clou	Cloud Infrastructure Mechanisms, SLAs, Specialized Cloud Mechanisms, Cloud Management Mechanisms, Cloud Security Mechanisms.							
Module 4	Module 4 09 Sessions							
Cloud Platform	s, Advances in cloud: introduction to Amazon	Web Se	rvices:	Introdu	ction to			
Google App Eng Media Clouds -	gine, Introduction to Microsoft Azure. Security Clouds - Computing Clouds - Mobile	Clouds	– Feder	ated C	Clouds –			
Hybrid Cloud								
 Text Book John Rittinghouse and James Ransome, "Cloud Computing, Implementation, Management and Security", CRC Press. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education. 								

References

1. David E.Y. Sarna, "Implementing and Developing Cloud Applications", CRC Press.

2. Anthony T Velte, Toby J Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw-Hill.

Web resources: https://puniversity.informaticsglobal.com:2229/login.aspx

Topics relevant to development of "Skill Development Aws, Azure, APIs, Aneka Cloud Platform, EC2, Installation of VM Workstation, Infrastructure Security Challenges for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Software	Architecture								
CSE 314				L- T-P- C	3	0	0	3		
	Type of Course: Theory	Type of Course: Theory Only								
Version No.	2.0									
Course Pre-	Software Engineering and Object-oriented Analysis and design									
requisites										
Anti-requisites	NIL									
Course	This course deals with b	asic concepts and prir	nciples rega	arding sof	tware	e archi	tectu	re and		
Description	software design. It start	oftware design. It starts with discussion on importance of Architectures, design issues,								
	followed by coverage of	on design patterns. I	t then give	es an ove	erviev	v of a	rchite	ctural		
	structures and styles.	Practical approaches	and meth	ods for o	creati	ng an	d ana	lysing		
	software architecture is	s presented. The emp	hasis is on	the inter	actior	ו betw	/een q	uality		
	attributes and software	e architecture. Studen	its will also	gain exp	erien	ce wit	h exa	mples		
	in design pattern applic	ation and case studie	s in softwa	re archite	ecture	<u>.</u>				
Course	The objective of the co	urse is to familiarize t	the learner	s with the	e con	cepts	of Sof	tware		
Objective	Architecture and attai	n Employability Si	KILLS throu	ugh PAR	ПСІР	AIIVE	LEAR	NING		
Course Out	techniques.	0	lation of th		41					
Course Out		: On successful comp	letion of tr	ne course	tne					
comes	CO1 Describe the impe	rtance of software ar	chitocturo	in largo d		oftwo	ro			
	systems	intalle of software af	cintecture	in large-s	cales	ontwa	ne			
	CO2 Recognize the mai	or software architect	ural styles	design n	atterr	ns and	4			
	frameworks.		arai seyies,	acoion p	atteri	is, and	A			
	CO3. Distinguish the au	ality attributes of a sy	stem at th	e archite	cture.	secur	itv an	d		
	performance levels.	- , ,			,		- / -	-		
	CO4. Identify the appro	priate architectural pa	attern(s) fo	or a given	scena	ario				
Course Content:		·								
Module 1	Introduction	Quiz	Patterns			08 5	Sessio	ns		
Topics: The Ar	chitecture Business Cycl	e: Where do archited	tures com	e from. S	oftwa	are pro	ocesse	es		
and the archit	ecture business cycle; v	What makes a "good	d" architect	ture. Infl	uence	e of so	oftwar	e		
architecture or	n organization-both busi	ness and technical, W	/hat softwa	are archit	ectur	e is ar	id wha	at		
it is not; Ot	her points of view; A	Architectural pattern	s, referen	ce mode	els ar	nd ref	ferenc	e		
architectures;	Architectural structures	and views.				- <u>r</u>				
Module 2	Architectural Styles and	l Quiz	SOA			07	Sessi	ions		
	Case Studies									
Topics: Architect	ural styles; Four Archit	ectural Designs for t	the KWIC	System <mark>;</mark>	Pipes	and f	ilters;	Data		
abstraction and o	object-oriented organiza	tion; Event-based, im	iplicit invo	cation; La	yerec	l syste	ems; S	ervice		
Studios: Kowword	Lin Contoxt Mobile Pob	at system	elers; nele	erogeneo	us ar	chitec	tures.	Case		
Studies. Reyword	Quality: Eunctionality									
Module 3	and architecture	Quiz	MVC			09	Sessi	ions		
Topics:Architectu	ire and quality attribut	tes; System quality	attributes;	Quality	attrik	oute s	cenar	ios in		
practice; Busines	s qualities; Introducing	tactics; Availability	tactics; Mo	, difiabilit	y taci	ics; P	erforn	nance		
tactics, Security t	actics. Quality Model, A	pplication of The Cus	tomized Q	uality Mo	del to	o a Cas	se Stu	dy		
Module 4	Architectural patterns and styles	Seminar	Architectu	ural styles	;	17	Sessio	ns		
Topics: Archite	ectural Patterns: Introd	uction; From Mud to	Structure	: Layers,	Pipe	s and	Filter	s,		
Blackboard, Di	stributed Systems: Broke	er. Design Patterns: St	ructural de	ecomposi	tion: \	Whole	– Par	t;		
Organization o	f work: Master – Slave;									
Model View C	ontroller and Reflection	patterns. Introduction	on to Servio	ce Oriento	ed Ar	chitec	ture,	Three		
Гуреs of Service-Oriented Architecture										

Targeted Application & Tools that can be used:

Multiple integrations with other major architecture software(ArchX, Archisoft, Build software, Astena, Bouwsoft, Teamleader, Total Synergy, etc.) and export opportunities with google drive, dropbox, and CSV formats allow this tool to be widely and comfortably used in the industry.

Professionally used software – Slack, Google calendar, outlook email, and others.

Text Book

1. T1. Software Architecture in Practice – Len Bass, Paul Clements, Rick Kazman, 2nd Edition, Pearson Education, 2003.

T2. Pattern-Oriented Software Architecture, A System of Patterns - Volume 1 – Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal, John Wiley and Sons, 2007.

T3. Mary Shaw and David Garlan: Software Architecture-Perspectives on an Emerging Discipline, Prentice-Hall of India, 2007.

References

R1. Design Patterns- Elements of Reusable Object-Oriented Software – E. Gamma, R. Helm, R. Johnson, J. Vlissides:, Addison- Wesley, 1995.

E-Resources

W1. Web site for Patterns: <u>http://www.hillside.net/patterns/</u>

Topics relevant to the development of SKILLS: Case study on Architectural styles, Model View Presenter (MVP) Architecture for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Compiler Desig	gn					2	4	0	4
CSE 217	Type of Course	o: Theory	Only			L-1-P- C	3	T	0	4
Version No	2 0	e. meory								
Course Pre-	nil									
requisites										
Anti-requisites	NIL	NIL								
Course	The Course is	intended	to tea	ch the stude	nts the basic	techniq	ues tha	it und	lerlie	the
Description	practice of Cor	practice of Compiler Construction. The Course will introduce the theory and tools that								
	can be employed in order to perform syntax-directed translation of a high-level									
	programming	programming language into an executable code. Topics consist of: Introduction to								
	Compilers, Lan	nguage tra	inslate	ors: compilers	s and interpre	eters. Le	kical Ar	nalysis	s, Rol	e of
	the parser ,sen	nantic ana	ilysis,	Intermediate	Code Genera	ation, Coo	de Opti	mizat	ion, L	DAG
	representation	1 OT Basic	BIOCKS	s, Global opti	mization, Pee	ephole O	ptimiza	ition,	Garb	age
	Collection, Par	allel Archi	itectu	les.						
Course	The objective	of the cou	ırse is	to familiarize	e the learners	s with th	e conce	epts o	f Con	npiler
Objective	Design and techniques.	attain S	SKILL	DEVELOPM	ENT throug	h PART	ICIPAT	IVE	LEAR	NING
Course Out	On successful (completio	n of t	he course the	e students sha	all be abl	e to:			
Comes	1. Explair	n the basi	c conc	epts of comp	iler and its va	arious ph	ases.			
	2. Constr	ruct front	end o	f the compile	r.					
	3. Apply	suitable d	ata st	ructure to im	prove efficie	ncy of co	mpiler.			
	4. Genera	ate Intern	nediat	e code for th	e given state	ments.				
	5. Discus	s how to o	optim	ize the progra	am for backe	nd of the	e comp	iler fo	or diff	erent
Course Contents	computer arci	nitecture								
course content.		ndlevica	1							
Module 1	Analysis		Term	paper	Data Ana	lysis		13	Sessi	ions
Topics: Compile	rs , Analysis of	the sour	ce pro	pgram ,Phase	es of a comp	iler ,Cou	isins of	f the	Com	, oiler
Grouping of Pha	ases, Compiler	construct	ion to	ools, Lexical	Analysis , R	ole of L	exical /	Analy	zer ,	Input
Buffering, Specif	ication of Toker	n, – Recog	nizer ·	- Introduction	n to LEX Prog	ramming	•	1.4-		
Module 2	Syntax Analysis	s	l erm	i paper	Data Ana	lysis		15	Sessi	ons
I OPICS: ROIE OF T	ne parser, lop	Down pa	rsing,	Recursive de	ecent parser	- Predict	ive par	ser -	BOTTO	m-up
parsing shirt red	Somantic Analy	veic And	R pars		Doto Apo	LR parser	- IACC	, prog	rann	ning.
Module 3	Intermediate (ode	Data	Allalysis	Data Alla	19515		8 Sossio		
inouale 5	Generation	louc						0	50351	0113
Introduction to s	syntax directed	translatio	n - Svr	nthesis and in	herited attril	outes - T	pe Che	ecking	g - Tvi	be
Conversions .To	oics: Intermedia	ate langua	nges, D	Declarations,	Assignment	Stateme	nts , Bo	olea	יי, ח	
Cas, Expressions	e Statements –	- Back pate	ching -	- Looping sta	tements - Pro	ocedure o	calls.			
•			Ū							
Module 4	Code Optimiza	ation	Data	Analysis	Data Ana	lysis		8	Sessi	ons
Topics: Optimiza	ation of basic Bl	locks, Int	roduc	, tion to Globa	I Data Flow	, Analysis,	Basic	Block	s and	Flow
Graphs, Next-us	e Information,	Machine	Indepe	endent Code	Optimization	is, DAG i	represe	entati	on of	Basic
Blocks, Peephole	Optimization.									
Module 5	Code Generation		Dat	a Analysis	Data Analy	ysis		8 Ses	sions	
Storage Organiza	ation, Stack Allo	cation Spa	ace, A	ccess to Non	-local Data or	n the Sta	ck, Hea	р Ма	nage	ment,
Issues in the des	ign of code gene	erator, Th	e targ	et machine R	egister alloca	ition, A si	imple C	ode g	gener	ator
Targeted Applic	ation & Tools th	nat can be	used			•	,		. .	
The knowledge o	of this course ca	in be appl	ied in	the building	automatic tr	anslators	(comp	oilers)	tor h	igher
ievei programmi	ng languages. P	roressiona	any us	ed software -	-iex and YAC					

Assignment:

Assignment 1- Translate the arithmetic expression: a+ -(b+c) into quadraples, triples and indirect triples. Assignment 2- Draw the DAG for the arithmetic expressiona+a*(b-c)+(b-c)*d.

Text Book

1. Alfred V. Aho, Jeffrey D Ullman, "Compilers: Principles, Techniques and Tools", Pearson .

References

- 1. Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", BS Publications.
- 2. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings.
- 3. HenkAlblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI.
- 4. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning.
- 5. Dhamdhere, D. M., "Compiler Construction Principles and Practice", Macmillan India Ltd.

E-Resources

https://puniversity.informaticsglobal.com:2229/login.aspx

Topics relevant to the development of SKILLS:

To optimize the program for backend of the compiler for different computer architecture for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course	Course Title: Digital Design Laboratory						
Code: CSE252	Type of Course: Laboratory Only	L-P-C	0	2	1		
Version No.	2.0						
Course Pre-requisites	Basics of Electronics: AC & DC Circu Number Systems, Logic Gates.	iits, Boo	lean A	lgebra	ι,		
Anti-requisites	NIL						
Course Description Course Objective	Implementing digital design concepts like verification of logic gates, De Morgan's theorem, Reducing Boolean expression using K-map, Adder and subtractor circuits, Number conversion, Multiplexer and De multiplexer using gates, Flip flops, shift registers and counters. The objective of the course is to familiarize the learners with the concepts of Digital Design and attain SKILL DEVELOPMENT through EXPERIENTIAL						
Course Outcome	 After successful completion of course, students shall be able to i.Develop a simplified logic through simplification technique for complex Boolean functions using logic gates and Hardware Description Language. ii.Demonstrate various combinational and sequential circuits. iii.Implement logic circuits that can function in real life situations 						
Course Content:							

1.	: Verify the truth table / functionality of basic logic gates and universal gates using appropriate ICs
2.	: Federal bank has implemented Intrusion Detection and Avoidance System, customer can access his locker only under below mentioned conditions. The security system for locker should not allow anybody to access the lockers at any other circumstances.
	 Lock A, B, C are Open. Lock A and B are Open but Lock C is Closed. Lock A and C are Open but Lock B is Closed. Lock C and B are Open but Lock A is Closed. i.Draw a truth table for this situation and obtain a Boolean expression. Minimize this expression and implement the logic circuit using NAND gates only
3.	 Mercedes Benz has implemented failsafe sensors for its latest engine. It has 4 failsafe sensors. Engine should switch off to safeguard the passenger and the vehicle for certain hazardous situations, else, engine should keep running unless any of the following conditions arise: If sensor 1 is activated. If sensor 2 and sensor 3 are activated at the same time. If sensor 4 and sensor 3 are activated at the same time. If sensors 2, 3, 4 are activated at the same time.

4.	: A digital system is to be designed in which the month of the year is given as input in four-bit form. The month January is represented as '0000', February '0001' and so on. The output of the system should be '1' corresponding to the input of the month containing 31 days or otherwise it is '0'. Consider the excess numbers in the input beyond '1011' as don't care conditions for system of four variables (A, B, C, D). Design and implement the simplified logic using NAND gates only
5.	: Realize and implement a logic circuit that can convert a given binary value to its gray code equivalent and vice versa
6.	: Infosys provides intercom facility (EPABX) to all its employees. Development team A is comprised of 16 people positioned in D block. All the team members can communicate with the outer world individually, but the outgoing line is only one. The condition is, the EPABX system is equipped with an 8:1 multiplexer. Realize and implement a logic circuit to enable all the 16 people communicate with the outer world (Function is given).
7.	: An event detector is implemented using single JK flip-flop. The output of the event detector becomes uncertain when both the inputs are high. Rectify the problem by cascading one more JK Flip Flop to the first one. Note the changes observed in the output and verify the truth table.
8.	: Implement a circuit to count number of floors in ascending order for an elevator that can travel from 0th floor to 7th floor using IC-7476
9.	: Using IC-7495, design a circuit to implement the following: i.Ring Counter ii.Johnson Counter
10.	: Implement the following function as a decoder using basic gates. $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
11.	: Write Verilog program for the following combinational design along with test bench to verify the design 2 to 4 decoder realization using NAND gates only (structural model)
12.	: Write Verilog program for the following combinational design along with test bench to verify the design b. 8 to 3 encoder with priority and without priority (behavioural model)
13.	: Write Verilog program for the following combinational design along with test bench to verify the design 8 to 1 multiplexer using case statement and if statements
14.	: Write Verilog program for the following combinational design along with test bench to verify the design 4-bit binary to gray converter using 1-bit gray to binary converter 1-bit adder and subtractor
15.	: Model in Verilog for a full adder and add functionality to perform logical operations of XOR, XNOR, AND and OR gates. Write test bench with appropriate input patterns to verify the modeled behaviour

Targeted Application & Tools that can be used: Xilynx Tool

Text Book

1. Mano, M. Morris and Ciletti Michael D., "Digital Design", 5^{th} Edition 2017, Pearson Education

References

 Donald P Leach, Albert Paul Malvino and Gautam Saha, "Digital Principles and its applications", 7th Edition 2010, McGraw Hill Education.
 <u>https://nptel.ac.in/courses/108106177</u>

Topics relevant to "SKILL DEVELOPMENT": 8:1 multiplexer, Ring Counter, Jhonson Counter, JK Flip-Flop, decoder for **Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.

	Course Title: Data Mining				3 0)	3			
Course Code: CSE307	Type of Course: Discipline E	lective/ Theory	Only	L- P- C						
Version No.	2.0						<u>i</u>			
Course Pre-	Students are expected to be	e familiar with t	the basics o	of Linear	Algebra	a, Probal	oility and			
requisites	Statistics and should have a	Statistics and should have a knowledge on DBMS.								
Anti-requisites	NIL									
	Introduction, Applications, i	ntroduction, Applications, issues in data mining, data pre-processing techniques, data								
Course	mining tasks, association i	nining tasks, association rules, advanced association rules, classification, different								
Description	approaches for classification	approaches for classification, clustering, outlier detection. Recent trends in data mining.								
Course	The objective of the course is to familiarize the learners with the concepts of Data									
Objective	Mining and attain Employ	ability through	h Problem	ı Solvin	g Metho	odologie	S			
	On successful completion o	f the course the	e students :	shall be	able to:					
	Apply the value	arious pre-proce	essing tech	niques n	eeded fo	or a data	mining			
Course Out	task.						h			
Comes	Understand Approciate f	the functionalit	ty of the va	rious da	ta minin rigus dat	ig algorit	nms.			
	models	the strengths ar			nous uat	.a mmm	>			
	Understand	the advances ir	n data mini	ng for re	eal life ap	oplicatio	ns.			
Course Content:										
Module 1	Introduction to Data Mining	Assignment	Data Colle	ction		5	Sessions			
Topics:						ł				
Introduction to	Data mining – Data Mining	g Goals– Stage	s of the D	ata Min	ing Prod	cess–Dat	a Mining			
Techniques– Me	erits and Demerits.		1							
Module 2	Data preprocessing	Quiz	Prot	olem Sol	ving	9	Sessions			
Topics: Types of data – I measures.	Pre Processing steps – Data P	Preprocessing Te	echniques -	– Similar	ity and [Dissimila	rity			
Module 3	Data Mining – Frequent Patterns	Assignment	Prot	olem Sol	ving	7	Sessions			
Topics:										
Market Basket Algorithm– FPG	Analysis, item sets – Gene rowth.	erating frequen	t item set	s and r	ules eff	iciently	– Apriori			
Module 4	Classification and clustering	Assignment	Prot	olem Sol	ving	11	Sessions			
Classification ar	nd Clustering Decision tree	Induction – Ba	yesian clas	sificatio	n –Class	sification	by Back			
Propagation - L	azy learners – Modern eva	luation and sel	ection tecl	hniques	to impr	ove clas	sification			
accuracy. Cluste	ring Analysis – portioning me	ethod – Hierarch	nical metho	ods – De	nsity bas	ed meth	od			
Module 5	Outlier detection & Data mining trends	Assignment	Prot	olem Sol	ving	5	Sessions			
Anomaly detect	ion preliminaries - Differen	nt Outlier detec	tion techn	iques-W	/eb min	ing- Tex	t mining-			
Demonstration of	of Weka tool.									
	Projec	ct work/Assignr	ment:							
Assignments	he dataget given find the 1	Entrony Cair	ualua of 1	10 attail	utos ar	d also	draw the			
decision tree using entropy for the given dataset.										

2. Transactional Data Base, D given below which contains set of items find the frequent item set using the Apriori Algorithm and generate the Association Rules. Minimum Support count is 2%. Minimum confidence is 60%.

Text Book

T1 T1. Tan P. N., Steinbach M & Kumar V. "Introduction to Data Mining", Pearson Education, 2016.

References

R1 Han J & Kamber M, "Data Mining: Concepts and Techniques", Elsevier, Second Edition, 2006

R2 *G K Gupta, "Introduction to Data Mining with Case Studies", PHI, Third Edition, 2014.*

R3 Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill

Additional web-based resources

W1. <u>https://onlinecourses.swayam2.ac.in/cec20_cs12/preview</u> Text book of Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber and Jian Pei, Morgan Kaufmann Publishers, 2012. W2.https://puniversity.informaticsglobal.com:2284/ehost/detail/detail?vid=7&sid=e2d7362afd3049a98f0393e963521dbd%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=377411 &db=nlebk

3. https://nptel.ac.in/courses/105105157

Topics relevant to "EMPLOYABILITY SKILLS": Data Mining Techniques, FP Growth for developing **Employability Skills** through **Participative Learning** techniques. This is attained through the assessment component mentioned in the course handout.

Course Code: CSE2009	Course Title: Computer Organization and Architecture	L- P- C	3	0	3			
Version No.	2.0	•						
Course Pre- requisites	CSE 2015 Digital Design							
Anti-requisites	NIL							
Course Description	This course introduces the core principles of computer architecture and organization from basic to intermediate level. This theory based course emphasizes on understanding the interaction between computer hardware and software. It equips the students with the intuition behind assembly-level instruction set architectures. It helps the students to interpret the operational concepts of computer technology as well as performance enhancement.							
Course Objective	The objective of the course is to familiarize the learners with the concepts of Computer Organization and Architecture and attain Skill Development through Participative Learning techniques.							
Course Outcomes	On successful completion of the course the students shall be able to: 1] Describe the basic components of a computer, their interconnections, and instruction set architecture [Comprehension] 2] Apply appropriate techniques to carry out selected arithmetic operations							

	3] Explain the organization of memory and processor sub-system						
Course Content:							
	Basic Structure of	d					
Module 1	computers	Assignment	Data Analysis task	12 Classes			
Topica							
Computer Types	Functional Units Bas	ic Operational conc	ents Bus Structures Com	nuter systems			
RISC & CISC. Perf	ormance – Processor (Clock, Basic Perform	ance Equation. Clock Rate.	Performance			
Measurement. Ai	rithmetic Operations o	n Signed numbers.	Instructions and Instruction	n Sequencing.			
Instruction forma	ts, Memory Instructior	IS.		1 0,			
	Instruction Set	-					
Module 2	Architecture and	Assignment	Analysis, Data Collection	12 Classes			
	Memory Unit						
Topics:							
Instruction Set A	Architecture: Address	ing Modes, Stacks a	nd Subroutines.				
Memory System	: Memory Location a	ind Addresses, Mei	mory Operations, Semicor	nductor RAM			
Memories, Intern	al Organization of Mer	nory chips, Cache m	emory mapping Techniques	S.			
	Arithmotic						
Module 3	and Input/output	Case Study	Data analysis task	10 Classes			
inouule 5	Design			10 Classes			
point operations. Input/output Des Memory Access, I	ign: Accessing I/O Devi Buses, Interface Circuit	ces, I/O communica s	tion, Interrupt Hardware, D	Virect			
Module 4	BPU and Pipelining	Assignment	Analysis, Data Collection	11 Classes			
		•					
Topics:				_			
Basic Processing	Unit: Fundamental Cor	ncepts, Single Bus or	ganization, Control sequen	ce, Execution			
Pinelining: Parall	al Processing Pipelinin	Organization. A Arithmetic Pinelin	e Instruction Pineline Haz	ards			
	tion & Tools that can b	e used:					
- al Perce Applied							
Targeted employ	ment sector is processo	or manufacturing an	d memory chip fabrication	vendors like			
Intel, AMD, Moto	rola, NVidia, Samsung,	Micron Technology	, western Digital etc. Target	ted job			
profiles include Memory circuit design and verification engineers, Physical system design engineer,							
System programmer, Fabrication engineer etc.							
Toolo							
Virtual La							
 Teias – la 	va Based Architectural	Simulator. IIT Delhi					
Text Book							
1. Carl Ham	nacher, Zvonko Vrane	sic, Safwat Zaky, "	Computer Organization",	Fifth Edition,			
McGraw-Hill	Higher Education, 2016	6 reprint.	,	,			
References							

1. William Stallings, "Computer Organization & Architecture – Designing for Performance", 11th

Edition, Pearson Education Inc., 2019

2. David A. Patterson & John L. Hennessy, "Computer Organization and Design MIPS Edition-The Hardware/Software Interface", 6th Edition, Morgan Kaufmann, Elsevier Publications, November 2020.

Web References:

1. NPTEL Course on "Computer architecture and organization" IIT Kharagpur By Prof. Indranil Sengupta, Prof. Kamalika Datta. https://nptel.ac.in/courses/106105163

2. NPTEL Course on "Computer Organization", IIT Madras By Prof. S. Raman. https://nptel.ac.in/courses/106106092

3. https://puniversity.informaticsglobal.com:2229/login.aspx

Topics relevant to "SKILL DEVELOPMENT": Generation of Computers, CISC and RISC processors, Bus Arbitration, Collaboration and Data collection for Term assignments and Case Studies for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course	Course Title: Discrete Mathematics					
Code:			4	0	4	
CSE203	Type of Course: Program Core& Theory	L-1 -C				
	Only					
Version No.	2.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course highlights the basics of discrete to solve problems involving mathematical l principles of counting, pigeonhole prin Principles of Inclusion and Exclusion. for applications in allied subjects. It is a pre- involving Compiler Design, Artificial Inte- conceptual and analytical in nature that wo concepts of discrete structures to solve an The students should have prior knowledge the Course. After successful completion of t acquire knowledge to solve problems invo- functions, relations, principles of count recurrence relations, Principles of Inclu- emphasis on real-world engineering application.	e structur logic, sets aciples, and crequisite lligence. uld help ad predict e of basic the Cours lving mat ting, pig sion and ations and	es and s, fund recurr mom for This the stution o c math e, the hema eon l d Exc d prob	d develop ctions, re ence re ents wit several (course udent to f data ar nematics students tical logi hole pri lusion w lem solv	ability lations, lations, lations, ch their Courses is both use the alytics. pursue s would c, sets, nciples, vith an ing.	
Course Objective	The objective of the course is to familiarize of Discrete Mathematics and attain SKILL D PROBLEM SOLVING Methodologies techniq	the learn EVELOPM ues.	iers w 1ENT t	ith the co hrough	oncepts	
Course Out Comes	 On successful completion of the course the students shall be able to: 1] Describe a logic sentence in terms of predicates, quantifiers, and logical connectives. 2] Solve problems on Functions and Relations using basic principles of Set Theory. 3] Explain the concepts of Boolean Algebra. 4] Apply basic counting techniques to combinatorial problem. 					
Course Content:						

Module 1	Foundations of Logics and Proofs	Assignment	Problem Solving	10 Sessions
Topics: Propositional Logic, Pro to Proofs, Resolution by Assignment: Problems.	positional Logic Eq Refutation, Predic	uivalences, Inferen cates and Quantifie	nce rules, Normal forms ers, Introduction to Proc	, Introduction ofs.
Module 2	Basic Structures: Sets, Functions, Relations	Assignment	Problem Solving	10 Sessions
Topics: Sets and set-operations, Composition, Sequences Equivalence Relations, Cl Assignment: Problems a	Venn Diagram, Car and Summations, osure of Relations nd applications	rdinality of Sets, Fu Relations and thei	unctions: Types, Invertik r properties & represen	le Functions, tations,
Module 3	Posets, Lattices and Boolean Algebra	Assignment	Problem Solving	10 Sessions
Topics: Partial ordering, Posset, I algebraic systems by latt lattice & Boolean algebra Assignment: Problems ar	Hasse Diagram, La ices, Distributive la a,Topological Sorti nd Applications	ttices & Algebraic s attices, complemer ng.	structures, Basic proper nt of an element in a lat	ties of tice, Boolean
Module 4	Principles of Counting Techniques	Assignment	Problem Solving	12 Sessions
Number Theory: Intege Pigeon Hole Principle, Recurrence Relations, Inclusion and Exclusion Assignment: Problems ar Targeted Application & NIL Project work/Assignme	ers and Division, Ge Mathematical Inc Applications of Re , Applications of In ad Applications Tools that can be	CD, Chinese Remai duction, Generalize currence Relation iclusion and Exclus used:	inder Theorem, Solving ed Permutations and (s, Generating Function ion.	Congruences, Combinations, s, Principle of
Problems on all the topi	ics and relevance v	with field of compu	iter science	
Text Book T1. Kenneth H. Rosen, Edition,2018.	"Discrete Mather	matics and its Ap	plications", McGraw-Hi	ll,s 7th
R1: Susanna EPP, "Dis Edition, 2010 R2. Thomas Koshy, "Dis R3: Discrete mathemati Mott, Abraham Kandel, 9332550490	crete Mathematic crete Mathematics cs for Computer S Theodore Baker; F	cs with Applications with Applications cientists and Math Pearson Education	ons", Cengage Learning ", Elsevier, India, 2009. nematicians, Paperback India; 2 edition (2015),	g, 4th (Rs. 533), Joel ISBN-13: 978-
Weblinks: W1: https://puniversity W2: <u>https://www.youtu</u>	.informaticsglobal ube.com/playlist?li	.com:2229/login.as <u>st=PLBInK6fEyqRh</u>	spx qJPDXcvYlLfXPh37L89g3	<u>3</u>

Course Code:	Course Title: Int	roduction to Combinat	orics and						
CSE225	Graph Theory			L- P- C	3	0	3		
	Type of Course:								
Version No.	2.0								
Course Pre-	Discrete Mathematical Structures								
requisites									
Anti-requisites	NIL								
Course	This course is a blend of the mathematical techniques applicable to Computer science,								
Description	Information Technology and Statistics. Graph Theory gives us, both an easy way to pictorially represent many major mathematical results, and insights into the deep theories behind them. In this course, among other intriguing applications, we will see how GPS systems find shortest routes, how engineers design integrated circuits, how biologists assemble genomes, why a political map can always be colored using a few colors. Topics Include: Principles of Inclusion and Exclusion, Rook Polynomial, Derangements. Graph Theory: Graph Terminologies, Isomorphism, Coloring, Matching, Planar Graphs, Trees Terminologies, Traversals, Spanning Trees, Shortest path algorithms, Prefix Codes.								
Course Objective	The objective of the course is to familiarize the learners with the concepts of Introduction to Combinatorics and Graph Theory and attain SKILL DEVELOPMENT								
Course Out	On successful com	pletion of the course t	he students s	hall be a	ble to:				
Comes	CO1: Discuss the fundamental concepts of Graph theory, theorems of matching, connectivity, coloring, and planar graphs. [L2: Comprehension] CO2: Discuss different types of trees and traversal techniques. [L2: Comprehension] CO3: Apply different algorithms to find optimal path for a given graph. [L3: Applications] CO4: Application of different mathematical proofs techniques in proving theorems. [L3:								
	Principles of		Comprehens	sion base	ed				
Module 1	Counting	Assignment and Quiz	, Quizzes and	Assignm	ent	12 S	essions		
The Principle of Inclusion and Exclusion, Generalizing Inclusion – Exclusion Principles, Derangements – Nothing is in its Right Place, First order and second order homogeneous recurrence relations – Non- homogeneous recurrence relations, Generating functions –Exponential generating function.									
Module 2	Introduction to Graph Theory	Assignment and Quiz	Comprehens Quizzes and	sion base Assignm	ed ent	18 S	essions		
Basic Concepts:	definition, types	of graphs, Graph T	erminology	and Spe	ecial Ty	pes of	Graph,		
representation of a graph and connectedness graph: (paths, walk. cycles, edge deleted and vertex deleted). Graph isomorphism, Eulerian graph, Hamiltonian graph, Planar graph (three utility problem), Graph traversal- BFS, DFS, Transport network-Max-flow/Min-cut algorithm ,Graph coloring.									
Module 3	Trees	Assignment and Quiz	Comprehens Quizzes and	sion base Assignm	ed ent	18 S	essions		
Tree: Definitions, properties, Binary search tree, Rooted trees-M-ary tree, weighted tree, Prefix code- Huffman code, Game Tree, Decision tree, Tree traversal: in-order, pre-order, post-order, infix, postfix, prefix, spanning tree, Algorithm on networks : Shortest path algorithm- Dijikstra's algorithm, Minimal spanning tree- Kruskal algorithm and Prim's algorithm.									

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Text Book

- 1. K H Rosen, "Discrete Mathematics and its Application", McGraw Hill.
- 2. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson
- Education. 2004.

References

- 1. Harris, Hirst amd Mossinghoff," Combinatorics and Graph theory", Springer. [R1]
- 2. Grimaldi," Graph Theory and Combinatorics", Pearson Education. [R2]
- 3. J Nestril and etal," Introduction to Discrete Mathematics", Oxford University Press. [R3]

Weblinks

https://puniversity.informaticsglobal.com:2229/login.aspx

Topics relevant to "SKILL DEVELOPMENT": Rooted trees-M-ary tree, weighted tree, Prefix code-Huffman code, Game Tree for Skill Development through Problem Solving Methodologies. This is attained through assessment component mentioned in the course handout.

Course Code: CSE 211	Course Title: COMPUTER NETWORKS Type of Course: Program Core Theory	L-P-C	3	0	3			
Version No.	2.0	•						
Course Pre- requisites	Analog and digital signals, Number representation-binary, decimal, hexadecimal, Binary-Logical, Operations, Frequency, Amplitude and Phase, Knowledge about directed and undirected graphs and Basics of Communications.							
Anti-requisites	NIL							
Course Description	The main emphasis of this Course is on the organization and management of networks. The Course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and protocols, and gaining practical experience in the installation, monitoring, and troubleshooting of LAN systems.							
Course Objectives	The objective of the course is to familiarize the learn COMPUTER NETWORKS and attain SKILL DEVELO PARTICIPATIVE LEARNING techniques	ners wit DPMEN	th the Γ thro	concepts ugh	s of			

Course Out Comes	Jourse OutOn successful completion of the course the students shall be able to:ComesCO1: Describe The Basic Concepts Of Computer Networks And Reference									
	Models. [Knowledge]									
	CO2: Describe The	Physical	And	Data	Link	Layer	Func	tionalities.		
	[Comprehension]	knowlodg	o of ID	addra	ccina ·	and rout	ina m	ochanisms		
	onnect to a computer i	etwork. [A	on ir	ationl	ssing	anu i out	mg m	echanishis		
	CO4:Explain Th	e Function	alities	s Of Tr	anspo	rt Layer	And A	pplication		
	er.[Comprehension]				-	-				
Course Content:										
	Introduction to data							No of		
Module 1	communication and	Assignmen	t	Know	vledge			Sessions:9		
Terries Interation	computer networks:	Turner later				1.1				
Topics: Introduct	tion, Networks, Network	Types, Inter	net H	istory, I	rotoco	l Layering	g, The	OSI Model,		
	inte, Networking Devices									
	Γ									
Module 2	Physical And Data Link	Assignmen	t	Comr	rehens	sion		No. of		
	Layer		•	· ·			<u>Se</u>	essions: 9		
Topics: Data An	d Signals, Digital Signal	s, Transmiss	sion Ir	npairm	ent, Da	ata Rate	Limits	: Noiseless		
Channel, Nyquist	BIT Rate, Noisy Channel	rror Control		ty Per	torman	ice, Error	– Dei	tection And		
ABO Sliding Wind	WINDER Wired I AN Fthe	rnet	-stop P	And wa	l, GO Da		i, selet	лие кереас		
	Network Laver:	. .								
Module 3	5	Assignmen	t	Appli	cation			No. of		
							Se	essions:12		
Topics: Network I	ayer Services, Packet Swi	tching, Ipv4 /	Addres	ses, IPv	4 Head	er, Basic I	Routing	g Algorithm,		
Unicast Routing P	rotocols: Interior Gatew	ay Protocols	s, Exte	rior Ga	teway	Protocols	Intro	duction To		
Iroubleshooting A	and The Future Of Netwo	rking, Ping:	Intern	et Cont	rolivies	ssage Pro	τοςοι,	Traceroute,		
ipvo neauers, mai	Transport layer and							No of		
Module 4	Application Layer	Assignmen	t	Appli	cation		Se	ssions: 12		
Topics: Introducti	on To The Transport Laye	ers, UDP, TC	P, The	Applica	ation La	yer: Dom	nain Na	ame System		
(DNS), Domain Nai	me Space, Name/Address	Mapping, To	elnet, S	SSH , HT	TP, SM ⁻	ГР, FTP.				
Text Books										
1. Behrouz A	. Forouzan, Data Commu	inications a	nd Net	workin	g,4th	Edition,	Tata M	1cGraw-Hill,		
2013.										
References		_					_			
1. Alberto Leon-Ga	arcia and Indra Widjaja: (tion Ne	etworks	- Fund	amental	Conce	pts and Key		
architectures, 2nd	edition Tata Nicgraw-Hill	1, 2004. mmunicatio	n 0+h	Edition	Doorce	on Educat	tion 20	007		
2. William Stalling 3. Larry I. Petersol	and Bruce S. Davie: Com	nuter Netw	n, oun orks — /	Cultion Δ System	, Pearso ms Δnn	roach 4tl	h Fditia	on Elsevier		
2007.	and brace 5. Davie. Com		01 K3 - 1	- Syster	пэ дрр	10acii, 40	Luiti	, בואבעוכו		
4. Nader F. Mir: Computer and Communication Networks. Pearson Education, 2007.										
E-references										
https://nptel.ac.ir	n/courses/106105183									
maata 1						(
Topics relevant to "SKILL DEVELOPMENT" Domain Name Space, Name/Address Mapping for Skill										
Development through Participative Learning. This is attained through the assessment component mentioned in the course handout										
Course Code: CSE255	Course Title: ANALYSIS OF ALGORITHMS LAB Type of Course: Practical	L- T-P- C	0	0	2	1				
------------------------	--	--	----------	----------------	-----------------------	---------	--	--	--	--
Version No.	2.0		•							
Course Pre-	aning of Analysis and various analysis and its extension, Mathematical Induction									
requisites	and its importance to analysis of Algorithms, Introc	its importance to analysis of Algorithms, Introduction to Pseudo code,								
	Knowledge of Recursive and Non Recursive algorith	nms.								
Anti-requisites										
Course	This Course introduces techniques for the design a	Course introduces techniques for the design and analysis of efficient algorithms								
Description	and methods of applications. It deals with analyzi	ing time	and s	pace c	omple	xity of				
	algorithms, and to evaluate trade-offs between dif	ferent a	lgorith	ms. To	pics ir	clude:				
	Brute force- Bubble sort, linear search, Divide-and	-conque	r- Mer	ge sor	t, Quic	k sort.				
	Dynamic programming and greedy technique- Prim	n's, Krus	kal's, E	Dijkstra	's Algo	orithm,				
	Warshall's algorithm, Floy'd algorithm, Coin chang	ging prol	blem, l	Multi s	stage g	raph –				
	Optimal Binary Search Trees ,Backtracking – N Qu	leens Pr	oblem	, Ham	iltonia	n Path				
	Problem, M Coloring Problem. Backtracking.									
Course	I he objective of the course is to familiarize the lear	ners wit	h the c	oncep	ts of A	nalysis				
Objective	of Algorithms Lab and attain SKILL DEVELOPMENT	through	EXPER	KIENTI/	AL LEA	KNING				
Course Out	techniques.	•• • • • • • • • • • • •								
Course Out	On successful completion of the course the studen	ts shall t		e to: and n	on roc	urcivo				
Comes	1. Compute time complexities for var	ious Rec	ursive	anu n	on-rec	ursive				
	Algorithms [Application].	nique fo	r roal	world	nrohlo	mc				
	2. Demonstrate the Brute Force rech	inque iu	n rear	wonu	proble	1115				
	3 Application	e for se	archin	o and o	orting					
	[Application]			Sunas	011116					
	4. Demonstrate the Dynamic Program	nming ai	nd Gre	edy Al	gorith	ns for				
	various applications [Application]	U		,	0					
Course	Non-recursive algorithms: Factorial, Max.									
Content:	Recursive algorithms: Factorial, GCD, Search, Towe	r of Han	oi.							
	Brute Force Technique: Bubble sort, Linear Search.									
	Divide and Conquer: merge sort, quick sort.									
	Dynamic programming: Coin changing problem, M	lulti stag	e grap	h – Op	otimal <mark>.</mark>	Binary				
	Search Trees ,The knapsack problem, Warshall's Al	gorithm	, Floyd	's Algo	rithm.					
	The Greedy Method: Prim's and Kruskal's algorithn	n to find	Minin	ոսm Տբ	bannin	g				
	Tree, Single source shortest path (Djikstra's Algorit	hm), <mark></mark> Bo	olean	Satisfia	bility					
	Problem (SAT).									
	Hamiltonian Path Problem, M Coloring Problem.									
	Backtracking: N-Queens problem.									

List of Laboratory Tasks

1. Apply non recursive algorithmic designing technique to solve Factorial of a number, Linear

Search , finding max element problem and calculate the time efficiency (best, average & worst).Apply recursive algorithmic designing technique to solve Factorial, GCD, , Tower of Hanoi, problems and calculate time (Best, average & worst) efficiency.

3. Apply Brute force algorithmic designing technique to sort elements using bubble sort algorithm and calculate time (Best, average & worst) efficiency.

4. Apply divide and conquer algorithmic designing technique to sort elements using merge sort algorithm and calculate time (Best, average & worst) efficiency.

5. Apply divide and conquer algorithmic designing technique to sort elements using Quick sort algorithm and calculate time (Best, average & worst) efficiency

6. Apply dynamic programming algorithmic designing technique to find All pair Shortest Path for a given graph using Floyds and Warshall's algorithm

7. Apply dynamic programming algorithmic designing technique for Solving 0/1 knapsack problem and find its efficiency.

Apply dynamic programming algorithmic designing technique for Solving Coin changing problem and find its efficiency.

Apply dynamic programming algorithmic designing technique to find Optimal Binary Search Trees.

10. Apply greedy algorithmic designing technique for constructing MST for a given graph using prim's algorithm

11. Apply greedy algorithmic designing technique for constructing minimum spanning tree using Kruskal's algorithm

Apply backtracking algorithmic designing technique for M Coloring Problem

13. Apply backtracking algorithmic designing technique for solving queen's problems for 4, 8 and 16 inputs.

Targeted Application & Tools that can be used:

Social media networks, GPS applications, Google search, e-commerce platforms, Netflix recommendation systems, etc.

Text Book

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI Learning Private Limited.

References

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, 3rd edition.

2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson

E-Resources

NPTEL course – https://nptel.ac.in/courses/106106131

Topics relevant to the development of SKILLS:

- 1. Quick sort
- 2. The knapsack problem
- 3. Warshall's Algorithm
- 4. Floyd's Algorithm.
- 5. Prim's and Kruskal's algorithm to find Minimum Spanning Tree
- 6. Single source shortest path (Dijkstra's Algorithm).
- 7. Backtracking: N-Queens problem.

Course	Course Title: Human-Computer Interaction		I - T-			
Code:			P- C	3	0	03
CSE218	Type of Course: Theory Only					
Version	2.0					
NO.	Desis knowledge of UTNAL and web design					
Course	Basic knowledge of HTIVIL and web design					
requisites						
Anti-						
requisites						
Course	This course highlights the fundamental theories to intro	duce students abo	ut the	hasi		ncents
Descriptio	of human-computer interaction. It will cover the theo	ry and methods the	hat exi	st ir	n the	field
n	Human-computer interaction is an interdisciplinary	field that integr	grates	the	orie	s and
	, methodologies from computer science, cognitive psych	ology, design, and	many	oth	er ar	eas. It
	stresses the importance of good interfaces and the relation	tionship of interfa	, ce desi	gn t	o eff	ective
	human interaction with computers. It helps in cate	gorizing the inter	faces	base	ed c	on the
	processes, methods and programming used. It focuses	s on applications	of eme	ergir	ng fie	elds in
	human computer interaction.					
Course	The objective of the course is to familiarize the learners	with the concepts	of Hur	nan	Con	puter
Objective	Interaction and attain Skill Development through Parti	icipative Learning	techni	que	s.	
Course	On successful completion of the course the students sh	all be able to:				
Out	 Identify the factors influencing user interface 	es; [Knowledge]				
Comes	2) Apply guidelines, principles, theories and m	nethodologies for	design	ing i	inter	faces;
	[Application]					
	3) Select user interfaces based on interface de	sign evaluation. [C	Compre	eher	nsior	ןו
	4) Identify the applications of emerging fie	elds in human co	ompute	er ir	ntera	iction;
	[Comprehension]					
Course						
Content:	Introduction to					20
Modulo 1		nowlodgo			c.	20
Would I		nowieuge			5	531011
Introductio	n to HCI – Importance of HCI - Human Perception - Inpu	ut output channels	. Hum	an n	nem	orv.
Thinking R	easoning and problem solving Emotion Psychology and	d the design of int	eractiv		ster	ns –
Cognition -	- Cognitive frameworks - Models of interaction. Framew	works and HCI – Fr	gonon	nics.	_	15
Universal i	isahility		Solioli	nes		
	isusiirty.					
	Interface					10
Module 2	design A	pplication			Se	ession
						S
Good and	Bad design – Interaction design – Guidelines – Principle	es – Theories – The	proce	SS O	f des	sign –
Prototypin	g and Construction - Conceptual design – Physical desig	n – The four pillar	s of de	sign	-	
Developme	ent methodologies – Participatory design – Scenarios de	evelopment – Socia	al impa	act s	tate	ment
for early de	esign review – Legal issues.					
						11
Modulo 2	Evaluating interface	omprobansion			c	TT Secion
would 5	design	omprenension			5	531011
Evaluating	interface design – Evaluation, Goals of evaluation, Expe	ert Reviews, Usabil	itv tes	ting	and	
Laboratori	es. Survey Instruments. Accentance Tests, evaluating du	ring Active Use C	ontrol	ed		
Psychologi	cally Oriented Experiments. Choosing an evaluation met	thod Natural Land		n		
Computing			Sange I	••		
Computing						

Module	Information 4 presentation	Term paper/Assignme nt	Comprehensi on	9 Session s
Informa	ion presentation – Data type by task taxonomy, Challer	nges for Informati	on Visualizatior	1 —
Groupw	are – Goals of collaboration and participation, Asynchro	onous distributed i	nterfaces,	
Synchro	nous distributed interfaces, Face to Face interfaces - Sp	eech and auditory	interfaces – M	ulti
modal ir	teraction - Design for diversity – Graphical user interfa	ces – The web mo	bile	
devices.				
Targete	Application & Tools that can be used:			
Assignm	ent:			
1.	Explain the role of cognition in human computer in	teraction.		
2.	Explain any three expert review methods			
Text Bo	<u></u>			
T1 . Be	n Shneiderman and Catherine Plaisant, "Designing the	e User Interface:	Strategies for	Effective
Hun	an-Computer Interaction", 6th Edition, Pearson Addison	Wesley, 2016.		
T2 . Dix A	. et al. "Human-Computer Interaction", 3rd Edition, Pear	rson Prentice Hall,	2004.	
Referen	ces			
R1 . Yvc	nne Rogers, Helen sharp, Jenny Preece, "Interact	ion Design: Beyc	ond Human Co	omputer
Interact	on", 5 th Edition, Wiley, 2019.			
R2 . The	Essentials of Interaction Design, Fourth Edition by Coop	er, Reimann, Cror	in, & Noessel (2	2014).
E-Resou	rces		_	_
https://	ouniversity.informaticsglobal.com:2229/login.aspx?dire	ct=true&db=nleb	&AN=2233842	&site=e
host-live				
Topics r	elevant to the development of SKILLS:			
1	Screen navigation and flow			
2.	Statistical graphics			
3.	Human interaction speeds			
4.	cons and increases – Multimedia			
for Skill	Development through Participative Learning technique	es. This is attained	through assess	sment
compon	ent mentioned in course handout.		2	

Course Code:	Course Title: Introduction to Bioinformatics		3	0	3	
CSE325	Type of Course: General CSE Basket, Theory	L- P- C				
	based					
Version No.	2.0					
Course Pre-	Basics of Biology, basics of Computers.					
Anti-requisites	NIL					
Course Description	This course is designed to provide the knowledge of the concepts related to bioinformatics. The course is aimed at understanding the DNA and Protein sequences and databases. It also deals with Pairwise comparison and calculating the scoring matrix. Further, it focuses on Sequence Alignment techniques, discovering the Motifs in the sequence. Students will also learn the overview of Structural Bioinformatics and Canoma sequencing					
Course	The objective of the course is to familiarize the learne	rs with th	ne conc	epts of		
Objective	Introduction to Bioinformatics and attain Employabi	lity throι	igh Par	ticipativ	e	
	Learning techniques.					
Course	C.O.1: Understand the DNA Protein sequenc	e and s	tructi	ires. (B	loom's	
Outcomes	Level: Knowledge)					
	C.O.2: Explain the file formats and sequence alignments of sequence. (Bloom's Level: Comprehension)				f DNA	

	C.O.3: Apply the te Protein Sequence. (chniques of th Bloom's Level:	ne motifs discovery for the Application)	e analysis of
Course Content:				
Module 1	Fundamentals of Bioinformatics	Quiz	Comprehension based Ouizzes and assignments:	9 Classes
Topics:				
Introduction to	Bioinformatics: In	troduction to r	nolecular biology, Cell, D	NA, RNA,
Transcription,	Franslation, Folding	, Gene Structu	re, Introduction to Bioin	nformatics,
Components a	and fields of bioinfo	ormatics, Om	ics, basic principles of	
structural/fur	nctional analysis of	f biological m	olecules, Biological Dat	a
Acquisition, T	ypes of DNA seque	nces,Genomi	c DNA <mark>,</mark> ,Mitochondrial D	NA,DNA
Sequencing to	ols, Protein seque	ncing and sti	ructure determination n	nethods,
Finding Rever	se complement of a	a sequence.		
	Genome databases	S		
Module 2	and Sequence	Quizzes and	Comprehension based	8 Classes
	Similarity	assignments	Quizzes and assignments	
Topics:				
Types and class	sification of genome	databases, DI	NA sequence retrieval syst	em, various
DNA and protei	n sequence file forma	ats, Common s	equence file formats; Files	for multiple
sequence align	ment; files for stru	ictural data, i	arity searching Sequence	ers in Text,
searching tools	NCBI BLAST P	SI BLAST Si	ignificance of sequence	alignments
Alignment score	es and gap penalties	5. <u>DE</u> 101, 5.	Simeance of sequence	unginnento,
	DNA sequence	Ouiggos and	Comprohension based	
Module 3	analysis and	assignments	Ouizzes and assignments	10 Classes
Saguanaa aimil	applications	lignmont toolo	Finding alignment using	Noodlomon
Wunsch and S	mith-Waterman alg	orithm Heuri	stic Methods of sequence	alignment
Pair-wise and r	nultiple sequence al	ignments. DN	A sequence analysis. Mot	if in protein
sequence ,Moti	f discovery using Gil	obs sampling,I	Motif finding, Gene Predict	tion models:
Hidden Markov	/ model(HMM), Ger	neralized Hidd	len Markov model(GHMM	l), Bayesian
method.				
Targeted Applica	ation & Tools that can	be used:		
BLAST, FastA, , (LiustalW, MEGA			
Froject work/As	udanta (calf calactad k	atch mator u	n to 4 in a batch) will be a	llocated case
studies/assignme	ints	atch mates – u	p to 4 in a batch win be a	inocateu case
Textbook(s):				
i excoon(o)i				
1. Bioinformatio	cs: Sequence and Ge	nome Analysis	, David W. Mount, Cold Sp	oring Harbor
Laboratory Pres	ss, 2004.			
2. Introduction	to Bioinformatics, A	Arthur Lesk, F	ifth Edition, Oxford Unive	ersity Press,
2019 Defense				
References	cs Methods and An	plications S	C Rastori N Mendiratta	P Pastori
Fourth Edition	Prentice Hall India	plications, 5.	C. Kastogi, N.Menunatta	, r.Nasiogi,
2.Bioinformatic	s Algorithms- An Ac	tive Learning	Approach, Phillip Compea	u & Pavel
Pevzner, 2nd E	dition, Vol. I & II, Ac	tive Learning	Publishers, 2015	
F-References				
1. https://nunive	rsity.informaticsglobal	com:2229/login	.aspx	
			· - 1 [×]	
Topics related to 1. String Rec	development of "Emplo construction problem	yability skills": 1	Batch wise presentations on so	elected topics

- 2. Sequence Similarity searching
- 3. Alignment scores and gap penalties
- 4. Protein sequencing
- 5. Gene Prediction models: Hidden Markov model(HMM)
- 6. Finding similarities by performing pairwise and multiple sequence alignment,
- 7. Evaluating phylogenetic trees.

for developing **Employability Skills** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.

Course Code: CSE396	Course Title: Software T	esting and Quality ass	urance	L- T-P- C	2	0	2	3	
	Type of Course: Lab Int	egrated							
Version No.	2.0	2.0							
Course Pre- requisites	Basic knowledge of so	ftware engineering an	nd progra	amming	know	vledge	;		
Anti-requisites									
Course Description	This Course is designed to make the students understand the strategies, methods and technologies of software testing effectively. It aims at Designing test plans and test cases, doing automatic testing; reporting on software defects; assessing the software product correctly; and distinguish the relationship between software testing and quality assurance. In addition, students are expected to do a group assignment on software testing tools of their choice. Topics include: Testing techniques, integration, code inspection, peer reviews, verification and validation, statistical testing methods, preventing and detecting errors, selecting and implementing project metrics, and defining test plans and strategies that map to system requirements. Testing principles, formal models of testing, all aspects of quality assurance, performance measuring and monitoring.								
Course Objective	This course is designed LEARNING Techniques.	to develop ENTREPREN	NEURIAL	SKILLS by	usin	g EXPI	ERIEN	TIAL	
Course	On successful completio	on of the course the stu	dents sha	ll be able	to:				
Outcomes	 Describe the fu Select the approx Report the bugs 	ndamentals of softwa opriate Testing type to s found in Testing	are testin o test Ap	g for Qu plicatior	ality 1s/So	assu: oftwai	rance res	•	
Course Content:									
Module 1	Basics of software testing	Knowledge				8	Sessio	ons	
Phases of Softwa	are Project, Quality, Qua	ality assurance and Qu	uality Cor	ntrol, Tes	ting,	Verifi	catio	ו and	
Validation, Life C	ycle Models. Software Te	esting life Cycle (STLC)							
Module 2	Types of testing	Comprehension	1 00		11	10	Sessi	ons	
Introduction to Testing, Fundai Boundary value	White Box Testing, S mentals of Black Box T e Analysis. Equivalence	esting, When and Ho Partition ,Problems of	ural Tes w to do E on Equi	ting. Ch Black Bo valence	allen x Tes Partit	ges 11 sting. tion	n Wh Prob	lems	
Module 3	TYPES OF TESTING, continued	Comprehension				12	Sessi	ons	
Integration Testi	ng overview, Integration	Testing as a Phase of Te	esting, De	fect Bash	1				
System Testing O	verview, Functional and	Non-Functional Testing	g, Accepta	ince Test	ing. C	ompa	tibilit	y	
Testing , Stress	and Interoperability Tes	ting, Test case Prepara	tion.						
Module 4	Specialized testing techniques	Comprehension				9 S	essio	ns	
Performance Te Defect Life Cycl Project Metrics.	sting, Regression Testi le, Bug Reporting, Bas	ng, Internationalizationics of Software Test	on Testir Automat	ng, Ad-h ion, Met	oc te crics,	sting Metr	ics T	ypes,	

Targeted Application & Tools that can be used: MS office

Assignment: Writing Test Cases and Bug Reports for simple Applications

Text Book

1. . Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education

References

1 Aditya P. Mathur, "Foundations of Software Testing _ Fundamental Algorithms and Techniques", Pearson Education.

2. KshirasagarNaik, PriyadarshiTripathy "Software Testing and Quality Assurance Theory and Practice", Wiley and sons.

E-Resources

https://puniversity.informaticsglobal.com:2229/login.aspx Topics relevant to "EMPLOYABILITY SKILLS":

- 1. Black Box testing
- 2. White Box Testing
- 3. Test Case preparations
- 4. Bug Reports

for developing **Entrepreneurial Skills** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Dat	a Analytics using R			2	2	3
CSE 299	Type of Course: Ir	ntegrated		L- P- C			
Version No.	2.0	2.0					
Course Pre-	Fundamentals of (ndamentals of Computers and Basic Knowledge of Statistics.					
requisites							
Anti-requisites	NIL						
Course	This course is de	esigned to provide t	he core con	cepts of	data	analytics in th	ne R
Description	environment. Init	ially train them with b	asic R, then p	rogressiv	ely ir	crease the diffi	culty
	as they move alo	ng in the course, ca	pping with a	dvanced	techr	iques through	case
	studies. Mastering	the core concepts and	d techniques	of data aı	nalytic	s in R, will hel	p the
	students to apply	their knowledge to	a wide ran	ge of D	ata A	nalytics. R is	now
	considered one of	the most popular ana	lytics tool in	the world	1.		
Course Objective	This course is o	designed to develop	• ENTREPR	ENEUR	IAL	SKILLS by u	using
	EXPERIENTIAL	LEARNING Technic	ques				
Course Outcomes	On successful con	npletion of this cours	e the studen	its shall b	be abl	e to:	
	analysis [Annli	cation	g to rundam	ental da	lä		
	2) Interpret data	Lauviij Lusing annronriate (statistical				
	methods	[Annlication]	statistical				
	3). Demonstrate 1	the decision trees co	ncept with th	ne given			
	dataset. [Apr	olication]					
	4). Demonstrate	the Mining concepts	for both Da	ta and			
	Text.	[Application]					
Course Content:							
	Introduction to						
Module 1	Data Analysis	Quiz	Coding Assig	nment		6 Session	s
	and R			•			
Topics:							
Introduction to R,	Overview of data a	nalysis, Working wit	h Directory in	n R, Load	ling a	nd Handling da	ata in
R, Exploring Data i	in R, Classification	of Data: Structured, S	Semi-Structur	ed, Appl	icatio	ns of Data Anal	ytics,
R Commands, Vari	ables and Data Typ	oes, Control Structure	es, Array, Ma	trix, Vect	ors, F	actors, Functio	ns, R
packages.	1	1					
Module 2	Exploratory Data	Coding Assignment	Case Study			11 Sessions	
Tonica	Analytics						
Evoloring a new da	taset Anomalies in	numerical data Visi	ualizing relati	one hotu		ariables Analy	sis of
Variance and Corr	relation Data Tran	sformation Merging	alizing relativ	oris Detw oc. Outli	or Do	tection Comb	ining
multiple vectors	Assumptions of Lin	hear Regression Sim	ole and mult	i linear r	egres	sion KNN Sur	nort
Vector Machine 1	ngistic Regression			i inicar i	cgrcs	51011, 1014, 544	port
Module 3	Decision Tree and	Coding Assignment	Project			12 Sessions	
	Clustering		i i oject				
Topics:							
What is Decision	Tree. Decision Tr	ee Representation in	R. Basic De	ecision T	ree L	earning Algori	ithm.
Measuring Feature	es, Issues in Decisi	ion Tree Learning, p	erformance e	evaluation	n of I	Decision tree. I	Basic
concepts of Cluster	ring, Hierarchical C	Clustering, k-means A	lgorithm, CU	JRE Algo	orithm	l.	
Module 4	Association Rules	Quiz	Project			8 Sessions	
Topica	and Text Mining		-				
Topics:	Vining Alassid	Interforce Distance 1	and Class	ing Tu-	an at	n and Assess	
Frequent Itemset, I	Mining Algorithm	allenges in Toxt Mini	Dased Cluster	ing Iran	sactio	II and Associat	ions,
in R Core Toyt M	ining Operations	anenges in Text Mini	ng, rext Min	ning vs L	vata IV	ming, rext Mi	mig
Targeted Applicati	ion & Tools that co	n he used:					
n argeleu Appliede	ion or i uuis tiidt td	n be useu.					

Tools: RStudio / Google Colab

Project work/Test:

During the course, students would need to do coding assignments to learn to train and use different models. Sample coding assignments include:

Analysis of Sales Report of a Clothes Manufacturing Outlet.

Comcast Telecom Consumer Complaints.

Web Data Anslysis

Text Book(s):

1. Data Analytics Using R – Seema Acharya, Mc Graw Hill.

Reference(s):

1. Exploratory Data Analytics Using R, Ronald K Pearson, CRC Press

Web link(s):

1. https://r4ds.had.co.nz/

2. https://puniversity.informaticsglobal.com:2229/login.aspx

Topics relevant to "Entrepreneurial SKILLS":

- 1. Linear Regression
- 2. Logistic Regression
- 3. K-means Algorithm
- 4. Hierarchical clustering
- 5. CURE Algorithm
- 6. Decision Tree Learning

for developing **Entrepreneurial Skills** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Databas	se Management S	Systems				
CSE2074	Type of Course: 1) Sc	hool Core		L-P-C	2	2	3
	2) La	aboratory Integr	ated				
Version No.	1.0						
Course Pre-	NIII						
requisites							
Anti-requisites	NIL						
Course	This course introduces	the core principle	es and technic	ques requi	red	in th	e design
Description	and implementation of database systems (RDI organize, maintain and to learn and practice da The associated labora MySQL (My Structu technology application creating, populating,	abase systems (RDBMS). More emphasis is set on how to design, develop, ganize, maintain and retrieve the information efficiently. It helps the students learn and practice data modeling and database designs. e associated laboratory is designed to implement database design using /SQL (My Structured Query Language-Open Source) in information hnology applications. All the exercises will focus on the fundamentals for eating, populating, sophisticated, interactive way of querying, and					
~	simultaneous execution	n of the transactio	ns of databas	e.			
Course Objective	The objective of the c Database Managemen EXPERIENTIAL LEA	ne objective of the course is to familiarize the learners with the concepts of atabase Management Systems and attain SKILL DEVELOPMENT through XPERIENTIAL LEARNING techniques.					
Course	On successful complet	ion of the course t	he students s	hall be ab	le to):	
Outcomes:	 Understand core cor Apply normalization Develop databas (Application)] Understand core concepts of database (Knowledge) 2] Apply normalization techniques to refine database schema (Application) 3] Develop database with concurrent transactions execution feature Application) 					
Course Content							
Module 1	Introduction to Database and its Conceptual Model (Knowledge)	Assignment	Problem So	lving	6	Class	ses
Topics:							
Introduction to independence, L traditional file sy Conceptual Dat Examples on ER	Database: Schema, In Data isolation problem systems. ta Modelling: Entity Re a model.	stance, 3-shema <i>in traditional file</i> elationship (ER) N	architecture, e system, adv Model, ER M	physical vantages of the other constraints of	<i>and</i> of d elat	<i>logio</i> ataba ional	<i>cal data</i> ase over Model,
Module 2	Query Languages (Application)	Assignment	Problem Se	olving	7	Clas	ses
Topics: Relational Alge (inner and outer MySQL Datab Functions, Joins	ebra with selection, pro joins), and division oper ase Querying, DDL, D , Views, Procedures, Fur	jection, rename, rator. Examples of ML, Constraints nctions and Trigg	set operation n Relational A , Operators, ers.	s, cartesia Algebra C Set Oper	an p pera ator	rodu ation s, Ag	ct, joins s. ggregate
Module 3	Designing and Refining Database Schema (Application)	Assignment	Program Task	ming	7 (Class	es

Schema Design: Problems in schema design, redundancy and anomalies.

Schema refinement: Normal Forms based on Primary Keys-(1NF,2NF, 3NF), Boyce-Codd Normal Form, Multi valued Dependency (Fourth Normal Form), Join Dependencies (Fifth Normal Form), *lossy and lossless decompositions*.

Module 4	Transaction Management and Concurrency Control (Application)	Assignment	Problem Solving	6 Classes
----------	--	------------	-----------------	-----------

Topics:

Transaction: Desirable properties (ACID) of Transactions, *Simultaneous Transactions and their problems like dirty read, lost update and incorrect summary*, Serializability, Conflict Serializability, View Serializability;

Concurrency Control: Locking and Time-stamping concurrency schemes.

List of Laboratory Tasks:

Create Employee, Student, Banking and Library databases and populate them with required data. Do the following experiments of different lab sheets on those databases.

Labsheet-1 [3 Practical Sessions]

Experiment No 1: [1 Session]

To study and implement Data Definition Language (DDL) commands and Data Manipulation Language (DML) commands of MySQL.

Level 1: Perform operations using Data Definition Language and Data Manipulation Language commands including different variants of SELECT on Student DB.

Level 2: Identify the given requirements; valid attributes and data types and Perform DDL and DML operations on a given scenario. [Banking Databases]

Experiment No. 2: [2 Sessions]

To implement different types of MySQL constraints and relational, logical, pattern matching, BETWEEN, IS NULL, IN and NOT IN Special Operators.

Level 1: Create tables on Banking database using PRIMARY KEY, NOT NULL, UNIQUE, FOREIGN KEY and demonstrate the working of relational, logical, pattern matching, BETWEEN, IS NULL, IN and NOT IN Special Operators on Student Database.

Level 2: Enforce different types of data and referential integrity constraints. Then try queries with special operators based on the student database. [Banking Database].

Labsheet-2 [3 Practical Sessions]

Experiment No. 3: [1 Session]

To try for aggregation of data in to groups and sub-groups using Group by, HAVING clauses and sort data using Order By Clauses.

Level 1: Implement the conjugate of GROUP BY, ORDER BY and aggregate functions on Banking Database.

Level 2: Implement MySQL queries on library database using appropriate clauses and aggregate functions. Also order the data either in ascending and descending order using corresponding clause. [Library databases].

Experiment No. 4: [2 Session]

To study and implement different types of Set and Join Operations [3 Slots]

Level 1: Demonstrate different types of Set Operations (UNION, UNION ALL, INTERSECT, MINUS) and Join Operations (INNER JOINS, OUTER JOINS, CROSS JOIN, NATURAL JOIN) on two or more tables of Banking Database.

Level 2: Use Set and Join operations to retrieve the data from two or more relations(tables) as per the given scenario. [Library databases]

Labsheet-3 [3 Practical Sessions]

Experiment No. 5: [3 sessions]

To study and implement Views, and Procedures in MySQL.

Level 1: Implement MySQL Views, and Procedures in MySQL on Employee database.Level 2: Analyze the requirement and construct views, and Procedures on Mini Project Domain.[Banking Database]

Labsheet-4 [3 Practical Sessions] Experiment No. 6: [3 Sessions]

To study and implement Functions, and Triggers in MySQL.

Level 1: Implement MySQL Functions and Triggers in MySQL on Employee database. Level 2: Analyze the requirement and construct Functions and Triggers on Mini Project Domain. [Banking Database]

Targeted Application & Tools that can be used:

Application Area: Relational database systems for Business, Scientific and Engineering Applications.

Tools/Simulator used: MySQL

Text Book

1] Elmasri R and Navathe S B, "Fundamentals of Database System", Pearson Publication, 7th Edition, 2017.

References

1] Hector Garcia Molina, Jeffery D Ullman, Jennifferwidom, "Database systems: The Complete Book", Pearson Publication, 2nd edition.

2] Avi Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill ,7th Edition, 2019.

Topics relevant to development of "Skill Development": Relational database design using ER-Relational mapping, Implementation of given database scenario using MySQL for Skill development through Experiential Learning Techniques. This is attained through assessment component in the course handout.

Course Code: CSE3006	Course Title: Artificial Intelligence and Neural Networks		3	0	3
	Type of Course: Theory only	L-P-C			
Version No.	2.0				
Course Pre- requisites	NIL				
Anti-requisites	NIL				
Course Description	This Course highlights the basic principles in Artificial Intelligence. It will cover representation schemes, problem solving paradigms, , search strategies, knowledge representation, probabilistic reasoning, elements of Artificial Neural Network. Topics include: AI methodology and fundamentals, intelligent agents, search algorithms, game playing, probabilistic reasoning in AI, Elements of Artificial Neural Network, models of neuron, architecture and learning laws. Several assignments will be given to enable the student to gain practical experience in using these techniques.				
Course Objective	The objective of the course is to familiarize the learn Artificial Intelligence and Neural Networks and atta through PROBLEM SOLVING techniques	ers with the ain EMPLO	e con (ABIL	cepts of ITY SKILL	.S

Course Out	On successful co	mpletion of the course	the students shall be able to:	
Comes	1. CO 1: A	oply techniques of Know	ledge Representation [Applica	tion]
	2. CO 2 :	Apply Artificial Intel	lligence techniques for pro	blem solving
	[Application	ı]		
	3. CO3 : Ur	derstand the models of	Neuron [Knowledge]	
	4. CO4 :	Explain the basic e	elements of Artificial Neu	iral Network
	[Comprehe	nsion]		
Course Content:				
	Introduction to			
	Artificial	A	T he second	
iviodule 1	Intelligence	Assignment	Ineory	14 Sessions
	Based Systems			
Topics: Introducti	Daseu Systems	telligence Definitions f	L	tions: Agents:
Types of Agent Str	ucture of Intellige	ent agent and its function	as: Introduction to Knowledge r	enresentation
approaches. Know	ledge-Based Syst	ems:Frame Structures. (Conceptual graphs, Logic- Prop	ositional Logic
First order Logic				
	Problem			
Module 2	Solving by	Assignment	Theory	13 Sessions
	Searching			
Topics: Introduction	on to Problem sp	ace and state space, Sta	ate space search techniques sol	ving problems
by searching: Class	, sical Search, Adve	ersarial Search, and Con	straint Satisfaction Problems, I	ntroduction to
reasoning. Probabi	listic reasoning ir	AI, Bayesian networks,	Hidden Markov Model, Certaint	y factors, rule-
based systems and	Demster Shafer	Theory.		
	Introduction to			
Modulo 2	Artificial	Accianment	Theory	0 Cossions
would 5	Neural	Assignment	Theory	9 565510115
	Network			
Topics :Introductic	on to learning, Fo	rms of Learning: Statistic	cal learning, Supervised Learnin	g,
Unsupervised Lear	ning, Reinforcem	ent Learning, Learning r	ules of AI, Learning Laws.	
Historical Develop	ment of Neural N	etwork Principles, Chara	acteristics of Neural Networks a	nd Artificial
Neural Networks: ⁻	Terminology, Mo	dels of Neuron		
	Essentials of			
Module 4	Artificial	Assignment	Theony	07 Sessions
	Neural	Assignment	Theory	07 565510115
	Network			
Topics: Artificial N	leuron Model, O	perations of Artificial N	euron, Types of Neuron Activa	tion Function,
ANN Architectures	s, Single-Layer Fe	ed forward Networks,	Multilayer Feed forward Netw	orks, Types of
Application				
Targeted Applicati	ion & Tools that	can be used:		
Use of PowerPoint	software for lect	ure slides and use of Go	ogle's Colab cloud service	-h
Text Dools	naispoint.com/g	oogie_colab/index.ntm	i for executing and snaring of I	au exercises.
1 Church L D		1	waaa A Maalawa Awaawaa ah (000	0) 2
1. Stuart J. Ri	ussell and Peter I	Norvig, Artificial Intellige	nce: A Modern Approach, (200	2) 3rd edition,
		ill. ficial natural naturative D	Lill coming Dut Ltd. 2000	
2. regnanara	yana, Bayya. Arti	ncial neural networks. P	ni Learning PVt. Ltd., 2009.	
	(1007) ^+:f:-:-!	Intolligonoo A norra atta	horis Eleguior Dubligations	
1. IN J INHISSON	(1997).Artificial	Intelligence- A new synt	nesis, Elsevier Publications.	
Z. IN J INIISSON	(1982). Principle	d ShivashankarB Mair ""	e, springer. Artificial Intelligence" TataMacci	raw_ Will Third
5. Eldifie KICh	, NEVILI NIIIgi L di) R N 1	u phivashalikai B.Ndif, <i>P</i>		aw- 1111, 111110
Δ Patterson	יייי.ן. D \\\/ (100/) וי	troduction to artificial	intelligence and expert system	s Englewood
Cliffs Prentice	Hall		intelligence and expert system	13. LIISIEWUUU

5.	Luger, G. F. (2002). Artificial intelligence: Structures and strategies for complex problem solving,
Har	low, Pearson Education.

- 6. Simon Haykin(2009), Neural Networks and Learning Machines , Third Edition, PHI
- 7. LaureneFausett(2004), Fundamentals Of Neural Networks, Prentice-Hall, Inc, USA

E-References

8. <u>https://presiuniv.knimbus.com/user#/home</u>

Topics relevant to development of "EMPLOYABILITY SKILLS":

- 1. Statistical Concepts for Knowledge representation.
- 2. Classical Search
- 3. Constraint Satisfaction Problems
- 4. Conceptual graphs
- 5. Multilayer Feed forward Networks

for developing **Employability Skills** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Object Orie	ented analysis and Desi	gn with					
CSE248	UML			L- T-P- C	3	0	2	4
	Type of Course: Integral	ad Only						
Version No	2 0							
Course Pre-	Object Oriented Program	nming fundamentals Se	oftware Fi	ngineerir	ıσ			
requisites				Billeelli	' Б			
Anti-requisites								
Course	This course deals with	producing detailed of	oject mod	els and	desig	ns fro	om sy	/stem
Description	requirements; using the	modeling concepts pro	vided by l	JML; ide	ntifyi	ng use	e case	s and
	expanding them into full	behavioral designs; exp	panding th	ie analyzi	ng int	o a de	esign	ready
	for implementing and co	onstructing designs that	t are relia	ble. The	cours	e beg	ins wi	ith an
	overview of the object o	riented analysis and de	esign.					
Course	The objective of the cou	rse is to familiarize the	learners v	vith the o	conce	pts of	A Ob	ject
Objective	Oriented analysis and De	esign with UML and at	tain SKILL	DEVELO	PMEN	IT thr	ough	
	EXPERENTIAL LEARNING	techniques	-					
Course Out	CO1 : Ability to analyze a	and model software spe	ecification	s.				
Comes	CO2 : Ability to abstract	object-based views for	generic so	oftware s	ysten	ns.		
	CO3 : Ability to deliver ro	obust software compor	ients.					
Course Content:								
	Introduction to Object							
	oriented system-	A	C D C			20		
Module 1	Knowledge level	Assignment	SRS			20	Sessi	ons
Object Basics-Ob	ject Oriented System Dev	elopment Life Cycle- U	lse case dr	riven app	roach	n-Rum	nbaug	h
Object Model- Bo	ooch Methodology-Jacob	son Methodology-Unifi	ied Approa	ach, Fran	ning p	roble	m	
statement and SF	RS document.							
	Object oriented							
Module 2	analysis-	Assignment	Class diag	gram		10	Sessi	ons
	Comprehensive Level							
Identifying us	e cases-Object Analysis	-Classification: Theory	y-Approa	ches for	Ident	ifyin	g Clas	ses:
Noun Phrase	approach, Common Cla	ass pattern approach,	Use case	e driven	аррі	oach	, Clas	sses,
Responsibiliti	es and Collaborators-	Identifying Object rel	lationship	os: Asso	ciatio	ns, S	uper-	-sub
class relations	hips, Aggregation.							
Module 3	Object oriented design-	Term				11	Sessi	ons
	Comprehensive Level	paper/Assignment	Object Di	agram				-

Object Oriented Design Axioms-Designing Classes -Class visibility -Redefining attributes -Designing methods and protocols -Packages and managing classes -Access Layer- Object Storage Persistence - Object oriented Database System-Designing view layer classes -Macro level process -Micro level process- Prototyping the user interface –Quality Assurance Tests-Testing Strategies.

Object oriented UML Term Modeling-Application Term level Dynamic Diagrams 9 Session						
Static and Dynamic Modeling-Unified Modeling Language -UML diagrams: Class Diagrams-U						
case Diagram- UML Dynamic modeling: Interaction diagram, Sequence diagram, Collaborati						
diagram, State-chart diagram <mark>,</mark> Activity diagram						
Targeted Application & Tools that can be used:						
Star UML						
Object Oriented Modeling and Design using UML, Second Edition, Michael Blaha and James Rumbaug						
Pearson Education, Second Edition, 2007						
References						
R1. Applying UML and Patterns, Third Edition, Craig Larman, Pearson Education, 2008 R2. Object						
Oriented Analysis and Design with Applications, Grady Booch, Addison-Wesly SecondEdition, 1994 R3						
Object Oriented Systems Development using Unified Modeling Language, Ali Behrami, McGraw Hill						
International Edition, 1999 R4. Design Patterns, Gamma et. al., Pearson Education, 2006.						
E-Resources						
https://presiuniv.knimbus.com/user#/home						
Topics relevant to the development of SKILLS:						
1. Aggregation						
2. Quality Assurance Tests						
3. Responsibilities and Collaborators						
4. Swimlane Diagram						
5. Pattern Model						

Course Code: CSE1001	Course Title: Problem Solving using JAVA Type of Course: Integrated	L- P- C	2	2	3
Version No.	2.0				
Course Pre-	Basic Programming knowledge.				
requisites					
Anti-requisites	NIL				

	This course introdu	ces the core co	ncepts of object-orient	ed prog	ramming. This
Course	course has theory a	and lab compor	tent which emphasizes	on und	erstanding the
Description	helps the student to	build real time of	a object-oriented progr	nnlying	g paradigili. It
Description	and also for effectiv	ve problem solv	ing. The students interr	ppiying viet and	understand the
	and also for object original	ted programmi	ing to build application		understand the
Course	The objective of the	course is to famil	liarize the learners with t	s. he conce	ants of Problem-
Objective	Solving using IAVA ar	nd attain SKILL D	FVFI OPMENT through F		TIAL LEARNING
	techniques				
	On successful comple	etion of the cour	se the students shall be a	able to:	
	C.O. 1: Describe th	e basic program	ming concepts. [Know	ledge]	
	C.O. 2: Apply the c	oncept of class	es, objects and methods	s to solv	e
Course Out	problems. [Applica	tion	1	• •	
Comes	C.O. 3: Apply the c	oncept of array	s and strings. [Applicat	ion]	1
	C.O. 4: Implement	inheritance and	polymorphism building	g secure	e applications.
	[Application]				
	C.O. 5: Apply the C	oncepts of inter	race and error handling	g mecna	nism.
Course Content:					
	Basic Concepts of				
Module 1	Programming and	Assignment	Data Collection/Interpret	tation	12 Sessions
	Java				
Topics: Introduc	tion to Principles o	f Programming	: Process of Problem S	Solving	, Java program
structure, Down	load Eclipse IDE to	run Java progra	ams, Sample program, I	Data ty	pes, Identifiers,
Variables, Con	stants in java, Ope	rators, Assignr	nents and Expression,	Basic	Input/ Output
functions, Contr	ol Statements: Bran	ching and Loop	oing.		
	Classes, objects,	Case studies /		1.1	
Wodule 2	methods and	Case let	Case studies / Case	let	12 Sessions
Topics Classon	Objects and Method	la Introduction	to object Oriented Drin	ainlag d	lafining a alass
adding data may	bare and mathode	to the class acc	to object Offented Fills	ting ob	ionto roforonoo
auunig uata mer	ing class members a	id methods	ess specifiers, instantia	ung ob	jects, reference
Static Polymorr	bism: Method overl	oading, constru	ictors, constructor over	loading	this keyword
static keyword.	Nested classes. Acce	essing members	in nested classes.	iouuing	, this keyword,
	Arrays, String and				
Module 3	String buffer	Quiz	Case studies / Case	let	14 Sessions
Topics: Arrays:	Defining an Array,	Initializing & A	Accessing Array, Multi	i –Dime	ensional Array,
Array of objects	. String: Creation &	Operation. Stri	ng builder class, metho	ds in St	ring Buffer <mark>.</mark>
Module 4	Inheritance and	Ομίτ	Case studies / Case	14 Ses	sions
	Polymorphism		let	14 303	510115
Topics: Inherita	ance: Defining a s	ubclass, Types	s of Inheritance, supe	er keyw	ord. Dynamic
Polymorphism:	Method overriding.	Final keyword:	: with data members, w	with me	mber functions
and with class.	Abstract keyword:	with data mem	bers, with member fun	ictions a	and with class,
Exception hand	ling <mark>.</mark>			1	
Module 5	Input & Output Operation in Java	Quiz	Case studies / Case let	14 Ses	sions
Input/output Ope	eration in Java(java.io	Package), Strean	ns and the new I/O Capat	bilities, L	Inderstanding
Streams, working	with File Object, File	I/O Basics, Readi	ng and Writing to Files, B	uffer an	d Buffer
Management, Re	ad/Write Operations	with File Channel	l, Serializing Objects, Obs	erver an	d Observable
Interfaces.					
List of Laboratory	y Tasks:				
List of Laboratory P1 - Problem Se	y Tasks: olving using Basic C	Concepts.			
List of Laboratory P1 - Problem S P2 - Problem S	y Tasks: olving using Basic C olving using Basic C	Concepts. Concepts and Co	ommand Line Argumen	ts.	

- P4 Programming assignment with method overloading.
- P5 Programming assignment with constructor overloading.
- P6 Programming assignment with Static members and static methods.
- P7 Programming assignment with Nested classes.
- P8 Programming assignment using Arrays.
- P9 Programming assignment using Strings.
- P10 Programming assignment using String Builder.
- P11 Programming assignment using Inheritance and super keyword.
- P12 Programming assignment using Method overriding and Dynamic method invocation.
- P13 Programming assignment using Final keywords.
- P14 Programming assignment using Abstract keywords.
- P15 Programming assignment using Interface.
- P16 Programming assignment using Interface.
- P17 Programming assignment CharacterStream Classes
- P18 Programming assignment Read/Write Operations with File Channel

Targeted Application & Tools that can be used : JDK /eclipse IDE/ net Beans IDE.

Text Book

T1 Herbert Schildt, "The Complete Reference Java 2", Tata McGraw Hill Education. **References**

R1: Cay S Horstmann and Cary Gornell, "CORE JAVA volume I-Fundamentals", Pearson **R2**: James W. Cooper, "Java TM Design Patterns – A Tutorial", Addison-Wesley Publishers.

E book link R1: <u>http://rmi.yaht.net/bookz/core.java/9780134177373-Vol-</u> <u>1.pdf</u>

E book link R2: Java(tm) Design Patterns: A Tutorial([PDF] [7qmsenjl97t0] (vdoc.pub)

Web **resources**

bs://youtube.com/playlist?list=PLu0W_9llI9agS67Uits0UnJyrYiXhDS6q

ps://puniversity.informaticsglobal.com:2229/login.aspx

Topics relevant to development of "Skill Development":

- 1. Static Polymorphism
- 2. Method overloading, constructors
- 3. constructor overloading
- 4. this keyword
- 5. static keyword and Inner classes
- 6. Inheritance and Polymorphism.

			. 1				
Course	Course Little: Prog	ramming in C# and					
Code:	.NET Framework	_		L- P -	1	4	3
CSE302	Type of Course: Pi	rogram Core		С			
	Theory & Laborate	ory integrated					
Version No.	2.0						
Course Pre-requisites	NIL						
Anti-requisites	NIL						
Course Description	This course is designed to teach third-year computer science students, to provide an introduction to the .net framework and C# language. This course deals with the programming skills that are required to create applications using the C# language. Helps the students to build an application that incorporates several features of the .NET Framework.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Programming in C# and .NET Framework and attain EMPLOYABILITY SKILLS through EXPERIENTIAL LEARNING techniques						
Course Out Comes	 COURSE OUTCOMES: On successful completion of the course the students shall be able to: Apply OOPS concepts in C# for solutions to real-world problems Use ADO.NET to manage databases; Write GUI applications in C#. 						
Course Content:							
Module 1	C # Language Syntax	Assignment	Progra	nming T	ask	12	Sessions
Topics:							
C # Language Syntax	- Dalalypes & Vallal	nes Deciaration, III	ipiicit aff	и ехрисі	i Casti	ing, Che	EUNEU dilu

C # Language Syntax - Datatypes & Variables Declaration, Implicit and Explicit Casting, Checked and Unchecked Blocks, Enum and Constant, Operators, Control Statements, Working with Arrays, working with Methods, Pass by value and by reference and out parameters.

OOPs-Concept - Learning about Class, Object, Component, encapsulation, Inheritance, Polymorphism.Abstract Class, Types of Inheritance with example programs .

Exception Handling-Defining Exception, Understandings try and catch keywords, Using "finally" block, Throw , Throws , Throwing exceptions, Creating User-defined/Custom Exception class and basic example for the both exception.

Module 2	Developing GUI	Assignment	Data Collection/Excel	12
	Application			Sessions
	Using			
	WINFORMS			

Developing GUI Application Using WINFORMS- Basic Controls, Panel & Layouts, Drawing and GDI Devices, MenuStrip, ToolbarStrip and ContextMenuStrip, Model and Modeless Dialog boxes, Multiple Document Interface(MDI), Form Inheritance, Building Login Form, Working with Resource Files and Setting, Notify Icon Controls, Using Components like Timer, FileSystemWatcher, Solving few case studies in developing GUI Application using WINFORMS.

Database Programming Using ADO.NET -Introduction, and Evolution of ADO.NET, Understanding the Role of Managed Provider and ADO.NET Objects, Connecting to Database and Connection Pooling, Performing Insert, Update and Delete Operations, Fetching Data from the database - Executing Select Statements, basics query. Solving few case studies.

Module 3	Managing Data using DataSet	Assignment	Programming/Data analysis task	14 Sessions

Managing Data using DataSet -Introduction DataSet and its Object Model, Filling DataSet using DataAdapter, Binding DataSet to DataGridView, Updating changes to the database using DataAdapter, DataAdapter events.

A few Advanced Features-Reflection and Attributes, Delegates & Events, User Control and Custom Control. Multithreading- Threading Overview, Thread States, Methods of Thread Class, Thread Pool, Thread Synchronization, Advantages of threads and thread in built functions. Solving some real world examples on threads.

Targeted Application & Tools that can be used:

Text Book

- 1. Andrew Troelsen, "C# and the .NET Platform"
- 2. J. Liberty, "Programming C#", O'Reilly

References

R1:E. Balagurusamy, "Programming in C#", Tata McGraw-Hill.

R2: Microsoft Visual C# Step by Step, 9th Edition By John Sharp, Microsoft Press

R3:Herbert Schildt, "The Complete Reference: C#" Weblinks:

https://presiuniv.knimbus.com/user#/home

https://dotnet.microsoft.com/en-us/apps/aspnet

Case study link:

https://www.researchgate.net/publication/296561714_C_and_the_NET_Framework https://docs.microsoft.com/en-us/dotnet/csharp/getting-started/

E book link R1:

https://www.oreilly.com/library/view/mastering-cand/9781785884375/

E book link R2:

https://www.packtpub.com/product/mastering-c-and-net-framework/9781785884375

Topics relevant to development of "Skill":

MVC — Model-View-Controller
 Encapsulation
 Inheritance
 Polymorphism
 Connection pooling

for developing **Employability Skills** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Dig	ital and Mobile For	ensics	L- P- C	3	0	3
CSE397	Type of Course:	neory					
version No.	2.0						
Course Pre-requisites	Operating System	, Computer Networ	KS.				
Anti-requisites	Nil						
Course Description	This course demons has increased dram attacks and thus the investigation. This n the security professi understanding on o interpretation of the Topics include: Wire phones and GPS, SN in SIM card, device evaluating digital ev	This course demonstrates the use of Mobile phones and digital devices across the globe has increased dramatically. These devices are more susceptible to information security ttacks and thus they also possess huge evidences which shall be used during crime scene hvestigation. This makes the Course on mobile and digital forensics an inevitable one for he security professionals. This Course on mobile and digital forensics will provide a better inderstanding on different forms of evidences in many digital devices, collection and hterpretation of the same. Topics include: Wireless technologies and security-wireless protocols, wireless threats, cell phones and GPS, SMS and data interception in GSM. Mobile phone forensics - files present in SIM card, device data, external memory dump, Android forensics. Digital forensics: - evaluating digital evidence, Digital forensics examination principles					
Course Objective	The objective of Database Manag PARTICIPATIVE Le	the course is to fan ement Systems an arning techniques	niliarize th d attain	e learne EMPLOY	rs with ABILITY	the con SKILLS	cepts of through
Course Outcomes	On successful con CO 1: Outline the CO 2: Employ vari investigation(L3) CO 3: Interpret se wireless devices. CO 4: Produce dig tools (L3)	npletion of this cour basic concepts of Cy ous digital Forensic curity challenges an (L2) ital evidence throug	se the stu /bercrime tools to po d Forensio (h the usa)	dents sha and digit erform Fo c examina ge of mol	all be at al Foren prensic ation pr pile dev	ole to: nsics. (L1 ocess of ice Forer) nsic
Course Content:							
Module 1	Cybercrime and Digital Forensic Principles	Assignment	Seminar			10 Se	essions
Cybercrime: Definition, Investigating Cybercrin Phases of Digital Foren open systems, Digital i awareness of digital evi	Nature and Scope on the, Digital Evidence sics, Digital devices nvestigation proces dence. Case studie	of Cyber crime, Type e, Prevention of cy s in society, Evident ss models: Staircase s on Cyber Crimes.	s of cyber ber crime ial Potent Model, f	crime, Ca e, Overvie ial of Dig Evidence	ategorie ew of E ital Dev Flow N	es of cybe Digital Fo vices: clo Iodel, Ine	er crime, prensics, sed and creasing
Module 2	Digital Forensics examination process	Case Studies	Case Stud	ly		11 Se	ssions
Language of Computer aspects of digital evid Contamination, Digital Evidence locations, A se	r crime investigati ence, Presenting forensics examina even-element secur	on, preparing a Dig digital evidence, Do tion principles: Prev ity model, A develo	ital Forer evice usa viewing, li pmental n	nsics Inve ge, Profil maging, (nodel of d	estigatio ing and Continu digital s	on, Chan d cyberp ity and l ystems.	llenging profiling, hashing,
Module 3	Wireless technologies and Wireless threats	Quiz	GSM, Par	ben's Cel	l Seizur	e 12 Se	ssions
Overview of Modern V Chalking, War Flying, V and Phreaking, Who's Forensics, Forensic Ru	Vireless Technolog oice SMS, GSM an Tracking You and Y les for Cellular Ph	y, Wireless Crime F d Identification Data our Cell Phone? Ho ones, Cell Phone F	Preventior Intercep Intercep W Does (Nowchart	n Technic tion in G Cellular F Processe	ues, W SM, Ce raud Oo s Using	ar-Drivir Il Phone ccur? Cel g Parabe	ng, War- Hacking Il Phone en's Cell
Module 4	obile phone prensics	Quiz	orensic	Tools	10 S	essions	

Importance and Motivation behind Mobile Forensics, Mobile Phone Forensics: Crime and Mobile Phones, the Evidence, Forensic Procedures of mobile phones, The SIM Card, Files Present in SIM Card, Device Data, SMS Spam, What Data Is Available from Mobile Phones?, Handling Instructions for Mobile Phones, Mobile Phone Forensics Tools and Methods, Social Media Forensics on Mobile Devices.

Targeted Application & Tools that can be used:

- Wireless Security
- Digital Forensics
- Android Forensics

Textbooks:

T1 Gregory Kipper, "Wireless Crime and Forensic Investigation", Auerbach Publications, 1st Edition, September 19, 2019.

References:

R1 Losif I. Androulidakis, "Mobile phone security and forensics: A practical approach", Springer publications, 2nd Edition, 2016.

R2 Andrew Hoog, "Android Forensics: Investigation, Analysis and Mobile Security for Google Android", Elsevier publications, 1st Edition, 15th June 2011.

R3 Angus M. Marshall, "Digital forensics: Digital evidence in criminal investigation", John – Wiley and Sons, November 2008, p 180.

Web references:

https://presiuniv.knimbus.com/user#/home

Topics relevant to "Employability":

- 1. Prevention of cybercrime
- 2. preparing a Digital Forensics Investigation
- 3. Mobile Phone Forensics: Crime and Mobile Phones.
- 4. Mobile Phone Forensics Tools

for developing **Employability Skills** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.

Course	Course Title: Artificial Intellig	gence and Machine				
Code:	Learning		L- P- C	2	2	3
CSE3001	Type of Course: Integrated					
Version No.	2.0					
Course Pre-	CSE1003 Innovation Project -	Raspberry Pi Using	Python			
requisites						
Anti-	NIL					
requisites						
Course Description	This course introduces the basic to the basic concepts and tech Intelligence (AI), is an importa several business and social prob learning model development us Topics include: Working with Classification algorithms; Opti Gradient Descent for simple Lir Boosting techniques – AdaBoo parameters; Clustering algorithm Integrated Moving Average Moo Collaborative Filtering, Text An- model.	concepts of artificial in niques of Machine Le nt set of techniques olems. The objective of ing Python. Collections and Data mization techniques near Regression; Ense ost and Gradient Bo ms; Forecasting with T dels, Recommender S alytics – Sentiment Cl	ntelligence. arning (ML and algorit f this course Frames; R – Gradien mble Learr osting; Gri ime-Series ystems : As assification	It intro), a sub thms us e is to d segressi it Desc ing – R d Seard data : A sociatio	duces s set of A sed for iscuss r on algo ent algo andom ch for uto-Rep on Rule Naïve B	tudents Artificial solving nachine prithms; orithm, Forest, optimal gressive Mining, ayesian
Course	The objective of the course is to	o familiarize the learn	ers with th	e conce	pts of A	Artificial
Objective	Intelligence and Machine Learn	ing and attain Skill De	evelopmen	t throu	gh expe	riential
_	Learning techniques.	-	-			
Course Out Comes	Consuccessful completion of the course the students shall be able to: CO1: To develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents. agents. [Comprehension] CO2: Produce machine learning models for predictive analytics. analytics. [Application] CO3: Apply ensemble learning, optimization and hyper parameter tuning techniques for machine learning algorithms. CO4: Demonstrate different types of clustering techniques. CO5: Employ time series forecasting techniques/models for real world problems. CO5: [Application]					
Course Content:						
Module 1	Introduction to Artificial Intelligence and Knowledge based systems	Assignment	Theory		6 S	essions
Topics:						
Introduction t	o Artificial Intelligence, Definitio	ns, foundation, Histor	y and Appli	cations	; Agent	s: Types
of Agent, Stru	icture of Intelligent agent and i	ts functions, Agents a	nd Environ	ment; l	ntrodu	ction to
Knowledge re	epresentation, approaches and	issues in knowledge	representa	ation, I	ntroduc	ction to
searching algo	orithm in Al,Conceptual graphs, I	Viethods for Logic rep	resentation	i(POL, F	UL).	
Module 2	Supervised Machine Learning Algorithms	Assignment	Program activi	nming ity	16 Se	essions

Introduction to the Machine Learning (ML) Framework, types of ML, types of variables/features used in ML algorithms, Feature engineering-Normalization, One-hot encoding, Simple Linear Regression, Multiple Linear Regression,Validation and Accuracy measures for Regression models. Classification models – Decision Tree algorithms using Entropy and Gini Index as measures of node impurity, model evaluation metrics for classification algorithms,Logistic regression, Bayes model for sentiment classification – an introduction..

	Module 3	Advanced Machine Learning Concepts	Assignment	Programming activity	14 Sessions
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Topics:

Nearest Neighbor techniques, Cost functions and Optimization Technique – introduction to Gradient Descent, its applications on Linear Regression. C.Ensemble Learning algorithms – Bagging (Random Forest), Boosting(AdaBoost), XGBoost.

Topics:

Partitioned Clustering – K-means and Hierarchical Clustering techniques, cluster validity measures, Components of Time Series data, Basic Concepts of Forecasting , An introduction to Forecasting from Time Series Models, calculating forecast accuracy, Association Rule Mining, Collaborative Filtering – User based and item based similarity, closed and maximal frequent item sets.

List of Laboratory Tasks:

Lab sheet -1

Level 1: A review of Python programming - Introduction to Python Stack for Data Science, Core Python Libraries for data analysis, Anaconda platform and its installation, Executing programs on Jupyter IDE/ Colab.

Level2: Programming exercises to revise variables, control statements and collections – lists, list comprehension

Lab sheet -2

Level 1 - Programming exercises on Tuples

Level 2- Nested data structures

Lab sheet -3

Level 1: Introduction to Numpy, Pandas,

Level 2: Scikit-learn and Visualization techniques.

Lab sheet -4

Level 1 - Dictionaries, dictionary comprehension.

Level 2 - Introduction to Data Frames using Pandas and working with frames

Lab sheet -5

Level 1- Regression Models Simple linear regression, outlier detection.

Level 2 - multiple linear regressions – model evaluation, multi-co linearity and handling multi-co linearity, outlier detection.

Lab sheet -6

Level 1- Decision Tree Classifiers - Decision Tree classifier using Gini Index- measuring test accuracy, displaying the tree, confusion matrix and ROC.

Level 2- Decision Tree Classifier using Entropy.

Lab sheet -7

Level 1 - Optimization Techniques Developing a Gradient Descent Algorithm for linear regression – using NumPy and using sklearn.

Level 2 - cohen_kappa_score.

Lab sheet -8

Level 1- Hyper parameter Tuning methods Hyper parameter tuning using Grid Search for Nearest Neighbor Classifiers and

Level 2- Hyper parameter tuning using Grid Search for Decision Tree Classifiers.

Lab sheet -9

Level 1 - Hyper parameter Tuning for Ensemble models Ensemble Learning – Random Forest – Building the model, Grid Search for optimal parameters,

Level 2 - Feature Importance. Ada Boost Classifiers and Gradient Boosting Classifiers Lab sheet -10

Level 2 - Clustering – Kmeans – cluster centers and interpreting the clusters, finding the optimal number of clusters using Elbow Curve method.

Level 2 - Agglomerative Hierarchical Clustering – Compare the clusters formed by kmeans and Agglomerative Clustering

Lab sheet -1 1

Level 1 – Probability theory(Conditional Probability)

Level 2 - Naïve Bayes Model

Lab sheet -12

Level 1- Models forecasting Applications

Level 2 - Models for Forecasting Time Series data

Lab sheet -13

Level 1- Recommender Systems - Association Rule Mining using Apriori for frequent Itemset Generation.

Level 2 - Recommender Systems – user based similarity

Targeted Application & Tools that can be used

Use of PowerPoint software for lecture slides and use of Google's Colab cloud service <u>https://www.tutorialspoint.com/google_colab/index.html</u> for executing and sharing of lab exercises.

Project work/Assignment:

Assignment:

1. Programming: Implementation of given scenario using Python and Colab.

Assignment: Learning courses for 4 Hours from the following link

https://learn.datacamp.com/courses?topics=Machine%20Learning

Text Book

T1. Andreas C Muller, Sarah Guido, "Introduction to Machine Learning with Python : A Guide for Data Scientists", Oreilly, First Edition, 2016

T2. Stuart J. Russell and Peter Norvig, Artificial intelligence: A Modern Approach, 3rd edition, Upper Saddle River, Prentice Hall.

References

R1. Tan P. N., Steinbach M & Kumar V. "Introduction to Data Mining", Pearson Education, 2016. R2. Giuseppe Bonaccorso, "Machine Learning Algorithms: A reference guide to popular algorithms from data science and machine learning", Packt Publishing, 2017.

R3. Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning Using Python", Wiley, First Edition 2019.

E-References

https://presiuniv.knimbus.com/user#/home

Topics relevant to development of "Skill Development":

1. Regression Models

- 2. Decision Tree Classifiers
- 3. Hyper parameter Tuning methods
- 4. Agglomerative Hierarchical clustering
- 5. Decision tree classifiers

Course Code:	Course Title: Innova	tion Project-Arduino	Using				
CSF 1002	Embedded C			L- P- C	0	4	2
C3L 1002	Type of Course: Lab o	only					
Version No.	2.0						
Course Pre-	NIL						
requisites							
Anti-requisites	NIL						
	The course deals wit	h the fundamental c	oncepts of '	C' and	Embedde	ed C, p	roblem-
	solving using C in a sys	stematic way to read a	ind write the	e C code	and to in	npleme	ent them
	on an Arduino protot	ype board.					
Course	The course will also	demonstrate how t	to assemble	variou	s sensor	y devi	ces and
Description	program them using t	he Arduino platform a	is a basis. Stu	idents w	vill have t	he opp	ortunity
-	of gaining real-work	a experience in nand	aling IOT de	evices ir	ivoiving	nardw	are and
	software combination	15. are in donth knowled	lao of docio	ning d	ovolonin	م ممط	ing and
	implementing Arduin	o projects	ige of desig	sning, u	evelopin	g, cou	ing, anu
Course Objective	The objective of the c	o projects. course is to familiarize	the learner	with th		nts of	
	Innovation Project-A	rduino Using Embedd	ed C and att	ain SKII			лт
	through EXPERIENTIA	L LEARNING techniqu	les				•••
	On successful comple	etion of the course th	e students s	hall be a	able to:		
	• Wri	te a program using Ar	duino progra	amming	language	e using	
	Embedded 'C'	Г.	1 0	U	0 0	U	
Course Out	• Exp	lain the main features	of the Ardu	ino prot	otype bo	ard	
Comes	• Den	nonstrate the hardware	e interfacing	of the p	eripheral	s to Ar	duino
	system.		6.1		•		
	• Den	nonstrate the function	ng of live va	arious pr	ojects ca	rried o	ut
Course Contentu	using Ardun	io system.					
course content.							
Modulo 1	Basics of C, Branching and	Ouiz	Problem So	lving	0 Soco	ione	
Would'e I	looping and	Quiz		Iving	1 5635	10115	
Tonics:	b 8						
Structure of C pro	grams, Variables, Key	words. Datatypes, dec	laration, and	l Initiali	zation		
Decision Making	and Branching: if, if	-else, else-if ladder, sv	witch statem	ent.			
Decision making	and looping: for, whi	le, and do-while stater	nents.				
Module 2	Arrays, functions,	Ouiz	Problem So	lvino	8 Sess	ions	
	strings	Quiz		iving	0 0 0 0 0 5 5	1011.5	
Topics:	1 1						
Arrays: Introduction	on ,one dimensional as	rray, two dimensional	array,				
Strings: Introducti	on string handling fu	gories, searching and s	sorting				
Sumgs. muodueu	Structures and						
Module 3	Pointers		Problem So	lving	7 Sess	ions	
	i oniters						
Topics:							
Charles and a fine it is							
Structure definitio	on, syntax and applicat	tion of structures, def	inition of po	inters ,s	yntax, pa	iss –by	-
reference.							
	Introduction to	_					
Module 4	Arduino and Sensory	Project	Modeling a	nd	6 Sess	ions	
WOULLE 4	, Devices	Development	Simulation	task			
		1	1				

Introduction to Arduino, Pin configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board, API's, Introduction to Embedded C and Arduino platform, Arduino Datatypes and variables, Arduino i/o Functions, Arduino Communications, Arduino IDE, Various Cloud Platforms.

List of Laboratory Tasks

Targeted Application & Tools that can be used:

Making it a reality (Arduino Projects) :

Projects will include but not limited to :

- 1) Intelligent home locking system.
- 2) Intelligent water level management system.
- 3) Home automation using RFID.
- 4) Real time clock-based home automation.
- 5) Intelligent Automatic Irrigation System

Professionally Used Software: Arduino IDE.

Project work/Assignment:

z1- Fundamentals of C-Programs,

z2- Basics of Embedded C and Arduino

Project work Text Book

T1 E Balagurusamy *"Programming in ANSI C"*, Mc Graw Hill Publications,7th Edition.

T2 Monk Simon "Programming Arduino: Getting Started with Sketches", Mc Graw Hill

Publications Second Edition.

References

R1 <u>https://www.tutorialspoint.com/arduino/index.html</u>.

R2 https://create.arduino.cc/projecthub/projects/tags/sensor.

Veb resources: https://3dprinting.com/what-is-3d-printing.

ttps://puuniversity.informaticsglobal.com

Topics relevant to the development of "Skill Development":

- 1. Basic Concepts of C-Programming
- 2. Embedded 'C' and Arduino
- 3. Problem solving
- 4. Creative Thinking
- 5. Team work
- 6. Prototype Development.

Course Code:	Course Title: Computer Graphics		3	0	3		
Version No.	2.0						
Course Pre- requisites	C Programming						
Anti-requisites	NIL						
Course Description	This course demonstrates the basics of graphics and visualization in computer science, enabling students to appreciate how the computer system displays graphics and visual effects on a display device. The course uses assignments to develop visualization skills of the students. The key topics covered in this course include algorithms for drawing basic						

	primitives, transformations, viewing an along with Bezier curves and Surfaces.	d clipping for both	2D and 3D objects		
Course Objective	The objective of the course is to familiarize Computer Graphics and attain Skill Devel techniques.	e the learners with th opment through Part	e concepts of icipative Learning		
Course Out Comes	 On successful completion of the course the students shall be able to: CO 1: Illustrate algorithms for drawing basic primitives like Point, Line and Polygon. CO 2: Illustrate algorithms for performing 2D Geometric Transformations, viewing and clipping. CO 3: Illustrate algorithms for performing 3D Geometric Transformations, clipping. CO 4: Describe plane Bezier curves and Bezier surfaces 				
Course Content:					
Module 1	Overview: Basics of Computer Graphics	Assignment	No. of Sessions 13		
graphics bystellis graphics Vs. Rando Devices, logical inpu Line drawing algor circle drawing algor	om Graphics, Flat panel Displays – emis uts, Graphics tools and software ithms - Midpoint, DDA, Bresenham's. C rithm, Bresenham's circle algorithm. Basi	ircle generation alg ics of 2D and 3D objection	sive displays, Input orithms - Midpoin <mark>t</mark> ects.		
Module 2	2D Geometric Transformations, viewing and clipping	Assignment	No. of Sessions : 12		
2D Geometric Transformations: Basics of translation, scaling, rotation, reflection and shearing. Matrix representations and homogeneous coordinates for translation, scaling, rotation, reflection and shearing. 2D Composite transformations, General pivot point rotation and scaling. Introduction to OpenGL concepts and libraries. OpenGL geometric transformations functions. Basics of 2D viewing and Clipping: Basics of viewing and Clipping, 2D viewing pipeline, Viewing Transformation systems, Normalization and Viewport Transformation Types of clipping: point, Line and polygon clipping, 2D line clipping algorithms: cohen-sutherland line clipping, Liang-Barsky line clipping algorithm, polygon fill area clipping: Sutherland-Hodgeman polygon clipping algorithm, OpenGL 2D viewing and clipping functions. Assignment: Numerical problems based on 2D transformations.					
Module 3	3D Geometric Transformations, clipping:	Mini-project	No. of Sessions : 11		

3D Geometric Transformations: 3D translation, rotation, scaling, reflection and shearing, composite 3D transformations, OpenGL 3D geometric transformations functions, Transformations between 3D Coordinate Systems.

Basics of 3D Viewing and Clipping: 3D viewing concepts, 3D viewing coordinate parameters,

Transformation from world to viewing coordinates, Projection transformation, parallel projections -

orthogonal projections and oblique projections, parallel-Projection Transformation Matrix, perspective projections, Perspective-Projection Transformation Matrix

Assignment: Based on the activities in the link: pu.informatics.global

Module 4	Plane curves and surfaces	Quiz	No. of Classes : 9
----------	---------------------------	------	--------------------

Plane Curves: Plane Curves representation, Nonparametric Curves, Parametric Curves, Curved Surfaces, Quadric Surfaces.

Basics of Curves and surfaces: Interpolation and Approximation Splines, Parametric Continuity Conditions, Geometric Continuity Conditions, Spline Specifications. Representation of Space Curves, Cubic Splines, Bezier Curves, Parametric Cubic Curves, Quadric Surfaces, Bezier Surfaces. OpenGL Quadric-Surface and Cubic-Surface Functions

Targeted Application & Tools that can be used:

Application Area: Game design and Animation

Tools/Simulator/Software used: Visual Studio 17.0 / CodeBlock

Text Book:

T1: Donald D. Hearn, M. Pauline Baker and Warren Carither, Computer Graphics with OpenGL, Pearson Education, 4th Edition, 2021

Reference Books:

- R1. John F Hughes, Andries van Dam, Steven K. Feiner, James D. Foley, Morga, Computer Graphics: Principles and Practice, Pearson Education India, Third Edition, 2013
- R2. John Kessenich, Graham Sellers, Dave Shreiner , OpenGL Programming guide , Addison-Wesley Ninth Edition, 2016
- R3. Edward Angel and Dave shreiner, Interactive Computer Graphics, A top down approach with shader based OpenGL, Pearson Education, 6th Edition, 2018

E-References

https://presiuniv.knimbus.com/user#/home

Topics relevant to development of "Skill Development":

- 1. Line drawing algorithms (DDA, Bresenham's)
- 2. Graphics tools and software
- 3. Liang-Barsky line clipping algorithm
- 4. cohen-sutherland line clipping
- 5. OpenGL 2D viewing and clipping functions

Course	Cryptography and Network Security					
		L- P- C	3	0	3	
2079						
Version No.	2.0				<u> </u>	
Course Bro	2.0 Desig Knowledge in Number Theory, Dinary Oners	tions				
requisites	Basic Knowledge in Number Theory, Binary Operations					
Anti- requisites	NIL					
Course Description	The Course deals with the principles and practice of cryptography and network security, focusing in particular on the security aspects of the web and Internet.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Cryptography and Network Security above and attain Skill Development through Problem Solving methodologies.					
Course Outcomes	 On successful completion of this course the students shall be able to: 1. Describe the basic concept of Cryptography 2. Classify different types of Cryptographic Algorithms 3. Solve Mathematical problems required for Cryptography 4. Illustrate Network Security concepts 					
Course Content:						

Introduction to Module 1 Cryptography	Assignment Recognize the techniques	07 Sessions
--	-------------------------------------	----------------

Introduction to Cryptography, Model of Network Security, OSI Security architecture, Security Attacks: active attacks, passive attacks, services: Authentication, Access Control, Data Confidentiality, Data Integrity, Nonrepudiation, Substitution Ciphers : Play-fair and Hill Cipher, Vigenere cipher, Introduction to Block Cipher and Stream Cipher, Feistel Structure, ECB modes of block cipher

Module 2	Symmetric Encryption Algorithms	Assignment	Analysis of results	09 Sessions
----------	------------------------------------	------------	---------------------	----------------

Topics:

Symmetric Encryption Algorithms : Data Encryption Standard, Introduction to Galois Field, Advanced Encryption Standard, Modular Arithmetic, Prime numbers, Fermat's little theorem, Applications of Fermat's little theorem in modular athematic<mark>,</mark> brief about primality testing and factorization, Euclidean and Extended Euclidean Algorithm, Euler Totient Function, Chinese remainder theorem.

		Assignment		09
Module 3	Public Key Cryptography		Analysis of solutions	Sessions

Topics:

Overview of Public Key Cryptography, RSA, Diffie-Helman Key exchange, Man in the middle attack, Cryptographic Hash functions, Secure Hash Algorithm, Message Authentication Codes – HMAC, Digital Signature, Ei-gamal Encryption, Elliptic curve cryptography overview<mark>.</mark>

		Assignment		05
Module 4	Network Security		Analysis of solutions	Sessions
T	1		1	

Topics:

Network Security fundamentals, Network Security applications: Authentication: Kerberos, PKI, Network Security applications: e-mail security: PGP, MIME, Network Security applications: IP Security: IPSec architecture, Network Security applications: DNS Security.

Targeted Application & Tools that can be used:

Students get the knowledge about cryptography techniques followed, the algorithms used for encryption and decryptions & the techniques for authentication and confidentiality of messages.

Textbooks:

T1 William Stallings, "Cryptography and Network Security - Principles and Practices", 7th Edition, Pearson publication, ISBN: 978-93-325-8522-5, 2017

References:

R1 Bruice Schneier, "Applied Cryptography – Protocols, Algorithms and Source code in C", Second Edition, Wiley Publication, ISBN: 978-81-265-1368-0, 2017

R2 Cryptography and Network Security, Express Learning, ITL Education Solution Limited.

R3 e-pg pathshala UGC lecture series

Web

references: https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=223 3842&site=ehost-live

https://nptel.ac.in/courses/106105031.

Topics relevant to "Skill Development": Topics relevant to "Skill Development":

- 1. Play-fair and Hill Cipher
- 2. Euclidean and Extended Euclidean Algorithm
- 3. Secure Hash Algorithm
- 4. Diffie-Helman Key exchange
- 5. Totient Function.
- 6. Fermat's little theorem

Course Code:	Course Title: Fu	ndamentals of Data Anal	ytics		3	0	3	
CSE2027				L- P- C				
	Type of Course:	Theory only		•				
Version No.	2.0							
Course Pro-	2.0							
requisites								
Anti-requisites	NIL	IL						
Course	Fundamentals	of Data Analytics i	s designe	d for in	snort	ing cl	aansing	
Description	transforming	and modeling data	with the	goal of	opuid Spuid	overing	useful	
	information a	and modeling data	-making T		a haa	ins hv d	overing	
	Data extractio	n pre-processing and	d transfor	mation 1	t dali t dali	ivors th	o hasic	
	statistics and t	aught in an intuitive w	un transion	vsis the d	lata T	This cou	ie basie	
	baln the stude	aught in an intuitive w	ay lu anai	ysis the u	iata.		anse will	
	neip the stude	ints to apply the known	euge on ua	ald dildlys	IS LU a	a wide i	ange of	
Course Objective	applications.	of the course is to fam	iliariza tha	loornors	with	the con	conto of	
course Objective	Fundamentals of	f Data Analytics and att			WILLI NT +h	rough D		
	SOLVING Metho	dologies.					NODLEIVI	
Course Out Comes	On successful co	mpletion of the course t	he students	shall be a	ble to			
	1) Explain differ	ent types of data and va	riables.					
	2) Interpret data	a using appropriate stati	stical meth	ods.				
	3) Demonstrat	e the collection, pro	cessing an	id analysi	is of	data	for any	
	given applicati	ion and Illustrate various	s charts usir	ng visualiza	ation	method	5.	
	Apply the Da	ta Analysis techniques b	y MAT Lab					
Course Content:		Γ	1					
Module 1	Introduction to Data Analysis	Assignment	Data Colleo analysis	ction , data	à	6 9	Sessions	
Topics: Introducing	Data, overview of	of data analysis: Data in t	he Real Wo	rld, Data v	s. Info	rmation	, The	
Many "Vs" of Data,	Structured Data	and Unstructured Data,	Types of Da	ta, Data Ar	nalysis	Defined	d, Types	
of Variables, Centra	al Tendency of Da	ata, Scales of Data, Source	es of Data, I	Data prepa	ratior	n: Cleani	ng the	
data, Removing var	lables, Data Tran	sformations.						
Module 2	Statistical	Assignment	Data analy	cic		g	Sessions	
	functions	Assignment	Data analy	313		0.	563310113	
Topics: Descriptive	e Statistics, Infe	rential Statistics (T test	<i>,</i> Z test,), P	robability	v Uses	i In Busi	ness	
and Calculating Pr	obability from	a Contingency Tables.						
		r	T					
	Data Collection,							
Module 3	Processing and	Project based MAT Lab	MAT LAB			6 9	Sessions	
	Analysis						11	
lopics: Collection	of Primary Data(Observation Method, In	terview Me	thod, Colle	ection	of Data	through	
Questionnaires, Col	de of Data Collo	nrough Schedule) Differe	nce betwee	Difference	nnaire o botu	is and Sc	neaules,	
Experiment Process	sing Operations	correlation	luary Data	,Dinerenci		veen su	ivey anu	
Introduction: Overv	view Classification	on Regression Building a	prediction	model				
			prediction	model				
	Data		Data Colley	ction				
Module 4	Visualization	Project MAT Lab	visualizatio	on and data	a	6	Sessions	
	and Charting		analysis		4		200110	
	Prediction		anaiyoio					
L								
Iopics: Types of c	narts and their s	ignificance, Organize dat	a interactiv	ely with ta	ables ,	Visualiz	ing data	
with charts, Analyz	ing data with piv	vot tables, Build presenta	ition ready	aashboard	is and	turn re	al world	
uata into business i	nsignus, Tracking	trends and making fored	asts, interp	retation al	iu rep	ort writ	ing	

Modu	le 5	Introduction to MATLAB	Project MAT Lab	Data analysis with optimization	12 Sessions			
Topics	: Defining Ca	tegories of Data	, Analyzing Groups wit	hin Data, Importing Data fro	om Multiple Files,			
Reviev	Review Project , Images and 3-D Surface Plots, Importing Unstructured Data							
Target	Targeted Application & Tools that can be used:							
Applic	ation Area a	re						
Decisi	on making in	business, health	n care, financial sector	, Medical diagnosis etc				
MAT L	ab							
Text B	ooks							
	1. Gl€	enn J. Myatt an	d Wayne P. Johnson,	"Making Sense of Data I:	A Practical Guide			
	to Explora	tory Data Analy	sis and Data Mining	Paperback", Import, 22 Ju	ıly 2014.			
	2. Wi	lliam Menke Ar	nd Joshua Menke,"Er	nvironmental Data Analysi	is with MAT Lab",			
	Elsevier, 2	012.						
	3. htt	ps://matlabaca	demy.mathworks.co	m/details/matlab-for-dat	a-processing-			
	and-visual	ization/mlvi						
Refere	ences							
1.	Paul McFe	dries , "Excel Da	ata Analysis-visual bl	ue print",Wiley 4th Edition	September 2019.			
2.	Gerald Kni	ight, "Analyzing	Business Data with	Excel",O'Reilly; 1 st Edition,	13 January 2006.			
3.	https://pe	ople.highline.e	du/mgirvin/AllClasse	s/348/348/AllFilesBI348A	nalytics.htm			
4.	Hansa Lysa	ander,"Data An	alysis and business m	odelling using Microsoft I	Excel", PHI, 2017.			
	Web Links	:						
	https://pre	siuniv.knimbus	.com/user#/home					
Topics	relevant to	development of	<i>"FOUNDATION SKILLS</i>	<i>"</i> :				
1.	Statistical C	Concepts for data	a, visualization techniq	ues.				
2.	Data collec	tion for project b	based assignments.					
3.	Inferential	Statistics (T te	st, Z test)					
4.	Probability	v Calculation						

4. Probability Calculation for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Course Code: CSE2008	Course Title: Programming in Java (Object Oriented Programming)		1	4	3		
	Type of Course: Program Core Theory and Laboratory Integrated	L-P-C					
Version No.	1.0						
Course Pre- requisites	Basic knowledge of any structured programming: Data ty operators, conditional & control structures, Loops, arrays	Basic knowledge of any structured programming: Data types, variables, constants, operators, conditional & control structures, Loops, arrays & function.					
Anti-requisites	NIL						
Course Description	This course introduces the core concepts of object-oriented programming by using Java. This course has theory and lab component which emphasizes on understanding the implementation and application of object-oriented programming paradigm. It helps the student to build real time secure applications by applying these concepts and also for effective problem solving. The students interpret and understand the need for object oriented programming to build applications						
Course Objective	The objective of the course is to familiarize the lear Programming in Java and attain SKILL I EXPERIENTIAL LEARNING techniques.	arners v DEVEL	with t OPMI	he con ENT	cepts of through		

Course Out	ourse Out On successful completion of the course the students shall be able to:						
Comes	1. Write programs using basic concepts in JAVA						
	2. Apply the concept of	2. Apply the concept of arrays, strings, polymorphism & inheritance for building					
	desktop	desktop					
	3. Implement interface	& packages for build	ding secure applications				
	4. Apply the concepts o	f error handling me	chanism and multithread	ling.			
	5. Apply the concepts o	f Collections to deve	elop high performance a	pplications.			
Course							
Content:							
Module 1	INTRODUCTION	Assignment	Programming	No. of Classes:10			
Topics: Introduc	tion to Object Oriented Pro	gramming, Java E	volution, and How Jav	a differs			
from C++, Feat	ures of Java.	6 6,	,				
Java Environme	ent: Installing JDK (JVM, J	RE), Java Source I	File Structure, Compila	tion and			
Execution of Ja	va Programs.	,,	/ I				
TOKENS: Data	types, Variables, Operator	s. Control Stateme	ents. Command Line A	guments.			
CLASSES, OBJECT	S, AND METHODS: Defining	a class, access spec	cifiers, instantiating obje	ects, reference			
variable, accessir	ig class members and method	s, constructors, met	hod overloading, static m	nembers, static			
methods, inner c	lass, Wrapper class , Autobox	ing and Unboxing,	0,	,			
	Arrays, Strings, inheritance			No.			
Module 2	and Polymorphism	Assignment	Programming	of Classes:6			
Topics:Defining	an Array. Initializing & A	ccessing Array. M	ulti –Dimensional Arra	IV.			
Operation on S	tring Mutable & Immutabl	e String, Creating	Strings using StringBu	ffer or			
StringBuilder		e sung, creang					
Defining a subc	lass types of Inheritance n	nethod overriding	super keyword dynam	nic method			
invocation dyn	amic polymorphism usage	of final abstract ar	nd this keyword	ne metrioù			
	Interfaces Packages and			No			
Module 3	Exception Handling	Assignment	Programming	of Classes:8			
Topics Defining	interfaces extending an in	terface Implemen	ting interfaces Organi	zing Classes			
and Interfaces in	n Packages Package as Δc_{c}	ress Protection De	fining a Package I ibr	ary			
Packages impo	rt nackages		lining a l'ackage, Lioi	ur y			
Exception hand	ling: Introduction to Except	tions Difference h	etween Exceptions & I	Frrors Types			
of Exception H	andling Exceptions: Use of	try catch finally	throw throws User D	efined			
Exceptions Che	cked and Un-Checked Exc	entions	, unow, unows. Oser D	ermed			
		eptions.		No			
Module 4	PROGRAMMING.	Assignment	Programming	of Classes 12			
Topics: Introduct	tion to threads life cycle of	a thread creating	threads extending the	Thread Class			
Implementing th	e "runnable" interface. Threa	d Priority Thread sy	inchronization Inter com	munication of			
Threads		a monty, micaa sy					
ini caus							
	Collections and Graphic			No			
Module 5	Programming(AWT Swings)	Assignment	Mini Project	of Classes:12			
Introduction to	Collections Classification of	Collection Introdu	ction to List Man and	Set Interface			
Introduction to A	nnlets			Set meridee,			
Introduction to t	he abstract window toolkit (A	WT), Frames, Even	t-driven programming: N	Aouse and Key			
Event handling.		,,,,,	e ann en pre8. ann 8. m				
Introduction to Swings, IEC, Swing GUI Components and Layout Manager.							
List of Laboratory Tasks:							
Experiment NO 1: Programming assignment with class. objects and basic control structures.							
(Application:	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	-,j with					
Build a basic mer	u driven application)						
Level 1: Program	iming scenarios which use co	ntrol structures to s	olve simple case scenario	os (Eg: Check if			
a number is odd or even)							

Level 2: Programming assignment which will build menu driven application by identifying the class and its relevant methods.

Experiment No. 2: Programming assignment using Arrays and Strings. (Application: Develop application on Matrices, build String based application like Telephone directory)

Level 1: Programming scenarios which build single dimensional and multidimensional array, apply the different methods to operate on strings.

Level 2: Programming assignment which will manipulate the data stored in matrices and identify the appropriate usage String methods.

Experiment No. 3: Programming assignment using Inheritance and Polymorphism

Level 1: Programming scenarios which use the concept the polymorphism for method overloading. Scenarios which apply the concept of inheritance (identifying parent, child class and its relationship)

Level 2: Programming assignment which build application which have same functions in different forms.

Experiment No. 4: Programming assignment using Exception Handling

Level 1: Programming assignment on building applications using built in Exceptions.

Level 2: Programming assignment on building application using user defined Exceptions.

Experiment No. 5: Programming assignment using Multithreading. (Eg: Building an application which performs different arithmetic operations and sharing the resources using threads)

Level 1: Programming scenarios to build a thread, assign priority and use the thread methods to perform operations

Level 2: Programming scenarios for building synchronized applications.

Experiment No. 8: Programming assignment using Collections

Level 1: Programming Scenarios to apply and use the Collection framework (List, SET, Map, Interface)

Experiment No. 9: Programming assignment to build GUI Applications.

Level 1: Programming Scenarios to build GUI for a given scenario using AWT and Swings concepts.

Targeted Application & Tools that can be used:

- Platform independent Application Development
- Secure Application Development
- Data Mining
- Operating Systems.
- Database Management Systems
- Banking software
- Automobiles
- Mobile Applications

Tools: JDK (Java Development Tool kit), Integrated Development Environment (IDE), Apache NetBeans, Eclipse.

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

After completion of each module a programming based Assignment/Assessment will be conducted.
A scenario will be given to the student to be developed as a Java Application. On completion of Module 5, student will be asked to develop a Mini Project using the GUI functionalities.

Text Book

- 1. Cay S Horstmann and Cary Gornell, "CORE JAVA volume I-Fundamentals", Pearson.
- 2. Cay S Horstmann and Cary Gornell, "CORE JAVA volume II-Advanced Features", Pearson.

References

1)Herbert Schildt, "The Complete Reference Java 2", Tata McGraw Hill Education. 2) James W. Cooper, "Java TM Design Patterns – A Tutorial", Addison-Wesley Publishers.

Topics relevant to development of "Skill Development": Real time application development using OOPs concept, Naming and coding convention for Project Development for Skill development through Experiential Learning Techniques. This is attained through assessment component mentioned in the course handout.

Course Code:	Course Title: Web Technol	ogy			3 ()	3	
CSE2067	Type of Course: Program c	ore		L- P- C				
	Theory Only							
Version No.	2.0							
Course Pre-	NIL							
requisites								
Anti-requisites		<u> </u>			<u> </u>			
Lourse	This course highlights the	e basic web design	n using Hyper	text Ma	rkup La	anguage	e and	
Description	Cascading Style Sneets. Stu	idents will be tra	ling tronds in t	ing and	design	ing ette	ective	
	web pages by writing code web pages with the use of	nage lavout techn	ning trends in t	rmattin	g gran	hics im	nonges	
	and multimedia. The focus	is on popular key	v technologie	s that w	vill help	studer	nts to	
	build Internet- and web-ba	sed applications t	that interact v	with oth	er app	lication	s and	
	with databases.							
Course	The objective of the cours	se is to familiariz	e the learner	rs with	the co	ncepts	of Web	
Objective	Technology and attain Skil	l Development th	nrough Experi	ential L	earn <mark>in</mark> g	<mark>g</mark> techni	iques.	
Course	On successful completio	n of this course	the student	s shall	be abl	e to:		
Outcomes	CO1: Implement web-ba	sed application	using client-s	side scr	ipting	langua	ges.	
	(Application level)		0		1 0	0	0	
	CO2 : Apply various const	tructs to enhance	e the appear	rance o	f a we	bsite.		
	(Application level)							
	CO3 : Illustrate java-script concepts to demonstration dynamic web site (Application							
	level)							
	CO4: Apply server-side server-	CO4: Apply server-side scripting languages to develop a web page linked to a						
	database. (Application le	evel)						
Course Content	:							
		Quizzos and	Quizzes o	n variou	S			
Module 1	Introduction to XHTML	Quizzes and	features o	of XHTM	L,	10 Session		
		Assignments	simple ap	plicatio	าร			
Topics:								
Basics: Web, V	VWW, Web browsers, Web	servers, Interne	et.					
XHTML: Origin	is and Evolution of HTML a	and XHTML: Bas	sic Syntax, St	tandard	I XHTN	ИL Doc	cument	
Structure, Bas	ic Text Markup, Images, H	ypertext Links,	Lists, Tables	, Forms	s, Fran	nes, Sy	ntactic	
Differences be	tween HTML and XHTML.							
			Comprehe	ension b	ased			
		Quizzes and	Quizzes ai	nd				
Module 2	Advanced CSS	assignments	assignmer	nts; App	lication	ן 8 50	essions	
		C C	of CSS in c	designin	g			
			webpages	5				
ropics:	an to CCC. Defining 9 Applying	- a stula Creating			ام ما سه		lantara	
CSS font proper	tion to CSS, Defining & Applying	s a style, Creating	Style sneets, t	lypes of	style si	leet, se	tectors,	
Advanced CSS	· Lavout Normal Flow Pos	itioning Flement	ts Floating F	lomont		nonsiva	دی <mark>.</mark> ۵	
Design CSS Er	ameworks XMI · Basics de	monstration of a	nnlications i	using XI	3, NE3 MI	JUIISIVE	-	
Design, essina			Applications	n of lav	viL vaScrint			
Module 3	Fundamentals of	Quizzes and	for dynam	nic web	nage	10 S	essions	
inouule 5	JavaScript	assignments	designing	ne web	page	10 5	23510113	
Topics:		<u>.</u>						
-								
JavaScript: Intro	oduction to JavaScript, Basic J	JavaScript Instruct	tions, Functio	ns, Met	hods &	Object	S,	
Decisions and Lo	oops, Document Object Mode	el, Event handling	, handling wir	ndow po	p-ups,	JavaSc	ript	

validation.

Module 4	PHP – Application Level	Quizzes and assignments	Application of PHP i web designing	n 14 Sessions
Topics:				
PHP: Introduction	on to server-side Develop	ment with PHP, Ar	rays, \$GET and \$ P	OST, \$_Files
Array, Reading/	Writing Files, PHP Classes	and Objects, Wor	king with Database	s, SQL, Database
APIs, Managing	a MySQL Database. Acces	sing MySQL in PH	Ρ.	
Targeted Applica	tion & Tools that can be us	ed:		
Xampp web serve	er to be used to demonstra	te PHP.		
Project work/Ass	ignment:			
Assignments are stipulated deadli	given after completion of enderging of the second	each module which	the student need to	submit within the
Textbook(s):				
1] Robert. W. S	ebesta, "Programming th	e World Wide Wei	<i>b",</i> Pearson Educati	on, 8th Edition,
2015.				
2] CSS Notes fo	r Professionals, ebook ava	ailable at https://b	ooks.goalkicker.co	m/CSSBook/
(Retrieved on J	an. 20, 2022)			
3] Deitel, Deite	l, Goldberg," <i>Internet</i> & W	orld Wide Web Ho	ow to Program", Fif	th Edition,
Pearson				
Education, 202	1.			
References				
1] Randy Conno	lly, Ricardo Hoar, "Fundar	mentals of Web De	evelopment", Pears	on Education
India, 1st. Editio	n.2016.			
2] Jeffrey C. Jac	kson, "Web Technologies	: A Computer Scie	nce Perspective", P	earson
Education, 1st E	dition,2016.			
Topics related to	development of "FOUNDA"	TION":		
I. Web, W	WW, Web browsers, Web	servers, Internet.		
2. CSS, PHP.	a for haalthaara			
for Skill Develop	ment through Experiential	Learning technique	s This is attained t	hrough assessment
component ment	tioned in course handout.	Learning teerinque	.s. This is actuired to	nough assessment
E-References				
pu.informatics.gl	obal, https://sm-nitk.vlabs	.ac.in/		
Course Code:	Course Title: Computer P	rogramming	2	4 4
CSE 151	Type of Course: Laborator	y Integrated Course	e L-P-C	
Version No.	1			
Course Bro				

version No.	L
Course Pre-	NA
requisites	
Anti-requisites	NA
	This Course will provide an introduction to foundational concepts of computer
	programming to students of all branches of Engineering. This course includes a mix
	of traditional lectures and laboratory sessions. Each meeting starts with a lecture
	and finishes with a laboratory session.
Course	Topics covered in this Course are problem formulation and development of simple
Description	programs, Pseudo code, Flow Chart, Algorithms, data types, operators, decision
	making and branching, looping statements, arrays, functions, structures and
	union.
	In the lab session students are required to solve problems based on the above
	concepts to illustrate the features of the structured programming.
Course Objective	The objective of the course is to familiarize the learners with the concepts of Computer
	Programming and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING
	techniques

	On successful completic COURSE OUTCOMES: O	on of the course n successful con	the students shall be able to: npletion of the course the stu	dents shall be
Course Out	able to:			
Comes	CO 1: Apply the basic	concepts and	control structures of progra	imming to so
	particular problems (L	3)		
	CO 2: Apply the concept	s of array and sti	rings to represent data and its c	perations.(L3)
Course Content:	CO 3: Illustrate the conc	cepts of functions	s, structure and unions in progr	amming.(L3)
Course content.				1
Module 1	Introduction	Quizzes		7 Sessions
Topics:		·	·	
Introduction to	Problem Solving			
Basic organizat	ion of Computer, System	n software and	Application software, Operat	ing System
and Programmi	ng languages.			
Logical analysi	s using Algorithm and F	lowchart. Intro	duction to C	
Structure of C p	program, variables, keyw	ords, data type	s and sizes, declaration and in	nitialization
of variables, sto	prage class, operators and	d expression, m	anaging input and output ope	erations,
compiling and I	linking.	1	1	1
	Branching and			
Modulo 2	looping	0		
Would 2	looping	Quizzes	Assignments	8 Sessions
Would 2	looping	Quizzes	Assignments	8 Sessions
Decision Mak	ting and Branching: if	Lif-else, if-els	Assignments se ladder. nested if and sw	8 Sessions
Decision Mak	ting and Branching: if	f, if-else, if-els	Assignments se ladder, nested if and sw	8 Sessions
Decision Mak Unconditional Decision Mak	ting and Branching: if l: break, continue, and ring and Looping: for	, if-else, if-els return while, do-wh	Assignments se ladder, nested if and sw	8 Sessions
Decision Mak Unconditiona Decision Mak	ting and Branching: if l: break, continue, and ting and Looping: for,	f, if-else, if-els l return , while, do-wh	Assignments se ladder, nested if and sw nile, and nested looping st	8 Sessions
Decision Mak Unconditiona Decision Mak Module 3	ting and Branching: if l: break, continue, and ting and Looping: for, Arrays and Functions	, if-else, if-els return while, do-wh	Assignments se ladder, nested if and sw nile, and nested looping st Assignments	8 Sessions vitch case atements.
Decision Mak Unconditiona Decision Mak Module 3 Arrays	ting and Branching: if l: break, continue, and ting and Looping: for, Arrays and Functions	Guizzes F, if-else, if-els l return , while, do-wh Quizzes	Assignments se ladder, nested if and sw nile, and nested looping st Assignments	8 Sessions ritch case atements. 12 Sessions
Decision Mak Unconditiona Decision Mak Module 3 Arrays Introduction, or	ting and Branching: if l: break, continue, and ting and Looping: for, Arrays and Functions	Quizzes , if-else, if-els l return , while, do-wh Quizzes wo dimensional	Assignments se ladder, nested if and sw nile, and nested looping st Assignments arrays, multi-dimensional ar	8 Session: ritch case atements. 12 Sessions rays,
Decision Mak Unconditiona Decision Mak Module 3 Arrays Introduction, or searching and s	ting and Branching: if l: break, continue, and ting and Looping: for, Arrays and Functions ne-dimensional arrays, tw orting.	Quizzes F, if-else, if-els l return while, do-wh Quizzes wo dimensional	Assignments se ladder, nested if and sw nile, and nested looping st Assignments arrays, multi-dimensional ar	8 Session: ritch case atements. 12 Sessions rays,
Decision Mak Unconditiona Decision Mak <u>Module 3</u> Arrays Introduction, or searching and s Functions	ting and Branching: if l: break, continue, and ting and Looping: for, Arrays and Functions ne-dimensional arrays, tw orting.	Quizzes , if-else, if-els l return , while, do-wh Quizzes wo dimensional	Assignments se ladder, nested if and sw nile, and nested looping st Assignments arrays, multi-dimensional ar	8 Session: vitch case atements. 12 Sessions rays,
Decision Mak Unconditiona Decision Mak Module 3 Arrays Introduction, or searching and s Functions Introduction, us	Ling and Branching: if is break, continue, and cing and Looping: for, Arrays and Functions me-dimensional arrays, two orting.	Quizzes , if-else, if-els d return , while, do-wh Quizzes wo dimensional tegories of func	Assignments se ladder, nested if and sw nile, and nested looping st <u>Assignments</u> arrays, multi-dimensional ar	8 Sessions vitch case atements. 12 Sessions rays, ecursion,
Decision Mak Unconditiona Decision Mak Module 3 Arrays Introduction, or searching and s Functions Introduction, us passing arrays t	ting and Branching: if is break, continue, and ting and Looping: for, Arrays and Functions he-dimensional arrays, two orting.	Quizzes F, if-else, if-els 1 return while, do-wh Quizzes wo dimensional tegories of func sibility and life	Assignments se ladder, nested if and sw nile, and nested looping st Assignments arrays, multi-dimensional ar etions, nesting of functions, re time of a variable.	8 Session: vitch case atements. 12 Sessions rays, ecursion,
Decision Mak Unconditiona Decision Mak <u>Module 3</u> Arrays Introduction, or searching and s Functions Introduction, us passing arrays t Module 4	ting and Branching: if is break, continue, and ting and Looping: for, Arrays and Functions he-dimensional arrays, two orting. ser defined functions, cat o function, the scope, vi Strings, Structures and union	Quizzes F, if-else, if-els 1 return while, do-wh Quizzes wo dimensional tegories of func sibility and life Quizzes	Assignments se ladder, nested if and sw nile, and nested looping st Assignments arrays, multi-dimensional ar etions, nesting of functions, re time of a variable.	8 Session: vitch case atements. 12 Session: rays, ecursion, 9 Session:
Decision Mak Unconditiona Decision Mak Module 3 Arrays Introduction, or searching and s Functions Introduction, us passing arrays t Module 4 Strings	ting and Branching: if is break, continue, and ting and Looping: for, Arrays and Functions me-dimensional arrays, two orting. ser defined functions, cat o function, the scope, vi Strings, Structures and union	Quizzes F, if-else, if-els d return while, do-wh Quizzes wo dimensional tegories of func sibility and life Quizzes	Assignments se ladder, nested if and sw nile, and nested looping st Assignments arrays, multi-dimensional ar ctions, nesting of functions, re time of a variable.	8 Sessions vitch case atements. 12 Sessions rays, ecursion, 9 Sessions
Decision Mak Unconditiona Decision Mak Module 3 Arrays Introduction, or searching and s Functions Introduction, us passing arrays t Module 4 Strings Introduction to	ting and Branching: if is break, continue, and ting and Looping: for, Arrays and Functions he-dimensional arrays, two orting. Ser defined functions, cat o function, the scope, vi Strings, Structures and union	Quizzes F, if-else, if-els 1 return while, do-wh Quizzes wo dimensional tegories of func sibility and life Quizzes Functions, Pas	Assignments se ladder, nested if and sw nile, and nested looping st Assignments arrays, multi-dimensional ar etions, nesting of functions, re- time of a variable.	8 Session vitch case atements. 12 Session rays, ecursion, 9 Session nction.
Decision Mak Unconditiona Decision Mak <u>Module 3</u> Arrays Introduction, or searching and s Functions Introduction, us passing arrays t <u>Module 4</u> Strings Introduction to Structure and U	ting and Branching: if is break, continue, and ting and Looping: for, Arrays and Functions he-dimensional arrays, two orting. ser defined functions, cat o function, the scope, vi Strings, Structures and union strings, String Handling function	Quizzes F, if-else, if-els 1 return while, do-wh Quizzes wo dimensional tegories of func sibility and life Quizzes Functions, Pas	Assignments se ladder, nested if and sw nile, and nested looping st <u>Assignments</u> arrays, multi-dimensional ar ctions, nesting of functions, re- time of a variable.	8 Session vitch case atements. 12 Session rays, ecursion, 9 Session nction.
Decision Mak Unconditiona Decision Mak Module 3 Arrays Introduction, or searching and s Functions Introduction, us passing arrays t Module 4 Strings Introduction to Structure and U Introduction, ar	ting and Branching: if l: break, continue, and ting and Looping: for, Arrays and Functions ne-dimensional arrays, two orting. ser defined functions, cat o function, the scope, vi Strings, Structures and union strings, String Handling finion ray of structure, structur	Quizzes F, if-else, if-els I return while, do-wh Quizzes wo dimensional tegories of func sibility and life Quizzes Functions, Pas within a struct	Assignments se ladder, nested if and sw nile, and nested looping st Assignments arrays, multi-dimensional ar stions, nesting of functions, re time of a variable. sing string as parameter to fu	8 Session: vitch case atements. 12 Session: rays, ecursion, 9 Session: nction. re and union
Decision Mak Unconditiona Decision Mak Module 3 Arrays Introduction, or searching and s Functions Introduction, us passing arrays t Module 4 Strings Introduction to Structure and U Introduction, ar as parameter to	ting and Branching: if is break, continue, and ting and Looping: for, Arrays and Functions he-dimensional arrays, two orting. Ser defined functions, cat o function, the scope, vi Strings, Structures and union strings, String Handling finion ray of structure, structur the function.	Quizzes F, if-else, if-els 1 return while, do-wh Quizzes wo dimensional tegories of func sibility and life Quizzes Functions, Pas e within a struct	Assignments se ladder, nested if and sw nile, and nested looping st Assignments arrays, multi-dimensional ar etions, nesting of functions, re- time of a variable.	8 Session: vitch case atements. 12 Session: rays, ecursion, 9 Session: nction. re and union
Decision Mak Unconditiona Decision Mak Module 3 Arrays Introduction, or searching and s Functions Introduction, us passing arrays t Module 4 Strings Introduction to Structure and U Introduction, ar as parameter to Targeted Applica	ting and Branching: if is break, continue, and ting and Looping: for, Arrays and Functions ne-dimensional arrays, two orting. Ser defined functions, cat o function, the scope, vi Strings, Structures and union strings, String Handling function ray of structure, structur the function.	Quizzes F, if-else, if-els 1 return while, do-wh Quizzes wo dimensional tegories of func sibility and life Quizzes Functions, Pas we within a struct used:	Assignments se ladder, nested if and sw nile, and nested looping st <u>Assignments</u> arrays, multi-dimensional ar etions, nesting of functions, re- time of a variable. sing string as parameter to fu	8 Session: vitch case atements. 12 Session: rays, ecursion, 9 Session: nction. re and union

Assignment:

Students will have to do group assignments for Modules 2 & 3. As a part of their assignments, they will have to implement the solution to particular problems.

Text Books

1. E. Balagurusamy, "Programming in ANSI C", Seventh Edition - Tata McGraw Hill.

References

1. Behrouz A Forouzan, Richard F Gilberg, "Computer Science: A structured programming approach using C", Cengage Learning.

2. Brian W. Kernighan / Dennis Ritchie, "The C Programming Language ", Pearson Edition.

3. Yashavant Kanetkar, "Let Us C", 16th edition, BPB Publications

E-Book Link for R2: <u>https://drive.google.com/file/d/10nbwAJd-dv6htOOZVBgAvLd1Wscl0RqC/view</u> Web resources: <u>https://web.stanford.edu/~jurafsky/slp3/</u> NPTEL Course: https://onlinecourses.nptel.ac.in/noc22 Topics relevant to development of "Skill Development":

Assignment implementations in software, batch wise presentations.

- 1. Decision Making and Looping
- 2. Storage class
- 3. Compiling and linking
- 4. Nesting of functions

for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Mobile Communicati	ion	I-P-C	3	0	3
CSE 304	Type of Course: Program Core - The	eory	L-1-C	5	0	5
Version No.	1.0					
Course Pre-						
	NIL					
Anti-requisites		. 1.1			• 1	1
Course Description	specification, design, devel communications. Students will understanding of the core skills Topics include: Fundamental k mobile communication system communications, mobile ne technology, wireless PAN/ LAN sensor networks, wireless mes	s to apply the en lopment, and l develop a detai s in mobile comm mowledge of wir ns / networks / tworks, includin V/ MAN/ WAN, M h networks.	deploy led kno unicatio eless an archite ng wire lobile IF	ng pri ment wledg ons an d mol ecture eless 2, Ad-1	of r ge and c id netwo bile netwo . The co transm Hoc netw	in the nobile critical orks. works, ellular dission works,
Course Objective	The objective of the course is to familiarize the learners with the concepts of Database Management Systems and attain EMPLOYABILITY through PARTICIPATIVE LEARNING techniques					
Course Outcomes	 On successful completion of this course the students shall be able to: 1. Explain the limitations of fixed networks, the need and the trend toward mobility, the concepts of portability and mobility. 2. Describe the network infrastructure requirements to support mobile devices and users. 3. Explain the concepts, techniques, protocols, and architecture employed in wireless local area networks, cellular networks, and perform basic requirements analysis. 4. Apply techniques and technologies to design a communication application for mobile devices. 					
Course Content:						
Module 1	Introduction	Assignment M	ultiplexin odulatior	g and	09 Se	essions
Topics: Introduction to Propagation - M	Wireless Communication – Mol ultiplexing - Modulations - Cellu	oile and Wireless ular Systems.	Devices	- Ant	ennas -	Signal

Module 2	MOBILE TELECOMMUNICATION SYSTEM	Assignment	GPRS, RFID	9 Sessions			
Topics:	l.						
Clobal System f	or Mobile Communications (C	SM) Conoral I	Dackat Dadia Comi				
Giobal System I	or Mobile Communications (G.	SWJ = General r		(GPRS) =			
Universal Mobi	le relecommunication System	i (UMIS) – Ra	alo Frequency Id	entification			
(RFID) – Blueto	oth – SMS and MMS.	1	T				
Module 3	WIRELESS PROTOCOLS AND STANDARDS	Seminar	Routing Protocols	09 Sessions			
Topics:							
MAC Protocol -	Wireless MAC Issues – Code	Division Multip	le Access (CDMA)	 Wireless 			
LANs and PANs	- IEEE802.11 – Mobile Internet	t Protocol – DH	CP – Routing Proto	cols.			
				00101			
Module 4	MOBILE APPLICATIONS AND PLATFORMS	Case Study	Applications of Cloud and IoT	10 Sessions			
Topics:		1 1					
Mohile Phones -	Tablet and Other Handheld Dev	vices - Mohile De	wice Operating Syste	ms - Mohile			
Computing: Apr	lications Characteristics and S	Structure Meh	ilo Computing Syste	nort: Cloud			
Computing. App	This and Missing Constants		ne computing sup	port. Ciouu			
and Internet of	Things - Wireless Security						
Targeted Applicat	ion & Tools that can be used:						
Application Area:							
Tools:							
Textbooks:							
1. Jochen S	Schiller, "Mobile Communicat	ions", Pearson	Education Limit	ed, Second			
Edition 2007							
2. Asoke K.	Talukder, Hasan Ahmed, Roopa	a R. Yavagal. "M	obile Computing: 1	'echnology.			
Applications	and Service Creation" Tata Mc	Graw-Hill Seco	nd Edition 2010	connorogy,			
Poforoncoc:	and bervice creation, rata me	diaw iiii, See					
references.		" ப					
I. Prasant	Kumar Pattnaik, Rajib Mall,	Fundamentals	of Mobile Comp	uting", PHI			
Learning Pvt.	Ltd, New Delhi – 2012.						
2. William	Stallings, "Wireless Communi	cations and N	etworks" Pearson	Education,			
Second Edition	on 2005.						
3. C.K.Toh,	"AdHoc Mobile Wireless Ne	tworks", Pears	on Education Lin	nited, First			
Edition 2002							
MDTEL https://onlinecourses.nntel.ag.in/neg20_co61/nroview							
	L. https://ohimecourses.npter.	ac.iii/ 110c20_cc	or/preview				
references: <u>https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=223</u>							
3842&site=ehost-live							
https://nptel.ac.in/courses/106102064							
Topics relevant to "Employability": Routing Protocols, Cloud Applications in Mobile for developing Employability Skills through Participative Learning Techniques. This is attained through assessment component in course handout.							

Course Code: CSE2051	Course Title: Information Retrieval	L- P- C	3	0	3
	Type of Course: Theory Only Course				
Version No.	1				
Course Pre- requisites	Basic Knowledge in Data Structures and algorithms and probability and statistics, background in machine learning				

Anti-requisites	NIL					
Course	The course studies the theory, des	sign and implementat	tion of Text- based	information		
Description Course Objective Course Out	systems. The Information Retriev characteristics of text, representa Include Several important retrieva (Term Frequency/Inverse Documer Model, Latent Semantic Indexing N Retrieval Metrics, Text Classificat Crawling. Recommender Systems: Content-based Filtering, Collabor neighborhood models. The objective of the course is to far of Information Retrieval and attai Learning techniques On successful completion of the co	ral core concepts of ation of information al models (Basic IR N nt Frequency) Weight Model, Neural Networ ion and Clustering a Basics of Content- rative Filtering, Mat miliarize the learners in SKILL DEVELOPMEN urse the students sha	the course includ needs and docum Aodels, Boolean M ing, Vector Model, rk Model). Retrieva algorithms, Web R based Recommend trix factorization with the concepts NT through Particip	le statistical ents. Topics odel, TF-IDF Probabilistic I Evaluation, etrieval and ler Systems, models and ative		
Comes	CO1: Define basic concepts of infor	mation Retrieval. [Kn	owledge]			
	CO2: Evaluate the effectiveness and efficiency of different information retrieval methods. [Application] CO3: Explain different indexing methodology requirements and the concept of web retrieval and crawling. [Comprehension] CO4: Classify different recommender system and its aspect. [Comprehension]					
Course						
Module 1	Introduction to Information Retrieval	Assignment	Data collection	7 Sessions		
Information Re Data Retrieval - Processes	etrieval – Early Developments – The – The IR System – The Software Arch	e IR Problem – The Us itecture of the IR Syste	sers Task – Informa em – The Retrieval a	tion versus Ind Ranking		
Module 2	Modeling and Retrieval Evaluation	Assignment	Problem solving	10 Sessions		
Basic IR Model – Vector Mode Retrieval Evalu Evaluation – Re	s – Boolean Model – TF-IDF (Term F el – Probabilistic Model – Latent Se ation – Retrieval Metrics – Precisio elevance Feedback and Query Expan	requency/Inverse Do mantic Indexing Moc on and Recall – Refe sion – Explicit Releva	cument Frequency lel – Neural Netwo rence Collection – nce Feedback.) Weighting rk Model – User-based		
Module 3	Indexing & Web- Retrieval	Term paper/Assignment	Data analysis	8 Sessions		
Indexing and S	earching – Inverted Indexes – Sequ	iential Searching – M	ulti-dimensional In	dexing. The		
Web – Search	Engine Architectures – Cluster base	d Architecture - Searc	h Engine Ranking –	Link based		
Ranking – Sim Crawler.	ole Ranking Functions, Evaluations	— Search Engine Rai	nking – Application	s of a Web		
Module 4	Recommender System	Term paper/Assignment	Problem solving	8 Sessions		
Recommender	Systems Functions – Data and Knowl	edge Sources – Recon	nmendation Techni	ques – Basics		
of Content-base	ed Recommender Systems – High	Level Architecture –	Advantages and D	rawbacks of		
Content-based F	iltering – Collaborative Filtering – N	latrix factorization mo	odels.			
Targeted Applic Information Ret	ation & Tools that can be used: rieval System, Collaborative Filterin	ng System, Feedback	System, Evaluatior	Metrics		
Assignment						
Group assignme	ent, Quiz					
Text Book	a-Vates and Berthier Ribeiro-Noto	—" Modern Informati	ion Retrieval: The C	oncents and		
Technology	behind Search". Third Fdi	ition. ACM Pre	ss Books 20)18. link		
https://people.i	school.berkeley.edu/~hearst/irbook	<u>.</u>				

T2 Ricci, F, Rokach, L. Shapira, B.Kantor, —"Recommender Systems Handbook", Fourth Edition, 2018. References

R1 Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, —"Information Retrieval: Implementing and Evaluating Search Engines", The MIT Press, 2017.

R2 Jian-Yun Nie Morgan & Claypool – "*Cross-Language Information Retrieval*", Publisher series 2011. R3 Stefan M. Rüger Morgan & Claypool – "*Multimedia Information Retrieval*", Publisher series 2014.

R4 B. Liu, Springer, - "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data", Second Edition, 2013.

R5 C. Manning, P. Raghavan, and H. Schütze, —"Introduction to Information Retrieval", Cambridge University Press, 2015. Link: <u>https://nlp.stanford.edu/IR-book/</u>

Web Based Resources and E-books:

https://puniversity.informaticsglobal.com/login

Topics relevant to the development of SKILLS: Recommender Systems, Content-based Filtering, Collaborative Filtering, Matrix factorization models and neighborhood models for Skill Development through Participative Learning Techniques. This is attained through assessment component mentioned in course handout.

Course	Course Title: Data Communications and Computer Networks	I D			
Code:	Type of Course: Program Core - Theory	C - F-	3	0	3
CSE2011					
Version	1				
No.					
Course Pre-	NIL				
requisites					
Anti-					
requisites					
Course Description	This is the first course on data communication and computer network thorough introduction to all the layers of a computer network foll approach. Application, Transport, Network, and data link layer proto analysis wherever applicable. All-important concepts required to take and to face placement tests by an undergraduate student will be cover course also covers necessary foundational topics pertaining to data of course can be followed up with an advanced computer network by complete understanding of this domain.	ts. This lowing pcols a up ad ed in t commo the st	s cou the are ta vance his co unica cuder	rse giv top-c aught ed cou ourse. tions. nt to g	ves a lown urses This This get a
Course Objective	The objective of the course is to familiarize the learners with the Communications and Computer Networks and attain Skill Decempative Learning techniques.	ne cor evelop	ncept men t	s of t thro	Data ough
Course Outcomes	 Explain the concepts of Computer Networks and Working Principles and Transport Layer (Comprehension) Apply the Knowledge of IP Addressing and Routing Mechanism in (Application) Discuss the functionalities of Data Link Layer (Comprehension) Explain the Basic Concepts of Data communication. (Comprehension) 	s of Ap Comp)	oplica	Netw	ayer orks.
Course					
Content:					

Module 1	Overview, Application and Transport Layers.	Assignment	Comprehension	13 Sessions
Introduction	ا ۲: Computer Networks, Topologies, OSI Reference Mode	I, TCP/IP mo	del. Principles of	Network
Applications	s, The Web and HTTP, DNS—The Internet's Directory Se	ervice, Socke	et Programming:	Creating
Network A	pplications. Introduction and Transport-Layer Service	es, Connecti	on-less Transpo	ort: UDP,
Principles o	of Reliable Data Transfer, Connection-Oriented Trans	port: TCP,	Principles of Co	ongestion
Control, TCI	P Congestion Control.			
		Accianmont		12
Module 2	Network Layer	Assignment	Application	Sessions
Overview of	f Network Layer, Forwarding and Routing, The Data and	Control Pla	nes.The Internet	Protocol
(IP): IPv4, A	ddressing, IPv6, IPv4 Datagram Format, IPv4 Addressing	, Network A	ddress Translatio	on (NAT),
IPv6. Introd	uction Routing Algorithms: The Link-State (LS) Routing	Algorithm, ⁻	The Distance-Ve	ctor (DV)
Routing Alg	orithm, Intra-AS Routing in the Internet, OSPF Routing a	Among the I	SPs: BGP, Introd	uction to
BGP. ICMP:	The Internet Control Message Protocol.			
	Data Link	Assignment	Communication	10
Module 3	Layer		comprehension	Sessions
Introduction	L hto the Link Laver. The Services Provided by the Link L	aver, Frror-F	L Detection and -Co	orrection
Techniques	Parity Checks Check summing Methods Cyclic Redu	ndancy Cher	rk (CRC) Multin	
Links and P	rotocols. Switched Local Area Networks. Link-Laver Add	ressing and	ARP. Ethernet. I	ink-Laver
Switches, Vi	irtual Local Area Networks (VLANs) DHCP UDP IP and Ft	hernet.		link Layer
		Assignment		07
Module 4	Physical Layer with Data Communication	, isolgi interie	Comprehension	Sessions
Rate, Noisy Bandwidth- Wavelength	Channel: Shannon Capacity, Performance: Bandw Delay Product, Parallel/Serial Transmission, Multiplex n-Division Multiplexing, Synchronous Time-Division Mult	vidth, Throu ing: Frequer iplexing.	ncy-Division Mul	(Delay), tiplexing,
Targeted Ap	oplication & Tools that can be used:			
1. Inst	ant Messaging			
2. Telr	net			
3. File	Transfer Protocol			
4. Vide	eo Conferencing			
Textbooks: T1. James F.	. Kurose, Keith W. Ross, "Computer Networking A Top de	own Approa	<i>ch",</i> 8 th Edition, P	earson,
2021.				
T2 . Behrouz	A. Forouzan, "Data Communications and Networking",	6 th Edition, 1	「ata McGraw-Hil	l, 2021.
References				
R1. William	Stallings: "Data and Computer Communication", 10th E	dition, Pears	on Education, 20	017.
R2. Larry L.	Peterson and Bruce S. Davie: Computer Networks – A Sy	stems Appro	bach, 4th Edition,	Elsevier,
2012.				
Web refere	nces:			
	ning kesources (Library Resources)			
vv1. <u>https://</u>	/puniversity.informaticsglobal.com/login			
nttps://npte	ei.ac.in/courses/105106053			
l opics relev	vant to "Skill Development":			
Virtual Loc through Pa	cal Area Networks (VLANs), DHCP, UDP, IP and I rticipative Learning Techniques. This is attained the	Ethernet for ough assess	Skill Developr sment compone	nent ent
mentioned				

r							
Course Code:	Course Title: Progr	amming in C++					
CSE2036	Type of Course: Dis	scipline Elective		L-P-C	1	4	3
	Th	eory & Integrated			-		
	Laboratory						
Version No.	2.0						
Course Pre-	C with Arduino (CSE 1002					
requisites							
Anti-requisites	Nil						
Course	The main goal of t	his course is to study	the fundar	nentals	of obj	ect-orie	ented
Description	paradigm with con	cepts of streams, class	ses, functio	ns, dat	a, and	objects	. The
	course aims to prov	vide the basic characte	ristics of O	OP thro	ough C+	+, to in	npart
	skills on various kin	ds of overloading and i	inheritance	, to intr	oduce	pointer	s and
	file handling in C++	together with exceptio	n handling	mechai	nism.		
Course Objective	The objective of t	he course is to famil	iarize the	learner	s with	the co	ncepts of
	Programming in	C++ and attain Emp	loyability	through	n E xpe	riential	Learning
	techniques.						
Course Out	On successful con	mpletion of the course	e the stude	nts sha	ll be al	ole to:	
Comes	1. Explain th	e need and features of	OOP and	idealiz	e how (C++ dit	ffers from
	C.						
	2. Understar	nd knowledge on vari	ous types o	of over	loading	g and st	treams.
	3. Choose su	uitable inheritance w	hile prop	osing	solutio	n for t	the given
	problem.			-			-
	4. Implemen	t the concept of point	ters and ef	fective	memo	ry mar	nagement,
	illustrate the a	pplication of pointers	in virtual	functio	ns.	•	0
	5. Apply the	attained knowledge	by applyi	ng the	learne	ed tech	niques to
	solve various r	eal-world problems.	5 11 5	U			1
Course Content:		*					
	Introduction to						
Module 1	object-oriented	Ouiz	Programm	ing/ Pro	blem		07 Hours
	programming		Solving				
Topics:							
Beginning with C+	+ and its features:						
Introduction to C+	+ Applications and s	tructure of C++ program	m. Different	t Data t	vnes. V	ariables	Different
Operators, expres	sions. Control strue	ctures, arrays, Functio	ns. Inline	functio	n func	tion ov	verloading.
[Blooms 'level sele	ected: Comprehensic	on]		ianetio	.,		chouding
]					
	Classes and						
Module 2	Objects Static	Lah evaluation	Programm	ing/ Pro	blem)8 Hours
	member		Solving				o nours
Tonics:	inember						
Functions classes	and Objects						
Define class data	members and memb	per functions (methods)	method o	verload	ing arr	avs witl	hin a class
array of objects	static members	nointers in C++ new	i, include i		Blooms		soloctod
Comprehension ¹	static members,			ι ι . [DIOOIIIS		JUICTEU.
	Constructors						
Module 3	Destructors and	Lah evaluation	Programm	ing/Dro	hlem Sr	lving r)7 Hours
	Onerator		- IOSI di IIII		SICILI SC	5.0116	,, 110013
1	operator	1	1				

	overloading,			
Tonics:	Strings			
Constructors De	estructors and Operato	or overloading.		
Constructors c	onstructor overloadi	ng conv constructo	or Destructors Polymorphism	· onerator
overloading Over	orloading Unary and hi	nary operators friend	function operator overloading	using friend
function strings	and its operators [Blo	nary operators, mena	Application]	
function, strings	Inhoritanco Virtual			
Modulo 4	Eurotions	Lab evaluation/	Brogramming (Broblem Solving	
Woulle 4	Pulletions,	Assignment		
Taulaa	Polymorphism			
Inheritance, Poir	nters, Virtual Function	s, Polymorphism:		
Define inheritan	ce, base and derived Cl	asses, types of inherita	ance: Single, multilevel, multiple	inheritance,
Multi-Path inher	itance, Pointers to obj	ects and derived class	ses, "this" pointer, Run time pol	ymorphism:
Virtual functions	and pure virtual funct	ions. [Blooms	'level selected: Application]	
	Streams and			05 Hours
Module 5	Working with files,	Assignment	Programming /Problem	
	Templates,	Assignment	Solving	
	Manipulators			
Topics:			•	
Streams and Wo	orking with files:			
Controlling outp	ut with manipulators.	Templates: Function te	emplates and class templates.	
[Blooms 'level se	elected: Comprehensi	on]		
List of Laborator	w Tasks	511]		
	,			
Level 1: Demon Level 2: Use of a Experiment No.	strate control structur arrays in C++. 2: Demonstrate the u	es in C++.	functions and function overload	ing. [2
hours: Application	on Level]			0
Level 1: Use of f	unctions and inline fu	nction.		
Level 2: Use of f	unction overloading.			
	J			
Experiment No.	3: Demonstrate the w	orking of classes, obje	ects, member functions and meth	od
overloading [2 h	ours: Application Leve	이지지정 이가 이상3563) 이외(6 1]		
Level 1. Linderst	and use of classes on	iects member functio	ns	
Level 1: Onderst	and use of classes, obj	jects, member functio		
Lever 2. Use of i	nethoù ovenbaulig.			
Experiment No. hours: Application	4: Demonstrate the w	vorking of array of obj	ects, static members, new and d	elete. [2
Level 1: Underst	tand use of array of o	niects		
	static members new a	ind delete		
Lever 2. Ose or s	static members, new a			
Experiment No.	5: Implement the con	cept of constructors, c	lestructors, constructor overload	ling and
Level 1. Linderst	and the concent of co	nstructors and destru	ctors and strings	
Level 1: Underst	tand the concept of co	instructors and destitut	and conv constructor	
Lever 2. Onuers	tand the concept of co		g and copy constructor.	
Experiment No. Application Leve	6: Implement the con el]	cept of operator overl	oading and friend function. [2 h	ours:
Level 1: Use of b	inary operator overlo	ading.		
Level 2: Importa	nce of friend function	in operator overloadi	ing.	
		-		
Experiment No. Level 1: Underst	7: Implement the use of and the concept of sin	of inheritance. [2 hou Igl e, multi-level inheri	rs: Application Level] itance.	

Level 2: Passing arguments to base and derived classes using constructors.

Experiment No.8: Implement the use of Virtual functions. [2 hours: Application Level] Level 1: Understand the concept of constructor in derived class. Level 2: Understand the concept of virtual function.

Experiment No.9: Apply the knowledge of manipulators and function templates [2 hours: Application Level]

Level 1: Understand the concept manipulators.

Lever 2: Understand the concept of function template.

Experiment No.10: Apply the knowledge of class templates. [2 hours: Application Level] Level 1: Understand the class templates.

Lever 2: Real time scenario problem to cover all the concepts.

Targeted Application & Tools that can be used:

Application Area is to understand and apply concept of object oriented concepts using C++. Tools/Simulator used: GCC compiler/ Linux terminal.

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

1. Problem Solving: Understanding different OOPS and implementation of programs.

2. Programming: Implementation of given scenario using C++.

Text Book

1. Herbert Schildt, "C++: The Complete Reference", McGraw Hill Education, 4th Edition, 2017.

2. Behrouz A. Forouzan, Richard F. Gilberg, "C++ Programming: An Object-Oriented

Approach", McGraw Hill Education, 1st edition, 2022.

References

- 1. Robert Lafore, "Object Oriented Programming using C++", Galgotia publication, 2010.
- 2. Bjarne Stroustrup, "The C++ Programming Language", Pearson Education, 2004.
- 3. Stanley B. Lippman and Josee Louie, "C++ Primer", Pearson Education, 2003.
- 4. K.R.Venugopal, Rajkumar Buyya, T.Ravishankar, "Mastering C++", TMH, 2003.

5. E. Balaguruswamy, "Object Oriented Programming with C++", TMH, 6th Edition, 2013.

Topics relevant to "EMPLOYABILITY SKILLS": Object, Class, Inheritance, Polymorphism, traction, Encapsulation for developing Employability Skills through Experiential Learning iniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE3070	Course Title: ADVANCED COMPUTER NETWORK Type of Course: Theory Only303
Version No.	1.0
Course Pre- requisites	Computer Networks and Computer Architecture Course
Anti-requisites	
Course Description	This course aims to provide understanding of advanced computer network concepts, building on the basic functions of various layers, protocols and standards used in practice to have a comprehensive and deep knowledge in computer networks.
Course Objective	The objective of the course is to familiarize the learners with the concepts of Advanced Computer Network and attain EMPLOYBILITY SKILL through PARTICIPATIVE LEARNING techniques
Course Out Comes	 On successful completion of the course the students shall be able to: Describe network architecture and application programming interface concepts (L2) Explain working of internetworking protocols (L2) Illustrate different routing protocols and end-to-end transmission (L3) Distinguish the various protocols used at the transport layer (L2)

	5. Summarize worl networks (L2)	king of traditiona	l, multimedia applications	and overlay			
Course Content:							
Module 1	Introduction	Assignment	Data Collection/Interpret	ation 12Sessions			
Topics: Introduction: App Sharing, Support Internet Architec Performance- Ba	olications, Requirements for Common Services. N ture. Implementing Net ndwidth and Latency, De	– Perspectives, etwork Architect work Software- lay×Bandwidth P	Scalable Connectivity, Cos ure- Layering and Protoco Application Programming roduct, Application Perfor	st-Effective Resource ols, OSI Architecture, Interface (Sockets). mance Needs.			
Module 2	Internetworking	Case studies / Case let	Case studies / Case le	et 12 Sessions			
Bridges and LAN addresses, Datag DHCP, ICMP, Virt Module 3	switches. Basic Interne ram Forwarding in IP, S ual Networks and Tunne Internetworking and Advanced Internetworking	ubnetting and cl	Ams, Virtual Circuit Switch hat is an internetwork, so assless addressing, addre Case studies / Case le	ervice model, global ss translation (ARP), et 14 Sessions			
Topics: Inter-networking Metrics. Implem Advanced Intern 6 (IPv6). Multicas	(Part - II): Routing - N entation and Performa etworking: The Global In st: Multicast addresses, N	letwork as a Gra ance- Switch Ba iternet – Routing Aulticast routing	oph, Distance Vector (RIP sics, Ports, Fabrics, Rout Areas, Inter domain Rout (DVMRP, PIM)), Link State (OSPF), ter Implementation. ing (BGP), IP Version			
Module 4	Advanced Internetworking and End-to-End Protocols	Quiz	Case studies / Case let	14 Sessions			
Topics: Multiprotocol Label Switching (MPLS): Destination-Based Forwarding, Explicit Routing, Virtual Private Networks and Tunnels, Routing among Mobile Devices: Challenges for Mobile Networking, Routing to Mobile Hosts (Mobile IP), End-to-End Protocols: Simple Demultiplexer (UDP), Reliable Byte Stream (TCP) - End-to-End Issues, Segment Format, Connection Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, Record Boundaries, TCP Extensions, Performance, Alternative Design Choices. Congestion Control and Resource Allocation: Issues in Resource Allocation - Network Model, Taxonomy, Evaluation Criteria. Queuing Disciplines - FIFO, Fair Queuing. Targeted Application & Tools that can be used:							
Assignment:		, , ,					
Text Book: T1. Larry L. Pete Publishers, Fifth I References R1. W. R. Steven R2. Andrew S Tar R3. Darren Spohr R4. D. Bertsekas,	rson, Bruce S. Davie. Cor Edition, 2012 s. Unix Network Program nenbaum and David J We n, Data Network Design, S R. Gallager, Data Netwo	nputer Networks nming, Vol.1, Pea therall, Compute 3/e TMH, 2002 rks, 2/e, PHI, 199	, A Systems Approach, Mc rson Education, 1990 r Networks, 5/e, Pearson 2	organ Kaufmann Education, 2010			
E-book link R1: a/courseovervie	https://cseweb.ucsd.ed w/compnetworks.pdf	u/classes/wi19/	cse124-				

Web resources:

NPTEL Course -https://onlinecourses.nptel.ac.in/noc23_cs35/preview

Coursera - https://in.coursera.org/specializations/computer-communications

os://presiuniv.knimbus.com/user#/home

informatics.global, <u>https://sm-nitk.vlabs.ac.in/</u>

Topics relevant to development of "Employability":

IP addressing for developing Employability Skills through Participative Learning Techniques. This is attained through assessment component mentioned in course handout.

Course Code: (CSE225)	Course Title: Combinatorics Type of Course Theory	Introduction to and Graph The e: Program Core	ory -	L- P- C	3	0	3	
Version No.	version 1							
Course Pre-	Basic logic and	Set theory						
requisites								
Anti-	nil							
requisites								
Course Description	Graph Theory to Computer s Theory gives us mathematical them. In this co how GPS syst integrated circ map can alway Topics Includ Polynomial, D Isomorphism, Terminologies, Prefix Codes	is a blend of the cience, Informa s, both an easy w results, and ins burse, among ot tems find shor uits, how biolog s be colored usi e: Principles erangements. C Coloring, M . Traversals, Spa	e ma tion vay to sights her in test ists a ng a of I Graph Jatch nning	them Tech pict into rout ssem few o nclus n Tho ing, g Treo	natic nolc oria o th uing tes, hble colo sion eory P es, S	al tech ogy and lly repr e deep applic how genom rs. and r: Grap lanar shortes	nniques applicable d Statistics. Graph resent many major o theories behind ations, we will see engineers design nes, why a political Exclusion, Rook oh Terminologies, Graphs, Trees it path algorithms,	
Course ObjectiveThe objective of the course is to familiarize the learners with the concepts : Introduction to Combinatorics and Graph Theory and attain Skill Development through Participative Learning techniques.								
Course Outcomes	Course Outcomes Outcomes CO1: Explain the fundamental concepts of Graph theory. [L1: Knowledge] CO2: Discuss theorems of matching, connectivity, coloring and planar graphs. [L2: Comprehension] CO3: Discuss different types of trees and traversal techniques. [L2: Comprehension] CO4: Apply different algorithms to find optimal path for a given graph. [L3: Applications]							
Course								
Content:								
Module 1	Introduction to Graph Theory	Assignment	Dat Coll	a ectic	n		07 Sessions	
Introduction to	o Graph Theory	07H	[Knc	owlee	dge	Level]		
Basic Concepts Graph, represe edge deleted a	: definition, typ entation of a g nd vertex delet	es of graphs, Gr raph and conne ed).	aph [·] cted	Term ness	inol gra	ogy an ph: (pa	d Special Types of aths, walk. cycles,	
Module 2	Introduction to Graph Theory contd	Assignment	Ana test and be o Lab	ilysis resu also dealt	of Ilts can witl	n	11 Sessions	
Introduction		to		Gra	ph		Theory	
<u>contd.</u>		11H [Co	ompi	rehei	nsio	n Leve]	
Graph isomorphism, Eulerian graph, Hamiltonian graph, Planar graph (three utility problem), Graph coloring, Combinatorics-Principle of Inclusion and Exclusion.								

			MS Excel,				
		A a ciana a a t	Using Graphs				
Module 3	Trees	Assignment	and Pi Charts	13 Sessions			
			and tables				
			for analysis				
Trees		1	.3H [Comprel	hension Level] Tree:			
Definitions. r	properties. Roote	d trees. Binarv	search tree. De	cision tree, prefix code.			
Tree traversa	al: in-order, pre-	order, post-ord	er, infix, postfix	, prefix, spanning tree:			
BFS, DFS.							
			MS				
			Excel,			MS Excel,	
			Using			Using	
			Graphs			Graphs	
	Algorithm on	Assignment	and Pi		Assignment	and Pi	13
iviodule 3	networks	-	Charts ¹³	3 Sessions		Charts	Sessions
			and			and	
			tables			tables for	
			for			analysis	
			analysis				
Algorithm o	<u>n networks</u> Sho	ortest path alg	orithm- Dijikstr	a's algorithm, Minimal			
spanning tre	e- Kruskal algor	ithm and Prim	's algorithm, Ti	ransport network-Max-			
flow/Min-cut	t algorithm, Coml	binatorics-Rook	c polynomial, De	errangements .			
	plication 8 Tools	that can be us	odu				
Targeteu Ap	plication & rools	that can be us	eu.				
Project work	x/Assignment:						
Project Assig	nment:						
Assignment :	1:						
Assignment 2	2:						
Textbooks:							
КН	Rosen, "Discrete	Mathematics a	and its Application	on", McGraw Hill. [T1]			
References:							
1. H	arris, Hirst amd N	Mossinghoff," C	ombinatorics ar	nd Graph theory",			
Spri	nger. [R1]						
2. G	irimaldi," Graph 1	Theory and Com	hbinatorics", Pea	arson Education. [R2]			
3. J	Nestril and etal,"	Introduction to	o Discrete Math	ematics", Oxford			
Univ	versity Press. [R3]]	_				
Web referen	ces: https://onl	inecourses.npt	el.ac.in/noc22_	_ma10/preview			
Topics releva	ant to "SKILL DEV	/ELOPMENT":					
Dijikstra's alg	gorithm, Minimal	spanning tree-	Kruskal algorith	m and Prim's algorithm,			
Iransport ne	etwork-Max-flow	/Min-cut algor	ithm, Combinat	torics-Rook polynomial,			
Derrangeme	nts for skill deve	elopment throu	ign Participativ	e Learning techniques.			
inis is attai	nea through the	e assessment	component me	encionea in the course			
nandout.							

Course	Course Title: Machine Learning Using	g Python			2	2	4
Code:	Type of Course: Laboratory Integrate	d		L- P- C			
CSE 261							
Version No.	2.0						
Course Pre-	Data Structures, Statistics, Linear A	lgebra, Pytho	on, Datab	ase			
requisites							
Anti-							
requisites	Naching Lograins (NAL) - subset s	£ A+:£: a: al 1		()) :-			+ + - f
 Course Description Classification algorithms; Optimization techniques – Gradient Descent algorithms; Classification algorithms; Optimization techniques – Gradient Descent algorithm, Gradient Descent for simple Linear Regression; Ensemble Learning – Random Forest, Boosting techniques – AdaBoost and Gradient Boosting; Grid Search for optimal parameters; Clustering algorithms; Forecasting with Time-Series data : Auto-Regressive Integrated Moving Average Models, Recommender Systems : Association Rule Mining, Collaborative Filtering, Text Analytics – Sentiment Classification using Naïve Bayesian model. 							
Course Objective	CourseThe objective of the course is to familiarize the learners with the concepts of MachineObjectiveLearning Using Python and attain Skill Development through ExperientialLearning techniques.						
Course Out Comes	On successful completion of the constraints of the constraint of t	ourse the stu odels for Pre Optimizatic Igorithms. [A of Clustering s in Machir Recommen	dents sha dictive Ar on and pplication Algorithm ne Learn der	all be a nalytics Hyper n] ns.[Ap ing su syster	ble to [App Parar blication ch as ns, [A	: licatio neter on] time Ser Spplica	n]. Tuning series ntiment tion]
Course Content:							
Module 1	Supervised Machine Learning Algorithms	Assignment	Data Collection	/Interp	retatio	n 8 S	essions
Topics:			<u></u>	-	-		~
Introduction to the Machine Learning (ML) Framework, types of ML, Feature Engineering, One- hot encoding, Simple Linear Regression, Multiple Linear Regression, Model Evaluation, Validation and Accuracy measures for Regression models. Classification models – Decision Tree algorithms using Entropy and Gini Index as measures of node impurity, model evaluation metrics for classification algorithms, Multi-class classification and Class Imbalance problem.							
Module 2	Advanced Machine Learning Concepts	Case studies / Case let	Case stu	dies / C	ase let	12	Sessions
Topics: Nearest Neighbor techniques, Support Vector Machine, Cost functions and Optimization Technique – introduction to Gradient Descent, its applications on Linear Regression. Ensemble Learning algorithms – Bagging (Random Forest), Boosting(AdaBoost), Hyperparameter Tuning							

for neares Regressio	st neighbor learning using Grid Sea on models- LASSO and Ridge Reg	arch. Introd ression an	ductior introdu	n to Regularization	on wi	ith A	dvanced
Module 3	Clustering and Forecasting with	Quiz		Case studies / Cas	e let	14	Sessions
Taulas	lime-Series Data	_					
Topics:			<u>.</u>				
Partitiona	al Clustering – K-means and Hi	erarchical	Cluste	ering techniques	S, CIU	ister	validity
measures	, Dimensionality Reduction Te	chniques-L	inear	Discriminant A	nalys	SIS,	Principal
Compone	ent Analysis, Components of Tim	e Series d	ata, fo	precasting using	mov	/ing	average,
exponent	al smoothing, calculating forecast	accuracy,	decom	iposing time seri	es da	ta.	
	Recommender Systems and						
Module 4	Text	Quiz		Case studies /	14 S	essio	ons
	Analytics			Case let			
				.	امما		
Associatio	on Rule Mining, Collaborative Filte	ering – Use	er base	ed and item bas	ea si	milai	rity, Text
Analytics	– text preprocessing, representation	on using BC	ow and	d vector space m	odel.	inai	ve Bayes
Classifiers	s and Naive Bayes model for sentin	nent classif	ication	n – an introductio	on.		
LIST OF Labo	A roview of Duthen programming	T Introduct	tion to 1	Duthon Stack for D	hata S	ciono	o Coro
	8 A review of Python programming	2 - mirouuci	tform a	nd its installation		uting	e, core
	programs on lunyter IDE/Colab Prog	ramming ev		s to revise variable		ntrol	
	statements and collections – lists list	t comnrehe	nsion		.3, 001	10101	
	 Programming exercises on Tuple 	s. dictionari	es fun	ctions using math	rand	om n	nodules
	 Introduction to Data Frames usin 	ng Pandas ai	nd worl	king with frames –	- shap	e. su	mmary.
	cross tabs, sorting by column names,	creating ne	ew colu	mns, aggregation	and g	roup	ing,
	CO11filtering records, removing a co	lumn/row, l	handlin	ig missing values, I	Plotti	ng us	ing
	matplot library histogram, scatter Pl	ot					
	o Regression Models Simple linear	regression,	outlier	detection, multip	le line	ear re	egression
	- model evaluation, multi-collinearit	y and handl	ing mul	lti-collinearity, out	tlier d	etect	tion
	• Decision Tree Classifiers - Decisio	on Tree class	sifier us	sing Gini Index- me	easuri	ng te	est
	accuracy, displaying the tree, confusi	ion matrix a	nd ROC	C, Decision Tree Cl	assifie	er usi	ng
	Entropy.						
	 Optimization Techniques Develo 	ping a Grad	ient De	scent Algorithm fo	or line	ear re	gression
	- using NumPy and using skiearn	. Il un ormore	motor	tuning using Crid	Cooro	h far	Nooroct
	Neighbor Classifiers and Decision Tre	o Classifior	anneter s	turning using Griu	Searc	11101	Nearest
	Hyperparameter Tuning for Ense	mble mode	ls Ensei	mble Learning – R	andoi	m Fo	rest –
	Building the model. GridSearch for o	ptimal para	meters	. Feature Importa	nce. A	da B	oost
	Classifiers and Gradient Boosting Cla	ssifiers		,			
	 Clustering – Kmeans – cluster cel 	nters and in	terpret	ting the clusters, fi	nding	the	optimal
	number of clusters using Elbow Curv	e method, A	Agglom	erative Hierarchic	al Clu	sterir	1g —
	Compare the clusters formed by kme	eans and Ag	glomer	ative Clustering			
o Mo	dels for Forecasting Time Series data						
o Rec	commender Systems - Association Rul	e Mining us	ing Apr	iori for frequent l	temse	et Ge	neration.
o Rec	commender Systems – user based sim	ilarity					
o Naï	ve Bayes Model						
Targeted A	pplication & Tools that can be used						
• Rap	pid Miner						
• Ora	ange						
• Ma	tLab						
	Project we	ork/Assignr	nent:				

Assignment:

Text book(s):

1. Manaranjan Pradhan, U Dinesh Kumar, *"Machine Learning Using Python"*, Wiley, First Edition 2019.

2. Rehan Guha, "*Machine Learning Cookbook with Python*", BPB Publications, First Edition, 2020.

Reference Book(s):

1. Tan P. N., Steinbach M & Kumar V. "Introduction to Data Mining", Pearson Education, 2016.

2. Giuseppe Bonaccorso, "Machine Learning Algorithms: A reference guide to popular algorithms from data science and machine learning", Packt Publishing, 2017.

E book link R1:

ps://www.pdfdrive.com/machine-learning-step-by-step-guide-to-implement-machine-learningalgorithms-with-python-e158324853.html

E book link R2:

ps://www.pdfdrive.com/hands-on-machine-learning-with-scikit-learn-and-tensorflow-concepts-toolsand-techniques-to-build-intelligent-systems-e168440497.html

Web resources:

https://machinelearningmastery.com/seaborn-data-visualization-for-machine-learning/ https://link.springer.com/article/10.1007/s42979-021-00592-x https://pu.informatics.global/

Topics relevant to "SKILL DEVELOPMENT": Data Visualization using Seaborn library, Applications of Machine Learning in different domains for Skill Development through Experiential Learning techniques. This is attained through the Lab Experiments as mentioned in the assessment component

Course Code: CSE3066	Course Title: Mobile Application for IoT Type of Course: Program Core& Theory Only	L-P-C	3	0	3
Version No.	1.0				
Course Pre-requisites	NIL				
Anti-requisites	NIL				
Course Description	Mobile Application is the essential part for which helps in understanding the architect The purpose of this course is to expo- understand the IoT Reference Architectu Design Constraints along with various IOT p is both conceptual and analytical in nature student to predict the effects of forces a carrying out creative design functions.	or IoT infi oural overv- ose the source and I protocols. That wou and its mo	rastru view c tuder Real N This c Ild he otion	cture, of IOT. Its to World ourse Ip the while	

Course Objective	The objective of Mobile anc Participative L	The objective of the course is to familiarize the learners with the concepts of Mobile and Application for IoT and attain Skill Development through Participative Learning techniques.						
Course Out Comes	On successfu	On successful completion of the course the students shall be able to:						
	1 2 5 3 4 4	 Able to understand the application areas of IOT Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks Able to understand building blocks of Internet of Things and characteristics. Learn about android application development 						
Course Content:								
Module 1	Overview	Assignment	Program	ming Task	9 Sessions			
loT-An Architectura capabilities, An IoT Fundamentals- Devices processes in IoT, Everyth	I Overview Buildir architecture outlin and gateways, Loc hing as a Service(Xaa	ng an architectore, standards co al and wide are aS), M2M and IoT	ure, Main des onsiderations. a networking, Analytics, Kno	sign principle M2M and lo Data manage wledge Manaş	s and needed oT Technology ment, Business gement			
Assignment: Case stud	y on Business proce	sses in loT.						
Module 2	Basic Design	Assignment	Data Collecti	on/Excel	10 Sessions			
Topics: Introduction Basics of e applications, both hardw for mobile applications usability, security, availa Assignment: Recent tre	mbedded systems ovare and software retored to the system of the system o	design Embeddeo elated Architectin gestures Achievi lity. cation developm	d OS - Design o g mobile applio ng quality con ent	constraints for cations user in straints perfo	⁻ mobile terfaces rmance,			
Module 3	IOT mobile apps	Assignment	Programmin analysis task	g/Data	9 Sessions			
Topics: IoT Mobile App Develop IoT - UX / UI design for Io tips on design for IoT mo	oment Trends In 202 oT Mobile apps - cha obile apps IoT App D	0 - Role of Mobile allenges of UX/UI esign Solutions	e Apps in revolu design for IoT	utionizing the v applications -	world of practice			
Assignment: Challenges Module 4	faced during mobile TECHNOLOGY I- ANDROID	e application dev Assignment	elopment Programmin analysis task	g/Data	10 Sessions			
Topics: Introduction Establishin Interacting with UI Persi side applications Using (g the development o sting data using SQL Google Maps, GPS a	environment And ite Packaging and nd Wifi Integratic	roid architectu deployment I n with social m	re Activities ar nteraction wit nedia applicati	nd views h server ons.			

Targeted Protocols & Tools that can be used: Bluetooth, ZigBee, LoRa, NBIoT, WiFi, and Thread

Text Book

T1: "From machine to machine to the internet of things: Introduction to the new age of intelligence", 1st edition, Academic press, 2014.

T2: Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012

References

R1: Bernd Scholz- -3-642-19156-5 e-ISBN 978-3- 642-19157-2, Springer R2: Andrea Goldsmith, "Android in practice," Cambridge University Press, 2005 **Weblinks:**

W1: https://relevant.software/blog/mobile-iot-apps/

W2: <u>https://medium.com/@its.mattfitzgerald/top-14-iot-mobile-app-development-trends-to-expect-in-2020-7fd7718155dc</u>

W3:<u>https://puniversity.informaticsglobal.com/login?qurl=https://search.ebscohost.com%2</u> flogin.aspx%3fdirect%3dtrue%26db%3dnlebk%26AN%3d1223875%26site%3dehost-%2520live%26ebv%3dEB%26ppid%3dpp_xiii

Topics relevant to "SKILL DEVELOPMENT":

Wifi integration and social media analysis for developing **Skill Development** through **Participative Learning Techniques.** This is attained through the assessment component mentioned in the course handout.

Course Code:	Course Title: Wi IOT	reless communicat	tion in	P-C	3	0	3
CSE3055	Type of Course: Only	Program Core& Th	eory				
Version No.	1.0						
Course Pre-requisites	NIL						
Anti-requisites	NIL						
Course Description	Wireless communication system is the essential part for IoT infrastructure, which acts as the bridge for dual directional communication for data collection and control message delivery. The purpose of this course is to expose the students to understand the fundamentals of wireless network and problems related to real-world scenarios. This course is both conceptual and analytical in nature.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Wireless communication in IOT and attain Skill Development through Participative Learning techniques.						
Course Out Comes	On successful completion of the course the students shall be able to:1. To understand the fundamentals of wireless networks2. Analyze the standards of IoT which employed for wireless networks3. Explain the use of various wireless technologies in IoT4. Design and develop various applications of IoT						
Course Content:		Γ					
Module 1	Cellular standards	Assignment	Programmi	ing Task		9 Se	ssions
Topics: Cellular carriers and Picocells, Handoff, 1st, 2nd, 3rd a IP, WCDMA	Frequencies, Cha	annel allocation, (n Cellular Systems (Cell coverage GSM, CDMA	e, Cell S , GPRS, E	Splitti EDGE	ng, Mic,	rocells, Mobile

Assignment: Case stu	dy on generation ce	ellular systems.		
Module 2	Radio Frequency (RF)	Assignment	Data Collection/Excel	10 Sessions
	Fundamentals			

Topics:

Introduction to RF & Wireless Communications Systems, RF and Microwave Spectral Analysis, Communication Standards, Understanding RF & Microwave Specifications. Spectrum Analysis of RF Environment, Protocol Analysis of RF Environment, Units of RF measurements, Factors affecting network range and speed, Environment, Line-of-sight, Interference, Defining differences between physical layers- OFDM.

Assignment: Determination of RF and Microwave spectral Analysis

Module 3	WLAN: Wi-Fi	Assignment	Programming/Data	9 Sessions
	Organizations		analysis	
	and Standards		task	

Topics:

IEEE, Wi-Fi Alliance, WLAN Connectivity, WLAN QoS & Power-Save, IEEE 802.11 Standards,802.11- 2007,802.11a/b/g, 802.11e/h/l,802.11n

Assignment: Protocols on WLAN connectivity

0		1		
Module 4	Wi-Fi Hardware	Assignment	Programming/Data	10
	& Software		analysis	Sessions
			task	

Topics:

Access Points, WLAN Routers, WLAN Bridges, WLAN Repeaters, Direct-connect Aps, Distributed connect Aps, PoE Infrastructure, Endpoint, Client hardware and software, Wi-Fi Applications

Targeted Protocols & Tools that can be used:

Bluetooth, ZigBee, LoRa, NBIoT, WiFi, and Thread

Text Book

T1: Wireless Communications – Principles and Practice; by Theodore S Rappaport, Pearson Education Pte. Ltd.

T2: Wireless Communications and Networking; By: Stallings, William; Pearson Education Pte. Ltd.

References

R1:Bluetooth Revealed; By: Miller, Brent A, Bisdikian, Chatschik; Addison Wesley Longman Pte Ltd., Delhi 4. R2:Wilson, "Sensor Technology hand book," Elsevier publications 2005. 5. R3: Andrea Goldsmith, "Wireless Communications," Cambridge University Press, 2005 **Weblinks:**

W1: https://pianalytix.com/wireless-communication-protocols-in-iot/

W2: <u>https://behrtech.com/blog/6-leading-types-of-iot-wireless-tech-and-their-best-use-cases/</u>

Topics relevant to "SKILL DEVELOPMENT":

GSM, CDMA for developing **Skill Development** through **Participative Learning Techniques.** This is attained through the assessment component mentioned in the course handout.

Course Code:	Course Title:						
CSE 3053	Big Data Analytics for I	т					
				L- P- C	1	4	3
	Type of Course: Progra	m Core					
	Theory with embedded	lab					
Version No.	1.0						
Course Pre-							
requisites							
Anti-requisites	NIL						
Course Description	The course covers bas Integration of IOT wir applying geospatial ar course also covers the and review of IOT in	sic concepts for IOT th Cloud, Big Data En- alytics and applying e organization of the various sectors.	Analytics, c nvironments machine lea IOT data, c	collections. Studen arning to cost ben	on of d nts car the IC efits o	ata fo 1 lear DT da of usin	or IOT, n about ita. The ng IOT
Course Objective	The objective of the c Data Analytics for Io LEARNING technique	ourse is to familiarize Γ and attain SKILL DF s.	e the learner EVELOPMEN	rs with th NT throu	he con 1gh EX	cepts PERI	of Big ENTIAL
Course Outcomes	On successful comple CO1: Demonstrate IC (Apply) CO2: Apply appropriat problem (Apply) CO3: Examine concep CO4: Illustrate techniq IOT Data (Apply)	tion of the course the OT Data Analytics and e Hadoop Ecosystem to ts of cloud based IOT, ues and strategies for da	e students sh d machine l ools to perfo Big data and ata collection	all be al earning rm data a IOT (A a and Geo	ble to: applica analytic pply) ospatia	ation cs for l Ana	in IOT a given lytics to
Course Content:	1012au (11991)						
Module 1	IOT Analytics	Assignment				5 ses	sions
Introduction – IO	Γ Data, Challenges of IOT	analytics Applications –]	IOT analytics	Lifecycle	and Te	chniq	ues. IOT
Cloud and Big Dat	a Integration – Cloud bas	ed IOT platform – Data	Analytics for	IOT, IO	T devic	es in	different
domains. IOT Anal	ytics for the Cloud.						
Module 2	Hadoop Ecosystem Tools					5 ses	sions
Introduction – Big	Data and Big Data Analyti	cs – Hadoop Ecosystem	– Hadoop Dis	tributed I	File Sys	tem (l	HDFS) –
MapReduce – YAF	RN Architecture – PIG Arci	nitecture – Apache HIVE	- Mahout $-$ A	Apache Sp	park –	Apach	e HBase
	Overview of AWS						
Module 3	and Thingworx	Assignment				5 ses	sions
AWS overview - A	WS key services for IOT	analytics. Thingworx o	verview. Crea	ting an A	WS C	loud A	Analytics
environment.				-			
Module 4	Geospatial Ar IOT Data	alytics to Case Study	у	Data Analy	Colle sis	ectio	1 and
Strategies and Tech for Geospatial.	niques in Data collection:	Designing data processing	g for analytics	s – Apply	ing big	data to) storage
List of Practical T	asks:						
Experiment 1:[M	odule 1]						
Level 1: In	stallation of Raspbian O	S,working basic comma	ands on raspl	perry pi			
Level 2: D	emonstrate to obtain the	e temperature using DH	HT22 sensors				
Experiment 2: [N	Nodule 1]						

Design and Simulate the RADAR SYSTEM Using Arduino and display on the serial Level 1: using ultrasonic sensor/PIR WITH &WITH OUT BUZZER/Servo motor monitor Level 2: using a raspberry pi to Demonstrate to find the distance using ultrasonic sensor hcsr04 Experiment 3: [Module 1] Level 1: using a raspberry pi Set the connections of healthcare sensors Level 2: using a raspberry pi to Demonstrate to find the ECG, Temperature, etc using Healthcare sensors Experiment 4: [Module 2] Level 1: Hadoop Single node cluster installation on ubuntu Hadoop Multiple node cluster installation, windows installation Level 2: Experiment 5: [Module 2] Level 1: Basic hadoop commands and Word count analysis for given dataset Level 2: Analysis on particular matching word on huge dataset Experiment 6: [Module 2] Level 1: Basic hadoop commands and Stock analysis on given dataset Level 2: Analysis with max, min, average functions on particular field with missing values Experiment 7: [Module 2] Level 1: Basic hadoop commands and Temperature analysis on given dataset Level 2: Analysis with max, min, average functions on particular field with missing values Experiment 8: [Module 3] Level 1: Working on hive commands Level 2: Apply bucketing technique to bring out the difference between partitioning and bucketing Experiment 9: [Module 3] Level 1: Working on Hbase commands . Level 2: Apply Hbase commands on Insurance database/employee dataset. Experiment 10: [Module 3] Level 1: Installation of spark and word count analysis Level 2: Using RDD and FlatMap count how many times each word appears in a file and write out a list of words whose count is strictly greater than 4 using Spark Experiment 11: [Module 4] Level 1: Temperature Data stored in cloud through IoT devices Level 2: Retrieve the data set for cloud and Apply data analytics techniques Experiment 12: [Module 4] Level 1: Healthcare Data stored through IoT sensors in Cloud Level 2: Retrieve the data set for cloud and Apply data analytics techniques Targeted Application & Tools that can be used: Hadoop ecosystem tools, Thingworx, AWS Cloud **Project work/Assignment:** Student will be asked to carry out a mini project integrating IoT & data Analytics. Text Book T1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley., 2nd Edition, 2019. T2. Analytics for the Internet of things, Andrew Minteer. Packt publishing, 1st Edition, 2017. T3. Big Data and the Internet of Things, Robert Stackowiak, Art Licht, Venu Mantha and Louis Nagode, Apress, 2nd Edition, 2020 References R1. IOT and Analytics in Agriculture., Prasant Kumar Pattnaik, Raghvendra Kumar, Souvik Pal, S. N. Panda. Springer, First Edition, 2020. R2. Building blocks for IOT Analytics. Internet-of-Things Analytics. John Soldatos (Editor). River Publisher Series in Signal Image and Speech Processing.2020 (iii) web resources W1. NPTEL: https://onlinecourses.nptel.ac.in/noc20_cs92/preview W2. Coursera: https://www.coursera.org/learn/big-data-introduction W3. EDX: https://www.edx.org/course/big-data-fundamentals W4. E-book Link : https://www.wiley.com /en-us/Internet+of+Things+and+ Data+ Analytics + Handbook -p-9781119173625

Topics relevant to "SKILL DEVELOPMENT": Organize IOT data – Linked analytics datasets – Managing data lakes for **Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE2032	Course Title: Introduction t Type of Course:1] Discipline 2] Lab Integra	o Fog Computing e Elective ated Course	L- P- C	3	0	3
Version No.	1.0					
Course Pre- requisites	NIL					
Anti-requisites	NIL					
Course Description	The course will provide a s problems underlying the design applications. Thus, this course analyze and implement such decentralized computing infor- applications are located some edge computing, fog computi- closer to where data is created computing and edge computi- intelligence and processing of done to improve efficiency, compliance reasons.	olid base for understan gn and development of fo rse will teach how to s n systems and application rastructure in which dat where between the data s ng brings the advantage ed and acted upon. Many ng interchangeably becau- closer to where the data though it might also b	ding the g compu pecify, c ons. Fog ca, comp source an s and po people u use both is creat e done	e chal ting s lesign comp ute, s nd the wer o use the involv red. Th for se	lenge yster putir torag clou of the e ter ve br his is ecurit	es and ns and ogram, ng is a ge and d. Like e cloud ms fog 'inging s often ty and
Course Objectives	The objective of the course of Introduction to Fog Cor Problem Solving techniques.	is to familiarize the leann in the leann is the leanness of the	arners w L DEVELO	ith th DPME	e co NT ti	ncepts hrough
Course Out Comes	 On successful completion of the figure of the second sec	his course the students s principles and concepts of models such as Cloud (enges of developing fog solutions. nd the issues mostly re- e fog programming mo Defined Network, load ba application areas. n is the best approach for elopment of a fog comput- plement an application u d analyze the performa	hall be a of fog cor Computin based elated to del and alancing for a par ting syste sing con nce of a	ble to: mputing and applic fog relate comr rticula em. tainer fog	ng sy d Ne ation comp ed n nuni ar pr s. com	/stems ar-Far ns and puting, nodels, cation, roblem puting
Course Content:		· · · · · · · · · · · · · · · · · · ·				
Module 1	INTRODUCTION TO FOG COMPUTING	Assignment Program activity	ming		Ses	11 ssions
Topics: Fog Computing, Ch Internet of Things-P Computing and Edge	aracteristics, Application Sce ros and Cons-Myths of Fog Con e Computing-IoT , FOG, CloudE	enarios, Issues and cha nputing-Need and Reaso Benefits.	llenges. ns for Fo	Fog (g Com	Comj iputi	puting, ng Fog
Module 2	ARCHITECTURE	Assignment Program activity	ming		Ses	10 ssions
Topics: Communication and healthcare and ve 802.11,4G,5G standa Range	l Network Model, Programn hicles. Fog Computing Cor ards, WPAN, Short-Range Tec	ning Models, Fog Archi nmunication Technolog hnologies, LPWAN and o	tecture ies: Int other me	for sr roduc edium	nart tion and	cities, ,IEEE Long-

Module 3 FOG PROTOCOLS AND COMMUNICATION TECHNOLOGIES Assignment Programming activity Sessi Topics: Fog Protocol-Fog Kit- Proximity Detection Protocols- DDS/RTPS computing protocols, Introduu ICEE 802.11.46,5G standards, WPAN, Short-Range Technologies, LPWAN and other medium Long-Range Programming activity Sessi Module 4 MANAGEMENT AND ORCHESTRATION Assignment Programming activity Sessi Topics: Management and Orchestration of Network Slicing in Software-Defined Clouds, Introduction, Background, Network Slicing in 5G, Network Slicing in Software-Defined Clouds, Network Slici Management in Edge and Fog, Middleware for Fog and Edge Computing, Realization for Big Data Analytics: Introduction to Big Data Analytics, Data Analytics in the Fog, Prototypes and Evaluation. FOG COMPUTING REQUIREMENTS WHEN Assignment Programming activity Sessi Module 5 FOG COMPUTING REQUIREMENTS WHEN Activity and privacy issues. Integrating IoT,Fog, Cloud Infrastructures: Methodology , Integr CZF2T Literature by Modeling Technique re by Use-Case Scenarios , Integrated C2F2T Literatur Metrics. Sensing Devices, Wearable Event Device, Wearable System, Demonstrations , Post Application & Tools that can be used: Case Study: Wind Farm - Smart Traffic Ligh System, Wearable Sensing Devices, Wearable Event Device, Wearable System, Demonstrations , Post Application Example Event Applications Example. Sensor Apale and Distrib Computing 1 Wiley Online Books 1 Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y	1000000				
Topics: Fog Protocol-Fog Kit- Proximity Detection Protocols- DDS/RTPS computing protocols, Introduc, IREE 802.11,4G,5G standards, WPAN, Short-Range Technologies, LPWAN and other medium Long-Range Module 4 MANAGEMENT AND ORCHESTRATION Assignment activity Sessi Topics: Management and Orchestration of Network Slices in 5G, Fog, Edge, and Clouds, Introduction, Background , Network Slicing in 5G, Network Slicing in Software-Defined Clouds, Network Slicing in SG, Network Slicing in Software-Defined Clouds, Network Slicing in SG, Network Slicing in Software-Defined Clouds, Network Slicing in SG, Network Slicing in Software-Defined Clouds, Network Slicing in SG, Network Slicing in Software-Defined Clouds, Network Slicing in Software-Defined Cloud Science Scientics, Network Slicing in Software-Defined Cloud Science Sc	Module 3	FOG PROTOCOLS AND COMMUNICATION TECHNOLOGIES	Assignment	Programming activity	10 Sessions
Fog Protocol-Fog Kit- Proximity Detection Protocols- DDS/RTPS computing protocols, Introduu, JEEE 802.11,46,5G standards, WPAN, Short-Range Technologies, LPWAN and other medium Long-Range Module 4 MANAGEMENT AND ORCHESTRATION Assignment Programming activity Sessi Topics: Management and Orchestration of Network Slices in 5G, Fog, Edge, and Clouds: Introduction, Background, Network Slicing in 5G, Network Slicing in Software-Defined Clouds, Network Slicing anagement in Edge and Fog, Middleware for Fog and Edge Computing, Need for Fog and Edge Computing Middleware, Clusters for Lightweight Edge Clouds, IoT Integration, Security Management for Edge Cloud Architectures. Fog Computing Realization for Big Data Analytics: Introduction to Big Data Analytics, Data Analytics in the Fog. Prototypes and Evaluation. Module 5 FOG COMPUTING REQUIREMENTS WHEN APPLIED TO IOT Assignment Programming activity Sessi Topics: Fog computing requirements when applied to IoT: Scalability,Interoperability,Fog-IoT: architect model, Challenges on IoT Stack Model via TCP/IP Architect DataManagement,filtering,EventManagement,DeviceManagement,cloudification,virualization, security and privacy issues. Integrating IoT,Fog, Cloud Infrastructures: Methodology , Integr C2F2T Literature by Modeling Technique re by Use-Case Study: Wind Farm - Smart Traffic Ligh System, Wearable Sensing Devices, Wearable Event Device, Wearable System, Demonstrations , Post Application & Tools that can be used: Case Study: Wind Farm - Smart Traffic Ligh System, Wearable Sensing Devices, Wearable Event Device, Wearable System, Demonstrations , Post Application Example Event Applications Example. Targeted Application & Tools that can be u	Topics:		1		I
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Long-Range Module 4 MANAGEMENT AND ORCHESTRATION Assignment Programming activity Sessi Topics: Management and Orchestration of Network Slicing in Software-Defined Clouds, Introduction, Background , Network Slicing in SG , Network Slicing in Software-Defined Clouds, Network Slici Management in Edge and Fog , Middleware for Fog and Edge Computing, Need for Fog and Edge Computing Middleware, Clusters for Lightweight Edge Clouds , IoT Integration , Security Management for Edge Cloud Architectures. Fog Computing Realization for Big Data Analytics: Introduction to Big Data Analytics, Data Analytics in the Fog, Prototypes and Evaluation. Module 5 REQUIREMENTS WHEN APPLIED TO IOT Assignment Programming activity Sessi Topics: FOG COMPUTING REQUIREMENTS WHEN ApPLIED TO IOT Assignment Programming activity Sessi Topics: Fog computing requirements when applied to IoT: Scalability,Interoperability,Fog-IoT: architec DataManagement,filtering,EventManagement,DeviceManagement,cloudification,virualization, security and privacy issues. Integrating IoT,Fog, Cloud Infrastructures: Methodology , Integr C2F2T Literature by Modeling Technique re by Use-Case Scenarios , Integrated C2F2T Literature Metrics. Targeted Application & Tools that can be used: Case Study: Wind Farm - Smart Traffic Ligh System, Wearable Sensing Devices, Wearable Event Device , Wearable System, Demonstrations , Post Application Example Event Applications Example. Text Book 1. Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albe	,IEEE 802.11,4G,5	5G standards, WPAN, Short-R	ange Technologi	es, LPWAN and othe	r medium and
Module 4 MANAGEMENT AND ORCHESTRATION Assignment Programming activity Sessi Topics: Management and Orchestration of Network Slices in 5G, Fog, Edge, and Clouds: Introduction, Background, Network Slicing in 5G, Network Slicing in Software-Defined Clouds, Network Slici Management in Edge and Fog, Middleware for Fog and Edge Computing, Need for Fog and Edge Computing Middleware, Clusters for Lightweight Edge Clouds, IoT Integration, Security Management for Edge Cloud Architectures. Fog Computing Realization for Big Data Analytics: Introduction to Big Data Analytics, Data Analytics in the Fog, Prototypes and Evaluation. Module 5 FOG COMPUTING REQUIREMENTS WHEN APPLIED TO IOT Assignment Programming activity Sessi Topics: FOG COMPUTING REQUIREMENTS WHEN Applied to IoT: Scalability,Interoperability,Fog-IoT: architect model, Challenges on IoT Stack Model via TCP/IP Architec DataManagement,filtering,EventManagement,DeviceManagement,cloudification,virualization, security and privacy issues. Integrating IoT,Fog, Cloud Infrastructures: Methodology , Integr CZF2T Literature by Modeling Technique re by Use-Case Study: Wind Farm - Smart Traffic Ligh System, Wearable Sensing Devices, Wearable Event Device, Wearable System, Demonstrations , Post Application & Tools that can be used: Case Study: Wind Farm - Smart Traffic Ligh System, Wearable Sensing Devices, Wearable Event Device, Wearable System, Demonstrations , Post Application Example Event Applications Example. Text Book 1. Fog computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya. 2. A. Sensors, Cloud, and Fog: The Enabling Technologies for	Long-Range				
Topics: Management and Orchestration of Network Slices in 5G, Fog, Edge, and Clouds: Introduction, Background, Network Slicing in 5G, Network Slicing in Software-Defined Clouds, Network Slici Management in Edge and Fog, Middleware for Fog and Edge Computing, Need for Fog and Edge Computing Middleware, Clusters for Lightweight Edge Clouds, IoT Integration, Security Management for Edge Cloud Architectures. Fog Computing Realization for Big Data Analytics: Introduction to Big Data Analytics, Data Analytics in the Fog, Prototypes and Evaluation. Module 5 FOG COMPUTING REQUIREMENTS WHEN APPLIED TO IOT Programming activity Sessi Topics: FOG COMPUTING REQUIREMENTS WHEN APPLIED TO IOT Assignment Programming activity Sessi Topics: Fog computing requirements when applied to IoT: Scalability,Interoperability,Fog-IoT: architect model, Challenges on IoT Stack Model via TCP/IP Architec DataManagement,filtering,EventManagement,DeviceManagement,cloudification,virualization, security and privacy issues. Integrating IoT,Fog, Cloud Infrastructures: Methodology , Integr CZF2T Literature by Modeling Technique re by Use-Case Scenarios , Integrated C2F2T Literature Metrics. Targeted Application & Tools that can be used: Case Study: Wind Farm - Smart Traffic Ligh System, Wearable Sensing Devices, Wearable Event Device ,Wearable System, Demonstrations , Post Application Example Event Applications Example. Text Book 1. Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya. 2. Fog and Edge Computing: Principles and Paradigms (Wiley Series on Parallel and Distrib Computing) by RajkumarBuyya and Satish Narayanan	Module 4	MANAGEMENT AND ORCHESTRATION	Assignment	Programming activity	11 Sessions
Module 1 FOG COMPUTING REQUIREMENTS WHEN APPLIED TO IOT Assignment Programming activity Sessi Topics: Fog computing requirements when applied to IoT: Scalability,Interoperability,Fog-IoT: architect model, Challenges on IoT Stack Model via TCP/IP Architec DataManagement,filtering,EventManagement,DeviceManagement,cloudification,virualization, security and privacy issues. Integrating IoT,Fog, Cloud Infrastructures: Methodology , Integr CZF2T Literature by Modeling Technique re by Use-Case Scenarios , Integrated C2F2T Literature Metrics. Targeted Application & Tools that can be used: Case Study: Wind Farm - Smart Traffic Ligh System, Wearable Sensing Devices, Wearable Event Device ,Wearable System, Demonstrations , Post Application Example Event Applications Example. Text Book 1. Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya. 2. Fog and Edge Computing: Principles and Paradigms (Wiley Series on Parallel and Distrib Computing) by RajkumarBuyya and Satish Narayana Srirama. 3. Sensors, Cloud, and Fog: The Enabling Technologies for the Internet of Things Paperbac SudipMisra , Subhadeep Sarkar , Subarna Chatterjee. Web Links: Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya. Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya. Sensors, Cloud, and Fog: The Enabling Technologies for the Internet of Things Paperbac SudipMisra , Subhadeep Sarkar , Subarna Chatterjee. Web Links:	Topics: Management and Background , Net Management in E Computing Middl Management for 1	Orchestration of Network Slic work Slicing in 5G , Network S dge and Fog , Middleware for eware, Clusters for Lightweig Edge Cloud Architectures. Fog	ces in 5G, Fog, Edg licing in Software Fog and Edge Cor nt Edge Clouds , Io g Computing Real	ge, and Clouds: Introc e-Defined Clouds, Net nputing, Need for Fog oT Integration , Secur ization for Big Data A	luction, twork Slicing g and Edge rity nalytics:
Module 5FOG COMPUTING REQUIREMENTS WHEN APPLIED TO IOTAssignmentProgramming activitySessiTopics: Fog computing requirements when applied to IoT: Scalability,Interoperability,Fog-IoT: architect model, Challenges on IoT Stack Model via TCP/IP Architec DataManagement,filtering,EventManagement,DeviceManagement,cloudification,virualization, security and privacy issues. Integrating IoT,Fog, Cloud Infrastructures: Methodology , Integr C2F2T Literature by Modeling Technique re by Use-Case Scenarios , Integrated C2F2T Literature Metrics.Targeted Application & Tools that can be used: System, Wearable Sensing Devices, Wearable Event Device ,Wearable System, Demonstrations , Post Application Example Event Applications Example.Text Book1.1.9.2.9.	Introduction to B	ig Data Analytics, Data Analyti	cs in the Fog, Pro	totypes and Evaluation	on.
Topics: Fog computing requirements when applied to IoT: Scalability,Interoperability,Fog-IoT: architec model, Challenges on IoT Stack Model via TCP/IP Architec DataManagement,filtering,EventManagement,DeviceManagement,cloudification,virualization, security and privacy issues. Integrating IoT,Fog, Cloud Infrastructures: Methodology , Integr C2F2T Literature by Modeling Technique re by Use-Case Scenarios , Integrated C2F2T Literature Metrics. Targeted Application & Tools that can be used: Case Study: Wind Farm - Smart Traffic Ligh System, Wearable Sensing Devices, Wearable Event Device ,Wearable System, Demonstrations , Post Application Example Event Applications Example. Text Book 1. Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya. 2. Fog and Edge Computing: Principles and Paradigms (Wiley Series on Parallel and Distrib Computing) by RajkumarBuyya and Satish Narayana Srirama. 3. Sensors, Cloud, and Fog: The Enabling Technologies for the Internet of Things Paperbac SudipMisra , Subhadeep Sarkar , Subarna Chatterjee. Web Links: Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya. Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya. Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya. SudipMisra , Subhadeep Sarkar , Subarna Chatterjee. Web Links: Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya. Fog Computing Wiley Online Books Eog and Edge Computing: Principles and Paradigms (Wiley Series on Parallel and Distrib		FOG COMPUTING	Assignment	Programming	11 Sossions
SudipMisra , Subhadeep Sarkar , Subarna Chatterjee. Web Links: Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya. <u>Fog Computing Wiley Online Books</u> Fog and Edge Computing: Principles and Paradigms (Wiley Series on Parallel and Distrib	Module 5 Topics: Fog computing re model, Challe DataManagement security and priv C2F2T Literature Metrics.	APPLIED TO IOT equirements when applied to Id enges on IoT Sta t,filtering,EventManagement,D vacy issues. Integrating IoT,Fo by Modeling Technique re by	oT: Scalability,Int ck Model eviceManagemen og, Cloud Infrast Use-Case Scenar	eroperability,Fog-Io via TCP/IP nt,cloudification,virua ructures: Methodolog ios , Integrated C2F2	F: architectura Architecture alization, gy , Integrated T Literature by
Web Links: Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya. Fog Computing Wiley Online Books Fog and Edge Computing: Principles and Paradigms (Wiley Series on Parallel and Distrib	Module 5 Topics: Fog computing re model, Challe DataManagement security and priv C2F2T Literature Metrics. Targeted Applic System, Wearable Post Application 1 Text Book 1. Fog Comp 2. Fog and E Computing) by Ra 3. Sensors, (APPLIED TO IOT equirements when applied to Id enges on IoT Sta t,filtering,EventManagement,D vacy issues. Integrating IoT,Fo by Modeling Technique re by ation & Tools that can be us e Sensing Devices, Wearable E Example Event Applications outing: Theory and Practice by dge Computing: Principles and ajkumarBuyya and Satish Nara Cloud, and Fog: The Enabling T	oT: Scalability,Int ck Model peviceManagemen og, Cloud Infrast Use-Case Scenar ed: Case Study: vent Device ,Wea Example. Assad Abbas, San l Paradigms (Wild ayana Srirama. Sechnologies for t	eroperability,Fog-Io via TCP/IP nt,cloudification,virua ructures: Methodolo ios , Integrated C2F2 Wind Farm - Smart T rable System, Demon mee U. Khan, Albert Y ey Series on Parallel a	F: architectura Architecture alization, gy , Integrated T Literature by raffic Light strations , C. Zomaya. and Distributed
Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya. <u>Fog Computing Wiley Online Books</u> Fog and Edge Computing: Principles and Paradigms (Wiley Series on Parallel and Distrib	Module 5 Topics: Fog computing remodel, Challed DataManagement security and prive C2F2T Literature Metrics. Targeted Applic System, Wearabled Post Application 1 Text Book 1. Fog Comp 2. Fog and E Computing) by Ra 3. Sensors, C SudipMisra, Subb	APPLIED TO IOT equirements when applied to Id enges on IoT Stat t,filtering,EventManagement,D vacy issues. Integrating IoT,Fo by Modeling Technique re by ation & Tools that can be us e Sensing Devices, Wearable Er Example Event Applications outing: Theory and Practice by dge Computing: Principles and ajkumarBuyya and Satish Nara Cloud, and Fog: The Enabling T nadeep Sarkar , Subarna Chatte	oT: Scalability,Int ck Model DeviceManagemen og, Cloud Infrast Use-Case Scenar ed: Case Study: vent Device ,Wea Example. Assad Abbas, San l Paradigms (Wild ayana Srirama. Fechnologies for t erjee.	eroperability,Fog-Io via TCP/IP nt,cloudification,virua ructures: Methodolo ios , Integrated C2F2 Wind Farm - Smart T rable System, Demon mee U. Khan, Albert Y ey Series on Parallel a the Internet of Things	F: architectura Architectura alization, gy , Integrated T Literature by Traffic Light strations , Z. Zomaya. and Distributed s Paperback by
Fog and Edge Computing: Principles and Paradigms (Wiley Series on Parallel and Distrib	Module 5 Topics: Fog computing re model, Challe DataManagement security and priv C2F2T Literature Metrics. Targeted Applic System, Wearable Post Application 1 Text Book 1. Fog Comp 2. Fog and E Computing) by Ra 3. Sensors, O SudipMisra , Subl Web Links:	APPLIED TO IOT equirements when applied to Id enges on IoT Sta t,filtering,EventManagement,D vacy issues. Integrating IoT,Fo by Modeling Technique re by ation & Tools that can be us e Sensing Devices, Wearable Er Example Event Applications outing: Theory and Practice by dge Computing: Principles and ajkumarBuyya and Satish Nara Cloud, and Fog: The Enabling T nadeep Sarkar , Subarna Chatte	oT: Scalability,Int ck Model DeviceManagemen og, Cloud Infrast Use-Case Scenar ed: Case Study: vent Device ,Wea Example. Assad Abbas, San I Paradigms (Wild ayana Srirama. Sechnologies for t erjee.	wind Farm - Smart T wind Farm - Smart T rable System, Demon	F: architectura Architecture alization, gy , Integrated T Literature by raffic Light strations , Z. Zomaya. and Distributed s Paperback by
Computing) by RajkumarBuyya and Satish Narayana Srirama. Fog and Edge Computing: Principles and Paradigms Wiley	Module 5 Topics: Fog computing remodel, Challed DataManagement security and prive C2F2T Literature Metrics. Targeted Applic System, Wearabled Post Application D Text Book 1. Fog Computing) by Ra 3. Sensors, O SudipMisra, Suble Web Links: Fog Computing: T Fog Computing D	APPLIED TO IOT equirements when applied to Idenges on IoT Stat, filtering,EventManagement,D vacy issues. Integrating IoT,Fo by Modeling Technique re by ation & Tools that can be us e Sensing Devices, Wearable Event Example Event Applications puting: Theory and Practice by dge Computing: Principles and ajkumarBuyya and Satish Nara Cloud, and Fog: The Enabling T nadeep Sarkar , Subarna Chatter Cheory and Practice by Assad A Wiley Online Books	oT: Scalability,Int ck Model DeviceManagemen og, Cloud Infrast Use-Case Scenar ed: Case Study: vent Device ,Wea Example. Assad Abbas, San d Paradigms (Wild ayana Srirama. Sechnologies for t erjee.	eroperability,Fog-Io via TCP/IP nt,cloudification,virua ructures: Methodolo ios , Integrated C2F2' Wind Farm - Smart T rable System, Demon mee U. Khan, Albert Y ey Series on Parallel a the Internet of Things	T: architectura Architecture alization, gy , Integrated T Literature by raffic Light strations , Z. Zomaya. and Distributed s Paperback by 7a.
Sensors, Cloud, and Fog: The Enabling Technologies for the Internet of Things Paperbacl SudipMisra , Subhadeep Sarkar , Subarna Chatterjee.	Module 5 Topics: Fog computing remodel, Challed DataManagement security and prive C2F2T Literature Metrics. Targeted Applic System, Wearabled Post Application D Text Book 1. Fog Computing 2. Fog and E Computing) by Ra 3. Sensors, C SudipMisra, Suble Web Links: Fog Computing [1] Fog and Edge Cor Computing) by Ra Fog and Edge Cor Computing) by Ra Fog and Edge Cor	APPLIED TO IOT equirements when applied to Idenges on IoT Stat, filtering,EventManagement,D vacy issues. Integrating IoT,Fo by Modeling Technique re by ation & Tools that can be us e Sensing Devices, Wearable Event Example Event Applications outing: Theory and Practice by dge Computing: Principles and ajkumarBuyya and Satish Nara Cloud, and Fog: The Enabling T nadeep Sarkar , Subarna Chatter Cheory and Practice by Assad A Wiley Online Books omputing: Principles and Paradi	oT: Scalability,Int ck Model DeviceManagemen og, Cloud Infrast Use-Case Scenar ed: Case Study: vent Device ,Wea Example. Assad Abbas, San d Paradigms (Wile ayana Srirama. Sechnologies for t erjee. Abbas, Samee U. H radigms (Wiley S ayana Srirama. igms Wiley	Eeroperability,Fog-Io via TCP/IP nt,cloudification,virua ructures: Methodolo ios , Integrated C2F2' Wind Farm - Smart T rable System, Demon mee U. Khan, Albert Y ey Series on Parallel a the Internet of Things Khan, Albert Y. Zomay Series on Parallel an	F: architectura Architectura Architecture alization, gy , Integrated T Literature by raffic Light strations , Z. Zomaya. and Distributed s Paperback by za.
	Module 5 Topics: Fog computing remodel, Challed DataManagement security and prive C2F2T Literature Metrics. Targeted Applic Metrics. Targeted Applic System, Wearabled Post Application 1 Text Book 1. Fog Comp 2. Fog and E Computing) by Ra 3. Sensors, C SudipMisra, Subble Web Links: Fog Computing: T Fog and Edge Cor Sensors, Cloud, a SudipMisra, Subble SudipMisra, Subble Fog and Edge Cor Sensors, Cloud, a SudipMisra, Subble SudipMisra, Subble Computing) by Ra Fog and Edge Cor Sensors, Cloud, a SudipMisra, Subble SudipMisra, Subble	APPLIED TO IOT equirements when applied to Idenges on IoT Stat, filtering,EventManagement,D vacy issues. Integrating IoT,Fo by Modeling Technique re by ation & Tools that can be us e Sensing Devices, Wearable E Example Event Applications outing: Theory and Practice by dge Computing: Principles and ajkumarBuyya and Satish Nara Cloud, and Fog: The Enabling T nadeep Sarkar , Subarna Chatte Theory and Practice by Assad A Wiley Online Books omputing: Principles and Paradi ajkumarBuyya and Satish Nara nputing: Principles and Paradi and Fog: The Enabling Tech nadeep Sarkar , Subarna Chatte	oT: Scalability,Int ck Model DeviceManagemen og, Cloud Infrast Use-Case Scenar ed: Case Study: vent Device ,Wea Example. Assad Abbas, San l Paradigms (Wile ayana Srirama. Technologies for the erjee. Abbas, Samee U. F radigms (Wiley ayana Srirama. igms Wiley nologies for the erjee.	reroperability,Fog-Io via TCP/IP nt,cloudification,virua ructures: Methodolo ios , Integrated C2F2 Wind Farm - Smart T rable System, Demon mee U. Khan, Albert Y ey Series on Parallel a the Internet of Things Khan, Albert Y. Zomay Series on Parallel an Internet of Things	F: architectura Architectura Architectura alization, gy , Integrated T Literature by Traffic Light strations , C Zomaya. and Distributed s Paperback by 7a.

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1. FlavioBonomi, Rodolfo Milito, Jiang Zhu, SateeshAddepalli, —Fog Computing and Its Role in the Internet of Things^{II}, MCC'12, August 17, 2012, Helsinki, Finland. Copyright 2012 ACM 978- 1-4503-1519-7/12/08... \$15.00.

2. Shanhe Yi, Cheng Li, Qun Li, —A Survey of Fog Computing: Concepts, Applications and Issues||, Mobidata'15, ACM 978-1-4503-3524-9/15/06, DOI: 10.1145/2757384.2757397, June 21, 2015, Hangzhou, China..

3. Amir M. Rahmani ,PasiLiljeberg, Preden, Axel Jantsch, —Fog Computing in the Internet of Things - Intelligence at the Edgell, Springer International Publishing, 2018.

4. Ivan Stojmenovic, Sheng Wen, "The Fog Computing Paradigm: Scenarios andSecurity Issues", Proceedings, Federated Conference on Computer Science and Information Systems, pp. 1–8, 2014

5. Fog Computing: Helping the Internet of Things Realize its Potential Amir VahidDastjerdi and RajkumarBuyya, University of Melbourne.

6. Multi-Dimensional payment Plan in Fog Computing with Moral Hazar,YanruZhang,Nguyen H. Tran,DusitNiyato, and Zhu Han,IEEE,2016

Topics relevant to "SKILL DEVELOPMENT":

Fog Computing requirements for **SKILL DEVELOPMENT** through **Problem Solving Techniques**. This is attained through the assessment component mentioned in course handout.

[Text Wrapping Break]

Last Modified: 25/05/2022

Course	Course Title:					
Code:	DevOps Tools And Interna	als		•		
CSE3046	Type of Course:		L-P-C	2	2	3
	Theory & Integrated Labo	oratory				
Version No.	1.2		•			_
Course Pre-	Fundamentals of Devops					
requisites						
Anti-	NIL					
requisites						
Course	This course is designed to offer	profound per	ceptions and k	nowle	edge in v	arious
Description	tools like Git. Ansible, Selenium and	Jekins. With	the proficien	t learn	ing of D	evOps
	course, a student will be able to wo	rk in all the	above tools a	nd bec	come a t	rained
	practitioner in the integration and m	onitoring of s	software.			
	DevOps Tool is an applicatio	n that helps t	the software of	levelo	pment p	rocess
	to industrialize. It mainly focuses	on communi	cation and co	llabor	ation be	tween
	product management, software dev	velopment, a	nd operations	s profe	essionals	s. The
	objective of this course is to discus	ss and imple	ment the vari	ous to	ols usag	e and
	internals practically.	·····				,
Course	The objective of the course is to	o familiarize	the learners	with	the co	ncepts
Objective	of DevOps Tools And In	ternals and	attain Skill D)evelo	oment t	nrough
objective	Experiential Learning techniques.					
Course Out	On successful completion of this co	urse the stude	ents shall be a	ble to:	1	
Comes	1] Apply the features and common	GIL WORKHOV	W.	AJ	ppiicalio)nj
	[2] Practice the filters and plugins (lo populate, n	nampulate, an	a man	lage data	l
	used by Ansible Playbooks.			ГА		- m]
	21 Compute the features of colonia	IDE		[A [A	ppiicatio)n] onl
	[5] Compute the features of selentu	IIII IDE.	no and huild	[A]	ppiicatio	onj
	4] Interpret the instantion and real	lures of Jenki	ins and build	JODS. ГА	nnligati	onl
				ĮΑ	ppncan	JII]
Course						
Content:						
Module 1	Git	Ouiz	Quiz on Git		51	∠ +4P
	on and a second s	Quiz	commands		C	asses
Topics						
Introduction t	o Git Features of Git Benefits W	orkflow Git	vs GitHub I	netalla	tion of (Git on
Windows/Lin	ux and Environment set up All Gi	t Commands	Working wi	th loc	al and r	emote
repositories F	Punning first Git command Fundame	entals of Ren	ository structu	ire and	l file sta	tue
life cycle Wo	rking locally with staging unstaging	and commit	situation y structu	iic airc	i ine sta	lub
	Containerization		Ouiz on		51	+4P
Module 2	Docker	Quiz	Ansible tool	16906		2 TTI
Topics		1		usage		40000
Docker Life Cy	cle Docker Installation Docker Operat	ions Docker C	oncents - Reg	istrv D	enositor	v Tag
Image and Con	tainers Create A Docker Hub Account	Docker Image	s and Containe	ors Due	cpositor	r, 198, ker To
Container Hub	Docker File			.13, FUS		
container nub,						
			Assignments	on		
Module 3	Ansible	Assignment	Selenium too	011] 116904	$_{\rm e and}$ 5I	ג +4P
THOULIE J		rissigninent	test case	i usagi		asses
Topics	1	1	usi case		I	
ropics:						

Ansible Workflow, Architecture, Installation in Linux/Windows, ad-hoc Commands, Playbooks, Roles, Variables open link, Tags, Galaxy, Commands Cheat Sheets, Modules, Shell, Templates, Tower, YAML, Inventory, Debug, Apt, Lineinfile, Copy, Command, File, Vault, Windows, Yum, AWX, Unarchive, Ansible Pip Assignments on Jenkins tool usage and Build 5L + 4PJenkins Module 4 Assignment iobs Topics: Introduction To Continuous Integration, Jenkins Architecture, Managing Nodes On Jenkins, Jenkins Master Node Connection, Jenkins Integration With Devops Tools, Understanding CI/CD Pipelines, Creating A CI/CD Pipeline List of Laboratory Tasks: Git 1. Level 1: Installation of Git on windows Level 2: Git commands-Local repositories Level 2: Git commands-Remote repositories 2. How Git can handle automatically file modifications when they are not related to the same lines of text. Level 1: You are in a new repository located in C:\Repos\Exercises\Ch2-1. Level 1: You have a master branch with two previous commits: the first commit with a file and the second commit with a file2.txt file. file1.txt Level 2: After the second commit, you created a new branch called File2Split. You realized that file2.txt is too big, and you want to split its content by creating a new file2a.txt file. Do it, and then commit the modifications. 3. How to resolve conflicts when Git cannot merge files automatically. Level 1: You are in the same repository used earlier, C:\Repos\Exercises\Ch2-1. On the master branch, you add the file3.txt file and commit it. Level 2: Then, you realize that it is better to create a new branch to work on file3.txt, so you create the File3Work branch. You move in this branch, and you start to work on it, committing modifications. Level 2: The day after, you accidentally move to the master branch and make some modifications on the file3.txt file, committing it. 5. Then, you try to merge it. 4. Level 1: Installation of Ansible Level 2: Create a basic inventory file Level 2: Running your first Ad-Hoc Ansible command. Ansible 5. Ansible Archive Level 1: Compressing the Directory with TAR and tar and gz Level 1: Compress the file - Default File Compress format and Remove the Source files after archiving Level 2: Create a ZIP file archive – File and Directory Level 2: Create a BZIP archive - File and Directory 6. A Quick Syntax of Ansible Shell module – ADHOC Level 1: A Quick Syntax of Ansible Shell module in a Playbook Level 1: Ansible Shell Examples Level 2: Execute a Single Command with Ansible Shell Level 2: Execute a Command with Pipe and Redirection Level 1: Run playbook

Level 2: Create the file on the target machines or servers as mentioned in the inventory file and the webserver's group, save the below code with .yml extension and run the playbook.

Level 2: Create multiple directories. To create multiple directories with one single task you can use the loop **with_items** statement. So when you run the below playbook it is interpreted as 3 different tasks.

Selenium

- 8. Level 1: Selenium IDE Download and Install
 - Level 2: Selenium IDE First Test Case, Login Test and command usage
- Level 1: Write a script to open google.co.in using chrome browser (ChromeDriver).
 Level 2: Write a script to open google.com and verify that title is Google and also verify that
- it is redirected to google.co.in.
- 10. Level 1: Write a script to open google.co.in using internet explorer (InternetExplorerDriver). Level 2: Write a script to create browser instance based on browser name.
- 11. Level 1: Write a script to close all the browsers without using quit() method.Level 2: Write a script to search for specified option in the listbox

Jenkins

- 12. Level 1:
 - Environment Setup

Level 2:

Jenkins downloading and installation

13. Level 1:

- 1. Setup a Jenkins Job with Apache Ant Build Tool
- 2. Setup a Jenkins Job with Apache Maven

Level 2 :

- 1. Setup a Jenkins Job with Batch Script.
- **14**. Level 1: Add a Linux Node (Also Check SSH Slaves plugin plugins)
 - Level 1: Add a Windows Node
 - Level 2: Assign a Java Based Job to Linux and Build it

Level 2: Assign a MSBuild Based to Windows and Build it

Targeted Application & Tools that can be used:

Tracking changes in the source code and source code management

Automates web browsers

Configuration Management and IT automation.

Integration of Individual Jobs and Effortless Auditing

Tools: Git, Ansible, Selenium and Jekins

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Each batch of students (self-selected batch mates) will identify projects from searching on Google and implement with the most suitable 2 or 3 antecedents.

Text Book

1. Craig Berg, "DevOps For Beginners: A Complete Guide to DevOps Best Practices (Including How You Can Create World-Class Agility, Reliability, And Security In Technology Organizations With DevOps) (Code tutorials)", Paperback – June 12, 2020.

2. Ferdinando Santacroce, "*Git Essentials*", Packt Publishing, April 2015, ISBN: 9781785287909

3. John Ferguson Smart. "*Jenkins: The Definitive Guide*", O'Reilly Media, Inc., July 2011, ISBN: 9781449305352

References

1. Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", Leanpub, August 5, 2020

2. Unmesh Gundecha, Carl Cocchiaro, "Learn Selenium", Packt Publishing, July 2019, ISBN: 9781838983048

3. Gaurav Agarwal, "Modern DevOps Practices: Implement and secure DevOps in the public cloud with cutting-edge tools, tips, tricks, and techniques", July 2021.

4. Mikael Krief, "Learning DevOps: The complete guide to accelerate collaboration with Jenkins, Kubernetes, Terraform and Azure DevOps", October 2019

Weblinks:

1. <u>https://git-scm.com/book/en/v2</u>

- 2. <u>https://www.simplilearn.com/tutorials/git-tutorial/git-tutorial-for-beginner</u>
- 3. https://www.javatpoint.com/selenium-tutorial
- 4. https://www.javatpoint.com/ansible
- 5. https://www.tutorialspoint.com/jenkins/jenkins_managing_plugins.htm
- 6. https://nptel.ac.in/courses/128106012

Topics relevant to "SKILL DEVELOPMENT": Git&Junit, Ansible, Selenium, Jenkins for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE3045	Course Title: Devel Type of Course: Elective in Devops F	opment Automation Basket		L-P-C	2	2	3
Version No	Theory & Integrate	d Laboratory					
Course Pre- requisites	NIL						
Anti-requisites	Scripting Language F	Knowledge, Linux Fund	lamentals				
Course Description	The Objective of th Automation. DevOp and operations (ops) philosophies. DevOp quality. DevOps spo automating the work	is course is to give a s refers to the integratic teams. It encompasses os tools enable faster of eeds delivery of high of software developme	strong four on of an organ an organizat development er quality s nt and IT ope	idation of nization's ion's cult cycles an oftware l erations te	the devel ure, p nd hig by co ams.	Develo opmer process gher so mbinin	opment it (dev) es, and oftware ig and
Course Objective	The objective of the of Development Au of Development Au Learning techniques.	ne course is to famil tomation and attain S	iarize the lo KILL DEVELO	earners N PMENT th	vith t rough	the co n Expe	ncepts r ientia
Course Outcomes	On successful comple I.Understand the Knowledge] II.Analyze the varie III.Demonstrate the IV.Implement scrip V.Implement make	etion of the course, the e automated softwar ous automation scenario e interaction with linux ts[Application] efiles to automate tasks	students shal e delivery os .[Compreh environment [Application]	l be able t and dep ension] [Application	o oloym on]	ent p	rocess
Course Content:							
Module 1	Introduction t Automation	O Assignment/Quiz	Fully Software process	Automa deliv	ted ery	06 Ses	sion
Topics: The Soft Automated Software Delivery Deployment, Bene Automated Deploy Phases in RAD, E Assignment: The I	ware Delivery Pipeline, Process, The Build Pro efits of Automated Depl yment and DevOps Add ssential Aspects of RAI puild process	Overview of the Conti ocess, Automated build, loyment, Automated De option, Overview of Raj D, Code generation, Car	nuous Delive , Automated ¹ eployment an pid Applicati tegories of C	ery Pipelir Test, Auto Id DevOp on Develo ode Gene	ne, Fu omate s Ado opmer rators	lly d ption, nt (RA , Comi	D), non.
Module 2	Advantages of Automation	Case study	Automati	ion)6 Ses	sion

Topics: Advantages of Automation, Automation Scenarios, Archiving Logs, Auto-Discard Old Archives,
MySQL (RDBMS) Backups, Email Web Server Summary, Ensure Web Server is Running, User
Command

Validation, Disk Usage Alarm, Sending Files to Recycle Bin, Restoring Files from Recycle Bin, Logging Delete Actions, File Formatter, Decrypting Files, Bulk File Downloader, System Information, Install LAMP Stack, Get NIC's IP, Scenarios Where Automation Prevents Errors.

Assignment: Email web server summary

Linux Environment Session	Module 3	Interacting with Linux Environment	Linux File system	06 Session
---------------------------	----------	---------------------------------------	-------------------	---------------

Topics: The Linux System, Linux File System, Partitions, Common System Directories, Shell, User Groups and Permissions, User Accounts, The passwd File, Creating User Accounts, File Ownership, File Permissions, Working with Bash, Shell Features

	~ • •			
Module 4	Scripting Development T	asks Case study	Linux commands	06 Session
Topics: Writing A	utomation Scripts,	Task Scheduling Using	g Cron, Basic Linux Comman	ds, Best Practic
for Scripting, Mak	te use of Shell's B	uilt-In Options, Nami	ng Conventions, Annotations	s Make the Log
Clean, Comman	d Substitution,	Always Begin w	vith a Shebang, Variab	le Substitutio
Conditionals, Reg	ular Expressions.			
Assignment Shell	's built in options			
Module 5	"Make"	and Case study	Makefile argumen	ts 06
viouale 5	"Makefiles"	and case study	and source cod	e Session
			creation	
Topics: Why "Ma "Make", Various v of a "Makefile" Ru Pattern Rules, The Source Code, Con	ake"? Why not Oth versions and Variar ale, Targets, Some "Make" command ditionals in "Makef	ners?, Why not use "Bants of "Make", Structu Special Built-in Targe , "Make" arguments, r file", Best Practices in	ash Script" instead of "Make re of a "Makefile", What is a t Names, Automatic Variable recu,rsive makefile, Building writing "Makefiles".	file"?, features of a Rule?, Structur s, Suffix Rules, Binary from
Assignment: Best	practices in writing	Makefiles		
List of Laborator	y Tasks:			
Experiment No 1	Working with Ba	sic Linux Commands,	make use of shells built in op	ptions, naming
conventions,				
Level 1: basic lin	ux commands			
Level 2: Advance	d linux commands	S		
Level 1: Simple co Level 2: configuri Experiment No 3	ommands for explo ng linux system : Working with wr	ring paritions, commo	n system directories ts	
Level 1: Simple at Level 2: Complication	atomation scripts ated automation scr	ipts		
Experiment No 4	• Working with va	riable substituition co	nditionals regular expression	19
Level 1: Simple re	gular expressions	conditionals	nutionais, regulai expression	15
Level 2: Advance	d regular expression	ns, conditionals		
Experiment No 5	creation of makef	file, Structure of make	ofile	
Level 1: Simple m	akefile creation			
Level 2: Advanced	l program on make	file		
Experiment No 6 Level 1: Basic patt Level 2: Advanced	Working with aut tern rules, make con pattern rules	tomatic variables, patte mmand	ern rules , make command	
Experiment No 7 Level 1: basic bina Level 2: Advanced	Building binary f ary from source cod binary from source	from source code le se code		
Experiment No 8 Level 1: Basic con Level 2: Advanced	Working with Conditionals in makefi	nditionals in "Makefild le st practices in writing	e", Best Practices in writing ' makefiles	Makefiles

Amazon, Target, Esty, Netflix, Google, Walmart use Devops in their day to day processes to increase efficiency and improve delivery time.

Professionally Used Software: Red hat Linux Operating system, GIT

Besides these software tools Visual studio code also used

Project work/Assignment:

1. Case Studies: At the end of the course students will be given a real-world scenario for any application on automating software development and deployment process, automation scenarios, working with linux environment using script and makefile.

2. Book/Article review: At the end of each module a book reference or an article topic will be given to an individual or a group of students. They need to refer the library resources and write a report on their understanding about the assigned article in appropriate format. <u>Presidency University</u> Library Link.

3. Presentation: There will be a group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same.

Text Book(s):

a. Running Linux – Book by Matthias Kalle Dalheimer, Matt Welsh

b. Mastering Linux Shell Scripting – Book by Andrew Mallett .

Reference(s):

Reference Book(s):

1.DevOps Handbook: How to Create World-Class Agility, Reliability and Security in Technology Organizations – IT Revolution Press; Illustrated edition (October 6, 2016), Gene Kim, Jez Humble, Patrick Debois, John Allspaw and John Willis

2. Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale 1st Edition, O'Reilly Media; 1st edition (May 30, 2016), Jennifer davis, Ryn daneils

Online Resources (e-books, notes, ppts, video lectures etc.):

Coursera:

1. DevOps on AWS | Coursera

- 2. DevOps, Cloud, and Agile Foundations | Coursera
- 3.Introduction to DevOps | Coursera

E-books :

1.https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=1223875&site=ehost-live&ebv=EB&ppid=pp_xiii

2.https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehost-live

Topics relevant to "SKILL DEVELOPMENT":

Simple automation Scripts, Linux commands for **SKILL DEVELOPMENT** through **Experiential** Learning Techniques. This is attained through the assessment component mentioned in the course handout.
	Course Title:				2	2	3
Course Code:							
CSE 3043	Automated Test Manage	ement		L C			
	Type of Course: Integrat	ed					
Version No.	1.0						
Course Pre- requisites	Introductory course on S	oftware Engin	eering.				
Anti-requisites	NA						
Course Description	This course is intended application of tools for t encompasses both appro to check whether progra to prove that software m occurring defects, such condition freedom, buff commonly-occurring bug learner will become fam approaches, and apply programs.	for understa he analysis an oaches to autor ms meet require neets requirem a divide-by er/array overf s that can leac niliar with the a variety of	nding the prin d testing of so matically gener rements, and a ents and that i <i>r</i> -zero, overflo low, uncaught l to program fa fundamental f automated an	nciples of ftware. T rate a ver ilso mear t is free f pw/unde t excepti ailures or theory an nalysis to	of autor The aut ry large ns by wh from cen rflow, ons, an securit nd appl echniqu	mation omated numbe nich it is rtain co deadloo d seve ty proble ications ies on	and the analysis r of tests possible mmonly- ck, race- ral other ems. The s of such example
Course Objective	The objective of the o of Automated Test N Experiential Learning teo	course is to Aanagement chniques.	familiarize th and attain	e learne SKILL D	ers with EVELOP	n the PMENT	concepts through
Course Out Comes	Course Out ComesOn successful completion of the course the students shall be able to:•Understand testing in DevOps.•Learn its approaches to testing.•Understand to design test cases.						
Course Content:			-			•	
Module 1		CA1	Lab Experime	nts		10 Se	essions
Topics:		1					
Seven Principles -	SDLC vs STLC - Testing Li	ife Cycle - Usal	oility Testing -	Functior	nal Test	ing - En	d to End
Testing - Compatik	pility Testing - GUI Testing	- API testing.	1				
Module 2		CA2	Lab Experime	nts		10 Se	essions
Topics: Usability Testing - testing.	Functional Testing - En	d to End Testi	ng - Compatib	ility Test	ing - G	UI Test	ing - API
Module 3		CA3	Lab Experime	nts		10 Se	essions
Topics: Manual Tes Regression Testing Repeatability.	sting - Automation Testin ; , Reasons for Automate	g - Unit Testing d Testing: Cont	g - Integration rolling Costs, A	Testing - Applicatio	Smoke	-Sanity rage, So	Testing - calability,
Module 4	CA	\4	Lab Experi	ments	10 S	essions	
Topics :Test Scena	rio - Test Case Design - Te	est Basis - Trace	eability Matrix		I		
Module 5	CA	\4	Lab Experi	ments	8 Se	ssions	
Topics : ESTIMATIO	ON TECHNIQUES :Estimat	ing automatior	n - Test Plan Do	ocument	- Bug Li	fe Cvcle	2
List of Laboratorv	Tasks:	0		2•		- /	
Introduction and in Integration testing	nstallation of DevOps. SD modules. Creating test s	LC, STLC, GUI a cenarios. Bug L	nd API testing ife Cycle	modules	. Unit T	esting a	ind

Targeted Application & Tools that can be used DevOps

Project work/Assignment:

Assignment: CA1, CA2, CA3, CA4

Text Book

T1.Flexible Test Automation - by Vitaliano Inglese, Pasquale Arpaia T2.Experiences of Test Automation: Case Studies of Software Test Automation - by Mark Fewster, Dorothy Graham

References

Web resources:

W1. https://presiuniv.knimbus.com/user#/home

Topics relevant to "SKILL DEVELOPMENT":

Unit testing, Functional testing for **Skill Development** through **Experiential Learning Techniques.** This is attained through assessment component mentioned in course handout.

Course Code: CSE 3040	Course Title: Agile Struc Type of Course: School C	ctures and Fra Core	ameworks	L- P- C	3	0	3
Version No.	1.0						
Course Pre- requisites	Software Engineering						
Anti- requisites	NIL						
Course Description	This course imparts know Process, methodology and The objective of this cours Significance. This course covers the Agi The objective of the cours	ledge to stude l its developme se is to provide ile and its met e is to underst	nts in the bas ent e the fundam hodologies. rand the Agili	sic concep entals con ty and Ass	ots of A cepts suranc	gile Sof of Agile e.	tware and its
Course Objectives	The objective of the cours Structures and Framew Learning techniques.	e is to familiar r orks and atta	rize the learn ain Skill Dev o	ers with t elopment	he con throuរ្	icepts o gh Parti	f Agile cipative
Course Out Comes	On successful completion of this course the students shall be able to: 1] Understand the basic concepts of Agile Software Process. (Knowledge level) 2] Comprehend the various Agile Methodologies. (Comprehension level) 3] Develop Agile Software Process. (Knowledge level) 4] Apply principles of Agile Testing. (Application level) 9						
Module 1	Introduction	Assignment	Agile Estima	ation		08 Sessi	005
Introduction to Agile Values, A Benefits. Agile I	Agile technology, Iterative Agile Principles, Compare Estimation Techniques. Cas	e and Evolutic and Contrast e Study	onary Methoo the agile w	ls, Agile - ith traditi	- Agile ional 1	Develo method	opment. s. Agile
Module 2	Agile and Its Significance	Assignment	Comparison technologies methods	of s with tra	Agi dition	le ^{al} 09 Se	essions
Agile Story : Ev Agile Motivatio cycle phases an	olutionary delivery ,Scrum n – Problems With The Wat d Work product roles and p	Demo, Plannii cerfall - Resear practices.	ng game, Spri rch Evidence.	int back lo Scrum : M	og, ada Iethod	ptive pl Overvi	anning. ew ,Life
Module 3	Agile methodology		Case Study			12 Se	essions
Extreme Progr practices. Unif practices. EVO Study.	camming: Method Overvie ied process : Method Ove : Method Overview ,Life c	ew ,Life cycl erview ,Life c ycle phases ai	e phases a ycle phases nd Work pro	nd Work and Wor duct role	prod k proo s and	uct rol luct ro practice	es and les and es. Case
Module 4	Agility and Quality Assurance	Assignment	Apply the te using Progra	sting conc aming	cepts	09 Se	ssions
Agile product d Quality Assurar Technology Too	evelopment – Agile Metrics nce. Test Driven Developme ols.	s – Feature Dr nt – Agile appi	iven Develop roach in Glob	ment (FD al Softwar	D). Ag e Deve	ile appr elopmer	oach to nt. Agile
Targeted Appl Project work/	ication & Tools that can b Assignment: Mention the	e used: JIRA Type of Proje	ect /Assignn	ient prop	osed	for this	
course 1. Agile Es	timation	with tradition	mathada				

3. Case Study: Student group must collaborate and report together along with assigned batch members. Collect the requirements from the client and adopt the suitable agile practice method for your project

4. Installation and features of JIRA tool.

Text Book

 Craig Larman, "Agile and Iterative Development – A Manager's Guide", Pearson Education – 2006
 Edward Scatter "Brilliant Agile Project Management: A Practical Guide to Using Agile, Scrum and Kanban, 2015

References

1] Chetankumar Patel, Muthu Ramachandran, Story Card Maturity Model (SMM): A Process rovement Framework for Agile Requirements Engineering Practices, Journal of Software, Academy lishers, Vol 4, No 5 (2009), 422-435, Jul 2009.

2] Hazza& Dubinsky, Agile Software Engineering, Series: Undergraduate Topics in Computer nce, Springer 2009

3]Kevin C. Desouza, Agile information systems: conceptualization, construction, and agement, Butterworth-Heinemann, 2007.

Web resources:

https://presiuniv.knimbus.com/user#/home

Topics relevant to "SKILL DEVELOPMENT":

Agile Estimation techniques for **skill development** through **Participative Learning techniques.** This is attained through the assessment component mentioned in the course handout.

[Text Wrapping Break]

Course Code: CSE227	Course Title: SOFTWARE MANAGEMENT	E ENGINEERING AND F	PROJECT L- T-P- C	3	0	0	3	
	Type of Course: Theory	Only						
Version No.	2.0							
Course Pre- requisites	Object Oriented Concep algorithms.	ts, Basic programming	knowledge, basic	unders	stand	ing of		
Anti-requisites	Nil							
Course Description	The objective of this fundamental principle project management. requirement engineeri and testing aspects o project evaluation, pla software project plann Topics include: Intr Models, Requirement Design, Software Te Estimation Technique Management.	course is to help st is involved in softwa The course covers ing processes, syste f software system of nning, effort estimating. oduction to Softwa Analysis and Specifi sting, Project Mar s, Project Schedulin	udents understa re system develo software proces em analysis, desi levelopment. The tion and risk man tre Engineering, fication, User Int agement, Project g, Project Metrics	nd th pmen ss mc gn, in cour nagen Proce erface ct Pla s & Ev	e protection of the protection	ocess 1 soft ment lso co aspec Life (alysis ng, I ttion,	and tware tware ation overs tts in Cycle and Effort Risk	
Course	The objective of the cou	rse is to familiarize the	learners with the	conce	nts of	F		
Objective	SOFTWARE ENGINEERING AND PROJECT MANAGEMENT and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING techniques.							
Course	On successful completion of the course the students shall be able to:							
Outcomes	 Describe the software engineering principles, ethics and process models. Identify the requirements and appropriate design models for a given application. Discuss the various types of testing methods and Quality Assurance. Apply project planning, scheduling, evaluation and risk management principles for a given project. 							
Course Content:								
Module 1	Introduction to Software Engineering & Process Models	Knowledge level	SCRUM Models		08	Sessi	ons	
Software and Sof	tware Engineering: Natu	re of Software, Softwa	re Engineering Pra	ctice, S	Softw	are N	1yths,	
SDLC, Software	Processes: Generic Mod	el, Prescriptive Proce	ss Model, Unified	Proce	ss M	odel,	Agile	
Development: Ex	treme Programming, <mark>I</mark> ter	ative Waterfall Model	, Classical Waterfal	l Mod	el			
Module 2	Software Requirements and Design	Comprehension level	Use Case Diagram		09	Sessi	ons	
Requirements Er	ngineering: Eliciting requ	irements, Functional	and non- Function	al req	uirer	nents	, SRS,	
Requirements m Design : Design c	odelling: Developing Use oncepts, Architectural de	e Cases, Developing A sign,, <mark>Introduction to S</mark>	Activity diagram ar Star UML tool	ıd Swi	mlan	e dia	gram,	
Module 3	Software Testing and Quality	Comprehension level	Software Testing		08	Sessi	ons	
Introduction to S Validation Testin Elements of softw Introduction to JI	oftware Testing: verificat g, White box Testing: Bas vare quality assurance, S RA and Selenium tools	ion and validation, Tes is path testing, Black k oftware configuration	st Strategies for con oox Testing. Softwa management : SCN	nventi re Qua A proc	onal : ality / ess.	Softw Assura	are, ance :	
Module 4	Software Project Management	Application	CMM level		13	Sessi	ons	
Project Managen Project Schedulin	nent Concepts, Project Pl ng, Risk Management, Ma	anning, Overview of m aintenance and Reengi	etrics, Estimation f neering, Introducti	or Sof on to	twar DevO	e proj ps	ects,	

Targeted Application & Tools that can be used: Star UML, Jira

Text Book

1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", VII Edition, McGraw-Hill, 2017.

2. Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", VI Edition, McGraw-Hill, 2018.

References

1. Ian Sommerville, "Software Engineering", IX Edition, Pearson Education Asia, 2011.

2. Rajib Mall, "Fundamentals of Software Engineering", VI Edition, PHI learning private limited, 2014.

E-Resources

- Library Presidency University https://presidencyuniversity.in > library
- Practice UML based modeling using "Software Engineering Virtual Lab" made available by IIT-Kharaghpur (URL https://vlabs.iitkgp.ernet.in/se/)

Topics relevant to "SKILL DEVELOPMENT": Software Testing Problems for **Skill Development** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Software En	gineering		L- P- C	3	0	3
CSE 2014	Type of Course: School Co	re [Theory Or	ואין				
Version No.	1.0						
Course Pre-	NIL						
Anti roquisitos	N111						
Anti-requisites							
Course Description	The objective of this cours Engineering process and p The course covers softwar design, implementation ar The course covers softwar	e is to provide rinciples. e requirement nd testing aspe e quality, conf	e the fundame t engineering ects of softwa figuration mar	ntals cor processe re systen nagemen	ncepts c s, syste n develo t and m	of Softwa m analys opment. naintena	nre sis, nce.
Course	The objective of the course	e is to familiar	ize the learne	rs with th	ne conc	epts of	
Objectives	Software Engineering an techniques.	d attain Skill D	evelopment t	hrough F	Participa	ative Lea	rning
Course Out	On successful completion	of this course	the students s	shall be a	ble to:		
Comes	1] Describe the Soft models(Knowledge)	tware Engin	eering prin	ciples,	ethics	and	process
	 Identify the requirement application(Comprehensio Understand the Agile Price Apply an appropriate planoving Application software(Application) 	plication(Comprehension) Understand the Agile Principles(Knowledge) Apply an appropriate planning, scheduling, evaluation and maintenance principles volved in software(Application)					
Module 1	Introduction to Software Engineering and Process Models (Knowledge level)	Quiz				09) Hours
Introduction: Need Ethics, Software Er Cycle Models: Waterfall Spiral, Prototype.	d for Software Engineering, ngineering Practice-Essence Model – Classical Waterf	Professional Second Sec	Software Deve General Princi rative Waterf	elopmen ples Soft all Mode	t, Softw ware De el, Evolu	are Engi evelopm utionary	neering ent Life model-
	Software Requirements.		Development	t of SRS			
Module 2	Analysis and Design (Comprehension level)	Assignment	documents fo scenario	or a giver	ı	11	Hours
Requirements En	gineering: Eliciting requir	ements, Fund	ctional and i	non- Fui	nctional	require	ements,
Software Require	ments Specification (SRS), Requireme	nt Analysis	and val	idation.	Requir	ements
modelling- Introdu	ction to Use Cases, Activity	diagram and	Swim lane dia	gram. CA	ASE sup	port in S	oftware
Life Cycle, Charact	eristics of CASE Tools, Arch	itecture of a C	ASE Environm	ient.			
Design: Design cor	cepts, Architectural design	, Component	based design,	User int	erface c	lesign.	
Module 3	Agile Principles & Devops (Knowledge level)	Quiz				09) Hours
Agile : Scrum Roles estimation techniq Devops: Introducti	and activities, Sprint Agile s ues, Product backlogs, Stal on, definition, history, tool	software deve ke holder roles s.	lopment meth s, Dynamic Sys	nods - Sca stem Dev	aling, Us velopme	er Storie ent Meth	es, Agile Iod.
Module 4	Software Testing and Maintenance (Application Level)	Assignment	Apply the tes using Prograr	ting cond ning	cepts	12	2 Hours
Software Testing- Automation Tools Software Quality Software configura	verification and validation for Testing. Assurance -Elements of sc ation management- SCM pr	, Test Strateg oftware qualit ocess, SCM To	gies - White I y assurance, pols (GitHub).	Box Test SQA Tas	ing, Bla ks, Goa	ck box	Testing. Metrics,

Maintenance- Characteristics of Software Maintenance, Software Reverse Engineering, Software Maintenance Process Models.

Targeted Application & Tools that can be used: Selenium, GitHub, CASE Tools

Text Book

1] Roger S. Pressman, "Software Engineering – A Practitioner's Approach", VII Edition, McGraw-2017.

2] Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", VI Edition, McGraw-2018.

References

Б.

Rajib Mall, "Fundamentals of Software Engineering", VI Edition, PHI learning private limited,

Ian Sommerville, "Software Engineering", IX Edition, Pearson Education Asia, 2011. Agile Software Development Principles, Patterns and Practices.1st Edition, Wiley, 2002

Topics Relevant to "Skill Development: Balck box Testing, White box Testing, Automated Testing **for Skill development** through **Participative Learning Techniques.** This is attained through assessment mentioned in the course handout

CSE3145 Prevention System L. P. C. 3 0 3 Type of Course:1] Program Core 2) Theory Only 2 3 0 3 Version No. 1.0 Encory Only 2 3 0 3 Course Pre- requisites Fundamental knowledge in Operating Systems, Information Security and Networks Analyze Anti-requisites Nit Course Out Objective of the course is to Understand when, where, how, and why to apply Intrusion Detection Tools and techniques in order to improve the security posture of an enterprise Anply knowledge of the fundamentals and history of Intrusion Detection Systems and Analyze intrusion detection allerts and logs to distinguish attack types from false alarms. Course Out Detection and Prevention System and attain Skill Development through Participative Learning techniques. Course Out On successful completion of the course the students shall be able to: On successful completion of the capture and analyze network packets. • Understand about the intruders. Option Define intrusion detection and prevention policies • Explain the fundamental concepts of Network Protocol Analysis and demonstrate the skill to capture and analyze network packets. Ourse Course Outs and Prevention Metwork Intrusion Detection Systems as security tools to detect network attacks and troubleshoot network problems. Cou	Course Code:	Course Title: In	trusion D	etectio	n and						
Type of Course:1] Program Core 1 3 0 3 Version No. 1.0 Course Pre- requisites Fundamental knowledge in Operating Systems, Information Security and Networks Anti-requisites NIL Course Pre- requisites Objective of the course is to Understand when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise Apply knowledge of the fundamentals and history of Intrusion Detection Systems and Analyze intrusion detection and evaluation of new Intrusion Detection System and Analyze intrusion detection and evaluation of new Intrusion Detection Systems and Analyze intrusion detection and train Skill Development through Participative Learning techniques. Course Detection and Prevention System and attain Skill Development through Participative Learning techniques. On successful completion of the course the students shall be able to: Course Out Comes On successful completion of the course and analyze network packets. Understand about the intruders. Define intrusion detection and prevention policies Exploying the fundamental concepts of Network Protocol Analysis and demonstrate the skill to capture and analyze network packets. Use various protocol analyzers and Network intrusion Detection Systems as security tools to detect network attacks and troubleshoot network problems. Course Content: Intrusion Detection – Intrusion detection – anonaly detection – specification based feetection – hybrid detection. Internal and external threats to data,	CSE3145	Prevention Syst	em								
Type of Course:1] Program Core 2] Theory Only Version No. 1.0 Course Pre- equisites Fundamental knowledge in Operating Systems, Information Security and Networks Anti-requisites NIL Course Pre- equisites Objective of the course is to Understand when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise Apply knowledge of the fundamentals and history of Intrusion Detection in order to avic common pitfalls in the creation and evaluation of new Intrusion Detection Systems and Analyze intrusion detection alerts and legis to distinguish attack types from false alarns. Course The objective of the course is to familiarize the learners with the concepts of Intrusion Detection and Prevention System and attain Skill Development through Participative Learning techniques. Course Out Comes On successful completion of the course the students shall be able to: Understand about the intruders. Define intrusion detection and prevention policies Explain the fundamental concepts of Network Protocol Analysis and demonstrate the skill to capture and analyze network packets. Use various protocol analyzers and Network Intrusion Detection Systems as security tools to detect network attacks and troubleshoot network problems. Course Content: Introduction to/assignment Intrusion Programming Task 10 Sessions Module 1 Introduction to/assignment external threats							L- P- C		3	0	3
Version No. 1.0 Course Pre- requisites Fundamental knowledge in Operating Systems, Information Security and Networks Anti-requisites Objective of the course is to Understand when, where, how, and why to apply Intrusion Description Description Objective of the course is to Understand when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoic common pitfalls in the creation and evaluation of new Intrusion Detection Systems and Analyze intrusion detection alerts and logs to distinguish attack types from false alarms. Course Out Course Out Comes On successful completion of the course the students shall be able to: Understand about the intruders. Define intrusion detection and prevention policies Explain the fundamental concepts of Network Protocol Analysis and demonstrate the skill to capture and analyze network packets. Use various protocol analyzers and Network Intrusion Detection Systems as security tools to detect network attacks and troubleshoot network problems. Course Content: Viodule 1 Introduction to Assignment intrusion Detection and Prevention System Programming Task 10 Sessions Gotes Assignment: Demonstrating the skills to capture and analyze network packets using network packets unalyzer. Module 2 Intrusion Prevention System Assignment: Demonstrating the skills to capture and analyze network packets using network packet unalyzer.		Type of Course	1] Progra	am Core	e						
Version No. 1.0 Course Pre- requisites Fundamental knowledge in Operating Systems, Information Security and Networks requisites Anti-requisites NIL Course Objective of the course is to Understand when, where, how, and why to apply Intrusion Description Detection tools and techniques in order to improve the security posture of an enterprise Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoic common pitfalls in the creation and evaluation of new Intrusion Detection Systems and Analyze intrusion detection alerts and logs to distinguish attack types from false alarns. Course Out On successful completion of the course the students shall be able to: Course Out On successful completion of the course to f Network Protocol Analysis and demonstrate the skill to capture and analyze network packets. Course Out Use various protocol analyzers and Network Intrusion Detection Systems as security tools to detect network attacks and troubleshoot network problems. Course Content: Introduction to Assignment Intrusion Programming Task 10 Sessions Module 1 Introduction to Assignment Intrusion Detection and prevention sources. Programming Task 10 Sessions Course Course Intrusion Detection and prevention analyze network packets using network packet analyze intrusion Detection and prevention sources. 10 Sessions Profics I			2] Theor	y Only							
Course Pre- equisites Fundamental knowledge in Operating Systems, Information Security and Networks Anti-requisites NIL Course Objective of the course is to Understand when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise Apply knowledge of the fundamentals and history of Intrusion Detection Systems and Analyze intrusion detection alerts and logs to distinguish attack types from false ealarms. Course The objective of the course is to familiarize the learners with the concepts of Intrusion Detection and Prevention System and attain Skill Development through Participative Learning techniques. Course Out On successful completion of the course the students shall be able to:	Version No.	1.0									
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Anti-requisites NL Course Dbjective of the course is to Understand when, where, how, and why to apply Intrusion Description Description Detection tools and techniques in order to improve the security posture of an enterprise Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoic common pitfalls in the creation and evaluation of new Intrusion Detection Systems and Analyze intrusion detection alerts and logs to distinguish attack types from false alarms. Course The objective of the course is to familiarize the learners with the concepts of Intrusion Detection and Prevention System and attain Skill Development through Participative Learning techniques. Course Out Course O	requisites										
Course Objective of the course is to Understand when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoic common pitfalls in the creation and evaluation of new Intrusion Detection Systems and Analyze intrusion detection alerts and logs to distinguish attack types from false alarms. Course Objectives The objective of the course is to familiarize the learners with the concepts of Intrusion Detection and Prevention System and attain Skill Development through Participative Learning techniques. Course Out Comes On successful completion of the course the students shall be able to:	Anti-requisites	NIL									
Description Detection tools and techniques in order to improve the security posture of an enterprise Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoic common pitfalls in the creation and evaluation of new Intrusion Detection Systems and Analyze intrusion detection alerts and logs to distinguish attack types from false alarms. Course Objectives The objective of the course is to familiarize the learners with the concepts of Intrusion Detection and Prevention System and attain Skill Development through Participative Learning techniques. Course Out Comes On successful completion of the course the students shall be able to: 	Course	Objective of the	e course i	s to Un	derstand	wh	nen, where,	how, ar	nd why to	apply li	ntrusion
Apply knowledge of the fundamentals and history of Intrusion Detection is order to avoic common pitfalls in the creation and evaluation of new Intrusion Detection Systems and Analyze intrusion detection alerts and logs to distinguish attack types from false alarms. Course Dbjectives The objective of the course is to familiarize the learners with the concepts of Intrusion Detection and Prevention System and attain Skill Development through Participative Learning techniques. Course Out Comes On successful completion of the course the students shall be able to: Understand about the intruders. Define intrusion detection and prevention policies Explain the fundamental concepts of Network Protocol Analysis and demonstrate the skill to capture and analyze network packets. Use various protocol analyzers and Network Intrusion Detection Systems as security tools to detect network attacks and troubleshoot network problems. Course Content: Introduction to/Assignment Programming Task 10 Sessions Module 1 Introduction to/Assignment Programming Task 10 Sessions Fopics Juderstanding Intrusion Detection – Intrusion detection and prevention basics – IDS and IPS analysis chemes, Network based information sources. Assignment: Demonstrating the skills to capture and analyze network packets using network packet analyzer. 10 Sessions Module 2 Intrusion Assignment Programming Task 10 Sessions System Sys	Description	Detection tools	and tech	niques i	in order t	o in	nprove the s	security	posture	of an ent	erprise.
common pitfalls in the creation and evaluation of new Intrusion Detection Systems and Analyze intrusion detection alerts and logs to distinguish attack types from false alarms. Course Objectives The objective of the course is to familiarize the learners with the concepts of Intrusion Detection and Prevention System and attain Skill Development through Participative Learning techniques. Course Out Comes On successful completion of the course the students shall be able to: Understand about the intruders. Define intrusion detection and prevention policies Explain the fundamental concepts of Network Protocol Analysis and demonstrate the skill to capture and analyze network packets. Use various protocol analyzers and Network Intrusion Detection Systems as security tools to detect network attacks and troubleshoot network problems. Course Content: Introduction to/Assignment Intrusion Detection and Prevention System Programming Task 10 Sessions Intrusion Detection approaches – Misuse detection – anomaly detection – specification based detection – hybrid detection. Internal and external threats to data, Need and types of IDS, Information sources, Host based information sources, Network based information sources. 10 Sessions Module 2 Intrusion Prevention System Assignment Programming Task 10 Sessions Fopics: ntrusion Prevention Systems, Network IDs protocol based IDs, Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis, techniquee, Responses, requirement of responses, Types		Apply knowledg	e of the f	undam	entals an	d hi	istory of Intr	usion D	etection	in order	to avoid
Analyze intrusion detection alerts and logs to distinguish attack types from false alarms. Course Objectives The objective of the course is to familiarize the learners with the concepts of Intrusion Objectives Distection and Prevention System and attain Skill Development through Participative Learning techniques. On successful completion of the course the students shall be able to: Course Out On successful completion of the course the students shall be able to: • Understand about the intruders. Course Out On successful completion of the course and analyze network packets. • Understand about the intruders and Network Protocol Analysis and demonstrate the skill to capture and analyze network packets. • Use various protocol analyzers and Network Intrusion Detection Systems as security tools to detect network attacks and troubleshoot network problems. Course Content: Introduction to Assignment Programming Task 10 Sessions Inderstanding Intrusion Detection – Intrusion detection and prevention basics – IDS and IPS analysis schemes, Attacks, Detection approaches –Misuse detection – anomaly detection – specification basec detection – hybrid detection. Internal and external threats to data, Need and types of IDS, Information sources, Network based information sources. Module 2 Intrusion Assignment Programming Task 10 Sessions Fopics: Intrusion Assignment Programming Task 10 Sessions 10 Sessions		common pitfalls	s in the c	reation	and eval	uat	ion of new	Intrusio	n Detect	ion Syste	ems and
Course Dbjectives The objective of the course is to familiarize the learners with the concepts of Intrusion Detection and Prevention System and attain Skill Development through Participative Learning techniques. Course Out Comes On successful completion of the course the students shall be able to: Understand about the intruders. Define intrusion detection and prevention policies Explain the fundamental concepts of Network Protocol Analysis and demonstrate the skill to capture and analyze network packets. Use various protocol analyzers and Network Intrusion Detection Systems as security tools to detect network attacks and troubleshoot network problems. Course Content: Introduction to Assignment Intrusion Detection and Prevention System Programming Task 10 Sessions Inderstanding Intrusion Detection – Intrusion detection and prevention basics – IDS and IPS analysis schemes, Attacks, Detection approaches –Misuse detection – anomaly detection – specification based detection – hybrid detection. Internal and external threats to data, Need and types of IDS, Information sources,Host based information sources, Network based information sources. Assignment: Demonstrating the skills to capture and analyze network packets using network packet analyzer. 10 Sessions Module 2 Intrusion Prevention System Programming Task 10 Sessions Fopics: ntrusion Prevention Systems, Network IDs protocol based IDs, Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis, techniques, Responses, req		Analyze intrusic	n detecti	ion aler	ts and log	gs t	o distinguisl	h attack	types fro	om false	alarms.
Objectives Detection and Prevention System and attain Skill Development through Participative Learning techniques. Course Out Comes On successful completion of the course the students shall be able to: 	Course	The objective of	the cour	rse is to	familiari	ze t	the learners	with th	e concep	ts of Int	rusion
Learning techniques. Course Out Comes On successful completion of the course the students shall be able to: Understand about the intruders. Define intrusion detection and prevention policies Explain the fundamental concepts of Network Protocol Analysis and demonstrate the skill to capture and analyze network packets. Use various protocol analyzers and Network Intrusion Detection Systems as security tools to detect network attacks and troubleshoot network problems. Course Content: Wodule 1 Introduction to Assignment Programming Task 10 Sessions Intrusion Detection and Prevention System Programming Task 10 Sessions Inderstanding Intrusion Detection – Intrusion detection and prevention basics – IDS and IPS analysis ischemes, Attacks, Detection approaches –Misuse detection – anomaly detection – specification based detection – hybrid detection. Internal and external threats to data, Need and types of IDS, Information sources, Host based information sources, Network based information sources. Assignment: Demonstrating the skills to capture and analyze network packets using network packet analyzer. Module 2 Intrusion Assignment Programming Task 10 Sessions System Programming Task 10 Sessions	Objectives	Detection and I	Preventio	on Syste	em and at	ttai	n Skill Deve	lopmen	t through	n Particip	oative
Course Out On successful completion of the course the students shall be able to: Comes • Understand about the intruders. • Define intrusion detection and prevention policies • Explain the fundamental concepts of Network Protocol Analysis and demonstrate the skill to capture and analyze network packets. • Use various protocol analyzers and Network Intrusion Detection Systems as security tools to detect network attacks and troubleshoot network problems. Course Content: Wodule 1 Introduction to Assignment Programming Task 10 Sessions Intrusion Detection and Prevention System System Violate etaction and prevention basics – IDS and IPS analysis chemes, Attacks, Detection – Intrusion detection – anomaly detection – specification based setection – hybrid detection – hybrid detection – specification based information sources, Network based information sources. Assignment: Demonstrating the skills to capture and analyze network packets using network packet analyzer. Module 2 Intrusion Assignment Programming Task 10 Sessions prevention Systems, Network IDs protocol based IDs, Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analyze, techniques, Responses, requirement of responses, Types for policy Vulnerability analysis, credentarial analysis, credentarial analysis credentarial analysis.		Learnin<mark>g</mark> techni	ques.								
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System Fopics: Intrusion Prevention Systems, Network IDs protocol based IDs, Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis, techniques, Responses, requirement of responses, Types of responses, mapping responses to policy Vulnerability analysis, credential analysis, non-credential		Prevent	ion	0			0 0				
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of responses, mapping responses to policy Vulnerability analysis, credential analysis, non-credential	about intrusion	A model for int	usion an	alveie +	echnique	s il	Responses in	equirer	nent of r	snonce	
	of responses. m	apping response	s to polic	zy Vulne	erability a	inal	vsis, creden	tial ana	lysis, non	-credent	tial

	Assignment: Applying	Intrusion	detection in	n security	applications.
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Module 3	Applications	Assignment	Programming/Data	12 Sessions
	and tools		analysis task	

Topics:

Tool Selection and Acquisition Process – Bro Intrusion Detection – Prelude Intrusion Detection – Cisco Security IDS – Snorts Intrusion Detection – NFR security. Introduction to Snort, Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-By-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes Snort Alert Modes

Assignment: Demonstrate the working with Snort Rules, Rule Headers, Rule Options and The Snort Configuration File.

Module 4	Legal issues and Assignment	Programming/Data	9 Sessions
	organizations	analysis task	
	standards		

Law Enforcement / Criminal Prosecutions – Standard of Due Care – Evidentiary Issues, Organizations and Standardizations.

Assignment: Addressing common legal concerns and myths about Intrusion Detection system Textbooks

T1. Carl Endorf, Eugene Schultz and Jim Mellander "Intrusion Detection & Prevention", 1st Edition, Tata McGraw-Hill, 2004.

T2. Earl Carter, Jonathan Hogue, "Intrusion Prevention Fundamentals", Pearson Education, 2006.

References

R1. Rafeeq Rehman : "Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID," 1st Edition, Prentice Hall , 2003.

R2. Christopher Kruegel, Fredrik Valeur, Giovanni Vigna: "Intrusion Detection and Correlation Challenges and Solutions", 1st Edition, Springer, 2005.

R3. Paul E. Proctor, "The Practical Intrusion Detection Handbook ",Prentice Hall , 2001.

Weblinks:

https://www.youtube.com/watch?v=RYB4cG8G2xo https://www.coursera.org/lecture/detecting-cyber-attacks/intrusion-detection-systems-UeDqJ

Topics relevant to "SKILL DEVELOPMENT": Agent development for intrusion detection for Skill Development through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.

Course Code:								
CSE2040	Course Title:	Cyber threat	ts for IOT and					
	Cloud			РС		Э	0	2
				- F- C		Э	U	Э
	Type of Cour	se:1] Program	n Core					
		2] Theory	Only					
Version No.	1.0							
Course Pre- requisites	Cyber Securi	ty, Informatio	on Security and N	etworks				
Anti- requisites	NIL							
Course	Objective of	the course is	to understand	he most ir	nportant	cyber thi	reats for	IOT and
Description	Cloud. Cyber cloud service computing es	attackers dis s. It mainly for specially conc	scover new poss ocuses on multip erns surrounding or risks relating to	bilities in t le security privacy an	the areas challenge nd cyber se	of Interr s facing t curity th	et of Thi he IoT ar reats of t	ngs and nd cloud he users
Course		of the course	e is to familiarize		miligaleu.	concent	c of Cuber	throats
Course Objectives	for IOT and	Cloud and	attain Skill D		throug	b Partic	inative	earning
Objectives	techniques.			-veropine.		I I UI UI UI		.can
Course Out	On successfu	l completion	of the course the	students s	shall be ab	le to:		
Comes	• Und	erstand the	different types	of cyber th	reats for I	OT and c	loud	
	• Deve	elop a deeper	understanding a	nd familiar	ity with va	rious typ	bes of cyb	er-
	attacks, o	cybercrimes, v	vulnerabilities an	d remedie:	s thereto.	•••	-	
	• Plan	, implement,	and monitor cyb	er security	mechanis	ms to en	sure the	
	protectio	on of information	tion technology a	ssets.				
Course Content:								
Module 1	Introduction	Assignmen	it Programmir	ig Task			12 S	essions
	to IOT a	nd		8				
	Cloud							
	computing							
Topics								
What is IoT, G	Genesis of Io	T, IoT and D	igitization, IoT I	mpact, IoT	[·] Challeng	es, IOT /	Architect	ure and
protocols, Vari	ous platforms	s for IoT, Rea	I-Time examples	of IoT, Ov	verview of	IoT com	ponents	and IoT
communicatior	n Technologie	s. Introductio	n to Cloud Comp	uting, The	Vision of C	loud Cor	nputing, I	Defining
a Cloud, Cloud	Computing R	eference Moo	del, Characteristi	s and Ben	efits, Chal	lenges Al	head, Dis	tributed
Systems, Virtu	ualization, Se	rvice-Oriente	d Computing,	Utility-Orie	ented Cor	nputing,	Building	g Cloud
Computing Env	ironments, Ap	oplication Dev	elopment, Infras	tructure ar	nd System	Develop	ment, Coi	mputing
Platforms and ⁻	Technologies.							
Assignment:								
Module 2	Cy	ber Threats	Assignment	Programn	ning Task		8 Sessio	ns
					C			

Topics:

What are Cyber Security Threats? Common Sources of Cyber Threats, Types of Cyber security Threats-Malware attacks, Social Engineering attacks, Supply chain attacks, Man-in-the middle Attack, Threat Detection Tools, Cyber Defense for Individuals. Assignment:

Module 3	Cyber Three Internet	eats in Assignmen of	t Programming/Data analysis task	10 Sessions
	inngs			
Topics:				
IoT threats and	vulnerabilities- IoT a	ttack surface, Atta	ack surface areas of the	IoT, Types of IoT security
threats-Botnets,	Denial of service, M	an-in-the-Middle,	Identity and data theft	, Social engineering,
Advanced persis	tent threats, Ranson	nware, Remote re	cording, How does the	IoT influence security?,
Best practices to	reduce risks and pre	event threats. Sec	urity guidelines for IoT.	Managing IoT Security
Threats.				
A !				
Assignment:				
Module 4	Cyber Threats inA Cloud computing	ssignment	Programming/Data analysis task	9 Sessions
Topics:				
Cybersecurity Th	nreats to Cloud Com	outing-Identity Fir	st Security, Cloud misco	onfiguration, Denial of
Service, Insider	Threats, Reduced Inf	rastructure Visibil	lity, Unauthorized use c	of Cloud workloads,
Insecure API's, C	compliance and regul	lation issues, Miti	gating cyber risks in clo	ud computing
Assignment				
Assignment.				
T1. Sunit Belapu Forensics And Le T2. David Hanes Fundamentals: M Edition, Pearson T3. Rajkumar B Education	ure and Nina Godbol egal Perspectives", W s, Gonzalo Salgueiro, Networking Technolo Education (Cisco Pre uyya, Christian Vecch	e, "Cyber Security Viley India Pvt Ltd, Patrick Grossetet ogies, Protocols, a ess Indian Reprint niola, and Thamar	r: Understanding Cyber ,2013 :e, Robert Barton, Jeror nd Use Cases for the In). (ISBN: 978- 93868737 ai Selvi Mastering Cloue	Crimes, Computer ne Henry,"IoT ternet of Things", 1 st 743) d. Computing McGraw Hill
References				
R1. Brooks, C John Wiley &	harles J., Christophe Sons,2018	r Grow, Philip Cra	ig, and Donald Short. C	ybersecurity essentials.
R2. Ollie Wh Things Device	itehouse, "Security on s and Beyond", NCC	of Things: An Imple Group, 2014	ementers' Guide to Cyb	er-Security for Internet of
R3. Securing	g The Cloud: Cloud Co	omputing Security	rechniques and Tactic	s by Vic (J.R.) Winkler
(Syngress/Else	evier) - 978-1-59749-	-592-9		
Weblinks:				
https://www.co	ursera.org/learn/clou	ud-security-basics		1
nttps://www.im	perva.com/learn/app	plication-security/	<u>cyber-security-threats</u>	<u></u>
nttps://presiuni	v.knimbus.com/use	er#/nome		
Cyber threats in techniques. This	It to "SKILL DEV In IoT and Cloud Con is is attained through	ELOPMEN T ²⁹ mputing for skill the assessmen	: development throug t component mention	h Participative Learning ed in the course handout.
1	e		L	

Course Code:	Course Title: Web Secu	ırity		L- P- C	2	2	3
CSE 3097	Type of Course: Integrat	ed					
Version No.	1						
Course Pre- requisites	Advanced Computer netv	works(CSE3070)					
Anti-requisites	NIL						
Course Description	The purpose of this cours understanding web func gateway to many critical s devices. Web vulnerabilit web applications is cha security principles, web applications, and a few ba	e this course is a ctionality and v services and is o ties are growing llenging. The o vulnerability asic topics on w	to introduce various secu juickly evolvi g on a year-to ourse cover and exploit eb encryptio	you to th rity valid ng as a pl o-year ba s fundam ation, va n.	e field o ations. atform t sis and nental c arious a	f web se The we o conne designir oncepts attacks	ecurity by b is our ect all our ng secure of web on web
Course Objective	Security and attain Skill D	irse is to famili Development th	arize the lea irough Exper	irners wit iential Le	th the c arning t	oncepts echniqu	s of Web Jes.
Course Out Comes	 On successful completion Define the funda Recognize the applications Explain the import Apply web attace [Application] 	n of the course imentals of web significance of rtance of sessio ck techniques	the students applications of password n manageme to find vul	s shall be s and valie l and a ent in web nerabiliti	able to: dation [I authenti [Co [Comp es in w	Knowled cation ompreher rehensioned veb app	វge] in web ension] on] plications
Course Content:							
Module 1	Introduction	Quiz	Comprehen: web fundam	sion base nentals	d Quiz c	ⁿ 10 9	Sessions
Topics: Web Functionalit Functionality, Ana Capturing User Da Validation - The D	ty, Encoding Schemes, I alyzing the Application By ata, Handling Client-Side E Defense in-Depth Approac	Mapping the A passing, Client-S Data Securely - I h - Attack Surfa	Application - Side Controls nput Validati ce Reductior	Enumer : Transmi on, Black n, Rules o	ating tl tting Da list Valio f Thumb	ne Con ta Via ti lation - o, Classi	tent and he Client, Whitelist fying and
Module 2	Web Application Authentication	Assignment	Comprehen: assignment authenticati	sive base on Web on	d	11	Sessions
Topics:							
Authentication F Authentication F credentials - Secu Complexity - Des Mechanisms - Sec	Fundamentals- Two Fac Password Based, Built-in red Password Based Authoricat sign Flaws in Authenticat curing Authentication.	tor and Thre , HTTP, Single entication: Atta ion Mechanisn	e Factor A Sign-on, Cu cks against P ns - Impleme	uthentica Istom Au assword, entation	tion, V Ithentica Importa Flaws ir	/eb Ap ation, \ ince of I n Authe	oplication /alidating Password entication
Module 3	Session Management &Web Security Principles	Quiz	Comprehen web secu	sion base rity techr	ed Quiz o niques.	^{on} 11	Sessions
Topics: Need for Session Handling, Securi	Management, Weaknesse ng Session Managemer	es in Session To nt; Access Co	ken Generati ntrol: Acces	on, Weal	knesses ol <u>Ove</u> r	in Sessi view,	on Token Common

Vulnerabilities, Attacking Access Controls, Securing Access Control. Origin Policy, Exceptions, Browser security Principles- Cross Site Scripting and Cross Site Request Forgery, File Security Principles: Source Code Security, Forceful Browsing, Directory Traversals.

			Comprehension based	
Module 4	Web Application Vulnerability	Assignment	assignment on web vulnerabilities	10 Sessions

Topics:

Attacking data-stores and backend components- Injecting into Interpreted Contexts, injecting into SQL, NoSQL, XPath, LDAP, Injecting OS Commands, Manipulating File Paths, Injecting into XML Interpreters, Injecting into Back-end HTTP Requests, Injecting into Mail Services, Attacking application logic-real world logic flaws, Attacking users-Cross site scripting-varieties of XSS,XSS attacks in action, finding and exploiting XSS vulnerabilities, preventing XSS attacks, Other techniques-cookie based Attacks, HTTP Header Injection

List of Laboratory Tasks:

Task 01: Practical knowledge of known vulnerabilities in CGI, LAMP stacks, REST APIs cross-site

scripting

Task 02: HTTP and setting up stacks, the various types of databases Access Controls, Vulnerabilities

Task 03: SQL injection and prevention

Task 04: Study of web authoring tools

Task 05: Testing web applications

Task 06: Cross site request forgery attack lab

Task 07: Web tracking

Targeted Application & Tools that can be used

- 1. Wordpress tool can be used for building websites with possible vulnerabilities.
- 2. Tools such as Nmap and Nessus can be used for web attack demonstration.

Project work/Assignment:

Assignment:

Group assignment to identify and write different web exploits to demonstrate vulnerabilities in web applications.

Text Book

T1 Dafydd Stuttard, Marcus Pinto, "The Web Application Hacker's Handbook", Willey Publishing Inc.

References

R1 B. Sullivan, V. Liu, and M. Howard, "Web Application Security", A B Guide. New York: McGraw-Hill

Education, 2011.

R2 Web Application Security: Exploitation and Countermeasure for Modern Web Applications, by Andrew

Hoffman

E book link R1: https://presiuniv.knimbus.com/user#/home

E book link R2 : https://presiuniv.knimbus.com/user#/home

Web resources:

```
NPTEL / Swayam Link : Introduction to Information Security I, IIT
Madras
https://nptel.ac.in/courses/106106129
PU Library Link : https://puniversity.informaticsglobal.com/login
```

Topics relevant to "EMPLOYABILITY SKILLS":

Session Management &Web Security Principles and Web Application vulnerability for **Skill Development** through **Experiential Learning Techniques.** This is attained through the assessment component mentioned in the course handout.

<mark>Course Code:</mark> CSE2037	Course Title: Cyber F Type of Course: Prog	orensics ram Core		L- P- C	2	2	3	
Version No.	1.0							
Course Pre-	Cryptography and Ne	etwork Security						
requisites								
Anti-requisites	NIL							
Course	The purpose of this cou	irse is to introduce t	the stud	dents Cyb	er For	ensic co	ncepts.	
Description	The course is both cond	ceptual and analytic	al and is u	understoo	od with	n various	s open-	
	source software's. The	course develops cr	itical thir	ıking like	correc	ctly colle	ect and	
	analyze computer fore	nsic evidence, anal	yze and	validate F	orensi	ics Data	, study	
	the tools and tactics as	sociated with Cyber	Forensic	s. The cou	irse in	volves q	uizzes,	
	assignments with vario	ous open-source sor	tware.					
Course	The objective of the c	ourse is to familia	rizo tho	loornora	with th	0.0000	opts of	
Obiective	Cyber Forensics and	Typer Forensies and attain Skill Development through Experiential Learning						
	techniques.		<u>mene</u> m					
Course	On successful comple	tion of this course	the stud	lents sha	ll be a	ble to:		
Outcomes	(1) understand va	rious digital inves	stigation	termino	logies	and m	ethods	
	(knowledge)	-	0		0			
	(2) understand various file formats (knowledge)						_	
	(3) Recognize the importance of digital forensic duplication and various tools							
	for analysis to achiev	for analysis to achieve adequate perspectives of digital forensic investigation in						
	(4) Apply techniques	(4) Apply techniques for forensic investigation (Application)						
	(+) Apply teeninques		gation (A	phicado				
Course Content:								
Module 1	DIGITAL INVESTIGATION	Quiz	MCQ/B Investig	ased on gation pro	ocess	No Sess). of sions: 19	
Digital Evidence	and Computer Crime - F	listory and Termino	ology of C	omputer	Crime	Investig	zation -	
Technology and I	Law - The Investigative	Process -Investigat	tive Reco	nstructio	n - Mc	dus Op	erandi,	
Motive and Techn	ology -Digital Evidence	in the Courtroom.				-		
							No. of	
Module 2	UNDERSTANDING	Ouiz	MCQ/B	ased on fi	le	Ses	ssions:	
	INFORMATION		format				09	
Methods of storir	ng data: number system	s, character codes,	record s	tructures	, file fc	ormats a	and file	
signatures - Word	l processing and graphic	c file formats - Struc	ture and	Analysis	of Opti	ical Med	lia Disk	
Formats - Recog	nition of file formats	and internal buffe	ers - Ext	raction c	of fore	nsic art	tifacts–	
understanding the	e dimensions of other la	test storage devices	s - SSD D	evices.			No. of	
Modulo 2	COMPUTER BASICS	Aggignment	Muiting	tool		Sa	NO. OI	
Module 5	INVESTIGATORS	Assignment	witting	lask		Sea	SSIUIIS: 09	
Computer Forens	sic Fundamentals - App	lving Forensic Scier	nce to co	mputers	- Com	puter Fo	orensic	
Services - Benef	its of Professional For	ensic Methodology	· Steps	taken by	/ com	puter fo	orensic	
specialists.			-	-		-		
Information war	fare: Arsenal – Surve	illance Tools – H	lackers a	and Thef	t of (Compon	ents –	
Contemporary Co	mputer Crime-Identity	Theft and Identity F	Fraud -0	rganized	Crime	&Terroi	rism.	
Computer forensic cases: Developing Forensic Capabilities – Searching and Seizing Computer Related								
Evidence – Processing Evidence and Report Preparation – Puture Issues.								
- isoigninent. com	pater or inte							

Modul	e 4	Computer Forensic Evidence and Data Recovery	Assignment	Writing task	No. of Sessions: 09
Data Ro Recove Data C Eviden Methoo Recons Assign	ecovery De ery Solutior ollection a ce, The Ru ds of Collec structing th ment: Data	fined, Data Backup and h, Hiding and Recovering nd Data seizure: why c les of Evidence, Volatil ttion, Artifacts, Collectio e Attack. Recovery	Recovery, The Role o g Hidden Data. collect evidence? - Co le Evidence, General on Steps, Controlling	of Backup in Data Recover ollection Options, Obstac Procedure, Collection an Contamination: The Chain	ry, The Data- les, Types of d Archiving, n of Custody.
List of 1. 2.	Laborator Case Studi FTK Forer	y Tasks: ies of Opensource Foren asic Tool kit for taking m	nsic Tools nirror image		
Dis 3. 4. 5. 6. 7. 8. Ne 9.	k Forensi Identify di Acquire th Authentic Preserve t Analyze th Report th twork For Intrusion	cs- igital evidences are evidence ate the evidence the evidence are evidence e findings ensics: detection			
10. 11. De 12. 13. 14. 15. 16. 17. 18. 19. 20.	Correlatin vice Foren Digital Mu Printer Fo Scanner F Credit Car Telecomm Forensic A Forensic a RAM Dum	g intrusion detection ar sics one sic rensics orensics d Forensics nunications Forensics nalysis of a Virtual Mac nalysis of Cloud storage ping Tool	nd logging chine e and data remnants		
Target 1. 2. 3. 4. Projec Each ba	ed Applica FTK Fore Encase Kali Linu: Autopsy - t work/As atch of stud	ation & Tools that can nsic Toolkit x- Vinetto, galatta - Disk Forensics signment: lents (self-selected batc	be used: :h mates) will identif	y projects based on the co	ntent and
implen Textbo 1.	nent with the state of the stat	he most suitable 2 or 3 a	antecedents. cs: Computer Crime S	cene Investigation". Cenga	age Learning.

2nd Edition, 2019

References

1. Ravi Kumar & B Jain,2006," Cyber Forensics - Concepts and Approaches", icfai university press 2. ChristofPaar, Jan Pelzl," Understanding Cryptography: A Textbook for Students and Practitioners", Springer's, Second Edition, 2010, 3. Ali Jahangiri," Live Hacking: The Ultimate Guide to Hacking Techniques & Countermeasures for Ethical Hackers & IT Security Experts", First edition, 2009

4. Computer Forensics: Investigating Network Intrusions and Cyber Crime", Ec-Council Press, 2010.

5. C. Altheide& H. Carvey," Digital Forensics with OpenSource Tools, Syngress", 2011, ISBN: 781597495868.,https://esu.desire2learn.com

NPTEL: <u>https://onlinecourses.swayam2.ac.in/cec21_ge10/preview</u> Udemy: <u>https://www.udemy.com/topic/digital-forensics/</u> E-book Link(PU):

Links

http://182.72.188.195/cgi-bin/koha/opacdetail.pl?biblionumber=14073&query_desc=ti%2Cwrdl%3A%20CYBER%20FORENSIC_

Topics relevant to "Skill Developemnt":

Cyber Forensics techniques for **Skill development** through **Experiential Learning techniques.** This is attained through the assessment component mentioned in the course handout.

Course Code: CSE3342	Course Title: Ethical Hack Type of Course: Discipline Basket	king e Elective in Cybe	er Security	L- P- C	1	4	3		
Version No.	1.0								
Course Pre- requisites	Basic networking tools kno	owledge and Cry	ptography &	a Networ	k Seci	urity	7		
Anti-requisites	NIL								
Course Description	This course introduces st hacking. It also provides an computer networks. These methodologies used by et what and who an ethical corporate and governmen	is course introduces students to a wide range of topics related to ethical cking. It also provides an in-depth understanding of how to effectively protect mputer networks. These topics cover some of the tools and penetration testing ethodologies used by ethical hackers and provide a thorough discussion of nat and who an ethical hacker is and how important they are in protecting rporate and government data from cyber-attacks							
Course Objective	The objective of the course Hacking and attain Skill Dev	e objective of the course is to familiarize the learners with the concepts of Ethical Icking and attain Skill Development through experiential Learning techniques.							
Course OutComes	On successful completion of1.Illustrate the impo2.Categorize the variant3.Demonstrate variant4.Demonstrate the fit	n successful completion of this course the students shall be able to: Illustrate the importance of ethical hacking Categorize the various techniques for performing reconnaissance. Demonstrate various types of system scanners and their functions Demonstrate the function of sniffers on a network							
Course Content:									
Module 1	Introduction to Hacking (Knowledge, Application)	Assignment	Programmi	ng activi	ty	12	Hours		
Topics: Introduction to Hac Vulnerability Asses: Categories of Penet: Assignment: Differ	king-Important Terminolo sments versus Penetration ration Test. ent phase methodologies o	gies - Asset - Vuli Test - Penetration	nerability - I on Testing M sting	Penetrat Iethodolo	ion Te ogies	est - -			
Module 2	Linux Basics	Assignment	Programmi	ng activi	ty	10	Hours		
Topics: Major Linux Operat Screen Resolution - Assignment: Penet	ing Systems - File Structur Some Unforgettable Basics ration testing distribution	e inside of Linux s.	- BackTrack	- Changi	ing th	e De	fault		
Module 3	Information Gathering Techniques	Assignment	Programmi	ng activi	ty	11	Hours		
Topics: Sources of Informat Interacting with DN Assignment: Domai	tion Gathering - Copying W S Servers - DNS Cache Sno in internet groper	ebsites Locally - oping - DNS Lool	NeoTrace - 2 cup with Fie	Xcode Ex rce - SNN	ploit MP - S	Scan MTF	iner - ?.		
Module 4	Target Enumeration and Port Scanning Techniques	Assignment	Programmi	ng activi	ty	13	Hours		
Fopics: Γarget Enumeration and Port Scanning Techniques - Host Discovery - Scanning for Open Ports and Services - Types of Port Scanning - Vulnerability Assessment. Assignment: Demonstrations for port scanning									

List of Laboratory Tasks: Experiments:

- 1. Installing BackTrack
- 2. Netcraft
- 3. Keyloggers
- **4.** Acunetix
- 5. Nslookup
- 6. SNMP
- 7. Port Scanning
- 8. NetStumbler
- 9. Performing an IDLE Scan with NMAP
- 10. Network Sniffing

Targeted Application & Tools that can be used: Application Software and open source tools

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Any appropriate tool can be given to demonstrate i.e Sql injections.

Text Book

1. Rafay Baloch, 2014: "Ethical Hacking and Penetration Testing Guide" Apple Academic Press Inc.

References

2. Gary Hall, Rrin Watson, 2016: "Hacking: Computer Hacking, Security Testing,Penetration Testing, and Basic Security".

3. James Corley, Kent Backman, Michael Simpson, 2010: "Hands-On Ethical Hacking and Network Defense", 2nd Edition, Cengage Learning.

Topics relevant to "EMPLOYABILITY SKILLS":

Ethical hacking techniques for **Skill Development** through **Experiential Learning techniques**. This is attained through the assessment component mentioned in course handout.

Course Code: CSE241	Course Title: Wireless Sensor and Adhoc Networks	L- P- C	3	0	3
	2] Lab Integrated Course				
Version No.	1.0				
Course Pre- requisites	NIL				
Anti-requisites	NIL				
Course Description	This course examines wireless cellular, ad how covering topics such as wireless communication access control, network and transport protocol routing algorithms, mobility and its impact application performance, quality of service gu Energy efficiency and the role of hardware and so also be presented for sensor networks.	c and se fundamo s, unicas on rou larantees ftware are	nsor ental t and ting , an chite	net s, m d mu pro d se ctur	works, nedium ulticast tocols, ecurity. es may
Course Objectives	The objective of the course is to familiarize the lea Wireless Sensor and Ad-Hoc Networks for SKILL PARTICIPATIVE LEARNING techniques.	rners with DEVELOP	n the MEN	con T by	cept of / using

	On successful completio	n of this course	the students shall be a	ble to:				
Comes	1. Explain the basic	1. Explain the basic working of the Wireless systems. (Knowledge)						
	2. Describe differe	nt protocols be	eing used by wireless	networks				
	including ABR and MAN	TS.(Knowledge)					
	3 Illustrate the Fun	damental Conce	, ents and applications of	ad hoc and				
	wireless sensor network	vireless sensor networks (Comprehension)						
	A Interpret the M	S. Comprehens	ung by considering re	lated Oos				
	4. Interpret the w	ion	ues by considering re	elateu Qus				
	measurements.(Applicat	.1011)						
Course Content:		1						
	Overview of Wireless							
Module 1	Sensor and Adhoc	Assignment	Programming activity	10 Hours				
	Networks							
Topics:		•						
Introduction, Sens	or Network Technology	background, El	ements of basic Senso	or Network				
Architecture, Sur	vev of Sensor Netwo	rks, Network	Characteristics and	Challenges,				
Applications of V	, Vireless Sensor Netwo	rks. Range of	Applications. Catego	rv 2 WSN				
Applications – Hor	me Control. Industrial Au	itomation. Med	ical Applications. Categ	ory 1 WSN				
Applications – Ser	nsor and Robots. Reconf	figurable Sensor	r Networks, Highway M	Monitoring.				
Military Applicat	ions Civil and Envir	onmental Eng	ineering Annlications	Wildfire				
Instrumentation	Habitat Monitoring Na	anosconic Sens	or Applications Intro	duction to				
Collular and Adb	nabilal Monitoring, Na	Adbac Natwork	ks – Pouting Multica	cting Oos				
Cellular and Auto	JC INELWOIKS, ISSUES III	Aunoc Netwon	ks – Kouting, Multica	sting, Qus,				
Security, Scalabilit	y. hagi sala sa T ara sa sa tari sa sa							
	Wireless Transmission		_					
Module 2	Technology and MAC	Assignment	Programming activity	10 Hours				
	Protocols for Adhoc							
Topics:								
Introduction, Radio Technology Primer – Propagation and Modulation, Propagation and								
Introduction, Rad	io Technology Primer –	Propagation a	nd Modulation, Propa	gation and				
Modulation impai	io Technology Primer – rments, Available Wirele	Propagation as ss Technologies,	nd Modulation, Propa , Campus Applications,	gation and MAN/WAN				
Modulation impai Applications, Med	 Iechnology Primer – rments, Available Wirele ium Access Control Proto 	Propagation a ss Technologies, cols – Fundame	nd Modulation, Propa , Campus Applications, ntals, Performance Req	gation and MAN/WAN uirements,				
Modulation, Rad Applications, Med MAC Protocols fo	io Technology Primer – rments, Available Wirele ium Access Control Proto r WSNs -Schedule based	Propagation a ss Technologies, cols – Fundame Protocols and	nd Modulation, Propa , Campus Applications, ntals, Performance Req Random Access based	gation and MAN/WAN Juirements, Protocols,				
Modulation impai Applications, Med MAC Protocols fo Sensor MAC case	Iechnology Primer – rments, Available Wirele ium Access Control Proto r WSNs -Schedule based study, Issues in Designin	Propagation and ss Technologies, cols – Fundame Protocols and g MAC Protocol	nd Modulation, Propa , Campus Applications, ntals, Performance Req Random Access based for Adhoc Networks -	gation and MAN/WAN uirements, Protocols, Bandwidth				
Modulation, Rad Applications, Med MAC Protocols fo Sensor MAC case efficiency, QoS su	Iechnology Primer – rments, Available Wirele ium Access Control Proto r WSNs -Schedule based study, Issues in Designin oport, Synchronization, e	Propagation and ss Technologies, cols – Fundame Protocols and g MAC Protocol rror-prone broa	nd Modulation, Propa , Campus Applications, ntals, Performance Req Random Access based for Adhoc Networks - dcast channel, Mobility	gation and MAN/WAN Juirements, Protocols, Bandwidth J of nodes.				
Modulation, Rad Applications, Med MAC Protocols fo Sensor MAC case efficiency, QoS sup	io Technology Primer – rments, Available Wirele ium Access Control Proto r WSNs -Schedule based study, Issues in Designin port, Synchronization, e Routing Protocols for Adhoc and WSN	Propagation and ss Technologies, cols – Fundame Protocols and g MAC Protocol rror-prone broa	nd Modulation, Propa , Campus Applications, ntals, Performance Req Random Access based for Adhoc Networks - dcast channel, Mobility Programming activity	gation and MAN/WAN Juirements, Protocols, Bandwidth Y of nodes. 10 Hours				
Modulation, Rad Modulation impai Applications, Med MAC Protocols fo Sensor MAC case efficiency, QoS sup Module 3 Topics:	io Technology Primer – rments, Available Wirele ium Access Control Proto r WSNs -Schedule based study, Issues in Designin port, Synchronization, e Routing Protocols for Adhoc and WSN	Propagation and ss Technologies, cols – Fundame Protocols and g MAC Protocol rror-prone broa Assignment	nd Modulation, Propa , Campus Applications, ntals, Performance Req Random Access based for Adhoc Networks - dcast channel, Mobility Programming activity	gation and MAN/WAN Juirements, Protocols, Bandwidth J of nodes. 10 Hours				
Modulation, Rad Applications, Med MAC Protocols fo Sensor MAC case efficiency, QoS sup Module 3 Topics: Background Data	io Technology Primer – rments, Available Wirele ium Access Control Proto r WSNs -Schedule based study, Issues in Designin, oport, Synchronization, e Routing Protocols for Adhoc and WSN	Propagation and ss Technologies, cols – Fundame Protocols and g MAC Protocol rror-prone broa Assignment	nd Modulation, Propa , Campus Applications, ntals, Performance Req Random Access based for Adhoc Networks - dcast channel, Mobility Programming activity	gation and MAN/WAN Juirements, Protocols, Bandwidth of nodes. 10 Hours				
Modulation, Rad Modulation impai Applications, Med MAC Protocols fo Sensor MAC case efficiency, QoS sup Module 3 Topics: Background, Data Varving Character	io Technology Primer – rments, Available Wirele ium Access Control Proto r WSNs -Schedule based study, Issues in Designin port, Synchronization, e Routing Protocols for Adhoc and WSN Dissemination and gathe	Propagation and ss Technologies, cols – Fundame Protocols and g MAC Protocol rror-prone broa Assignment	nd Modulation, Propa , Campus Applications, ntals, Performance Req Random Access based for Adhoc Networks - dcast channel, Mobility Programming activity allenges, Network Scale	gation and MAN/WAN Juirements, Protocols, Bandwidth y of nodes. 10 Hours e and Time-				
Modulation, Rad Modulation impai Applications, Med MAC Protocols fo Sensor MAC case efficiency, QoS sup Module 3 Topics: Background, Data Varying Character Adboc Networks	io Technology Primer – rments, Available Wirele ium Access Control Proto r WSNs -Schedule based study, Issues in Designin, oport, Synchronization, e Routing Protocols for Adhoc and WSN Dissemination and gathe istics,, Routing Techniques	Propagation and ss Technologies, cols – Fundame l Protocols and g MAC Protocol rror-prone broa Assignment ring, Routing ch s, characteristic	nd Modulation, Propa , Campus Applications, ntals, Performance Req Random Access based for Adhoc Networks - dcast channel, Mobility Programming activity allenges, Network Scale s of an ideal Routing P	gation and MAN/WAN Juirements, Protocols, Bandwidth of nodes. 10 Hours e and Time- rotocol for				
Modulation, Rad Modulation impai Applications, Med MAC Protocols fo Sensor MAC case efficiency, QoS sup Module 3 Topics: Background, Data Varying Character Adhoc Networks, V	io Technology Primer – rments, Available Wirele ium Access Control Proto r WSNs -Schedule based study, Issues in Designin port, Synchronization, e Routing Protocols for Adhoc and WSN Dissemination and gathe istics,, Routing Strategies WSN Routing Techniques	Propagation and ss Technologies, cols – Fundame I Protocols and g MAC Protocol rror-prone broa Assignment ring, Routing ch s, characteristic , Classifications	nd Modulation, Propa , Campus Applications, ntals, Performance Req Random Access based for Adhoc Networks - dcast channel, Mobility Programming activity allenges, Network Scale s of an ideal Routing P of Routing Protocols, Ta	gation and MAN/WAN Juirements, Protocols, Bandwidth of nodes. 10 Hours e and Time- rotocol for able-driven				
Modulation, Rad Modulation impai Applications, Med MAC Protocols fo Sensor MAC case efficiency, QoS sup Module 3 Topics: Background, Data Varying Character Adhoc Networks, V and on-demand Re	io Technology Primer – rments, Available Wirele ium Access Control Proto r WSNs -Schedule based study, Issues in Designin port, Synchronization, e Routing Protocols for Adhoc and WSN Dissemination and gathe istics,, Routing Strategies WSN Routing Techniques puting Protocols, Routing	Propagation and ss Technologies, cols – Fundame Protocols and g MAC Protocol rror-prone broa Assignment ring, Routing ch s, characteristic , Classifications g Protocols with	nd Modulation, Propa , Campus Applications, ntals, Performance Req Random Access based for Adhoc Networks - dcast channel, Mobility Programming activity allenges, Network Scale s of an ideal Routing P of Routing Protocols, Ta efficient flooding mech	gation and MAN/WAN Juirements, Protocols, Bandwidth of nodes. 10 Hours e and Time- rotocol for able-driven nanism.				
Modulation, Rad Modulation impai Applications, Med MAC Protocols fo Sensor MAC case efficiency, QoS sup Module 3 Topics: Background, Data Varying Character Adhoc Networks, N and on-demand Re	io Technology Primer – rments, Available Wirele ium Access Control Proto r WSNs -Schedule based study, Issues in Designin oport, Synchronization, e Routing Protocols for Adhoc and WSN Dissemination and gathe istics,, Routing Strategies WSN Routing Techniques outing Protocols, Routing Demonstration of WSN	Propagation and ss Technologies, cols – Fundame l Protocols and g MAC Protocol rror-prone broa Assignment ring, Routing ch s, characteristic , Classifications g Protocols with	nd Modulation, Propa , Campus Applications, ntals, Performance Req Random Access based for Adhoc Networks - dcast channel, Mobility Programming activity allenges, Network Scale s of an ideal Routing P of Routing Protocols, Ta efficient flooding mech	gation and MAN/WAN Juirements, Protocols, Bandwidth of nodes. 10 Hours e and Time- protocol for able-driven nanism.				
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 T2: C. Siva Ram Murthy and B. S. Manoj, Adhoc Wireless Networks – Architecture and Protocols, Pearson Publication, 2013. ISBN : 978-81-317-0688-6
 Web Links:

R3: <u>https://networksimulationtools.com/glomosim-simulator-projects/</u> R4 : <u>http://vlabs.iitkgp.ac.in/ant/8/</u>

References

1. R1: Jagannathan Sarangapani, Wireless Adhoc and Sensor Networks – Protocols, Performance and Control, CRC Press 2017, e-book ISBN: 9781315221441

2. R2: Chai K. Toh, Ad Hoc Mobile Wireless Networks: Protocols and Systems, Prentice Hall Publisher 2007, ISBN : 0-13-007617-4Ivan Stojmenovic, Sheng Wen, "The Fog Computing Paradigm: Scenarios andSecurity Issues", Proceedings, Federated Conference on Computer Science and Information Systems, pp. 1–8, 2014

3. Fog Computing: Helping the Internet of Things Realize its Potential Amir VahidDastjerdi and RajkumarBuyya, University of Melbourne.

Topics relevant to "SKILL DEVELOPMENT": Campus Applications and Routing Protocol for Adhoc Networks for Skill Development through Participative Learning techniques. This is attained through the Presentation as mentioned in the assessment component.

Last Modified: 25/05/2022

Course Code:	Course Title: CLIENT S	ERVER COMPUTING							
CSE 262	Type of Course: Theor			L-T-P- C	3	0	0	3	
Version No.	2.0	y only							
Course Pre- requisites	Knowledge of Computer networks.								
Anti-requisites	NIL								
Course Description	Course description: Th side services, server environment. The stu components of client s operating system, Mide	Course description: The course covers basic concepts of client server computing, client side services, server side services, protocols for implementation of client server environment. The students will learn the concepts of client server architecture, components of client server computing, Client/Server Database Architecture, Network operating system, Middleware and RPC.							
Course Objective	The objective of the course is to familiarize the learners with the concepts of Client Server Computing and attain Skill Development through Participative Learning techniques.								
Course Out Comes	 On successful completion of the course the students shall be able to: 1) Describe the basic concepts of client server computing and types of client server architecture [knowledge] 2) Discuss the components and operating system of client server computing [Comprehension] 3) Understand the Client/Server Database Computing. [Comprehension] 4) Distinguish the different category of client server applications. [Comprehension] 								
Course									
Content:		1							
Module 1	Client Server System Concepts and Architecture	Assignment	Client Serv Architectu	ver ire		8	Sessi	ons	
Topics: Client Server Sy Client, Multiple Server: File ser Thin and Fat cl N-Tier Architec	vstem Concepts - Introc Clients Single Servers, ver Print server Applic ients. Client Server Arc ture- client server Adv	luction – Server, Clie Multiple clients Mul ation server Mail se chitecture: Two-Tier antage and Disadvan	nts, client - ltiple Serve rver. Chara Architectu tage - Clien	- client se r. Charact cteristics re – Thre t /server	rver t teristi and t e-Tiei Build	opol cs ar ypes Arc ing B	ogy: S nd typ of Cli hitect Blocks	Single bes of ients: ture -	
Module 2	Client Server Computing Components and Operating system	Assignment/Quiz1	Componer Server Computin of Server, operating	nts of Clie g, Compo Network system	nt onents	s 8	Sessi	ons	
Topics: Components of Client Server Computing , Client: Hardware, Operating System, communication, GUI. Role of the Client , Client Services :Request for Service , Components of Server: Server – File server, Fax server, Mail,Server Functionality in detail.Network operating system : server operating system.									
Module 3	Client/Server Database Computing	Assignment/Quiz2	Client/Ser Architectu Middlewa	ver Datal ire, Datal <u>re Comp</u> o	oase oase onent	10	Sessi	ions	
Topics:				-					
Client/Server Da Architecture: pro	tabase Computing: Serv ocess per client architec	rice of client/server ap ture. multi-threaded a	oplication. Clarchitecture	lient/Serv . Hvbrid a	er Dat rchite	abas cture	e . Data	abase	

Architecture: process per client architecture, multi-threaded architecture, Hybrid architecture. Database Middleware Component: API, Database translator, Network translator..Distributed Client/Server Database Systems: Web/Database System for Client/Server Applications , Design Approach.

Module 4 Client/Server Applications	Assignment/Quiz2	Categories Of Client/Server Applications, DDE, OLE	12 Sessions
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Topics:

Client/Server Application: Technologies for client/server applications. Categories Of Client/Server Applications: File sharing, Database centered system, Groupware, Transactional processing. Inter Process Communication: socket interface -RPC-RMI. Dynamic Data Exchange (DDE)- Object Linking and Embedding (OLE)- Middleware - Role and Mechanism of Middleware- Types of Middleware. Targeted Application & Tools that can be used:

This course helps the student to understand the concepts of client server architecture, components of client server computing, Client/Server Database Architecture, Network operating system, Middleware and RPC.

Text Book

T1. Robert Orfali, Dan Harkey and Jerri Edwards: Essential Client/Server Survival Guide, John Wiley & Sons Edition 3 2019

T2. Patrick Smith & Steave Guengerich, "Client/Server Computing". PHI 2011 Edition 2 References

R1. <u>Subhash Chandra Yadav</u>: An Introduction to Client/Server Computing newagepublishers; First edition January 2009

E-Resources

NPTEL course –<u>NPTEL :: Computer Science and Engineering - NOC:Cloud computing</u>**IIT Kharagpur**, Prof. Sowmya Kanti Gosh.

https;//presiuniv.knimbus.com/user#/home

Topics relevant to "SKILL DEVELOPMENT": Socket Programming, RMI and RPC for **Skill Development** through **Participative Learning** techniques. This is attained through assessment component mentioned in course handout.

Course	Course Title: Information Security	L- P-	•		
Code:	Type of Course: Open Elective/ Theory Only Course	с	3	0	3
CSE240					
Version	2.0				
No.					
Course Pre-	CSE-236 Principles of Data Communications and Computer Netwo	rks			
requisites					
Anti-	NIL				
requisites					
	The course explores information security through some introducto an appreciation of the scope and context of information sec introduction to cryptography, security management, network a	ory mat curity. nd con	erial a It incl noute	ind help ludes a r secur)s gain ⊨brief itv. It
Course	allows a student to begin a fascinating journey into the study of	inform	ation	securit	tv and
Description	develop an appreciation of some key security concepts. The	course	conc	ludes v	with a
	discussion of a simple model of the information security in inc	lustry a	and e	xplores	skills,
	knowledge and roles required for employability. A student will	, be able	to d	etermir	ie and
	analyze potential career opportunities in this profession.				
Course	The objective of the course is to familiarize the learners with	the c	oncep	ots of <mark>(</mark>	Course
Objective	Title_as_mentioned above and attain Entrepreneurship throug	gh Par t	ticipat	tive Lea	arning
-	techniques	_	-		-

	On successful completion of the course t	he students s	hall be able to:					
Course Out	Describe the basic concept of information security. (Knowledge)							
Comes	Explain the concepts and	methods of c	ryptography. (Compreher	nsion)				
comes	Demonstrate the aspects	of risk manag	gement. (Application)					
	Illustrate Network Securit	y concepts. (/	Application)					
Course								
Content:								
Module 1	Introduction to Information Security	Assignment	Data Collection/Interpretation	08 Sessions				
Topics:								
What is Inf	ormation Security, The CIA Triad: Conf	identiality In	tegrity and Availability,	why study				
information	security, Basic principles of information sy	stem security	y, Information classification	on, A model				
for Network	Security.							
Madula 2	Introduction to	Assignment	Basics and	13				
wodule 2	Cryptography		Interpretation	Sessions				
Topics:								
Introduction	to Cryptography, Role of cryptography in	information s	security, OSI Security arch	itecture,				
Security Atta	acks, Security Services, Security Mechanism	n, Types of Cr	yptography, Overview of	Public and				
, Private Key (Cryptography.							
	Information Security Management &							
Module 3	Risk Analysis	Quiz	Questions Set	9Sessions				
Topics:		· · · ·						
Information	Security Managements, Security Policy	y, Standards	and Procedures, Risk	Analysis of				
Information	Security, Risk Analysis.							
	Securityin			e Soccions				
Module 4	Networks	Quiz	Questions Set	osessions				
Biometrics fo Security,Wel	or security, Kerberos, PKI, Network Securit b Security, Intrusion Detection, Firewalls.	y application	s: e-mail security: PGP, M	IME, IP				
Targeted Ap	plication & Tools that can be used:							
This course h	nelps the students to understand the conc	epts related t	o information and netwo	rk				
security.								
InfoSec prov	ides coverage for cryptography, mobile co	mputing, soc	ial media, as well as infra	structure				
and network	s containing private, financial, and corpor	ate information	on, and tools includes We	eb				
vulnerability	, scanning tools, Antivirus software, Netwo	ork intrusion	detection, Packet sniffers	, Firewall				
tools.								
	Project work/A	ssignment:						
Project Assig 1) Projects fo Web Applica Assignment:	gnment: or students interested in thisAntivirus, Onl Ition.	line Fund Trai	nsfers with DES Encryptio	n, Firewall				
1]What do y	ou understand by Risk, Vulnerability & Thi	reat in a netw	vork?					
2] What are	the response codes that can be received	from a Web A	Application?					
3] What is th	ne difference between Symmetric and Asy	mmetric encr	yption?					
Text Book								
T1: Informa	tion Security: The Complete Reference, Se	cond Edition,	2nd Edition. by Mark Rho	odes-				
Ousley. Rele	ased April 2013. Publisher(s): McGraw-Hill							
T2: William	Stallings, "Cryptography and Network Sec	urity - Princip	les and Practices", 7th Ed	ition,				
Pearson pub	lication, ISBN: 978-93-325-8522-5							
T3: Michael	E Whitman and Herbert J Mattord, "Princ	iples of Inforn	nation Security", Vikas					
Publishing H	ouse, New Delhi, 2003							
References								

1: Cryptography & Network Security (Sie) 2E. Author, Forouzan. Publisher, McGraw-Hill Education (India) Pvt Limited.

2: Information Systems Security, 2ed: Security Management, Metrics, Frameworks and Best Practices. Nina Godbole.

3: Information Security: Principles and Practices, 2nd Edition. Mark S. Merkow. Jim Breithaupt. 2014, Pearson

R4: Roadmap to Information Security: For IT and Infosec Managers, Michael E. Whitman, Herbert J. Mattord

e study

link:https://www.researchgate.net/publication/320960482_Information_Security_Management_Practic es_Case_Studies_from_India

E book link

R1: https://d.cxcore.net/InfoSec/Information%20Security%20The%20Complete%20Reference,%202nd %20Edition/Information%20Security%20The%20Complete%20Reference,%202nd%20Edition.pdf **E book link R2:**

https://engineering.futureuniversity.com/BOOKS%20FOR%20IT/Book%20Information%20Security%20M angement%206th%20ed.pdf

Web resources: <u>https://nptel.ac.in/courses/106106199</u>- IIT Madra, Prof. Chester Rebeiro Web resources: <u>https://nptel.ac.in/courses/106106129</u> - IIT MadrasProf. V. Kamakoti.

bs://presiuniv.knimbus.com/user#/searchresult

Topics relevant to "ENTREPRENEURIAL SKILLS": Sustainable development tools, Integrity Availability Concepts Policies, procedures, Guidelines, Standards Administrative Measures and Technical Measures, People, Process, Technology for developing **Entrepreneurial Skills** through **Participative Learning** techniques. This is attained through assessment component mentioned in course handout.

CSE3034 Type of Course: Elective in Big Data Basket L-P-C 3 0 3 Version No. 1.0 Course Pre- requisites Sec219 Big Data Analytics Course Description The purpose of this course is to sensitize security in Big Data environments. This course will discover cryptographic principles, mechanisms to manage access controls in Big Data system. This course teaches the principles and practices of big data for improving the privacy and the security of computing systems. Big data is being applied in areas where there is great commercial advantage to be had, and consequently, attacks and failures have become a serious concern. It delves into a set of techniques for defending big data techniques against breaching of bigdata (the privacy aspect) and against malicious attacks (the security aspect). Course Objective The objective of the course is to familiarize the learners with the concepts of BIG DATA SECURITY AND PRIVACY and attain Skill Development through Participative Learning techniques. Course Objective On successful completion of this course the students shall be able to: 1.Define cryptographic principles and mechanisms to manage access controls in Big Data system. [Knowledge] iii. Recognize all security related issues in big data systems. [Knowledge] iii. Recognize all security related issues in big data system. [Knowledge] iii. Recognize all security - Organizational security organizational security 08 classes Topics: Trivacy - Reidentification of Anonymous People – Why Big Data Privacy is self regulating? – Ethics – Ownership – Ethical Guidelines – Big Data Security – Organizational Security. Assignment. Big data -	Course Code:	Course Title: BIG D	ATA SECURITY AND P	RIVACY						
Theory Image: Control of the purpose of this course is to sensitize security in Big Data analysics requisites Anth-requisites NIL Course Pre- requisites The purpose of this course is to sensitize security in Big Data environments. This course will discover cryptographic principles, mechanisms to manage access controls in Big Data system. This course teaches there is great commercial advantage to be had, and consequently, attacks and failures have become a serious concern. It delives into a set of techniques for defending big data techniques against breaching of bigdata (the privacy aspect) and against malicious attacks (the security aspect). Course Objective The objective of the course is to familiarize the learners with the concepts of BIG DATA SECURITY AND PRIVACY and attain Skill Development through Participative learning techniques. Course Objective On successful completion of this course the students shall be able to: 1.Define cryptographic principles and mechanisms to manage access controls in Big Data system. [Knowledge] ii. Kacopize all security related issues in big data systems. [Comprehension] iv.Apply Kerberos configuration for Hadoop ecosystem components.[Application] Module 1 Big Data Privacy, [Ethics And Security - Organizational security] OB classes Topics: Protection of Anonymous People – Why Big Data Privacy is self regulating? – Ethics – Ownership – Ethical Guidelines – Big Data Security – Organizational Security. OB classes Nodule 2 Security And Security – Organizational Security. OB classes OB classes Topics:	CSE3034	Type of Course: Ele	ctive in Big Data Bask	ket	L-P-C	3	0	3		
Version No. 1.0 Course Pre- course Pre- course of CSE219 Big Data Analytics CSE219 Big Data Analytics requisites NIL Course Ocurse will discover cryptographic principles, mechanisms to manage access controls in Big Data system. This course teaches the principles and practices of big data for improving the privacy and the security of computing systems. Big data is being applied in areas where there is great commercial advantage to be had, and consequently, attacks and failures have become a serious concern. It delves into a set of techniques for defending big data techniques against breaching of bigdata (the privacy aspect) and against malicious attacks (the security aspect). Course Objective The objective of the course is to familiarize the learners with the concepts of BIG DATA SECURITY AND PRIVACY and attain Skill Development through Participative Learning techniques. Course Objective In Big Data system.[Knowledge] ii.Kzplain security risks and challenges for Big Data system.[Comprehension] ivApply Big data security assignment/Quiz Big data security of Bacasses Topics: Topics: Topics: Components Security Assignment Security. Compliance, Auditing, And Assignment Sesignment security Ob classes Module 2 Hadoop Security & Compliance, Auditing	_	Theory								
Course Pre- requisites CSE219 Big Data Analytics Anti-requisites NIL Course The purpose of this course is to sensitize security in Big Data environments. This course will discover cryptographic principles, mechanisms to manage access controls in Big Data system. This course teaches the principles and practices of big data for improving the privacy and the security of computing systems. Big data is being applied in areas where there is great commercial advantage to be had, and consequently, attacks and failures have become a serious concern. It delves into a set of techniques for defending big data techniques against breaching of bigdata (the privacy aspect) and against malicious attacks (the security aspect). Course Objective The objective of the course is to familiarize the learners with the concepts of BIG DATA SECURITY AND PRIVACY and attain Skill Development through Participative Learning techniques. Course Outcomes On successful completion of this course the students shall be able to: i.Define cryptographic principles and mechanisms to manage access controls in Big Data system. [Knowledge] ii.Explain security related issues in big data system. [Knowledge] ii.Explain security related issues in big data system. [Knowledge] ii.Explain security related issues in big data systems. [Gomprehension] tw.Apply Kerberos configuration components.]Application] Course Content: Big Data Privacy, Ethics And Security - Organizational security- organizational security- thica Guidelines - Big Data Security - Organizational security- organizational security- organizational security- thica Guidelines - Big Data Compliance - Intellectual Property Challenge - Research Questions in Cloud Security - Open Problems.	Version No.	1.0								
requisites NIL Anti-requisites NIL Course The purpose of this course is to sensitize security in Big Data environments. This course will discover cryptographic principles, mechanisms to manage access controls in Big Data system. This course teaches the principles and practices of big data is being applied in areas where there is great commercial advantage to be had, and consequently, attacks and failures have become a serious concern. It delves into a set of techniques for defending big data techniques against breaching of bigdata (the privacy aspect) and against malicious attacks (the security aspect). Course Objective The objective of the course is to familiarize the learners with the concepts of BIG DATA SECURITY AND PRIVACY and attain Skill Development through Participative Learning techniques. Course Objective On successful completion of this course the students shall be able to: i.Define cryptographic principles and mechanisms to manage access controls in Big Data system. [Knowledge] ii.Explain security related issues in big data system. [Comprehension] iw.Apply Kerberos configuration for Hadoop ecosystem components.[Application] Course Content: Big Data Privacy, Ethics And Security - Organizational Security organizational security organizational security organizational security. 08 classes Privacy - Reidentification of Anonymous People – Why Big Data Privacy is self regulating? – Ethics – Ownership – Ethical Guidelines - Big Data Security - Organizational Security. 08 classes Module 1 Big data - Classifying Data –	Course Pre-	CSE219 Big Data An	alytics							
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	Topics: Integrating Hadooj system – Setting up Assignment: Event	Module 4 Data Description Case study Description Description <thdescription< th=""> Description <thdes< td=""></thdes<></thdescription<>								

1. Book/Article review: At the end of each module a book reference or an article topic will be given to an individual or a group of students. They need to refer the library resources and write a report on their understanding about the assigned article in appropriate format. Presidency University Library Link.

2. Presentation: Group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same.

Text Book(s):

- 1. Sudeesh Narayanan, "Securing Hadoop", Packt Publishing, 2013.
- 2. Ben Spivey, Joey Echeverria, "Hadoop Security Protecting Your Big Data Problem", O'Reilly Media, 2015.

Reference(s):

Reference Book(s):

1. Mark Van Rijmenam, "Think Bigger: Developing a Successful Big Data Strategy for Your Business", Amazon, 1 edition, 2014.

2. Frank Ohlhorst John Wiley & Sons, "Big Data Analytics: Turning Big Data into Big Money", John Wiley & Sons, 2013.

3. SherifSakr, "Large Scale and Big Data: Processing and Management", CRC Press, 2014. Online Resources (e-books, notes, ppts, video lectures etc.):

- 1. Top Tips for Securing Big Data Environments:
 - e-book (http://www.ibmbigdatahub.com/whitepaper/top-tips-securing-big-dataenvironments-ebook)
- 2. http://www.dataguise.com/?q=securing-hadoop-discovering-and-securing-sensitivedatahadoop-data-stores
- 3. Gazzang for Hadoop

http://www.cloudera.com/content/cloudera/en/solutions/enterprisesolutions/security-forhadoop.html

- 4. eCryptfs for Hadoop https://launchpad.net/ecryptfs.
- 5. Project Rhino https://github.com/intel-hadoop/project-rhino.

Weblinks:

https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=1223875& site=ehost-live&ebv=EB&ppid=pp_xiii

https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929& site=ehost-live

Topics relevant to "SKILL DEVELOMENT": Configuring Kerberos for Hadoop ecosystem components – Pig, Hive, Oozie, Flume for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

[Text Wrapping Break]

Course Code:	Course Title:							
CSE3032	Streaming Data Ana	lytics			2	2	3	
	Type of Course: Pro	gram Core		L-P-C			l	
	Theory and Lab Inte	egrated Course					l	
Version No.	1.0							
Course Pre-	CSE3032 -Big Data	Analytics						
requisites								
Anti-requisites	NIL							
Course	The nurnose of th	a course is to introd	uca theoretic	al foun	dations	مامر	rithme	
Description	methodologies, and	applications of streaming	g data. It also	provides	practic	al kno	wledge	
Description	for handling and an	lyzing streaming data.	D	r	F			
	The associated lab	e associated laboratory provides an opportunity to implement the concepts and						
	enhance critical thir	king and analytical skill	S.			•		
	With good knowled	th good knowledge of the fundamentals of streaming analytics, the student can gain atical experience in implementing them enabling the student to be an effective						
	solution provider fo	ation provider for applications that involve huge volume of streaming data.						
Course Objectives	The objective of t	e objective of the course is to familiarize the learners with the concepts of						
	Streaming Data Ana	Streaming Data Analytics as mentioned above and attain Skill Development through						
	experiential Learnii	ig techniques.						
	0 61	1	1 4 1 4	1 11 1	11 /			
Course	On successful con	Becompize the characteristics of data streams that make it useful to solve						
outcomes	• Recognize	lems	uata streams	mat ma	ke it us	serun	U SOIVE	
	• Identify a	• Identify and apply appropriate algorithms for analyzing the data						
	streams for a v	streams for a variety of problems						
	Implemen	t different algorithms	for analyzing	g the dat	ta strea	ms.		
Course Content:		U		-				
Module 1	Introduction to Da	taProgramming	Streaming n	nethods		8 Cla	isses	
In the durat	Streams	Assignment	dala Daaam	ale Taorre		ata C	4.4.0.0.4.0.0	
Managem	ent Systems Know	vledge Discovery fi	rom Data	Streams	S III D Basic	ala S Stre	aming	
Methods:	Counting the Num	ber of Occurrence of t	he Elements	in a Str	eam. (Count	ing the	
Number	of Distinct Value	s in a Stream, Bou	inds of Rai	ndom V	Variabl	es. F	oisson	
Processes	, Sliding Windows	· ·				-~, -		
	Ċ,							
	1		T					
	Decision Trees a	nd Programming	Streaming	-	Data			
Module 2	Clustering fro	Assignment	Collection		and	lo Cl	asses	
Desision Trees	Data Streams	n Data Straama, Jute	Analysis	. Verry	East D		Tue a	
Algorithm Exten	sions to the Basic /	a Data Streams: Inu	Continuous	ie very Attribut	Fast D	ecision	ol Tree	
Leaves Cluster	ing Examples.	Partitioning Clusteri	ng Hierarc	hical (∼luster	ino	Micro	
Clustering.Grid C	Clustering .		ing, morare	incur v	ciustoi	m <u>5</u> ,	WIIC10	
6,	8							
Modul- 2	Frequent Patte	rnProgramming	Streaming		Data	0 (1)		
viodule 3	Mining	Assignment	analysis			8 Cla	isses	
Frequent Patte	rn Mining: Intr	oduction to Frequer	t Itemset	Mining	The	FP-	growth	
Algorithm,Summ	arizing Itemsets,	Heavy Hitters, Ma	ining Frequ	ent Ite	msets	from	1 Data	
Streams: Landma	ark Windows, Min	ing Recent Frequent I	temsets, Fre	quent It	emsets	at N	lultiple	
Time Granularitie	es, Sequence Patter	n Mining						
Madul-4					7 1	a a -		
iviouule4					/ cia	isses		

Evaluating Streaming Algorithms Evaluation Issues, Design of Evaluation Experiments, Evaluation Metrics, Error Estimators using a Single Algorithm and a Single Dataset, Comparative Assessment, The 0-1 loss function, Evaluation Methodology in Non-Stationary Environments, The Page-Hinkley Algorithm

List of Laboratory Tasks: 1.Level 1: Exploring stream processing engine STORM Level 2:Exploring stream processing engine STREAM

2. Implementation of decision tree algorithms
Level 1: Implementation of VFDT decision tree algorithm
Level 2:Implementation of CVFDT decision tree algorithm

3. Implementation of partitioning clustering on stream.
 Level 1:Implementation of partitioning clustering The Leader Algorithm.
 Level 2: Implementation of Single Pass k-Means partitioning ClusteringAlgorithm.

4. Implementation of micro clustering on stream. Level 1:Implementation of Fractal Clustering algorithmInitialization phase Level 2:Implementation of Fractal Clustering algorithm Incremental phase

5.Level 1: Implementation of The ODAC Global Algorithm. Level 2: Implementation of The ODAC: The TestSplit Algorithm

6. Level 1Implementation of the Apriori algorithm to find frequent itemsets Level 2:Implementation of the Apriori algorithm to find association rules

7. Level 1: Frequent Itemsetsmining of data streams using LossyCounting algorithm Level 2:Reservoir Sampling for Sequential Pattern Mining overData Streams.

Targeted Application & Tools that can be used:

- Apache Spark
- Social media Data Analysis

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• Predictive Analytics

Project work/Assignment:

Students will be asked to develop a mini-project for streaming Data Analysis on streaming data.

Text Book

Joao Gama, "Knowledge Discovery from Data Streams", CRC Press, 2018.

References

David Luckham, "The Power of Events: An Introduction to Complex Event Processing in Distributed Enterprise Systems", Addison Wesley, 2016.

Charu C. Aggarwal, "Data Streams: Models And Algorithms", Kluwer AcademicPublishers, 2017.

Weblinks:

http://www.liaad.up.pt/area/jgama/DataStreamsCRC.pdf https://presiuniv.knimbus.com/user#/home

Topics relevant to "SKILL DEVELOPMENT":

Streaming data analysis of twitter data using Apache Spark for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE 212/2007	Course Title: Analysi	s of Algorithms		L- T-P- C	3	0	0	3
	Type of Course: THEOR	Y Only						
Version No.	2.0							
Course Pre-	Introduction to Pseudo	code, Knowledge of R	ecursive an	d Non Re	ecursiv	ve alg	orithr	ns,
requisites	Meaning of correctness							
Anti-requisites								
Course	This Course introduces	techniques for the desi	ign and ana	lysis of e	fficier	it alg	orithm	ıs
Description	and methods of applications. Deals with analyzing time and space complexity of algorithms, and to evaluate trade-offs between different algorithms.							
Course	The objective of the cou	urse is to familiarize th	e learners v	vith the c	oncer	ts of	Analy	vsis of
Objective	Algorithms and attain S	Algorithms and attain Skill Development through Problem Solving Methodologies.						
Course Out	On successful completi	on of the course the st	udents sha	ll be able	to:			
Comes	1. Classify the types of	asymptotic notations.						
	2. Discuss the Brute Fo	rce Technique used for	r solving a j	problem.				
	3. Explain divide and co	onquer technique for se	earching an	d sorting	proble	ems.		
	4. Discuss the Dynamic	Discuss the Dynamic Programming Algorithm used for solving a problem.						
	5. Discuss the Back tracking technique and limitations of Algorithms.							
Course Content:	T (T (P	.						
Module 1	Introduction	Assignment	Simulatio	n/Data Ai	nalysis	<u>80 3</u>	Sessi	ons
Important Proble and Non-recursiv	m types, Asymptotic No ve algorithms.	tations and its properti	les, Mathen	natical an	alysis	for R	lecurs	ive
	Algorithm design		Numerica	l from E-				
Module 2	techniques-Brute	Assignment	Resource	5		09	Sessi	ons
Salastian Sont as	torce	ness of Amore Exhaust	tive coord	Tuorrallin	~ Solo		Vno	ncoalr
Problem.	equentiai search, Unique	ness of Anay, Exhaust		Travening	g Sale	sman	, Kna	рѕаск
Module 3	Divide-and-conquer	Term paper/Assignment	Simulatio	n/Data Ai	nalysis	5 08	Sessi	ons
Master Theorem,	, Merge sort, Quick sort,	Binary search.						
	Dynamic	Term						
Module 4	programming and greedy technique	paper/Assignment	Simulatio	n/Data Aı	nalysis	5 08	Sessi	ons
Introduction, Coi floyds,0/1 Knaps	n changing problem, Mu ack, Prim's, Kruskal's, I	ılti stage graph – Optir Dijkstra's Algorithm.	nal Binary S	Search Tro	ees, v	varsh	all's,	
Module 5	Complexity Classes	Term paper/Assignment	Simulatio	n/Data Ai	nalysis	5 0 6	Sessi	ons
Complexity Class	es- P,NP- NP Hard and N	IP Complete - Boolean	Satisfiabili	ty Proble	m (SA	Г).		
Hamiltonian Path	n Problem, M Coloring P	roblem. Backtracking,	- Backtracl	king – n-Q	Jueen	s prol	olem.	
Text Book								
1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, <i>"Introduction to Algorithms"</i> , PHI Learning Private Limited.								
References	······································	ha Daria and da da da		1		D 4		
1. AnanyLe 2. Alfred V. Aho 3. Donald E. Knu	yitin, <i>Introduction to t</i> John E. Hopcroft and J Jth, " <i>The Art of Compute</i>	ne Design and Analysi effrey D. Ullman, "Da er Programming", Vol	s of Algorit ta Structur umes 1 and	es and Al 3 Pearson	arson g <i>orith</i> 1.	Educ ms",	ation. Pears	on.
E-Resources				-				
NPTEL course –								

https://onlinecourses.nptel.ac.in/noc19 cs47/preview

https://www.coursera.org/learn/analysis-of-algorithms

https://puuniversity.informaticsglobal.com

Topics relevant to "SKILL DEVELOPMENT": knapsack, prims, kruskals algorithm, quick sort, binary search for **Skill Development** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.

[Text Wrapping Break]

Course Code	Course Title: Web Intellig	Topco and Anal	lutics		2	2	2
CSF3031	Type of Course: Integrated			L- P- C	2	2	5
Version No	10						
Course Pre-	CSE2021-Data Mining						
requisites							
Anti-requisites							
Course Description	to provide an in-depth review of marketing principles and web intelligence - is not intended to provide an in-depth review of marketing principles and concepts. Nor is it intended to provide an in depth explanation or review of statistical analysis principles, though some of these principals and concepts will be mentioned from time to time in the lectures and reading materials. Rather, this course will give you the mastery of analytics to a sufficient degree to deploy Web Analytics platforms within your organizations and gain meaningful insights from them that can drive the bottom line.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Web Intelligence and Analytics and attain Skill Development through Experiential Learning techniques.						
Course Out Comes	 On successful completion of the course the students shall be able to: 1. A grounded understanding of web intelligence and business analytics terminology related to the above. 2. How to deploy web intelligence to improve the outcomes of your marketing or business plan. 3. How Analysts impact the bottom line (their role) within various businesses and lines of business 4. Growth potentials for Web Analysts and Big Data professionals 						
Course Content:							
Module 1	INTRODUCTION TO INTELLIGENT WEB	Assignment	Data Collecti	on/Interp	retatior	n 6 9	Sessions
INTRODUCTION TO INTELLIGENT WEB -Inside the search engine - Examples of intelligent web applications - Basic elements of intelligent applications - Machine learning, data mining – Searching, Reading, indexing, and searching.							
Module 2	LISTEN AND LOAD	Case studies / Case let	Case stu	dies / Cas	e let	6 5	Sessions
LISTEN AND LOAD- Streams, Information and Language, - Statistics of Text - Analyzing Sentiment and Intent – Load - Databases and their Evolution, Big data Technology and Trends.							
Module 3	CLUSTERING AND CLASSIFICATION	Quiz	Case stu	dies / Cas	e let	9 9	Sessions
CLUSTERING AND CLASSIFICATION An overview of clustering algorithms - Clustering issues in very large datasets - The need for classification - Automatic categorization of emails and spam filtering - Classification with very large datasets - Comparing multiple classifiers on the same data.							
Module4- REASONING (4 hours) Reasoning: Logic and its Limits, Dealing with Uncertainty - Mechanical Logic - The Semantic Web - Limits of Logic - Description and Resolution - Collective Reasoning. Module-5 PREDICTING (6 hours) Statistical Forecasting - Neural Networks - Predictive Analytics - Sparse Memories - Sequence Memory - Network Science – Data Analysis: Regression and Feature Selection - Case Study - set of retrieved and processed news stories.							

List of Laboratory Tasks: Laboratory Work: to analyzing the web for various functionalities given in the subject and using various tools and technologies to do the experimentation. It also involves installation and working on tools and technologies in this domain.

Targeted Application & Tools that can be used

Project work/Assignment:

Assignment:

Text Book

1. Gautam Shroff, "Intelligent Web - Search, Smart Algorithms, and Big Data", Oxford University Press, 2016.

2. HaralambosMarmanis, Dmitry Babenko, "Algorithms of the Intelligent Web", Manning publications, 2019.

References

hristopher D. Manning, PrabhakarRaghavan, HinrichSchütze, "An Introduction to Information Retrieval", Cambridge University Press, 2019.

. Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley & Sons, Inc., 2012. . W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013. R3

b resources:

b://www.coursetalk.com/coursera/web-intelligence-and-big-data Course code Course Title L T informatics.global,

<u>ps://sm-nitk.vlabs.ac.in/</u>

Topics relevant to "Skill Development": Intelligent Web and Clustering for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.
Course Code: PG	Course Title:NoSQL Dat	abases							
COURSE:	Type of Course:Program	n Core		L-P-C					
CSE 2024	Theory and Laboratory	Integrated			2	2	3		
	1.0								
Version No.	1.0								
Course Pre-	CSE2074-DBMS								
requisites	NTT								
Anti-requisites	NIL								
Course	Introduction to non-relat	ional (NoSQL) data n	nodels, su	ich as K	ey-Val	lue, Doc	ument,		
Description	Column, Graph and	Object-Oriented da	tabase	models	. Adv	vantage	s and		
	alsadvantages of the diffe	rent data architectu	re patter	ns will i		databa	Hands-		
	be provided The rapid	and efficient proce	ssing of	data se	osyr ets wi	th a fo	ses will		
	performance, reliability,	and agility will be co	vered.	uutu St			cus on		
Course	The objective of the cours	e is to familiarize the	loarnors	with th		conts of	NoSOL		
Objectives	Databases and attain Skill	Development throug	h Experie	ential Le	arning	techni	aues.		
Course Out	On successful completion	of the course the stu	udents sh	all be a	ble to	:			
Comes	1. Understand history, fundamentals,characteristics, and main benefits of NoSQL								
	databases. [Knowledge]								
	2.Comprehenddifferent	types of NoSQL	databas	es thro	ough	case s	studies.		
	[Comprehension]								
	3. Design different types	of NoSQL databases, a	add conte	ent, and	try qu	ieries o	n them.		
Course Content:									
course content.									
	NoSOL Database						No of		
Module 1	Architectures	Assignment	Knowled	ge		Cla	sses:6		
Topics: Transacti	ons: Concurrency and Int	egration, ACID, NoS	QL emerg	gence a	nd its	main fe	eatures,		
BASE for reliable	database transactions, A	chieving horizontal	scalabilit	ty with	data	base sh	arding,		
Brewers CAP theo	orem.								
Main Data model	s of NoSQL: Document D	ata Model, Key-Value	e Data Mo	odel, Co	lumn	ar Data	Model,		
Graph Data Mode	1.								
Modulo 2	Dogument data model	Assignment	Apolycic			N	o. of		
Mouule 2		Assignment	Allalysis			Clas	sses:6		
Topics: Character	ristics of Document Data	Model, Collection, Model, Collection, Model	Naming,	CRUD ()perat	ion, Qu	erying,		
Indexing, Replica	ation, Sharding, Consiste	ency, Update Consis	stency, R	lead Co	onsiste	ency, R	elaxing		
Consistency, Capp	bed Collection.								
	Document		D						
Module 3	Data Model Hands on:	Assignment	Program (Embodd	ming lod Lob	`		No. of		
	Mongo DB/Casandra		Linnear)	Cla	sses:7		
Topics:Install. Pe	erform CRUD (create, rea	ad. update and dele	ete) Oper	ations.	Aggr	egation	s. Data		
Models, Transacti	ions, Indexes, Security, Re	plication and Shardi	ng.	,	00	0	-,		
	Basics of Columnar and						No of		
Module 4	Graph Data Models	Assignment	Compreh	nend		Cla	sses:7		
Topics:									
Columnar Data	Model: Comparison of	columnar and ro	w-orient	ed sto	rage,	Colum	n-store		
Architectures: C-	Store and Vector-Wise,	Column-store inter	rnals and	d, Inse	rts/up	dates/	deletes,		
Indexing, Adaptiv	e Indexing and Database	Cracking.			a :	• • ·			
Graph Data Mode	el: Comparison of Relatio	onal and Graph Mod	eling, Pr	operty	Graph	Mode	Graph		
Analytics: Link an Topic specific pas	alysis algorithm- Web as a rank (Page Panking Cor	a grapn, Page Kank-M	iarkov ch	ain, pag	ge ran	Rondo	utation,		
distribution	se rallk (rage Nallkillg Col	inputation technique	S. ILEI ALIV	e proce	ssing,	nallu0	III Walk		

Learn MongoDB/Casandra by doing the following

- Master the art of queries, CRUD, schema design, and data aggregation
- Understand scalability using sharding and replication
- Write code, build real-world projects and learn hands-on with Cloud Labs

List of Lab Experiments

Lab Experiments are to be conducted on the following topics

Topic 1: Install MongoDB

Topic 2: Do lab experiment to perform CRUD (create, read, update and delete).

Topic 2: Demonstrate Aggregations in NoSQL with a real-life application.

Topic 3: Demonstrate different aspect of transactions in NoSQL by taking suitable problem.

Topic 5: Show making indexes in NoSQL with a suitable application.

Topic 6: Illustrate security features of NoSQL with a suitable problem.

Topic 6: Explain Sharding concept practically through a suitable example.

Targeted Applications(few are as given below):

1.Content Management systems are pretty common. All the comments on posts on social media are contained in a separate database. In MongoDB, a model has been designed to store such comments and is known as "MetaData and Asset Management".

2.MongoDB is widely used for storing product information and details by finance and e-commerce companies. You can even store the product catalogue of your brand in it.

3. MongoDB can also be used to store and model machine-generated data. For this, you can learn the "Storing Log data" document. This is known as operational intelligence.

List of MongoDB Tools

- MongoDB Compass.
- Mongo Management Studio.
- MongoJS Query Analyzer.
- Nucleon Database Master.
- NoSQLBooster.
- Studio 3T.
- MongoDB Spark Connector.
- MongoDB Charts.

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Project Works:

1. Create a database that stores road cars. Cars have a manufacturer, a type. Each car has a maximum performance and a maximum torque value. Do the following: Test Cassandras replication schema and Consistency models.

2. Shopping Mall case study using cassendra, where we have many customers ordering items from the mal land we have suppliers who deliver them their ordered items.

Text Books

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition,2019

https://bigdata-ir.com/wp-content/uploads/2017/04/NoSQL-Distilled.pdf

2. Bradshaw & Chodorow. *MongoDB: The Definitive Guide: Powerful and Scalable Data Storage*, 3rd ed., O'Reilly, 2019

https://www.oreilly.com/library/view/mongodb-the-definitive/9781491954454/

References

1. Pivert. *NoSQL Data Models: Trends and Challenges*, 1st ed. Wiley, 2018 <u>https://www.perlego.com/book/995563/nosql-data-models-trends-and-challenges-pdf</u>

2. Amit Phaltankar, Juned Ahsan, Michael Harrison, LiviuNedov, MongoDB Fundamentals A hands-on guide to using MongoDB and Atlas in the real world: 1st edition, Packt publications, 2020

https://www.perlego.com/book/2059687/mongodb-fundamentals-a-handson-guide-tousing-mongodb-and-atlas-in-the-real-world-pdf

More than 25% of changes are made from the earlier version. Changesare highlighted in bold.

Topics relevant to "SKILL DEVELOPMENT": Usage of un-structured data for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course	Course Title: Data Communications and Computer Net	works	L. P.						
Code:	Type of Course: Program Core - Theory		C	3	0	3			
CSE2011			`						
Version	1								
No.									
Course Pre-	NIL								
requisites									
Anti-									
requisites									
Course Description	This is the first course on data communication and cor thorough introduction to all the layers of compute approach. Application, Transport, Network, and data analysis wherever applicable. All-important concepts re and to face placement tests by an undergraduate stude course also covers necessary foundational topics pert course can be followed up with an advanced compute complete understanding of this domain.	nputer netw r network link layer pr equired to ta ent will be co aining to da er networks	following rotocols a ake up ad vered in t ta comm by the s	the the are ta vance this co unicat tuden	se giv top-d ught d cou urse. ions. t to g	ves a lown with urses This This get a			
The objective of the course is to familiarize the learners with the concepts of									
Course	Operating Systems and attain SKILL	, DEVE	LOPME	ЛЛ	thro	ough			
Objective	PARTICIPATIVE LEARNING techniques								
 Explain the concepts of Computer Networks and Working Principles of Application Layer and Transport Layer (Comprehension) Apply the Knowledge of IP Addressing and Routing Mechanism in Computer Networks. (Application) Discuss the functionalities of Data Link Layer (Comprehension) Explain the Basic Concepts of Data communication. (Comprehension) 									
Course									
Content:									
Module 1	Overview, Application and Transport Layers.	Assignment	Compreh	ensior	Sess	l 3 Sions			
Introductior	n: Computer Networks, Topologies, OSI Reference Model	l, TCP/IP mod	del. Princi	ples o	fNet	work			
Applications	s, The Web and HTTP, DNS—The Internet's Directory Se	ervice, Socke	t Progran	nming	: Crea	ating			
Network Ap	oplications. Introduction and Transport-Layer Service	s, Connecti	on-less T	ransp	ort:	UDP,			
Principles o	f Reliable Data Transfer, Connection-Oriented Trans	port: TCP, I	Principles	of C	onge	stion			
Control, TCF	P Congestion Control.								
Module 2	Network Layer	Assignment	Applicatio	on	1 Sess	2 sions			
Overview of Network Layer, Forwarding and Routing, The Data and Control Planes.The Internet Protocol (IP): IPv4, Addressing, IPv6, IPv4 Datagram Format, IPv4 Addressing, Network Address Translation (NAT), IPv6. Introduction Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Intra-AS Routing in the Internet, OSPF Routing Among the ISPs: BGP, Introduction to									
	Data Link	Assignment			1	0			
Module 3	Layer	J	Compreh	ensior	Sess	ions			
Introductior	n to the Link Layer, The Services Provided by the Link La	ayer, Error-D	etection	and -O	Corre	ction			
Techniques,	Parity Checks, Check summing Methods, Cyclic Redur	ndancy Chec	k (CRC),	Multip	ole Ac	cess			
Links and Pr	otocols. Switched Local Area Networks, Link-Layer Add	ressing and A	ARP, Ethe	rnet, I	_ink-L	ayer			
Switches, Vi	rtual Local Area Networks (VLANs),DHCP,UDP,IP and Eth	nernet.							
Module 4	Physical Layer with Data Communication	Assignment	Compreh	ensior	Sess)7 Sions			

Data communications: Components, Data Representation, Data Flow, Analog and Digital Signals, Periodic Analog Signals: Sine Wave, Phase, Wavelength, Time and Frequency Domains, Composite Signals, Bandwidth, Digital Signals, Transmission Impairment, Data Rate Limits: Noiseless Channel, Nyquist Bit Rate, Noisy Channel: Shannon Capacity, Performance: Bandwidth, Throughput, Latency (Delay), Bandwidth-Delay Product, Parallel/Serial Transmission, Multiplexing: Frequency-Division Multiplexing, Wavelength-Division Multiplexing, Synchronous Time-Division Multiplexing.

Targeted Application & Tools that can be used:

- 1. Instant Messaging
- 2. Telnet
- 3. File Transfer Protocol

4. Video Conferencing

Project work/Assignment:

Project Assignment:

Assignment 1: Data Flow Directions

Assignment 2: Types of Topology

Textbooks:

T1. James F. Kurose, Keith W. Ross, *"Computer Networking A Top down Approach",* 8th Edition, Pearson, 2021.

T2. Behrouz A. Forouzan, "Data Communications and Networking", 6th Edition, Tata McGraw-Hill, 2021. References:

R1. William Stallings: "Data and Computer Communication", 10th Edition, Pearson Education, 2017.
 R2. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2012.

Web references:

Digital Learning Resources (Library Resources)

W1. <u>https://puniversity.informaticsglobal.com/login</u> https://nptel.ac.in/courses/105106053

Topics relevant to "Skill Development":

Virtual Local Area Networks (VLANs), DHCP, UDP, IP and Ethernet **for Skill Development through Participative Learning techniques**. This is attained through the assessment component mentioned in the course handout.

Course Code: CSE 3028	Course Title:Blockchain security and performances Type of Course:Program Core Theory and Laboratory Integrated				2	2	3
Version No.	1.0						
Course Pre- requisites	Blockchain Technology and Ap	plications					
Anti-requisites	NIL						
Course Description	The purpose of this course is blockchain based systems. Th security, risks, methods, and augmenting the student's abilit The associated laboratory pro enhances the ability to visuali various tools and techniques.	to introduce the stude e course provides a co best practices. The c ty to tackle security rela- vides an opportunity to ize the real-world prob	ents to se omprehen ourse de ated issue to validat olems in	ecurity a sive und velops c es of bloc te the co order to	nd priva erstand ritical t ekchain oncepts provide	acy techn ing of blo hinking s taught as e a solutio	iques in ockchain skills by well as on using
Course Out Comes	On successful completion o CO1:Comprehend security and CO2: Apply cryptographic tech CO3: Implement secure transa CO4: Apply security technique world problems	f the course the stud l performance perspect hniques to enhance sec ction models. es to blockchain system	lents sha ive of blo urity in b as that pro	all be ab ockchain lockchai	le to: technol n based utions t	ogy. systems o some re	al
Course Outcome	The objective of the course CSE3028_BLOCKCHAIN SEC Experiential Learning techr	is to familiarize the l URITY & PERFORMA hiques.	earners NCE and	with the d attain	e conce Emplo	epts of yability t	hrough
Course Content:							
Module 1	Fundamentals of Privacy And Security Techniques In Blockchain	Assignment	Progran	nming		9 Se	essions
Introduction to Bloc of blockchain threat vulnerabilities, N techniques: Mixing Multi-Party Compu Based Smart Contra	kchain Technology, Cyber Sect ts and vulnerabilities: Client vul letwork vulnerabilities, S g, Anonymous Signatures, H tation, Non-Interactive Zero-H cts.	urity Threats and incide alnerabilities, Consensumart Contract vu Iomomorphic Encrypt Knowledge (NIZK) Pro	ents on bl 1s Mecha Ilnerabili ion, Att 100f, TEl	ockchain nism vu ties; F ribute-Ba E Based	networ Inerabil Privacy ased Er Smart (ks, Categ ities, Min and acryption, Contracts,	orization ing Pool security Secure Game-
Module 2	Cryptography	Assignment	Program	nming		12 se	essions
Cryptography, Pul a Random Numb Generating a Pu Cryptographic Has Protocol	blic Key Cryptography and C er, Public Keys, Elliptic Cu blic Key, Elliptic Curve sh Function: Keccak-256, Etl	Cryptocurrency, Priva urve Cryptography, Libraries, Cryptog hereum Address and D	Elliptic graphic Formats	Genera Curve Hash I , Inter E	ting a I Arithm Functio xchang	Private K letic Opeons, Ether e Client	ey from erations, ereum's Address
Module 3	Transaction Model	Assignment	Program	nming		9 ses	sions
Topics: Blockchai Properties in Bloc Properties: Cons Spending attacks, Properties of Bloc Algorithms, BFT Authority, Proof o	n Level Transaction Models ckchain, Security and Priva istency, Tamper-Resistance Resistance to the Consensu ckchain: Unlinkability, Con based Consensus Algorithm of Reputation, Comparison of	: UTXO, Account-lacy Requirements of e, Resistance to D as attacks, Pseudony nfidentiality of Trans ms, Sleepy Consens of Consensus Algorith	Based O f Online DoS att mity; A sactions us, Pro hms	nline Tr Transa acks, I dditiona and Da of of E	ansacti actions, Resista al Secu ta Priv lapsed	on Mode Basic S nce to I rity and acy, Co Time, F	I, CAP Security Double- Privacy nsensus Proof of

Targeted Application & Tools that can be used:

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

After completion of each module a programming based Assignment/Assessment will be conducted. On completion of Module 3, student will be asked to develop a Project.

Textbook(s):

T1. Antonopoulos, Andreas M., and Gavin Wood. Mastering ethereum: building smart contracts and dapps. O'reilly Media, 2018.

T2.Howard E. Poston, Blockchain Security from the Bottom Up: Securing and Preventing Attacks on Cryptocurrencies, Decentralized Applications, NFTs, and Smart Contracts, John Wiley & Sons, 2022.

References

R1.Parisi, Alessandro. Securing Blockchain Networks like Ethereum and Hyperledger Fabric: Learn advanced security configurations and design principles to safeguard Blockchain networks. Packt Publishing Ltd, 2020.

Web Based Resources and E-books:

Digital Learning Resources (Library Resources)

W1: NPTEL : https://nptel.ac.in/courses/106/104/106104220/#

W2: UDEMY : https://www.udemy.com/course/build-your-blockchain-az/

W3 : Book

https://www.google.co.in/books/edition/Blockchain By Example/ci59DwAAQBAJ?hl=en&gbp v=1

W4 : Book

https://www.insiderintelligence.com/insights/blockchain-technology-applications-use-cases/

W6: https://www.analyticsinsight.net/real-world-applications-of-blockchain-technologies/

W7:PU Library Link : https://puniversity.informaticsglobal.com/login Or : http://182.72.188.193/

Topics relevant to "SKILL DEVELOPMENT": Real time data analysis used for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:CSE3023	CourseTitle:Distrib	uted Ledger					
	Technology	U	I	L-P-C	2	2	3
	TypeofCourse:Disci	pline Elective					
Version No.	1.0						
Course Pre-requisites	Foundations of Block	chain Technology					
Anti-requisites	NIL						
CourseDescription	The purpose of the c distributed ledger te of distributed ledger smart contract. With a good knowle distributed ledger ted	ourse is to provid chnologies as well r techniques like dge in the fundar chnologies, the stu	le the fu l as to o Ethere mental dent ca	indament explore v eum, Hyp concepts in gain pra	tal cor arious er led of ble actical	icepts s aspec lger an ock ch l exper	of ts 1d ain an ience i
	implementing them,	enabling the stu	dent to) be an e	effectiv	ve cha	in cod
	creator.						
Course Objective	The objective of the o of Distributed Ledge Experiential Learni	course is to familia e r Technology and ng techniques .	arize th d attair	ie learner i Skill De	s with velop	n the co ment (oncept throug
Course Out Comes	On successful comp	letion of this cours	se the s	tudents s	hall be	e able t	:0:
	 Understand a technology (Know Understand t Apply the lease (Application). 	wledge) he working of Sma rning of solidity ar	art Cont nd de-c	tracts (Kr entralized	iowlec d apps	dge) s on Eth	ıereun
Course Content:							
Version No.	1.0						
Module 1	Introduction to Distributed Ledger Technologies	Assignment	Data (Collection	1	No Sessio). of)ns: 09
Topics:	0						
What is Distributed Le Distributed Nature of th Bitcoin, Ethereum; Perr Key Advantages of DLT, Assignment: Permissio	edger Technology (D) e Ledger, Consensus M nissioned Distributed Challenges and Risks onless Distributed Led	LT) and How Do Aechanism,Open/I Ledgers :, Ripple, I related to DLT, Ap gers/ Permissione	es it v Permiss Fabric (oplicationed Distr	vork? Ke sionless D (Hyperled ons of DL' ibuted Le	y Fea)istrib lger Pi T. edgers	tures uted L roject)	of DL1 edgers , Corda
Module 2	Introduction to Hyperledger	Assignment	Writir	ıg Task		Sessio	No. o ons: 09
Topics: What is Hyperledger? Hy of Hyperledger design, transaction, Hyperledge Assignment: Hyperledge	yper ledger frameworl , reference architect r Composer. er Fabric Design	ks, Hyperledger Fa ure, run time ar	abric- C chitect	omponen ure, the	its des journ	ign, pr ey of	inciple sampl
Module 3	Designing a Data and Transaction Model	Assignment	Progr	amming	Task	No Sessio). of)ns: 10
Topics: Starting the chaincode d	levelopment, Compilin	ng and running ch	aincod	e, Installi	ng and	d insta	ntiatin

chaincode, Invoking chaincode, Creating a chaincode, The chaincode interface, setting up chaincode file, Access control – ABAC- Registering a user, Enrolling a user, Retrieving user identities and attributes in chaincode, Implementing chaincode functions, Defining chaincode assets, Coding chaincode functions Creating an asset, Testing.

Assignment: Creating Chaincode and interfacing among them.

Module 4	Applications of DLT	Case Study	Discussion	No. of Sessions: 08
Topics: Applications: Inter Future of Blockcha Case study: Manag	net of Things, Medical Ro in, Alt Coins. ing the Metal and Mining	ecord Managemen	nt System, Domain Nan Chain with Hyperledge	ne Service and r Fabric
 List of Laboratory 1. Level 1: Cra Level 2: Crea 2. Level 1: De Level 2: Depo 3. Level 1: Cra Level 2: Crea 4. Level 1: Te Level 2: Test a 5. Level 1: Ad Level 2: Add r 6. Level 1: Cra Level 2: Progr 7. Level 1: Cra Level 2: Creat 8. Level 1: Sir Level 2: Com 9. Level 1: Use Level 2: Use 0 10. Level 1: Bu Level 2: Case 12. Level 1: Cra Level 2: Case 12. Level 1: Cra 	7 Tasks: eate a Simple Blockchain i te a complex Blockchain in posit oneEther in your Metal eate Single account. te multiple accounts and r st any one property of cry all the properties of crypto d a transaction to a block nultiple transaction to a block nultiple transaction to a b eate a new file 'WorkingW 'am to write a solidity pro eate a new file 'SendMone e new transaction with sig ngle Error Handling using plex exception Handling u e Geth to Implement Priva Geth to Implement public ild Hyperledger Fabric Clif Hyperledger Fabric Serv ild Hyperledger Fabric Wi study on Hyperledger Fabric Wi study Study Wi Study Wi S	in any suitable pro n any suitable prog etaMask accounts. Mask accounts make a transaction optographic hashing chain blockchain VithVariables.sol' in ogram with require ey.sol' in solidity gning solidity the Ethereum Block Ethereum Block Cli ient Application. fer/network Applic the Smart Contract. oric chain being used in chain Application	gramming language. gramming language a between these accoun g n Solidity ed variables c Chain. hain. cation.	ts world.
Targeted Applica Meta mask, Docker	tion & Tools that can be • and Docker compose, Go	used: Programming lan	guage	
Project work/Ass Topics: 1. Permission 2. Chaincode- Textbook(s): T1. Nitin Gau with Hyperlee	ignment: ed Distributed Ledgers <u>Creation and interface</u> , Hands-on blockchain wi dger Fabric and Compose	th Hyperledger_ B r, Packt,2020.	uilding decentralized a	pplications
References R1. Andreas M Blockchain,Or R2. hyperledg R3. D. Dresch R4. Arvind N	4. Antonopoulos, "Masteri eilly,2017 er-fabricdocs Documenta er, Blockchain Basics. Apr	ng Bitcoin- Progra tion, Release Mast ess, 2017. L Edward Felten 4	amming" - The Open er, 2021. Andrew Miller and Stev	en Goldfeder

R4. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Other Resources

- Distributed Ledger Technology (DLT) and Blockchain, Fintech
- NPTEL online course : <u>https://nptel.ac.in/courses/106/104/106104220/</u>
- Udemy: <u>https://www.udemy.com/course/build-your-blockchain-az/</u>

• EDUXLABS Online training :<u>https://eduxlabs.com/courses/blockchain-technologytraining/?tab=tab-curriculum</u>

E-Book Links:

T1. https://presidencyuniversityin-

my.sharepoint.com/:b:/g/personal/sampath_ak_presidencyuniversity_in/EXc_hRKtg1dOu6Gu Nvv0MZMBQ_Zo0lpNJyXsJ4IANfcJdQ?e=YAvywC

R1. <u>https://presidencyuniversityin-</u>

my.sharepoint.com/:b:/g/personal/sampath ak presidencyuniversity in/EUMg4-

zAc3dGgl1RWeDDJR8B4SCqMMeO0lIzun51qbDlTw?e=ObRwKr

R2. <u>https://presidencyuniversityin-</u>

my.sharepoint.com/:b:/g/personal/sampath_ak_presidencyuniversity_in/EWrs6M9zaYpJhvf9R I2jRaUB9PIJhXmQfZC5vdg284oVlg?e=aD9RgX

Topics relevant to "Skill Development": Applications of DLT is used for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course	Course Title: Smart Contract and Solidity		2	2	3				
Code:	Type of Course: Integrated	L- P- C							
CSE 3020									
Version	1								
NO.	Decise of Mathematics and any Dragramming Language								
Dro-	Basics of Mathematics and any Programming Language								
requisites									
Anti-	NONE								
requisites									
Course Descriptio n	Solidity is an object-oriented, high-level language for imp Smart contracts are programs which govern the behav Ethereum state. Solidity is a curly-bracket language desig Virtual Machine (EVM). It is influenced by C++, Python and Virtual Machine (EVM) and assembly (low level langu	olement iour of gned to d JavaS	ing sm accou target cript. T	nart con nts with the Eth The Eth and Ic	ntracts. hin the nereum ereum				
	blockchain emissions send vs transfer methods scoping and more								
Course	The objective of the course is to familiarize the learners with the concents of Smart								
Objective	Contract and Solidity and attain EMPLOYABILITY through Experiential								
,	Learning Techniques.								
Course Out Comes	CO 1 :Understand the fundamentals of computational Element of the Blockchain Technology CO 2: Implementuser-defined operations of arbitrary complexity that are not possible through plain cryptocurrency protocols C.O 3: Exhibitbest practices for designing solutions with smart contracts using Solidity and Remix IDE Module: 1: Introduction to Smart Contract[14 Hrs - L[14] + T[00]] [Knowledge]								
	A Simple Smart Contract, Blockchain Basics, Machine, Versioning, Remix, npm / Node.js, Do Building from Source, CMake options.	The E cker, E	Ethere Binary	eum \ Pack	/irtual ages,				
	Module: 2: Solidity in Depth [22 Hrs – L[08] + T[02] + P[12]] [Application] Layout of a Solidity Source File, Structure of a Contract, Types, Units and Globally Available Variables, Expressions and Control Structures, Contracts, Solidity Assembly, Miscellaneous, Solidity v0.5.0 Breaking Changes								
Course Content:	Module 3: Contract Metadata & Contract ABI Specification [22 Hrs – L[08] + T[02] + P[12]] [Comprehension]] Encoding of the Metadata Hash in the Bytecode Interface Generation and NatSpec, Usag Verification, Basic Design, Function Selector Types, Design Criteria for the Encoding, Form Encoding, Function Selector and Argument Enc of Dynamic Types, Events, JSON, Strict E standard Packed Mode	e, Usa e for , Argu nal Spe coding Encodi	ge fo Sou ment ecifica , Exa ng M	r Auto urce Enco ation o mples lode,	matic Code oding, of the , Use Non-				

Module 1	Introduction to Smart Contract	TEST-1	Fundaments of Smart Contract and Solidity	12Sessions						
Topics:										
Module 2	Solidity in Depth	TEST-1	Case studies / Case let	12 Sessions						
Topics:										
Module 3	Contract Metadata & Contract ABI Specification	Endterm lab Exam	Implementing Applications	14 Sessions						
Topics:										
List of Labo	pratory Tasks:									
Develop a	Develop a complex voting application									
Build blind	l auction App									
Create saf	e remote purchase									
Develop micropayment channel										
Creating Decentralized Apps with Solidity										
Store Patient Health Records using Solidity										
Implement Supply Chain Management App using Solidity										
Targeted Application & Tools that can be used										
NetBeans										
	Projec	t work/Assignment:								
Assignmen	t: Quiz and Group Project									
Text Book										
T1 Solidity	Smart Contracts: Build DApps In Et	thereum Blockchain-	Rangel Stoilov							
T2Masterin	ng Blockchain Programming with So	olidity- Jitendra Chi	ttoda							
References	i Jitu Dua sua na sina Sasantiala. A ka		ild and at a star star for Ft	h						
blockch	nain	iginner's guide to bu	and smart contracts for Et	nereum and						
R2 Ha	Inds-On Smart Contract Dev	velopment with S	Solidity and Ethereum	From						
Funda	mentals to Deployment- Book	by David H. Hoov	ver. Kevin Solorio, and F	Randall						
Kanna				(diridair						
ook linkR1:	NA									
E book link	R2: NA									
Web resources: Udemy course - https://www.udemy.com/course/the-complete-solidity-course-										
blockchain-	zero-to-expert/			-						
Coursera C	Course https://www.coursera.c	org/learn/smarter-co	ontracts/							

Topics relevant to "SKILL DEVELOPMENT": Encoding of the Metadata Hash in the Bytecode, Usage for Automatic Interface Generation and NatSpec, Usage for Source Code Verification, Basic Design, Function Selector, Argument Encoding, Types, Design Criteria for the Encoding, Formal Specification of the Encoding, Function Selector and Argument Encoding for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE3020	CourseTitle:Blockch Applications TypeofCourse:Progra	ain Technology and amCore	L-P-C	3 0		3
Version No.	1.0					
Course Pre-	Fundamentals of Block	chain Technology				
requisites						
Anti-requisites	NIL					
CourseDescription	The purpose of the or technology with speci Financial system, trac Healthcare sectors and technology, Students w with them.	course is to provide fic focus on industria de/supply chain ma l Insurance system. W will learn how these s	an introdu al application nagement, a Vith the knov system are b	ction to nslike B gricultu vledge o uilt, hov	Block lockcha re ind of block w to in	cchain ain in ustry, cchain teract
Course Objectives	The objective of the co Blockchain Technolo through Participative Le	ourse is to familiarize ogy and Application earning techniques.	the learners 1 s and attai	with the n Skill [e conce Develo j	pts of: pment
Course OutComes	Onsuccessfulcompleti	ionofthiscoursethestu	dentsshallbe	ableto:		
	 Understand the Explain the me transactions (Comp Explore the use Illustrate the re 	e concepts of Blockcha thods for verification prehension). e the Ethereum progra ole ofblockchain in va	ain technolog and validatic amming (App rious domain	y (Know on of Bito olication (Comp	vledge) coin). rehensi). ion).
CourseContent:						
Module 1	Introduction to Blockchain	Quiz	Knowledge quiz on Cryptog Hash Functi	based	N Class	lo.of es:8
Topics: Incentives and Exchanges, Payr and Data Structures,	nd proof of work. Simp nent Services, Transacti Digital Signatures.	le Local Storage, Hot ion Fees, Cryptograph	and Cold Sto nic Hash Fund	rage, Or ctions, H	line W ash Po	/allets inters
Module 2	Bitcoin	Assignment	Bitcoin n pools	ining	N Class	lo.of es:10
Bitcoin Mechanics: B blocks, The Bitcoin n Bitcoin mining: The Mining incentives an	Bitcoin transactions, Bitc etwork, Limitations and task of Bitcoin miners, N Id strategies.	coin Scripts, Application d improvements. Mining Hardware, Ene	ons of Bitcoir	i scripts, ition, Mi	, Bitcoi ning po	n ools,
Module 3	Ethereum	contract using solidity language	gEthereum Ecosystem	.5 01	N Classe	lo.of es:10
The Ethereum Netwo Languages: Runtime Solidity Language.	ork – Components of Et Byte Code, Blocks and I	hereum Ecosystem – 1 Blockchain, Fee Sched	Ethereum Pro ule – Suppor	ogramm ting Pro	ing tocols ·	-
Module 4	Blockchains in Business	Case Study	Conduct a c study on he BaaS is ado industries.	ase ow pted in	N Classo	lo.of es:10
Topics: Blockchain i Blockchain in Health	n Supply Chain - Blockc .care- Blockchain in Fina	hain in Manufacturing ancial Industry	g - Blockchaiı	1 in Auto	omobile	es -
List of Laboratory T	asks: NA					

Targeted Application & Tools that can be used:

- Etherum Remix online& Ganache
- Solidity programming language

Project work/Assignment:

1. Calculate the 'number of ethers' for the transaction of gas limit for the scenario in which the sender sets the gas limit to 50,000 and a gas price to 20 gwei.

- 2. Represent the EthereumMerkley Tree for the given list of Transactions.
- 3. Create Survey report of various types of Blockchain and its real time use cases.

Textbook(s):

1. BellajBadr, Richard Horrocks, Xun (Brian) Wu, "BlockchainBy Example: A developer's guide to creating decentralized applications using Bitcoin, Ethereum, and Hyperledger", Packt Publishing Limited, 2018.

References:

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart contracts explained", 2nd Edition, Packt Publishing Ltd, March 2018. **Weblinks:**

- Udemy: <u>https://www.udemy.com/course/build-your-blockchain-az/</u>
- NPTEL online course : <u>https://nptel.ac.in/courses/106/104/106104220/#</u>

Textbook(s):

1. BellajBadr, Richard Horrocks, Xun (Brian) Wu, "BlockchainBy Example: A developer's guide to creating decentralized applications using Bitcoin, Ethereum, and Hyperledger", Packt Publishing Limited, 2018.

https://www.google.co.in/books/edition/Blockchain_By_Example/ci59DwAAQBAJ?hl=en&gbpv=1

Topics relevant to "SKILL DEVELOPMENT": Ethereum, Blockchain in Manufacturing for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:CSE2019	CourseTitle: Founda Technology TypeofCourse:Progra	itions of Blockcha	ain only	L-P-C	3	0	3
Version No.	1.1						
Course Pre- requisites	Networks						
Anti-requisites	NIL						
CourseDescription	The purpose of the onBlockchaintechnolog like types of Blockchain With a good knowledge the mechanism of Bitce	course is to pr gyand explore vari n, Bitcoin and Ethe e of block chain tee	ovide the ious aspect ereumBlo chnology,	e funda cts of Bl ckchain the stu	ament ockch i platfo dent c	al kno ain tech orm. an unde	wledge inology erstand
Course Objectives	The objective of the c of Foundations of B through Participative Le	course is to famili lockchain Techn earning techniques	arize the lology an	learner nd attai	rs with in Skil	n the co I Develo	oncepts opment
 Understand the concepts of anemerging blockchain technology(Knowledge). Infer the knowledge about consensus protocols (comprehension). Explore Bitcoin payment methods(comprehension). Develop simple smart contract(comprehension). 							
CourseContent:							
Module 1	BlockchainBasics	Quiz	Knov quiz ledge	vledge on dist er	based ribute	d Ses s	10 sions
Topics: The history limitations of Block Blockchain: Distribut	of Blockchain: Blockcl cchain, Tiers of Block ted ledgers, Public Bloc	hain, Generic eler chain technology kchain, private Blo	nents of , Feature ockchain,	a block s of B shared	kchain lockch ledge	, Benef ain. Ty r.	its and /pes of
Quiz:Knowledge bas	ed quiz on distributed	ledger					
Module 2	Distributed Consensus	Assignment	PoW			Ses	08 sions
Topics: Consensus: (Blockchain.	Consensus mechanism,	Types of consensu	ıs mechar	nisms, C	Conser	isus in	
Assignment: Write a	an assignment on PoW	consensus mechar	nism				
Module 3	Introducing Bitcoin	Case study	Bit	coin ne wallet	twork s	Ses	10 sions
Topics: Bitcoin definit Bitcoin payments.	ion, Digital keys and ad	ldresses, Transacti	ions, mini	ng, Bitc	oin ne	etwork v	wallets,
Case Study: Conduct :	a study about hot bitco	in wallets					
Module 4	Smart contracts	Case study	how smar	to exec t contra	ute act	Ses	10 sions
Topics:History, Defir ecosystem, Smart co Case Study: Create a and show how to exec	nition, Introduction to E ntracts. simple smart contract f cute.	thereum,Ethereur or User identity m	n networ anageme	k,Comp nt using	onent g Solid	s of Eth ity lang	ereum guage

Targeted Application & Tools that can be used:

- Ethereum Remix
- MetaMask
- Truffle
- Ganache

Textbook

T1.Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart contracts explained", 2nd Edition, Packt Publishing Ltd, March 2018. **Weblinks:**<u>Mastering Blockchain - Google Books</u>

References

R1.Andreas M. Antonopoulos , "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly Media Inc, 2015.

 $\ensuremath{\textbf{R2.Blockchain}}$ by Melanie Swa, O'Reilly .

Weblinks:

1. <u>Blockchain A-Z[™]: Learn How To Build Your First Blockchain | Udemy</u>

2. <u>https://www.coursera.org/learn/wharton-cryptocurrency-blockchain-introduction-digital-currency</u>

3. <u>https://www.coursera.org/specializations/introduction-to-blockchain</u>

4. <u>https://presiuniv.knimbus.com/user</u>

Text book of Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart contracts explained, 2nd Edition, Packt Publishing Ltd, March 2018.

https://www.google.co.in/books/edition/Mastering_Blockchain/3ZlUDwAAQBAJ?hl=en&gbpv=1_

Topics relevant to "SKILL DEVELOPMENT":

Bitcoin and Smart Contracts for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Machin	e Learning Techniques								
CSE3008	Type of Course: 1] D 2] L	Discipline Elective aboratory integrated		L- P- C	2	2	3			
Version No.	1.0				l		<u> </u>			
Course Pre-	CSE3001 Artificial Int	telligence and Machine L	.earning							
requisites	-									
Anti-requisites	[List the Anti -requis	ist the Anti -requisites of the course]								
Course Description	Machine Learning alg Siri, Google's self-dr machine learning teo learning, Perceptron from Gaussian mixtu both the theoretical learning methods. La developing intelligen	gorithms are the key to d iving cars etc. This count chniques such as Regress learning, Unsupervised ire models and learning foundations as well as ab sessions complement t systems for real life pro	evelop in rse intro ion learn learning to detect the esse the lect oblems.	ntelligent duces th ing, Baye g, Compe t outliers ential alg ures and	system e conce sian lea titive le . Course orithms enable	is such as epts of arning, E earning, e lecture s for the e the stu	3 Apple's the core nsemble learning 25 covers 2 various idents in			
Course Objectives	The objective of the Learning Techniques techniques.	course is to familiarize the sand attain Skill Devel	he learne lopment	ers with t throug	he conc h expe i	cepts of riential	Machine Learning			
Course Out Comes	On successful comple 1] Apply advanced su [Application] 2] Produce machine I learning algorithms [3] Create predictive r 4] Employ advanced learning and outlier o 5] Implement machir [Application]	etion of the course the st pervised machine learnin learning models with bet Application] models using Perceptron unsupervised learning alg detection[Application] ne learning based intelligo	udents sl ng methc ter predic learning gorithms ent mode	nall be ab ods for pr ctive per algorithn for clusto els using l	ile to: edictive formand ns[Appl ering, co Python	e modelin ce using ication] ompetitiv libraries.	ng. meta ve			
Course Content:										
Module 1	Supervised Learning	Assignment	Program Keras/Sk	iming usi dearn	ng	of C	No. Classes 2 P – 12			
Topics: An ove Engineering -Da functions; Polyn function; Bayes continuous feat Machines – soft	rview of Machine Lea ata Imputation Meth omial Regression; Log ian Learning – Bayes ures, Naïve Bayes for margin and kernel tri	rning(ML); ML workflow nods; Regression – intra gistic Regression; Softma Theorem, estimating co r supervised learning; Ba cks.	; types o oduction ax Regres nditional ayesian E	f ML; Ty ; simple ssion wit probabil Belief net	pes of f linear h cross lities fo works;	features, regressi entropy r catego Suppor	Feature ion, loss / as cost rical and rt Vector			
Module 2	Ensemble Learning	Assignment	Program Keras/Sk	iming usi dearn	ng	of C	No. Classes 3 P-4			
Topics: Ensemb	le Learning – using s	ubset of instances – Bag	gging, Pa	sting, us	ng sub	set of fe	atures –			
random patches	and random subspace	es method; Voting Classif	fier, Rand	lom Fore	st; Boos	sting – A	daBoost,			
Gradient Boostir	ng, Extremely Random	ized Trees, Stacking.					No			
Module 3	Perceptron Learning	Assignment /Quiz	Program Keras/Sk	iming usi klearn	ng	of C	lasses P-2			
Topics: Percept Units, logical co	r on Learning – from	n biological to artificial ceptrons, common activ	neurons ation fun	, Percep Ictions –	trons, I sigmoi	Linear T d, tanh.	hreshold relu and			

softmax, common	loss functions,	multi-layer	Perceptrons	and	the	Backpropagation	algorithm	using
Gradient Descent.								

Module 4	Unsupervised Learning	Assignment	Programming using Keras/Sklearn	No. of Classes L-6 P -6
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Topics: Unsupervised Learning – simple k Means clustering- simple and mini-batch; updating centroids incrementally; finding the optimal number of clusters using Elbow method ; Silhoutte coefficient, drawbacks of kMeans, kMeans++ ; Divisive hierarchical clustering – bisecting k-means, clustering using Minimum Spanning Tree (MST) Competitive Learning - Clustering using Kohenen's Self Organising Maps (SOM), Density Based Spatial Clustering – DBSCAN; clustering using Gaussian Mixture Models (GMM) with EM algorithm ; Outlier Detection methods – Isolation Forest, Local Outlier Factor(LOF)

List of Laboratory Tasks:

Experiment N0 1: Methods for handling missing values

Level 1: Given a data set from UCI repository, implement the different ways of handling missing values in it using Scikit-learn library of Python

Level 2: Implement one of these methods using a custom defined function in Python.

Experiment No. 2: Data Visualization

Level 1 Perform Exploratory Data Analysis for a given data set by creating Scatter Plot, Pair Plot, Count Plot using Matplotlib and Seaborn

Level 2 Create Heat Maps, WordCloud

Experiment No. 3: Regression learning

Level 1 Given a data set from UCI repository, implement the simple linear regression algorithm and estimate the models parameters and the performance metrics. Plot the learning curves.
 Level 2 Implement the polynomial regression algorithm. Compare the learning curves of Polynomial and Linear Regression.

Experiment No.4: Logistic regression

Level 1 Write custom code for generating the logistic/sigmoid plot for a given input Level 2 Given a data set from UCI repository, implement the Logistic regression algorithm. Estimate the class probabilities for a given test data set. Plot and analyze the decision boundaries.

Experiment No.5: Bayesian Learning

Level 1 Given a data set from UCI repository, implement a classification model using the Bayesian algorithm

Experiment No.6: Support Vector Machine(SVM)

Level 1 Given data sets from UCI repository, implement a linear SVM and a non-linear SVM based classification model.

Experiment No. 7: Ensemble Learning

Level 1 : Implement Ensemble Learning algorithms such as Bagging, Pasting and Out-of Bag Evaluation Level 2 : Random Patches and Random Subspace Method

Experiment No. 8: Ensemble Learning Level 1 : AdaBoost and Gradient Boosting, Stacking

Experiment No. 9: Perceptron Learning

Level 1 : Implement the Perceptron Classifier Level 2 : – An Image Classifier Using the Sequential API of Keras Experiment No. 10: Unsupervised Learning

Level 1 : K-means – simple and mini-batch. Finding the optimal number of clusters using Elbow method and Silhoutte Coefficient . Compare the inertia of both as k increases. Tuning the hyperparameter 'k' using GridSearchCV.

Level 2 : – Using clustering for Image segmentation and Preprocessing. Kmeans++

Experiment No. 11: Density Based Clustering

Level 1 Implement DBSCAN – clustering using the local density estimation. Perform hard and soft clustering for new instances.

Experiment No. 12: Outlier Detection

Level 1 Outlier Detection using Isolation Forest and Local Outlier Factor

Targeted Application & Tools that can be used :

1. Execution of the ML algorithms will be done using the Google's cloud service namely "Colab", available at https://colab.research.google.com/ or Jupyter Notebook.

2. The data sets will be from the bench marking repositories such as UCI machine learning repository available at : <u>https://archive.ics.uci.edu/ml/index.php</u>

3. Laboratory tasks will be implemented using the libraries available in Python such as Scikit learn, matplotlib, seaborn, perceptron and the deep learning framework namely Keras.

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Students can be assigned a mini project to develop a machine learning application for real-life problems in various domains such as health care, business intelligence, environmental modeling, etc.

Text Book

There are a number of useful textbooks for the course, but each cover only a part of the course syllabus. Following is an indicative list of textbooks.

1. Aurélien Géron, "Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow", Oreilly, Second Edition, 2019.

2. Andreas C Muller, Sarah Guido, "Introduction to Machine Learning with Python : A Guide for Data Scientists", Oreilly, First Edition, 2018

3. Giuseppe Bonaccorso, "Machine Learning Algorithms: A reference guide to popular algorithms from data science and machine learning", Packt Publishing, 2017.

References In references apart from the books and web links, mention a few standards & Hand books relevant to the Laboratory tasks used by the professionals.

1. Tan P. N., Steinbach M & Kumar V. "*Introduction to Data Mining*", Pearson Education, 2016.

2. https://towardsdatascience.com/machine-learning/home

MITopencourseware: <u>https://ocw.mit.edu/courses/6-0002-introduction-to-computational-thinking-and-data-science-fall-2016/resources/lecture-11-introduction-to-machine-learning/</u>
 <u>https://onlinecourses.nptel.ac.in/noc21_cs85/preview</u>

Topics relevant to "Skill Development ": Assignment implementations in software, batch wise presentations are used for developing **Skill Development through Experiential Learning techniques.** This is attained through assessment component mentioned in course handout.

Course Code:			Course Title: Microprocessor and							
CSE254			Microcontroller Laboratory	I-P-C	0	2	1			
			The of Course Laboratory Only							
Version No.			2.0							
Course Pre-reg	uicito		2:0							
course rre-req	uisites	•								
Anti-requisites			NIL							
Course Descrip	tion		This course introduces the assembly level lan The course introduces the core concept of r in students the assembly language programm applications of microprocessor. It gives a pra- perform interfacing peripheral devices with lab focusses mainly on software and few microprocessor	nguage pro microproc ning skills actical tra a 8086 mi v interfac	ogrami essor a along v ining to cropro ing pr	ming of and dev with rea o stude ocessors ograms	8086. velops I time nts to s. This with			
Course Objective			The objective of the course is to familiarize t of Microprocessor and Microcontroller Labo DEVELOPMENT through EXPERIENTIAL LEAF	he learne pratory a RNING teo	rs with nd atta hnique	n the co ain SKIL es.	ncepts L			
Course Outcome			 (i) Learn 80x86 instruction sets and gain the knowledge on how assembly language works. (ii) Implement programs written in 80x86 assembly language. (iii) Explore functioning of hardware devices and interfacing them to x86 family. (iv) Implement basic 8051 microcontroller programs. 							
Course Content	t:									
1.	:	W op nu	rite an Assembly Language Program (ALP) to p perations like Addition, subtraction, Multiplica umbers	perform A ition and I	rithme Divisio	etic n on tw	0			
2.	:	W	rite an ALP to add two Binary Coded Decimal	(BCD) nu	mbers					
3.	:	W ar	rite an ALP To move 8-bit contents of array front other memory location	om one m	iemory	/ locatio	on to			
4.	:	W	rite an ALP to find the sum of N consecutive n	umbers						
5.	:	a. Bu b.	Write an ALP to sort N numbers in ascendi Ibble sort technique Write an ALP to print N Fibonacci numbers	ng/descer	nding c	order us	sing			
6.	:	W se	rite an ALP to search a key element in a list c arch	of numbe	rs usin	g linear				
7.	:	a. sc b.	Write an ALP to read the current time from reen Write an ALP to check whether a string is P	n the syste	em and e or no	d displatot	y on			
8.	:	Write	e an ALP to search a key element in a list of r	numbers ι	ising b	inary se	earch			
9.	:	Write	e an ALP to read the current date from the sys	tem and o	display	on scre	een			

10.	:	Write an ALP to read two strings from the keyboard and check whether they are
		equal or not.
	_	
8255 Interfaci	ng Exp	periments
11.	:	Design and develop an ALP to drive a Stepper Motor interface and rotate the
		rotor in specified direction (clockwise or anti-clockwise) by N steps
12.	:	Design and develop an ALP program using Logic Controller to multiply (X*Y)
8051 Microco	ntrolle	er Experiments
13.	:	Design and develop 8051 ALP program to store values in registers and swap
		the contents of Registers
14.	:	Design and develop 8051 ALP program to perform arithmetic operations
15.	:	Design and develop 8051 ALP program to perform FIBONACCI series
16.	:	Design and develop an 8051 ALP to drive a Stepper Motor interface
		and rotate the rotor in specified direction (clockwise or anti-clockwise) by N
		steps
Targeted Applic	ation	& Tools that can be used: MASM,
Professionally u	ised s	oftware - KEIL software
Text Book		
1. Douglas	V Hall	SSSP Rao, "Microprocessor and Interfacing", 3rd editon, Mc Graw Hill, Higer
Education, 201	12.	
2. Barry B B	srey, "	The Intel Microprocessors", 8th edition, Pearson, 2014.
References		
1. Muhamn	nad Al	i Mazidi, Janice Gillispie Mazidi, Danny Causey, "The x86 PC Assembly Language
Design and	Interfa	acing", 5th Edition, Pearson, 2013.
2. Muhamn	nad Al	i Mazidi, "Microprocessors and Microcontrollers", First Impression, Pearson
Education.		
3. <u>https://n</u>	ptel.a	c.in/courses/108105102
4. <u>https://n</u>	ptel.a	<u>c.in/courses/117104072</u>

Course Code:	Course Title:CSE	3016 Neural Networks	and					
C3E3010	ruzzy Lugic Type of Course: I	Niscinling Flactive in A	I & MI	I-P-C	3	0	3	
	Basket	Scipille Licetive III A		L-I -C	5	0	5	
	Th	eory Course						
Version No.	1.0							
Course Pre-	NIL							
requisites								
Anti-requisites	NIL							
Course	This course aims	to introduce the basic o	concepts	of Neura	Netw	orks and	l Fuzzy	
Description	Logic. Neural netw	orks reflect the behavio	r of the h	uman bra	in, allo	wing co	nputer	
	programs to reco	ograms to recognize patterns and solve common problems in the fields of AI,						
	machine learning,	and deep learning. Fu	zzy Logic	is a met	hod of	reasoni	ng that	
	decision making i	reasoning. The approx	ach of Fl	IZZY LOGI rmodiato	c imita	ites the	way or	
	digital values YFS	and NO This course int	s all litte	findamen	possio ital con	cents in	Neural	
	Networks and Fuz	zy Logic Theory.	rouuces i	unuamen		leepts in	Neurai	
Course	The objective of th	e course is to familiarize	the learne	ers with th	e conc	epts of N	eural	
Objective	Networks and Fu	zzy Logic and attain Sk	ill Develo	pment t	nrough	Participa	ative	
	Learning technique	2S.		-	-	-		
Course	On successful con	npletion of this course	e the stu	dents sha	all be a	ble to:		
Outcomes	1. Define the	concept of Neural Netw	orks. [Kı	nowledge				
	2. Define the	ideas behind most com	mon lear	ning algo	rithms	in Neura	al	
	Network.[Kno	wledge]	and Dal	tiona [C	omnno	honsion	1	
	4 Demonstr	e concepts of Fuzzy Sets	ants and	ite appli <i>c</i>	ompre.	$\Delta nnlica$] tion 1	
Course Content:	T. Demonstra	ate the Tuzzy logic cone	cpts and	its applied	110113.	пррпса		
			-					
Module 1	Introduction to Neural Network	Quiz	Single La	ayer Perc	eptron	9Cla	isses	
Topics:								
Introduction to N	IN: History, Artific	cial and biological neur	al netwo	orks, Arti	ficial in	ntelligen	ce and	
neural networks.								
Neurons and Neu	ural Networks: Bi	ological neurons, Mod	els of sin	ngle neur	rons, D	ifferent	neural	
network models.								
Single Layer Perce	eptron: Least mear	i square algorithm, Lear	ning curv	/es, Learn	ing rat	es, Perce	eptron.	
Module 2	Perceptron	Quiz	Multilay	er Percep	tron	10 C	lasses	
Topics:								
Multilayer Percep	tron: The XOR pro	blem, Back-propagation	n algoritł	ım, Heuri	stic for	· improv	ing the	
back-propagation	algorithm, Some e	examples.						
Kadial-Basis Fund	tion Networks: Int	erpolation, Regularizati	on, Leari	ling strat	egies.	orning	wastar	
quantization	gamsing maps: 3	en-organizing map,	The SOM	i aiguitti	.1111, Lt	arning	vector	
quantization	Fuzzy Sets.							
Module 3	Operations and	Quiz	Fuzzy O	perations		100	lasses	
	Relations	-	-					
Topics:								
Fuzzy Sets: Crisp S	Sets - an Overview,	Fuzzy Sets - Definition a	and Exam	ples, α - C	Cuts and	d its Prop	perties,	
Representations of	of Fuzzy Sets, Exter	ision Principles of Fuzzy	y Sets.	T . (
Fuzzy Operations	Operations on Fuz	zy Sets - Fuzzy Compler	nents, Fu	zzy Inters	ections	s, Fuzzy (Jnions,	
Fuzzy Relations F	Sinary Fuzzy relatio	auon operauons. Ins. Fuzzy Equivalence F	Relations	FuzzyCo	mnatik	oility Rel	ations	
		no, i uzzy zquivalchet i	ciacions,	, i u <i>zzy</i> 00	mpaul			
	Fuzzy Logic an	d _r)evelonir	ισ Ευσσυ		c		
Module 4	Fuzzy Log	i c Assignment	Controlle	16 IUZZY [LUSI	10Clas	ses	
	Controller							

Fuzzy Logic: Classical Logic, Multivalued Logic, Fuzzy Propositions, Fuzzy Quantifiers, Linguistic Hedges, Inference from Conditional Fuzzy Propositions, Conditional and Qualified Propositions and Quantified Propositions.

Fuzzy Controllers: An Overview, Fuzzification Module, Fuzzy Rule Base, Fuzzy Inference Engine, Defuzzification Module, An Example.

Targeted Application & Tools that can be used:

1. Python Libraries and Software (Eg., Tensorflow, Scikit-Learn etc.)

2. Matlab (Neural Network Toolbox, Fuzzy Logic Toolbox)

Project work/Assignment:

Students will have to do group assignments for Modules 2 & 4. As a part of their assignments, they will have to implement the solution to particular problems.

Textbook(s):

1. Haykin, Simon. "*Neural networks and learning machines*", 3/E. Pearson Education India, 2011. https://www.pearson.com/en-us/subject-catalog/p/Haykin-Neural-Networks-and-Learning-Machines-3rd-Edition/P20000003278/9780133002553

2. George J. Klir and Bo Yuan, "*Fuzzy Sets and Fuzzy Logic- Theory and Applications*", Prentice Hall of India, 2015.

https://www.worldcat.org/title/fuzzy-sets-and-fuzzy-logic-theory-and-applications/oclc/505215200

References:

1. Shivanandam, Deepa S, "*Principles of Soft computing*", N Wiley India, 3rd Edition, 2018.https://www.wileyindia.com/principles-of-soft-computing-3ed.html

2. Timothy J. Ross, *"Fuzzy Logic with Engineering Applications"*, Third Edition, Wiley, 2011. https://onlinelibrary.wiley.com/doi/book/10.1002/9781119994374

3. Kumar S., "*Neural Networks - A Classroom Approach*", Tata McGraw Hill, 2nd Edition 2017.https://www.worldcat.org/title/neural-networks-a-classroom-approach/oclc/56955342

4. Fakhreddine O. Karray, and Clarence W. De Silva. "Soft computing and intelligent systems design: theory, tools, and applications". Pearson Education, 2009.

Weblinks

https://www.pearson.com/en-gb/search.html?q=Karray%20Soft-Computing-and-Intelligent-Systems-Design-Theory-Tools-and-Applications

Topics relevant to "Skill Development ": Assignment implementations in software, batch wise presentations are used for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: APPLIED ARTI	FICIAL INTELLIG	ENCE	L- P- C	2	2	3		
Version No	1 0								
Course Dro	.u SE 2001: Artificial Intelligence and Machine Learning								
requisites									
Anti-requisites	NIL								
Course Description	This course covers some of the applications in artificial intelligence, such as logic, searching, adversarial search, constraint satisfaction, Bayesian networks, etc. Topic include: AI methodology, Logic in AI, Resolution Principle, Graphical Search techniques, Adversarial Search techniques, Game playing, Uncertainty and Probability, Reasoning in AI, Bayesian Networks and Statistical Learning.								
Course Objective	The objective of the course ARTIFICIAL INTELLIGENCE at techniques.	Ie objective of the course is to familiarize the learners with the concepts of APPLIED TIFICIAL INTELLIGENCE and attain Skill Development through Experiential Learning chniques.							
Course Out ComesOn successful completion of the course the students shall be able to: • Explain different methods of searching, proving, and analysis in AI. [Knowledge]• Prove by Resolution, different situations in First-order logic. [Application] • Implement various graphical and adversarial search algorithms. [Application] • Solvesequence-labeling problems using HMM. [Application]									
Course Content:		1							
Module 2	Logic in Al					12	Sessions		
Topics: Propositio Conversion to Clau	nal Logic,Predicate Logic, Finusal Form, The Resolution Pri	st order Logic, nciple, Inferenc	Properties ce in First C	-of well)rder Lo	formed gic (FOL)	formula).	as (Wffs),		
Module 1	Problem Solving by Searching	Case studies / Case let	Case stu	udies / C	ase let	12	Sessions		
Topics: Introduction by searching:Class	on to Problem space and sta ical Search, Adversarial Searc	te space, State ch, Game playir	space sean ng, and Cor	rch tech Istraint S	niques s Satisfact	olving ion Pro	problems blems.		
Module 3	Learning and Probabilistic Reasoning	Quiz	Case stu	udies / C	ase let	14	Sessions		
Topics: Introducti AI,Uncertainty in <i>A</i> tagging.	on to Reasoning, Various t Al, Bayesian Networks, Hidde	ypes of Reaso n Markov Mod	ning meth el, Applicat	iods, Pro tions of I	obabilist HMM fo	tic Reat r Part-c	soning in of-Speech		
 Reading t Reading t IDEs like PyCl Evaluatio Evaluatio Implement 	ext files in Python (may be harm. n of well-formedness of fo n of well-formedness of fo ntation of graph-based rep ion between Adjacency Lis ntation of Uninformed Sea ntation of Uninformed Sea ntation of Heuristic Search ntation of Heuristic Search	e needed for s ormulae in pro ormulae in first oresentations - t and Adjacen rch Algorithm rch Algorithms Algorithms (1 Algorithms (2)	ome of th positional t-order log - Adjacenc cy Matrix. s (1) - Bre s (2) - Dep s (2) - A* Sea	e later (logic. gic. cy List, A adth-Fir oth-First / Best Fi rch	experin Adjacen st Sear Search rst Sea	nents), cy Mat ch n rch	using :rix -		
o. impicitici			., ,, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						

10. Implementation of Adversarial Search Algorithms (2) - Alpha Beta Pruning and Ideal Ordering Algorithms

11. Implementation of Constraint Satisfaction Problems (1) - Sudoku

12. Implementation of Constraint Satisfaction Problems (2) - Map Colouring

13. Implementation of Constraint Satisfaction Problems (3) - Timetable Scheduling

14. Implementation of Decision-Making - Minesweeper

15. Implementation of Probabilistic Decision-Making - Battleship

16. Implementation of HMM

17. Building a PoS Tagger using HMM.

Targeted Application & Tools that can be used

- 1. Google Colab
- 2. Java (any online or desktop IDE)

Project work/Assignment:

Assignment: Students will have to do a course assignment as designed by the Instructor-in-charge. The assignment can be a programming-based assignment, or solving a number of problems, etc.

Text Book

T1. Stuart J. Russell and Peter Norvig.2021. Artificial intelligence: A Modern Approach, 4th Edition. Pearson.

References

R1.Elaine Rich, Kevin Knight and Shivashankar B Nair. 2009. *Artificial Intelligence,* 3rd Edition. Tata McGraw-Hill.

bok linkT1:<u>https://ia803402.us.archive.org/35/items/artificial-intelligence-a-modern-approach-4th-edition/Artificial%20Intelligence%20A%20Modern%20Approach%20%284th%20Edition%29.pdf</u>

b resources:

W1.<u>http://aima.cs.berkeley.edu/global-index.html</u>

W2. https://presiuniv.knimbus.com/user#/

Topics relevant to "Skill Development": Probabilities for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE2053	Course Title: Enterprise Net	work Design	L- P- C	3	0	3				
Version No.	1.0									
Course Pre- requisites	CSE-2011-Data communicati Computer Networks: OSI R Routing IP Addresses 3. Inter	SE-2011-Data communication and Computer Networks Computer Networks: OSI Reference Model and TCP/IP Protocol Suite 2. Louting IP Addresses 3. Internetworking Devices								
Anti-requisites	NIL	IL								
Course Description	In Enterprise Network Design enterprise network configura through the process of custom specifications. Methodologies for established complex netw	Enterprise Network Design, students will investigate and design a variety of interprise network configurations. They will enhance their consulting skills irough the process of customer requirement analysis, network design, product pecifications. Methodologies for Analysis of network performance and traffic or established complex networks.								
Course Objective	The objective of the course is ENTERPRISE NETWORK DESIG Solving Methodologies.	e objective of the course is to familiarize the learners with the concepts of TERPRISE NETWORK DESIGN and attain Skill Development through Problem lving Methodologies.								
Course Outcomes	On successful completion 1. Understand the Modularize the Networ 2. Compare Oper enterprise networks. [C 3. Design Basic O Connectivity, IP Add for the Network. [APP] 4. Apply a Metho	 On successful completion of the course the students shall be able to: 1. Understand the customer requirements, Structure and Modularize the Network. [KNOWLEDGE] 2. Compare Openflow controllers and switches with other enterprise networks. [COMPREHENSION] 3. Design Basic Campus and Data Center Network, Remote Connectivity, IP Addressing and Select suitable Routing Protocols for the Network. [APPLICATION] 4. Apply a Methodology to Network Design [APPLICATION] 								
Course Content:										
Module 1	Applying a Methodology to Network Design:	Assignment	Theory	No. o	f Class	ses:09				
Applying a Methon Network Design Network and S Implementation F	odology to Network Design: The Methodology, Identifying Custories, Using the Top Down Process. Network Design Demo	he Cisco Service tomer Requireme Approach to onstration through	Oriented N ents, Charac Network E h CISCO Pa	letwork cterizing Design, acket Tra	Archite the Ex The I acer.	ecture, xisting Design				
Module 2	Structuring, Modularizing the Network, and Designing Basic Campus and Data Center Networks	Assignment	Theory	No. o	f Class	ses:12				
Network Hierarch Networks, Netwo Enterprise Campt	hy, Using a Modular Approac ork Management Protocols a is Design, Enterprise Data Cen	h to Network D ind Features, C ter Design Consi	esign, Serv Campus De iderations.	ices Wi sign Co	thin M onsider	odular ations,				
Module 3	Remote Connectivity, Designing IP Addressing in the Network & Selecting Routing Protocols	Assignment	Theory	No. of Cl	asses:	12				
Enterprise Edge V WAN and MAN	WAN Technologies, WAN Des N Architecture, Selecting En	sign, Using WAN terprise Edge (N Technolog Components	gies, En s, Desi	terprise gning	e Edge an IP				

Addressing Plan, Enterprise, Routir	Introduction to IPv6, Routing Protocol Deployment, Rout	ng Protocol Feat e Redistribution,	ures, Routin Route Sumn	g Protocols for the narization
Module 4	Software Defined Network	Assignment	Case Study	No. of Classes:12
Understanding SI Controller to Swit OpenFlow control changed Tradition Targeted Applics 1. CISCO Pa 2. SDN Oper Suggested List of 1. Perform a 2. Using CIS suitable IP ac 3. DO a case	ON and Open Flow : SDN – ch, Symmetric and Asynchron llers , POX and NOX, Open F al Enterprise network Design ation & Tools that can be use cket Tracer. flow Hands-on Activities self stu case study on VLSM CO Packet Tracer design a ldressing and routing proto study on an SDN for an Enterprise	- SDN Building nous messages, In Flow in Cloud Co ed: dy LAN with 50 PC cols for an Enter terprise.	Blocks, Ope mplementing omputing, Ca CV and conf CV and conf	enFlow messages – g OpenFlow Switch, ise study: how SDN
Text Book 1. Authorized Second Editio 2. Network A 3. CCDA Cis Publishing Siz References 1. Top-Down Oppenheimer	I Self-Study Guide, Designing n, Cisco Press-Diane Teare. Analysis, Architecture, and De- sco official Guide 4. Software mak Azodolmolky n Network Design (Networki Cisco Press Book	g for Cisco Intern sign 3rd Edition, Defined Network	etwork Solut Morgan Kau king with Op 3rd Edition	ions (DESGN), Ifman, James D. en Flow : PACKT , Priscilla
2. Network l Resources and	Planning and Design Guide l Research Articles links;	Paperback – 200	0, Shaun Hu	ummel Web
3. Network P	lanning and Design Guide Pa	perback – 2000, S	Shaun Humm	nel
Weblinks:				
1.httpm%2floginlive%26eby2.http3.httpkDesign_3re4.ise_Design_5.http	<u>ps://puniversity.informaticsglc</u> aspx%3fdirect%3dtrue%26db /%3dEB%26ppid%3dpp_xiii ps://www.youtube.com/watch p://www.teraits.com/pitagoras <u>1_ed.pdf</u> ps://www.cisco.com/c/dam/en Profile/chap2sba.pdf ps://nptel.ac.in/courses/10610	<u>bbal.com/login?q</u> <u>%3dnlebk%26AN</u> ?v=ITsezBQU_C /marcio/gpi/b_PC /us/td/docs/soluti 5184	<u>url=https://se N%3d122387</u> Dppenheimer ons/Enterpri	earch.ebscohost.co 75%26site%3dehost TopDownNetwor se/Medium_Enterpr

Topics relevant to development of "EMPLOYABILITY SKILLS": Network Design Methodology, Identifying Customer Requirements, Characterizing the Existing Network and Sites. [Text Wrapping Break]

Course Code: CSE 6001	Course Title:Deep Learning Type of Course:Program Core Theory and Laboratory Integra	ated	L-P-C	2	2	3				
Version No.	1.0	.0								
Course Pre-	Data Mining and Machi Basic working knowled	Data Mining and Machine Learning fundamentals								
requisites	 Basic working knowled Familiarity with progra 	mming languages	s and har	ids on	coding					
Anti-requisites	NIL	0 0 0 0			0					
Course Description	The course introduces the core intuitions behind Deep Learning, an advanced branch of Machine Learning involved in the development and application of Artificial Neural Networks that function by simulating the working principle of human brain. Deep learning algorithms extract layered high-level representations of data in a way that maximizes performance on a given task. The course includes theory and lab components which emphasizes on understanding the implementation and application of deep neural networks in various prominent problem domains like speech recognition, sentiment analysis, recommendations, and computer vision etc. The course facilitates the students to interpret and appreciate the successful application of deep neural nets in various prediction and classification tasks of ML.									
Course Object	The objective of the course is Deep Learning and attain Skill techniques.	to familiarize the I Development th	e learners rough E	with xperi	the con ential L	cepts of earning				
Course Out Comes	 On successful completion of the course the students shall be able to: 1. Apply basic concepts of Deep Learning to develop feed forward models 2. Apply Supervised and Unsupervised Deep Learning techniques to build effective modelsfor prediction or classification tasks 3. Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains of Machine Learning and Machine vision. 									
Course Content:			<u>r</u>							
Module 1	Introduction to Deep Learning	Assignment I	Programm	ning	Cla	No. of sses:10				
Topics:					I					
Machine Learni Neural Networ Functions, Loss Building your D	ng in a nutshell, Fundamental k,Feedforward Neural Netwo Functions, Gradient Descent, eep Neural Network: Step by St	s of deep learnin rk, , Perceptron, Back-propagatio ep, Deep Neural 1	ng and r , MLP S n, Traini Network	eural structu ng N for Cl	networ ires, Ac eural N assificat	ks,Deep tivation etworks ion.				
Module 2	Improving Deep Neural Networks	Assignment I	Programm	ning	of Cla	No. sses:09				
Huperparameter	tuning Initialization Owe	fitting and Und	orfitting	Rom	Ilarizati	on and				
Optimization, D	ropout, Batch Normalization	inding and Ond	ernung,	regi	u1a11Za(1	on and				

Module 3 Deep Supervised Learning Models	Assignment	Programming	No. of Classes:10
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Topics:

Convolutional neural network,Prediction of image using Convolutional Neural Networks,Deep learning in Sequential Data, RNN & LSTM, GRU, Sentiment Analysis

Module 4	Deep Unsupervised Learning	Assignment	Programming	No. of Classes:10
T				

<u>Topics:</u>

Basics of Deep unsupervised learning, Auto encoders,Restricted Boltzmann Machine, Recommender systems

Text Book

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press, 2017

References

- Duda, R.O., Hart, P.E., and Stork, D.G. Pattern Classification. Wiley-Inderscience, 2nd Edition. 2013
 - 2. Theodoridis, S. and Koutroumbas, K. Pattern Recognition. Edition 4, Academic Press, 2015
 - 3. Russell, S. and Norvig, N. Artificial Intelligence: A Modern Approach. Prentice Hall Series in Artificial Intelligence, 2013
 - 4. Bishop, C. M. Neural Networks for Pattern Recognition, Oxford University Press, 2008. https://sm-nitk.vlabs.ac.in/

https://nptel.ac.in/courses/105105157

Topics relevant to "SKILL DEVELOPMENT": Real time Data Analysis, Naming and coding for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

	Course Title: FUNDAMENT	ALS OF NATUR	RAL		3	0	3					
Course Code:	LANGUAGE PROCESSING			L- P- C								
CSE 3014	Type of Course: Theory Or	nly Course										
Version No.	1.0											
Course Pre-	[1] CSE 3001 – Artificial Int	elligence and N	/lachine L	earning								
requisites		0		0								
Anti-requisites	NIL											
	The purpose of this course	e is to introduce	e student	s to the scie	nce of r	natural l	language					
	processing (NLP). NLP is th	e science of ex	tracting i	nformation	from ur	structu	red text.					
Course	It is basically how we can t	each machines	to under	stand huma	n langua	ages and	d extract					
Description	meaning from text. In addi	aning from text. In addition to regular theory, the course also involves:										
	1. Programming Assignme	nts										
	2. Regular Quiz Tests (once	a week and or	nce after o	every modul	e)							
Course Objective	The objective of the cou	urse is to fam	iliarize tl	he learners	with t	he con	cepts of					
,	Fundamentals of Natura	al language P	rocessing	g and attai	in Skil l	Deve	lopment					
	through Participative Lear	r ning technique	es.									
	On successful completion	of the course t	he stude	nts shall be a	able to:							
	Understan	Id the fundame	ental conc	epts of Natu	iral Lan	guage						
	Processing. [Knowle	edge]		•		5						
Course Out	Read corp	ora and train m	nodels for	different NI	_P tasks	. [Appli	cation]					
Comes	Use word	embeddings fo	r solving a	an NLP Appli	cation.	[Applica	ation]					
	Understan	id sequence t	o sequer	ice modelin	g as us	sed in	machine					
	translation. [Applica	ation]	-		-							
Course Content:												
Module 1	Introduction	Quizzes				7 9	Sessions					
Topics:	L	1	1									
Introduction. Hist	tory. Text Analytics. Vari	ious tasks in	NLP. Se	ntence bou	ndary	Detecti	on. Edit					
distance. Introduc	ction to word embeddings,	PoS tagging, ch	iunking, p	arsing, mach	nine tra	nslatior	۱.					
Module 2	Word and Text	Quizzes		Assignments		8 9	Sessions					
Topics:	Representations											
Logistic Regression and Neural Langu sequence processi	n and Naïve Bayes classifica age Models. Text represer ing (CNN and LSTM).	ation. Vector sont ations and cl	emantics assificatio	and embedon. Deep lea	Jings. N Irning a	leural N rchitect	letworks tures for					
Module 3	PoS Tagging, NER Tagging and Parsing	Quizzes	,	Assignments		12 9	Sessions					
Topics:												
Part-of-Speech Ta	gging – using NLTK and space	cy. Building a P	oS Taggei	⁻ using existi	ng data	and Hid	dden					
Markov Model. Na	amed Entity Recognition. Re	elationship betw	ween NEF	R tagging and	l PoS ta	gging.						
Constituency Pars	ing.	I										
Module 4	NLP Applications	Quizzes				99	Sessions					
lopics:		··· • • • • • • • • • • • • • • • • • •			D.							
Lexical Resource (creation. Sentiment Analys	sis. iviachine Ti	ansiation	i. vvora Sen	se Disa	mpigua	uon and					
Targeted Applicat	in Answering.											
	hom & TOOIS LITAL CAN DE USE	su:)										
2. Java (Stan	ford CoreNIP)	<i>j</i>										
3. Google Co	olab					3. Google Colab						

Project work/Assignment:

Assignment:

Students will have to do group assignments for Modules 2 & 3. As a part of their assignments, they will have to implement the solution to particular problems.

Text Book

T1Daniel Jurafsky, and James Martin. "Speech and Language Processing" (3rd edition draft, 2022)

References

1Chris Manning and HinrichSchutze, *"Foundations of Statistical Natural Language Processing"*, 1st Edition, MIT Press. 1999.

2PawanGoyal, "*Natural Language Processing*". NPTEL.

E-Book Link for R2: <u>https://drive.google.com/file/d/10nbwAJd-dv6htOOZVBgAvLd1WscI0RqC/view</u> Web resources:<u>https://web.stanford.edu/~jurafsky/slp3/</u>

NPTEL Course: <u>https://onlinecourses.nptel.ac.in/noc22_cs98/course</u>

Topics relevant to "SKILL DEVELOPMENT": Assignment implementations in software, batch wise presentations for developing Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

[Text Wrapping Break]

	Course Title: FUNDAMENT	ALS OF NATUR	RAL		3	0	3	
Course Code:	LANGUAGE PROCESSING			L- P- C				
CSE 3014	Type of Course: Theory Or	nly Course						
Version No.	1.0							
Course Pre-	[1] CSE 3001 – Artificial Int	elligence and N	/lachine L	earning				
requisites		0		0				
Anti-requisites	NIL							
	The purpose of this course	is to introduce	e students	s to the scie	nce of r	natural l	language	
	processing (NLP). NLP is th	e science of ex	tracting i	nformation	from un	structu	red text.	
Course	It is basically how we can t	each machines	to under	stand huma	n langua	ages an	d extract	
Description	meaning from text. In addi	aning from text. In addition to regular theory, the course also involves:						
	1. Programming Assignme	nts						
	2. Regular Quiz Tests (once	a week and or	nce after o	every modul	e)			
Course Objective	The objective of the cou	urse is to fam	iliarize tl	ne learners	with t	he con	cepts of	
	Fundamentals of Natura	al language P	rocessing	g and attai	in Skil l	Deve	lopment	
	through Participative Lear	r ning technique	es.				-	
	On successful completion	of the course t	he stude	nts shall be a	able to:			
	Understan	Id the fundame	ental conc	epts of Natu	iral Lan	guage		
Course Out	Processing. [Knowle	edge]						
Course Out	Read corp	ora and train m	nodels for	different NI	_P tasks	. [Appli	cation]	
Comes	Use word	embeddings fo	r solving a	an NLP Appli	cation.	[Applica	ation]	
	Understan	id sequence to	o sequen	ice modelin	g as us	sed in	machine	
	translation. [Applica	ation]						
Course Content:								
Module 1	Introduction	Quizzes				7 9	Sessions	
Topics:	L	1	1					
Introduction. Hist	tory. Text Analytics. Vari	ious tasks in	NLP. Se	ntence bou	ndary	Detecti	on. Edit	
distance. Introduc	ction to word embeddings,	PoS tagging, ch	unking, p	arsing, mach	nine tra	nslatior	۱.	
Module 2	Word and Text Representations	Quizzes		Assignments		8 9	Sessions	
Topics:	representations	<u> </u>				<u> </u>		
Logistic Regression and Neural Langu sequence processi	n and Naïve Bayes classifica age Models. Text represer ing (CNN and LSTM).	ation. Vector sont ations and cl	emantics assificatio	and embedo on. Deep lea	dings. N Irning a	leural N rchitect	letworks tures for	
Module 3	PoS Tagging, NER Tagging and Parsing	Quizzes		Assignments		12 9	Sessions	
Topics:								
Part-of-Speech Ta	gging – using NLTK and space	cy. Building a P	oS Taggeı	using existi	ng data	and Hig	dden	
Markov Model. Na	amed Entity Recognition. Re	elationship betw	ween NEF	R tagging and	l PoS ta	gging.		
Constituency Pars	ing.	1						
Module 4	NLP Applications	Quizzes				9 9	Sessions	
lopics:				M/ 10				
Lexical Resource	creation. Sentiment Analys	sis. Machine Ti	ranslation	i. Word Sen	se Disa	mbigua	tion and	
wordinet. Questio	in Answering.							
		30: ·~)						
2 Java (Stan	iford CoreNI D)	C. J						
3. Google Co	2. Java (Stanford CoreNLP) 3. Google Colab							

Project work/Assignment:

Assignment:

Students will have to do group assignments for Modules 2 & 3. As a part of their assignments, they will have to implement the solution to particular problems.

Text Book

T1Daniel Jurafsky, and James Martin. "Speech and Language Processing" (3rd edition draft, 2022)

References

1Chris Manning and HinrichSchutze, *"Foundations of Statistical Natural Language Processing"*, 1st Edition, MIT Press. 1999.

2PawanGoyal, "Natural Language Processing". NPTEL.

E-Book Link for R2: <u>https://drive.google.com/file/d/10nbwAJd-dv6htOOZVBgAvLd1WscI0RqC/view</u> Web resources:<u>https://web.stanford.edu/~jurafsky/slp3/</u>

NPTEL Course: <u>https://onlinecourses.nptel.ac.in/noc22_cs98/course</u>

Topics relevant to "SKILL DEVELOPMENT": Assignment implementations in software, batch wise presentations for developing Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

[Text Wrapping Break]

Course Code:	Course Title: .	NET Full Stack Developm	ient						
CSE3152				L- P- C	2	2	3		
Version No.	1.0			1			1		
Course Pre- requisites	Nil								
Anti-requisites	CSE3151 Java F	ull Stack Development							
	This advance	d laval accuracy analy	1	40 000		G. 11	1-		
Course	This advance	and an advanced level course enables students to perform full stack							
Description	technologies	using INET, with empt	lasis on emp	ic boood	y skills	s. The K	key		
	technology or	chology or NET technology. In this course, the focus is on using NET							
	and the related	d technologies/tools li	ke C# ASP	NET E	s on u ntity F	sing .iv	ork		
	Core etc. On s	successful completion	of this course	the stud	liny 11 lent ch	all be a	hle		
	to pursue a ca	reer in full-stack deve	elopment T	, uie studer	ioni sn ite cha	an oe a 11 deve	lon		
	strong problem	n-solving skills as part	of this cours		115 5114		lop		
Course Objectives	The objective o	f the course is to familia	rize the learn	ors with t	he con	cents of	DotNET		
course objectives	FULL STACK D	evelopment and attain	n Employabi	litv Skills	throu	gh Fxn	eriential		
	Learning techni	iques.		,		8 -P			
Course Outcomes	On successful c	ompletion of the course	the student	s shall be	able to				
	1] Practice the	use of C# for developing	a small appl	ication [A	pplicat	ionl			
	2] Show web a	oplications using Entity	Framework. [Applicati	on]	-			
	3]Solve simple	web applications that u	se SQL and A	SP.NET [A	pplicat	ion]			
	4] Apply conce	pts of ASP.NET to develo	op a Full Stacl	k applicat	ion. [A	pplicatio	on]		
Course Content:									
	C#								
Modulo 1	Programming	Draiget	Drogrammin	~			10		
	for Full Stack	Project	Programming				ssions		
	Development								
Topics:									
.NET Framework F	undamentals, V	isual Studio IDE Fundan	nentals, C# La	anguage F	eature	s, Work	ing with		
arrays and collect	ions, Working	with variables, operato	rs, and expr	essions, l	Decisio	n and i	iteration		
statements, Manag	ging program fl	ow and events, Workin	g with classe	es and me	ethods,	OOP c	oncepts,		
Properties, Auto I	mplemented, L	Pelegates, Anonymous	Methods and	d Anonyn	nous l'	ypes, E	xtension		
methods, Sealed C	lasses/Methods,	, Partial Classes/Method	s, Asynchron	ous progra	amming	g and th	reading,		
Data validation and	i working with da ting Nupit from	ata collections including i	LINQ, Handlin	gerrorsa	nd exce	ptions,	working		
Assignment: Devel	ung – Nunit Iran on a small annli	nework	ny using C#						
Assignment. Dever	Entity								
Module 2	Framework	Project	Programmin	σ			06		
	Core 2.0		1.1081.011111	5		Se	ssions		
Topics:	•					1			
Entity Framework	Core 2.0 Code F	irst Approach; Introduct	ion To Entity	Framewo	ork and	EDM; C	Querying		
the EDM; Working	With Stored Pr	ocedures; Advanced En	tity Framewo	ork - DbCc	ontext	[EF6]; A	dvanced		
Operations; Perfor	mance Optimiza	tion; Data Access with A	DO.NET	.					
Assignment: Devel	op an applicatio	n for managing HR polic	les of a depar	tment.			00		
Module 3	ASP.NET	Project	Programmin	5		Se	06 ssions		
Topics:									
ASP.NET Core, A	SP.Net Core 3.1	MVC, ASP.NET Core	Middleware	and Requ	est pipe	eline, Ro	eview of		
SQL using MS SQ	L, Working Witl	h Data In Asp.Net, Razor	r View Engin	e, State M	anagen	nent In A	Asp. Net		
MVC & Layouts;									
Assignment: I	Develop a web appl	ication to mark	entry/exit of guests in a building.						
--	---	--	--	---					
Module 4	ASP.NET	Project	Programming	08 Sessions					
Topics: Introduction To Advanced Asp Microsoft Test Assignment: I Targeted Appli Application Ar used by all app Professionally	D Models, Validatic . Net MVC - Ajax ing Framework – U Develop a software ication & Tools that ea is to Design and plication developed Used Software: V	ons In Asp.Net M Action Link In Jnit Testing the tool to do inven at can be used: Analyzing the rs.	IVC, Authentication and Authorizat: MVC, Advanced Asp.Net MVC - A .NET Application atory management in a warehouse.	ion In Asp.Net MVC, Ajax Forms In MVC, amental course is					
Project work// 1. Proble 2. Progra	Assignment: m Solving: Design mming: Implemer	of Algorithms a ntation of given	nd implementation of programs. scenario using .NET.						
3. Assigi	iment: Case study	y on web sites	development						
T1. Fender, T2. Valerio Angular	Young, "Front-end De Sanctis, "ASP.I 11", 4th Edition,	l Fundamentals' NET Core 5 and Packt, 2021.	", Leanpub, 2015 Angular: Full-stack web developm	ent with .NET 5 and					
References R1. Benjami R2. Piotr Ga R3. Tamir D <i>Core"</i> , R4. Dustin <i>Core"</i> , N Topics relev Employability assessment co	in Perkins, Jon D. R inkiewicz, <i>"Full Sta</i> resher, Amir Zuker Packt Publishing, 2 Metzgar, <i>"Explorin</i> <u>Manning, 2017.</u> ant to developme omponent mention	eid, <i>"Beginning</i> ck .NET Web Dev , Shay Friedmar 018. ng .NET core wi nent of "Empl nt through Expe ned in course h	<i>C# and .NET"</i> , Wiley, 2021 Reid, 20 velopment", Packt Publishing, 2017 n, <i>"Hands-On Full-Stack Web Develo</i> ith microservices, ASP.NET core, ar loyability": C#, ASP.NET & S eriential Learning techniques This andout.	221. 7. Spment with ASP.NET and Entity Framework QL for developing is attained through					

[Text Wrapping Break]

Course Code: CSE391	Course Title: Java Full Stack Development	L- P- C	0	4	2			
Version No.	1.0							
Course Pre- requisites	Nil							
Anti-requisites	CSE392 .NET Full Stack Development							
Course Description	This advanced level course enables students to using Java, with emphasis on employability ski Full Stack development is based on either Java In this course, the focus is on using Java, and Java EE, Java Persistence, Hibernate, Maven, completion of this course, the student shall be a development. The students shall develop strong this course.	o perform full s lls. The key tech a technology or the related tech Spring Core, e ble to pursue a o g problem-solvin	stack de hnologi .NET t nologie etc. On career i ng skill	evelopm ies used echnolo s/tools l success n full-st s as part	ent for gy. ike sful ack t of			
Course Objective	The objective of the course is to familiarize the learners with the concepts of Java Full							
	Stack Development and attain EM EXPERIENTIAL LEARNING techniques	PLOYABILITY	Y SK	ILLS	through			

Course Outcomes On successful completion of the course the students shall be able to: Practice the use of Java for full stack development [Application] Show web applications using Java EE. [Application] Solve simple applications using Java Persistence and Hibernate [Application] Apply concepts of Spring to develop a Full Stack application. [Application] Employ automation tools like Maven, Selenium for Full Stack development. [Application]								
Course Content:								
Module 1	Introduction	Project	Programming	03 Sessions				
Topics: Review of Java; Ac tools.	lvanced concept	s of Java; Java generic	s; Java IO; New Features of Java.	Unit Testing				
Module 2	Java EE Web Applications	Project	Programming	05 Sessions				
Introduction to Eclipse & Tomcat; JSP Fundamentals; Reading HTML form Data with JSP; State Management with JSP; JSP Standard Tag Library - Core & Function Tags; Servlet API Fundamentals; ServletContext, Session, Cookies; Request Redirection Techniques; Building MVC App with Servlets & JSP; Complete App - Integrating JDBC with MVC App Assignment: Develop an application for managing HR policies of a department.								
Module 3 Persistence Project Programming 06 Sessions Sessions								
Fundamentals of Ja Performance and C Versioning; Entity JPQL and Criteria A Assignment: Desig housing society.	va Persistence w Concurrency; Fin Relationships, In API (JPA) gn and develop	with Hibernate; JPA for rst & Second Level C nheritance Mapping & a website that can act	Object/Relational Mapping, Queryi aching, Batch Fetching, Optimistic Polymorphic Queries; Querying da ively keep track of entry-exit infor	ng, Caching, Locking & tabase using rmation of a				
Module 4	Spring Core	Project	Programming	10 Sessions				
Topics: Spring Core, Spring MVC, Spring Boot REST API; Understanding Spring Framework; Using Spring MVC; Building a Database Web App with Spring and Hibernate o Spring AOP (Aspect Oriented Programming); Implementing Spring Security; Developing Spring REST API; Using Spring Boot for Rapid Development Assignment: Develop a software tool to do inventory management in a warehouse.								
Module 5	Automation tools	Project	Programming	06 Sessions				
Module 5 Project Programming Sessions Topics: Introduction to Automation Tools; Apache Maven: Maven Fundamentals, Software Setup - Commandline and Eclipse, pom.xml and Directory Structure, Multi-Module Project Creation, Scopes, Dependency Management, Profiles; Functional/BDD Testing using Selenium, Selenium Fundamentals and IDE, Selenium WebDriver, Installation and Configuration, Locating WebElements, Driver Commands, WebElement Commands Assignment: Illustrate the use of automation tools in the development of a small software project. Targeted Application & Tools that can be used: Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers. Professionally Used Software: Eclipse, NetBeans, Hibernate, Selenium, Maven, GIT.								

Text Book:

T1. Fender, Young, "Front-end Fundamentals", Leanpub, 2015

References

1. Soni, Ravi Kant. "Full Stack AngularJS for Java Developers: Build a Full-Featured Web Application from Scratch Using AngularJS with Spring RESTful.", Apress, 2017. in https://presiuniv.knimbus.com/user#/home

R2. Mardan, Azat. "Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB.", Apress, 2015 Weblinks:

https://www.javatpoint.com/java-full-stack https://nptel.ac.in/courses/106105191

Topics relevant to development of "Employability": Hibernate, Eclipse & Spring for developing Employability Skills through **Experiential Learning techniques**. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Front	-end Full Stack						
CSE390	Development		L- P- C	0	4	2		
Version No.	1.0							
Course Pre-	Nil							
requisites								
Anti-requisites	NIL							
Course Description	This intermediate development, with technologies and arc front-end. On succe pursue a career in f problem-solving ski	development, with emphasis on employability skills. The course covers key technologies and architectures that enables the student to design and implement front-end. On successful completion of this course, the student shall be able to pursue a career in full-stack development. The students shall develop strong problem-solving skills as part of this course.						
Course Objectives	The objective of the Full Stack Develop techniques.	course is to familian oment and attain Er	rize the learners v nployability thro	vith the c ugh expe	oncep erienti	ts Fron <mark>t</mark> end al Learning		
Course Outcomes	On successful com Describe the funda [Comprehension] Illustrate a basic w Illustrate developm Apply concepts of A	pletion of the cours amentals of DevOp eb design using HT tent of a responsive Angular.js to develo	se the students sl os and Front-end FML, CSS, Javas e web. [Application op a web front-e	nall be al d full sta script. [A ion] end. [App	ble to ck de Applic olicati	: evelopment. ation] on]		
Course Content:			•			-		
Module 1	Fundamentals of DevOps	Project	Programming		0	4 Sessions		
Topics:								
Introduction to Agile Architecture, Lifecyc Review of GIT sourc	e Methodology; Scrun cle, Workflow & Princ ce control.	n Fundamentals; Sci ciples; DevOps Tool	rum Roles, Artifa s Overview – Jen	cts and F kins, Do	Rituals cker, l	; DevOps – Kubernetes.		
Module 2	Web Design & Development	Project	Programming		0	3 Sessions		
Topics:								

HTML5 – Syntax, Attributes, Events, Web Forms 2.0, Web Storage, Canvas, Web Sockets; CSS3 – Colors, Gradients, Text, Transform;

Assignment: Develop a website for managing HR policies of a department.

Module 3	Responsive web design	Project	Programming	08 Sessions
L .				

Topics:

BootStrap for Responsive Web Design; JavaScript – Core syntax, HTML DOM, objects, classes, Async; Ajax and jQuery Introduction

Assignment: Design and develop a website that can actively keep track of entry-exit information of a housing society..

, ingularity

Topics:

Setting up Development & Build Environment: Node.js and NPM; Introduction to TypeScript; Working with OOP concepts with TypeScript; Angular Fundamentals; Angular CLI; Introduction to TypeScript; Debugging Angular applications; Components & Databinding in Depth; Angular Directives; Using Services & Dependency Injection; Angular Routing; Observables; Handling Forms in Angular Apps; Output transformation using Pipes; Making Http Requests; Authentication & Route Protection; Dynamic Components; Angular Modules & Optimizing Angular Apps; Deploying an Angular App; Angular Animations; Adding Offline Capabilities with Service Workers; Unit Testing in Angular Apps (Jasmine, Karma). Overview of React.js

Assignment: Develop a software tool to do inventory management in a warehouse.

Targeted Application & Tools that can be used:

Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers.

Professionally Used Software: GCC compiler.

Text Book:

Fender, Young, "Front-end Fundamentals", Leanpub, 2015

Northwood, Chris, "The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer", APress, 2018

References:

R1. Flanagan D S, "*Javascript : The Definitive Guide*" 7th Edition. 7th ed. O'Reilly Media; 2020. Alex Libby, Gaurav Gupta, and Asoj Talesra. "*Responsive Web Design with HTML5 and CSS3 Essentials*", Packt Publishing, 2016

B. Duckett J Ruppert G Moore J. "Javascript & Jquery : Interactive Front-End Web Development."; Wiley; 2014.

Web Reference:

/www.youtube.com/watch?v=JGNTYXkVCVY&list=PLd3UqWTnYXOkTSBCBNyyhxo_jxlY_uTWA &index=2

Web Reference: <u>https://www.freecodecamp.org/news/frontend-web-developer-bootcamp/</u>

https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&A N=2233842&site=ehost-live

https://nptel.ac.in/courses/106102064

Topics relevant to development of "Employability": DevOps Tools Overview – Jenkins, Docker, Kubernetes for developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Data V	isualization			1	4	3
CSE 367	Type of Course: Inte	grated		L- P- C			_
Version No.	1.0	<u> </u>					<u> </u>
Course Pre-	Fundamental knowle	edge of data stru	uctures, statis	stics. datak	base con	cepts and	Pvthon.
requisites		0	···· ··, ····	,			1
Anti-requisites	Nil						
And requisites	This course provides	an introduction	n to turning	data into	procont	blo graph	nice Data
Course	Visualization is impo Data visualization te	rtant today as th chniques help p	ne usage of da people to bet	ata is grow	ving in m stand th	any differ is data. Tl	ent fields. he goal of
Description	and algorithms to	create effective			on pring	incipies, u	echniques
Description	difu algorithms, to design visual art po	reate enective		nitivo scio	un princ	donte will	ll graphic
	value of visualization	specific techni	nues in data v	visualizatio	nce. Stu	mar of gra	nhics and
	how to leverage visu	alization tools	ques in uata v	Isualizatic	ni, grani	inal of gra	apriles and
Course Objective	The objective of the	anzation tools.	miliorize the	learners	with the	concent	s of Data
	visualization and a LEARNING techni	ttain EMPLO	YABILITY	SKILLS t	hrough	EXPERI	ENTIAL
	On successful compl	etion of the cou	irse the stud	ents shall	be able	to:	
	1. Understand	the visual repres	sentation of o	data (Knov	vledge).		
Course Out	2. Analyze the	one, two and	multi-dimens	sional data	a for the	e data vis	ualization
Comes	process and evaluate	e the visualizatio	on of groups,	trees, gra	phs, clu	sters, netv	works and
comes	software (Application	n).					
	3. Construct th	e effective mode	el for data vis	ualization	by using	various to	echniques
	(Application).						
Course Content:							
Module 1	A Conceptual Framework for Data Visualization	Quiz / Assignment	Data Collecti	on/Interp	retation	L – 2 se – 4 ses	essions, P ssions,
Tonics: Data information knowledge and insight: The transformation of data: Data visualization history:							
How does visualization help decision-making. Visualization plots							
	Visualization					L – 5 s	essions.
Module 2	Techniques for Spatial Data	Quiz / Assignment	Data Collec	tion/Inter	oretatio	n Lab – 1 sessior	.0 15
Topics: One Di	imensional Data; Tv	vo-Dimensional	Data; Three	e-Dimensio	onal Da	ta; Dynar	nic Data;
Combining Techn	iques.						
Visualization Tec	hniques for Time-Ori	ented Data: Ch	aracterizing ⁻	Time-Orier	nted Dat	a; Visualiz	zing Time-
Oriented Data.							
Visualization Tec	hniques for Multivari	ate Data: Point-	Based Techn	iques; Line	-Based	lechnique	s; Region-
Based rechniques	s; combinations of re	chniques.					
	Visualization					L – 2 s	essions,
Module 3	Techniques for	Group Project	Case st	udies / Cas	se let	Lab – a	8
	Networks					sessior	ıs
Tonics: Displayin	g Hierarchical Structu	res: Displaying	L Arhitrary Gra	nhs / Notu	vorks		
Text a	nd Document Visuali	ration: Levels of	Text Renres	entations.	Vector 9	Snace Mo	del· Single
Doci	ument Visualizations:	Document Colle	ection Visuali	zations: Ex	tended	Text Visua	alizations.
	Visualization					L – 4 s	ession.
Module 4	Techniques for	Group Proiect	Case st	udies / Cas	se let	Lab	,
_	Geospatial Data			,		– 8 se	ssions
Topics: Visualizi	ng Spatial Data; Visu	alization of Poin	t Data; Visua	alization of	f Line Da	ata; Visua	lization of
Area Data.							

Interaction Concepts: Interaction Operators; Interaction Operands and Spaces; A Unified Framework. Designing Effective Visualizations: Steps in Designing Visualizations; Problems in Designing Effective Visualizations.

Comparing and Evaluating Visualization Techniques: User Tasks; User Characteristics; Data Characteristics; Visualization Characteristics; Structures for Evaluating Visualizations; Benchmarking Procedures.

List of Laboratory Tasks: Introduction to Data Visualization, Introduction to Python Packages (pandas), Visualization Tools, Time Series Data Visualization, Advanced Visualizations, Visualization Techniques for Geospatial Data, Interaction Concepts

Targeted Application & Tools that can be used:

Text Book

T1: Ward, Matthew O., Georges Grinstein, and Daniel Keim. *Interactive data visualization: foundations, techniques, and applications*. CRC Press, 2010.

T2: Madhavan, Samir. *Mastering Python for Data Science*. Packt Publishing Ltd, 2015.

T3: Wilkinson, Leland, *The Grammar of Graphics*, Springer-Verlag New York, 2015

References

R1: Wilke, Claus O. Fundamentals of data visualization: a primer on making informative and compelling figures. O'Reilly Media, 2019.

R2: Tamara Munzner, Visualization Analysis and Design (VAD), CRC press, 2014

R3: Show Me the Numbers: Designing Tables and Graphs to Enlighten, Few, Stephen. 2nd Edition. Analytics Press.

R4: Interactive Data Visualization for the Web by Scott Murray 2nd Edition (2017)

R5: Andy Kirk, Data Visualization A Handbook for Data Driven Design, Sage Publications, 2016

R6: Philipp K. Janert, Gnuplot in Action, Understanding Data with Graphs, Manning Publications, 2010.

R7: Semiology of Graphics by Jacques Bertin (2010)

R8: Sosulski, K. (2018). Data Visualization Made Simple: Insights into Becoming Visual. New York: Routledge.

R9: (Information Science and Statistics). Springer-Verlag, Berlin, Heidelberg.

E book link R1: <u>https://data.vk.edu.ee/PowerBI/Opikud/Fundamentals_of_Data_Visualization.pdf</u>

E book link R2: https://www.cs.ubc.ca/~tmm/vadbook/

E book link

R3: <u>https://courses.washington.edu/info424/2007/readings/Show_Me_the_Numbers_v2.pdf</u>

Web resources:

1. https://www.coursera.org/specializations/data-

visualization?utm_source=gg&utm_medium=sem&campaignid=18216928764&adgroupid=1412960257 52&device=c&keyword=coursera%20website&matchtype=b&network=g&devicemodel=&adpostion=&c reativeid=619458216881&hide_mobile_promo=

2. <u>https://www.udemy.com/course/learning-python-for-data-analysis-and-</u>

visualization/?gclid=CjwKCAiAvK2bBhB8EiwAZUbP1AMoQv7rzjp8XYldXw1d5bz2VQs6GvhLcB7z6a3Wxn Do_Gwq4NbYlBoCQUgQAvD_BwE&matchtype=b&utm_campaign=LongTail_la.EN_cc.INDIA&utm_conte nt=deal4584&utm_medium=udemyads&utm_source=adwords&utm_term=___ag_84769191288___ad 533157478534___kw_%2Bdata+%2Bvisualization+%2Bcourse___de_c___dm___pl___ti_kwd-143520005604___li_9062050__pd___

3. <u>https://www.youtube.com/watch?v=iPPGfEA2s2M</u>

- 4. <u>https://www.youtube.com/watch?v=PSeRjy7y9yE</u>
- 5. <u>http://www.ifs.tuwien.ac.at/~silvia/wien/vu-</u>

infovis/articles/Chapter8_VisualizationTechniquesForTreesGraphsAndNetworks_271-290.pdf
 <u>https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=</u>2ahUKEwjY-

<u>56U5KD7AhUq7TgGHRPxBXYQtwJ6BAgIEAI&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%</u> <u>3D1k7sryECatk&usg=AOvVaw2ZyMwaMdBZiF4cH2YqXmYc</u>

Topics relevant to development of "Employablity": Visualization Techniques for Spatial Data, Trees, Graphs, Networks and Geospatial Data for developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

[Text Wrapping Break]

Course Code:	Course Title: Go Pro	ogramming		L- P- C	3 0		3
CSE 2033	1 o	ory Only Cou	rse				
version No.	1.0	/ 01 : 0 :	(1 D	• /•	```		
Course Pre-	Computer Programmi	ng/ Object Orie	ented Program	mming (ja	va)		
requisites	N 111						
Anti-	NIL						
requisites	~ .				. ~ .		
Course Description	Concise, clean, and efficient. Its concurrency mechanisms make it easy to write programs that get the most out of multicore and networked machines. Go compiles quickly to machine code yet has the convenience of garbage collection and the power of run-time reflection. It's a fast, statically typed, compiled language that 						
Course	The objective of the co	ourse is to fam	iliarize the le	arners wit	h the conc	epts c	of GO
Objective	Programming and att	ain Emplovabilit	v Skills throug	zh Problem	Solving tec	chniau	es.
j			.,	5			
Course Out ComesOn successful completion of the course the students shall be able to: CO1: Identify primitive programming constructs in GO. (Knowledge) CO2: Discuss composite data types with concepts of modular programming. (Comprehension) CO3: Implement garbage collection using pointers, structs, interfaces and modules. (Application) CO4: Apply concurrent programming and test routines with applications. (Application)							
Course Content:							
Module 1	Introduction to Go Programming Language	Assignment	Data Collection/I	nterpretatio	on 1	0 Ses	sions
Topics: Knowledge] Feature of Go l playground. Str declaration, zero packages, funct	anguage, Installing and ucture of Go program o values, naming, rules ions from other packa	d Configuring ; Basic types- , conversions, ges, println, re	the developm numbers, boo constants, m cading input,	nent enviro olean, strii ultiple var Control S	onment- G ngs, runes iables. Intr structures	io too Vari oduct - if, s	ls and ables- ion to witch,

Conection/interpretation	Module 2	Composite types and functions	nment Collec	Data ction/Interpre	tation 9	Sessions
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[Comprehension]

Composite types - arrays, slices, slices with overlapping storage, Structs. Functions-declaring, parameters, returning multiple values, variadic functions; Programming exercises

Module 3	Pointers, Structs, Interfaces and	Quiz	Case studies / Case let	9 Sessions
	modules			

Application]

Pointers: *and & operator, types, pointers with functions, garbage collector – history, Methods and Interfaces, Modules, packages – importing and creating custom packages; Programming exercises.

|--|

Topics:

Application]

Concurrency using Go routines, multiple go routines, channels – channel operations, Testingwriting test, Go test command, Core Packages for – strings, containers and lists, Writing Web Applications, Basic Statistical Computations, histogram plotting, encryption and decryption.

Targeted Application & Tools that can be used:

- 1. <u>https://go.dev/play/</u>
- 2. <u>https://go.dev/doc/install</u>

Project work/Assignment:

Text Book

T1 1. John Badner, "Learning Go: An Idiomatic Approach to Real World Go Programming", Oreilly, California, 2021.

References

R1. 1. Alan A.A. Donovan and Brian W. Kernighan, "The Go Programming Language", Pearson Education, India,2016.

R2. Tsoukalos M. Mastering Go: Create Golang production applications using network libraries, concurrency, machine learning, and advanced data structures. Packt Publishing Ltd; 2019 Aug 29. **Web resources:** https://www.golangprograms.com/go-language.html

EBSCO database of Presidency University:<u>https://puniversity.informaticsglobal.com/login</u> W3. GO document: https://go.dev/doc/

Online tool for program execution:

- GO Play Ground <u>https://go.dev/play/</u>
- Download and install: <u>https://go.dev/doc/install</u>

Topics relevant to development of "Employability": Go Programming basics for developing **Employability Skills** through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

[Text Wrapping Break]

Course Code: CSE2015	Course Title: Data Anal Type of Course:1] Progr 2] Lab	ysis and Visuali am core Integrated Cou	zation	L- P- C	2	4	4		
Version No.	1.0	0			1	1			
Course Pre- requisites	Course Pre- requisites Python Programming								
Anti-requisites	NIL								
Course Description	The purpose of the course orientation that is the co design thinking appended visualizations of data. The programming and basic ku The associated laborator skillset in the arena of Dat With a good knowledge in handling and visualizing d enabling the student to be	e is to instill a str principation of eff with strong prog he student should nowledge of data y provides an of ta Preprocessing the fundamental lata the student ca an effective anal	ong founda fective data ramming sl d have prio concepts. pportunity and Visual concepts c an gain a st yst for pros	tion of s handlin kills to cr or know to stren ization. of the var ronghold spective	cient ng, a reate ledge ngthe ious l in D empl	ific j nd c mean of n stu libra vata S oyer	process reative ningful python udent's ries for Science		
CourseThe objective of the course is to familiarize the learners with the concepts oObjectiveData Analysis and Visualization and attain EMPLOYABILITY through Experiential Learning techniques.							epts of hrough		
Course Out Comes Course Content:	 On successful completion of this course the students shall be able to: 1. Understand the various types of data, apply and evaluate the principles of data visualization. 2. Acquire skills to apply visualization techniques to a problem and its associated dataset. 3. Create interactive visualization for better insight using various visualization tools. 4. Handle data occurring in large volumes 5. Implement the visualization concepts practically using Python 								
Introduction to Data Visualization (Comprehension)AssignmentProgramming activity10 Hours							Hours		
Topics: Data collection, E Task Abstraction - and Preparation, I Python Libraries :	Data Preparation Basic Mod Analysis: Four Levels for V Handling Missing Data, Dat NumPy, pandas, matplotlib, C	lels- Overview of alidation, Interact ta Transformation GGplot,Introductio	data visuali ing with D n. n to pandas	zation - I Databases Data Stru	Data A s, Da	Abstr ta Cl s	action - leaning		
Module 2	Data Visualization Techniques (Application)	Assignment	Programm	ing activ	vity	10	Hours		

Scalar and point techniques – vector visualization techniques – matrix visualization, Visualization Techniques for Trees, Graphs, and Networks, Multidimensional data, Visual Variables- Networks and Trees - Map Color and Other Channels- Manipulate View- Heat Map.

Module 3	Visual Analysis of data from various domain (Application)	Assignment	Programming activity	10 Hours
	(i ipplication)			

Time-oriented data visualization – Spatial data visualization, Text data visualization – Multivariate data visualization and case studies, Finance- marketing-insurance-healthcare etc.

Topics:

Guidelines for designing successful visualizations, Data visualization dos and don'ts, Best practices of Data Streaming, processing streaming data for visualization, presenting streaming data, streaming visualization techniques, streaming analysis.

List of Laboratory Tasks:

Labsheet -1 [4 Practical Sessions]

Working with Numpy Functions and Pandas functions Acquiring and plotting data.

Labsheet -2 [4 Practical Sessions]

Practicals based on Data Cleaning and Preparation

Practicals based on Data Wrangling

Statistical Analysis – such as Multivariate Analysis, PCA, LDA, Correlation regression and analysis of variance

Labsheet – 3 [4 Practical Sessions]

Practicals based on Data Visualization using matplotlib Visualization of various massive dataset - Finance - Healthcare - Census

Labsheet – 4 [4 Practical Sessions]

Practical based on Time Series Data Analysis-stock market Market-Basket Data analysis-visualization Text visualization using web analytics

Labsheet -5 [4 Practical Sessions]

Financial analysis using Clustering, Histogram and HeatMap Visualization on Streaming dataset (Stock market dataset, weather forecasting)

Targeted Application & Tools that can be used: Anaconda/Google Colab, Google Data Studio, Deep Note

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

1. Problem Solving: Choose an appropriate set of visualization elements and design for a dashboard.

2. Programming: Implementation of the chosen dashboard

Text Book

1. McKinney, W.(2017). Python for Data Analysis: Data Wrangling with Pandas, NumPy and IPython. 2nd edition. O'Reilly Media.

2. Tamara Munzer, Visualization Analysis and Design, CRC Press 2014.

3. Aragues, Anthony. Visualizing Streaming Data: Interactive Analysis Beyond Static Limits. O'Reilly Media, Inc., 2018

4. Dr. OssamaEmbarak, "Data Analysis and Visualization Using Python", Apress, (2018)

References

R1. Dr.Chun-hauh Chen, W.K.Hardle, A.Unwin, Handbook of Data Visualization, Springer publication, 2016.

R2. Christian Toninski, Heidrun Schumann, Interactive Visual Data Analysis, CRC press publication, 2020 3. Alexandru C. Telea, Data Visualization: Principles and Practice, AK Peters, 2014.

R3. García Salvador, LuengoJulián, & Herrera, F. "Data preprocessing in Data Mining", Springer,(2015)

R4. Stephen Few, "Information Dashboard Design: the effective visual communication of data", Oreilly, 2006

R5. Belorkar, A, "Interactive Data Visualization with Python" - [S.l.]: Packt Publishing, Second Edition. (2018)

Web links

R1. https://pythonprogramming.net/live-graphs-data-visualization-application-dash-python-tutorial/

R2. <u>Google Data Analytics Professional Certificate | Coursera</u>

R3. Learning Python for Data Analysis and Visualization Ver 1 | Udemy

R4. <u>Data Science</u>, <u>Analytics and Visualization</u> (DS) <u>Courses</u> | <u>Chaminade University - PROD</u> [Integrated] <u>Catalog</u>

R5. Data Visualization Training and Certification Courses | Koenig Solutions (koenig-solutions.com)

Topics relevant to "Employability": Visual Analysis and Streaming of Data for Employability through Experiential Learning techniques. This is attained through the assessment component mentioned in the course handout.

Decision	Course Title: Inno	vation Project-Raspbe	erry Pi Using		0	4	2
	Python					This includes	
				L- P- C		few lecture	
						sessions	
Version No.	0.9						
Course Pre-	NIL						
requisites							
Anti-requisites	NIL						
Course	In this course the	students will learn fur	ndamental co	oncepts c	of 'Pyt	thon' and Pytho	n for
Description	Raspberry Pi throu	igh problem solving us	ing Python i	n a syster	natic	way to read and	write
	the Python code ar	id to implement them of	on Raspberry	Pi proto	type b	oard. The course	e will
	also demonstrate	how to assemble vari	ous sensory	devices	and	program them i	using
	experience in hand	lling IoT devices invo	win nave ui lving hardwa	are and s	oftwa	re combinations	The
	course also offer	rs in-depth knowleds	pe of desig	pning. d	levelo	pping. coding	and
	implementing Ra	spherry Pi projects.		B, ·		.p8,8	
Course	The objective of	f the course is SKI	LL DEVEI	LOPME	NT o	f student by u	ising
Objective	EXPERIENTIAI	LEARNING techn	iques.	-		j.	0
			1				
Course	On successful com	pletion of this course	the student	ts shall b	e able	to:	
Outcomes	1. Develop	beginn	er	le	vel	ру	/thon
	code.		A]	pplicatio	on]		
	2. Explain	the main	features	of	the	Raspberry	Pi
	board.	[Comprenension]	torfacing of	the new	inhor	als to Dasabar	
	3. Demonstr	ate the hardware in	terracing of	the per	ipner	als to Raspber	IY PI
	System.					[Applicati	ion]
	4. Demonstr	ate the functioning of	live various r	proiects o	arried	l out using Raspl	berrv
	Pi system.	U		,		[Applicatio	n] Í
Course							
Content:							
Module 1	Basics of Python	Quiz	Problem Sol	ving		4 Session	าร
Topics:							
Introduction, Ge	tting started with P	ython, Variables and Li	terals, Print	function,	input	function, Data 1	ypes
Type Conversior	ns, Operations on	Strings, Arithmetic an	d logical Op	perators,	Boole	ean expression,	Data
sequence, lists, t	uples, sets, diction	ary.					
Concepts will be	e taught by solving	problems through pro	ograms.				
Module 2	Decision Making	Quiz	Problem Sol	ving		4 Session	าร
Topics:	and iterations						
Conditional codi	ng and Control stat	ements-if elif else w	hile loon fo	r loon ne	sted f	for loon range	
function, break a	and continue, pass.		inc 100p, 10	1000,110	Juca		
Concepts will be	taught by solving	problems through pro	ograms.				
•		· · · ·					
Module 3	Functions, Files	Project Development	Problem Sol	ving		4 Session	ns
Topics:							
Introduction to f	unctions, syntax, v	ariables scope and life	time, functio	on param	eters	and arguments,	
importing modu	les.						
Concepts will be	taught by solving	problems through pro	ograms.				
Module 4	Interaction with API Services	Project Development	Modeling ar	nd Simula	tion t	ask 3 Sessio r	15
Topics:							

Raspberry Pi interact with online API services through the use of public APIs and SDKs using Firebase, Gspread API.

Node-RED – a programming tool for wiring together hardware devices, MQTT. Android/Case study.

Targeted Application & Tools that can be used:

Making it a reality (Raspberry Pi Projects) :

Projects will include but not limited to :

- 1) Intelligent home locking system.
- 2) Intelligent water level management system.
- 3) Home automation using RFID.
- 4) Real time clock-based home automation.
- 5) Intelligent Automatic Irrigation System

Professionally Used Software: Raspberry Pi.

Project work/Python Lab Test:

Project work

Python test.

Text Book(s):

Ashok Namdev Kamthane, Amit Ashok Kamthane, "Problem Solving and Python Programming", Mc Graw Hill Education, 2018.

Reference(s):

- 1. https://github.com/thibmaek/awesome-raspberry-pi
- 2. MagPi magazine

Topics relevant to development of "Skill Development": Basic Concepts of Python-Programming, and Raspberry Pi for Skill Development through Experiential Learning Techniques. This is attained through assessment component mentioned in course handout.

Evaluation: Review-1-20%, Review-2-25%, Python test-25%, Project Expo-30%

[Text Wrapping Break]

Course Code: CSF253	Course Title: Database Management Systems Lab	L- T-P- C	0	0	4	2
Version No.	2.0					
Course Pre- requisites	Basic elements of programming language, set theory, M system basics	odular ap	oproa	ch, Oj	perati	ng
Anti-requisites	-					
Course Description	Database management lab is designed to have a real structured query languages, which includes use of manipulation commands, functions, joins, sub-que procedures and triggers.	feel of o various eries, vie	databa data ews ,	ase d defin set	esign ition, opera	using data tions,
Course Objective	The objective of the course is to familiarize the learners Management Systems Lab and attain SKILL DEVELOPN LEARNING techniques	with the /IENT thr	conco ough	epts c E EXI	of Dat PERIE	abase NTIAL
Course Out Comes	On successful completion of the course the students sha 1. Apply the various data models and ER modeli design. (Application) 2. Demonstrate SQL commands for structu (Application) 3. Develop the solutions for solving database pr (Application)	all be able ing conce red dat roblems	e to: epts u abase throu	sed i ma gh ca	n dat mage se st	abase ment. udies.
Course Content:	Entity Relationship (ER) Model, ER Model to Relational constraints, SQL Query Language, insert, delete, and upo change statements (alter, drop), in, Exists, not exists cla of aggregate functions (min, max, sum, count etc.), ma Triggers, Views, Functions, Procedure and cursor.	Model, E late state use, Impl th functio	xamp ment emen ons, c	les or s in S t diff omm	i ER n QL, Sc erent it, rol	nodel, hema types lback,

List of Laboratory Tasks

Draw E-R diagram and convert entities and relationships to relation table for a given scenario. a. Two assignments shall be carried out i.e. consider two different scenarios (eg. bank, college)

2. To study and implement Data Definition Language commands of SQL.

3. To study and implement Data Manipulation Language of SQL.

4. To study and implement SQL data retrieval using SELECT, FROM and WHERE clause.

Perform the following: a. Viewing all databases, creating a Database, Viewing all Tables in a Database, Creating Tables (With and Without Constraints), Inserting/Updating/Deleting Records in a Table, Saving (Commit) and Undoing (rollback)

6. To Retrieve Data from Database using different types of special operators.

7. To study and implement aggregating Data using Group by Clause and HAVING clause and sort data using Order By.

8. To study and implement different types of Set Operations.

9. To study and implement different types of Joins in SQL.

Subqueries- With IN clause, With EXISTS and Not Exists clause

To study and implement different types Math Functions

12. To Retrieve Data from a given Database using Nested queries, Correlated queries.

- 13. To study and implement Views, Triggers in SQL.
- 14. To study and implement Functions and Procedures.

Write a SQL program using FOR loop to insert ten rows into a database table

16. To design and implement the DDL, DML and Retrieval for the BANK DATABASE.

17. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID) write a cursor to select the five highest paid employees from the table

Targeted Application & Tools that can be used:

Data base management applications and Oracle-Mysql

Text Book

Elmasri R and Navathe S B, "Fundamentals of Database System", Pearson Education.

References

Silberschatz A, Korth H F and Sudarshan S, "Database System Concepts",McGraw Hill Education. <mark>E-Resources</mark>

NPTEL course:

- <u>https://onlinecourses.nptel.ac.in/noc22_cs51/preview</u>
- <u>https://onlinecourses.swayam2.ac.in/cec22_cs08/preview</u>

Topics relevant to "SKILL DEVELOPMENT": Aggregates, Join, Views and Triggers for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Real Time Operating Systems		2	0	0	
CSE3085	Type of Course : Theory	L- P- C	5	0	0	
Version No.	1					
Course Pre-	NIL					
requisites						
Anti-requisites	NIL					
Course Description	he Real-time Operating Systems program is an educational and methodological ocument included in the master's educational program, provides for the acquisition of cills and competencies related to the study of the features of embedded operating /stems, as well as real-time systems. Real-time Operating Systems is aimed at the ormation of competencies aimed at obtaining theoretical knowledge about embedded perating systems, and the acquisition of practical skills and competencies in installing, onfiguring and debugging operating systems.					
Course Objective	Time Objective of the course is to familiarize the learne Time Operating Systems and attain EMPLOYABILITY S LEARNING techniques.	KILL thro	ne conce ugh PAR	TICIPA	real TIVE	
Course Out Comes	 Dn successful completion of the course the students shall be able to: Explain the fundamentals of Real time systems and its classifications. Understand the concepts of computer control and the suitable computer hardware requirements for real-time applications. Describe the operating system concepts and techniques required for real time systems. Apply deadlock detection and prevention algorithms to solve the given problem 					
Course Content:						
Module 1			8	Sessio	ns	
Introduction Re Introduction to Op threading concepts	al Time Operating System perating System: Computer Hardware Organization, percesses, Threads, Scheduling	BIOS an	id Boot	Proces	s, Multi-	
Module 2			8	Sessio	ns	
BASICS OF REAL-TIME CONCEPTS Terminology: RTOS concepts and definitions, real-time design issues, examples, Hardware Considerations: logic states, CPU, memory, I/O, Architectures, RTOS building blocks, Real-Time Kernel						
Module 3			8	Sessio	ns	
PROCESS MANAGEMENT Concepts, scheduling, IPC, RPC, CPU Scheduling, scheduling criteria, scheduling algorithms Threads: Multi-threading models, threading issues, thread libraries, synchronization Mutex: creating, deleting, prioritizing mutex, mutex internals						
Module 4			8	Sessio	ns	
INTER-PROCES	S COMMUNICATION: Messages, Buffers, ma	ilboxes,	queues	, sema	phores,	
deadlock, priority a PIPES MEMOR overlays, bloc collection	inversion, Y MANAGEMENT: - Process stack management, k/page management, replacement algori	run-time thms,	buffer real-ti	size, s [.] me	wapping, garbage	
Text Book 1. J. 2. Ja	J Labrosse, "MicroC/OS-II: The Real –Time Kernel", ne W. S. Liu, "Real-time systems", Prentice Hall, 2000	Newnes,).	2002.			

References

1. W. Richard Stevens, "Advanced Programming in the UNIX® Environment", 2nd Edition, Pearson Education India, 2011.

2. Philips A. Laplante, "Real-Time System Design and Analysis", 3rd Edition, John Wley& Sons, 2004

Doug Abbott, "Linux for Embedded and Real-Time Applications", Newnes, 2nd Edition, 2011.

Web resources: <u>http://pu.informatics.global</u>

Topics relevant to development of "Skill Development": Threads: Multi-threading models, threading issues, thread libraries, synchronization for developing Employability Skills through Participative Learning Techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Quantum Cor	nputing	L- P-	22	3			
CSE 3080	Type of Course: Integrated		C					
Version No.	1							
Course Pre-	Linear Algebra							
requisites	Probability and Statistics							
Anti-requisites								
Course Description	This course provides an computation. Topics covere computation. Quantum al search algorithm Mathemat Learning, and to physical sy	nis course provides an introduction to the theory and practice of quantum omputation. Topics covered include: quantum mechanics to understand quantum omputation. Quantum algorithms. The Shor's factorization algorithm Grover's earch algorithm Mathematical models of quantum computation, Quantum Machine earning, and to physical systems.						
Course Objective	The objective of the course	is to familiarize the	e learners wit	h the concept	s of			
	EVDEDIENTIAL LEADNING +	schniques	IT SKILLS UI	lough				
	On successful completion of	of the course the st	udants shall	ha ahla ta:				
Course Out Comes	 Understand the background backg	 In successful completion of the course the students shall be able to: Understand the basic principles of quantum computation and quantum mechanics. Design quantum circuits using quantum gates. Analyze the behavior of basic quantum algorithms. Understand the difference between classical and quantum machine learning approach 						
Course Content:								
Module 1	INTRODUCTION	Quiz	Quiz		10 sessions (8 T + 2 L)			
Topics:								
Topics: Introduction to quar	ntum computing. Qubits, Blo	och sphere, multiple	e qubits, quan	tum states and	1			
Topics: Introduction to quar measurements, Post	ntum computing. Qubits, Blc ulates of quantum mechanic	och sphere, multiple s, Classical comput	e qubits, quan ation vs quan	tum states and tum computat	l tion.			
Topics: Introduction to quar measurements, Post Module 2	ntum computing. Qubits, Blo ulates of quantum mechanic QUANTUM MODEL OF COMPUTATION	och sphere, multiple s, Classical comput Quiz	e qubits, quan ation vs quan Quiz	tum states and tum computat	l tion. 12 sessions (8 T + 4 L)			
Topics: Introduction to quar measurements, Post Module 2 Topics: The model of quar quantum circuits.	ntum computing. Qubits, Blo ulates of quantum mechanic QUANTUM MODEL OF COMPUTATION ntum computation, Quantum	och sphere, multiple s, Classical comput Quiz circuits: single qub	e qubits, quan tation vs quan Quiz oit gates, mult	tum states and tum computat iple qubit gate	l 12 sessions (8 T + 4 L) es, design of 12 sessions			
Topics: Introduction to quar measurements, Post Module 2 Topics: The model of quar quantum circuits. Module 3	ntum computing. Qubits, Blo ulates of quantum mechanic QUANTUM MODEL OF COMPUTATION atum computation, Quantum QUANTUM ALGORITHMS	och sphere, multiple s, Classical comput Quiz circuits: single qub Assignment	e qubits, quan tation vs quan Quiz vit gates, mult Case Stu	tum states and tum computat iple qubit gate dies	l 12 sessions (8 T + 4 L) es, design of 12 sessions (8 T + 4 L)			
Topics: Introduction to quar measurements, Post Module 2 Topics: The model of quar quantum circuits. Module 3 Topics: Deutsch-Joz	ntum computing. Qubits, Blo ulates of quantum mechanic QUANTUM MODEL OF COMPUTATION atum computation, Quantum QUANTUM ALGORITHMS resa algorithm and Grover's s	och sphere, multiple s, Classical comput Quiz circuits: single qub Assignment earch algorithm. Sh	e qubits, quan tation vs quan Quiz oit gates, mult Case Stu	tum states and tum computat iple qubit gate dies	l 12 sessions (8 T + 4 L) es, design of 12 sessions (8 T + 4 L) g, Quantum			
Topics: Introduction to quar measurements, Post Module 2 Topics: The model of quar quantum circuits. Module 3 Topics: Deutsch-Joz Fourier transform.	ntum computing. Qubits, Blo ulates of quantum mechanic QUANTUM MODEL OF COMPUTATION ntum computation, Quantum QUANTUM ALGORITHMS rsa algorithm and Grover's s	och sphere, multiple s, Classical comput Quiz circuits: single qub Assignment earch algorithm. Sh	e qubits, quan tation vs quan Quiz tit gates, mult Case Stu nor's algorithm	tum states and tum computat iple qubit gate dies m for factoring	l 12 sessions (8 T + 4 L) es, design of 12 sessions (8 T + 4 L) g, Quantum			
Topics: Introduction to quar measurements, Post Module 2 Topics: The model of quar quantum circuits. Module 3 Topics: Deutsch-Joz Fourier transform. Module 4	ntum computing. Qubits, Blo ulates of quantum mechanic QUANTUM MODEL OF COMPUTATION atum computation, Quantum QUANTUM ALGORITHMS rsa algorithm and Grover's s QUANTUM INFORMATION THEORY & QUANTUM MACHINE LEARNING	och sphere, multiple s, Classical comput Quiz circuits: single qub Assignment earch algorithm. Sh Assignment	e qubits, quan tation vs quan Quiz vit gates, mult Case Stu tor's algorithm Case Stu	tum states and tum computat iple qubit gate dies n for factoring dies	l ion. 12 sessions (8 T + 4 L) es, design of 12 sessions (8 T + 4 L) g, Quantum 11 sessions (9 T + 2 L)			
Topics: Introduction to quar measurements, Post Module 2 Topics: The model of quar quantum circuits. Module 3 Topics: Deutsch-Joz Fourier transform. Module 4 Topics: Comparison	ntum computing. Qubits, Blo ulates of quantum mechanic QUANTUM MODEL OF COMPUTATION atum computation, Quantum QUANTUM ALGORITHMS rsa algorithm and Grover's s QUANTUM INFORMATION THEORY & QUANTUM MACHINE LEARNING between classical and quant	och sphere, multiple s, Classical comput Quiz circuits: single qub Assignment earch algorithm. Sh Assignment tum information the	e qubits, quan sation vs quan Quiz it gates, mult Case Stu nor's algorithm Case Stu eory, Applica	tum states and tum computat iple qubit gate dies m for factoring dies tions of quant	tion. 12 sessions (8 T + 4 L) es, design of 12 sessions (8 T + 4 L) g, Quantum 11 sessions (9 T + 2 L) um			
Topics: Introduction to quar measurements, Post Module 2 Topics: The model of quar quantum circuits. Module 3 Topics: Deutsch-Joz Fourier transform. Module 4 Topics: Comparison information, Bell sta	ntum computing. Qubits, Blo ulates of quantum mechanic QUANTUM MODEL OF COMPUTATION atum computation, Quantum QUANTUM ALGORITHMS esa algorithm and Grover's s QUANTUM INFORMATION THEORY & QUANTUM MACHINE LEARNING a between classical and quant ates, Quantum Machine Lear	och sphere, multiple s, Classical comput Quiz circuits: single qub Assignment earch algorithm. Sh Assignment tum information the rning, no cloning th	e qubits, quan sation vs quan Quiz vit gates, mult Case Stu nor's algorithm Case Stu eory, Applica seorem.	tum states and tum computation iple qubit gate dies n for factoring dies tions of quant	l 12 sessions (8 T + 4 L) es, design of 12 sessions (8 T + 4 L) g, Quantum 11 sessions (9 T + 2 L) um			
Topics: Introduction to quar measurements, Post Module 2 Topics: The model of quar quantum circuits. Module 3 Topics: Deutsch-Joz Fourier transform. Module 4 Topics: Comparison information, Bell str List of Laboratory T Lab 1: Use Lab 2: Disp Lab 3: Cons	ntum computing. Qubits, Blo ulates of quantum mechanic QUANTUM MODEL OF COMPUTATION atum computation, Quantum QUANTUM ALGORITHMS esa algorithm and Grover's s QUANTUM INFORMATION THEORY & QUANTUM MACHINE LEARNING a between classical and quant ates, Quantum Machine Lear casks: Qiskit Tools [Module 1] lay and Use System Informa struct Visualizations [Modul	och sphere, multiple s, Classical comput Quiz circuits: single qub Assignment earch algorithm. Sh Assignment tum information the rning, no cloning th tion [Module 1] le 1]	e qubits, quan sation vs quan Quiz vit gates, mult Case Stu nor's algorithm Case Stu eory, Applica seorem.	tum states and tum computat iple qubit gate dies n for factoring dies tions of quant	tion. 12 sessions (8 T + 4 L) es, design of 12 sessions (8 T + 4 L) g, Quantum 11 sessions (9 T + 2 L) um			
Topics: Introduction to quar measurements, Post Module 2 Topics: The model of quar quantum circuits. Module 3 Topics: Deutsch-Joz Fourier transform. Module 4 Topics: Comparison information, Bell sta List of Laboratory T Lab 1: Use Lab 2: Disp Lab 3: Cons Lab 4: Perfe	ntum computing. Qubits, Blo ulates of quantum mechanic QUANTUM MODEL OF COMPUTATION atum computation, Quantum QUANTUM ALGORITHMS rsa algorithm and Grover's s QUANTUM INFORMATION THEORY & QUANTUM MACHINE LEARNING a between classical and quant ates, Quantum Machine Lear fasks: Qiskit Tools [Module 1] lay and Use System Informa struct Visualizations [Modul orm Operations on Quantum	circuits: single qub Assignment earch algorithm. Sh Assignment tum information the ming, no cloning th tion [Module 1] e 1] n Circuits [Module	e qubits, quan sation vs quan Quiz oit gates, mult case Stu nor's algorithm Case Stu eory, Applica seorem.	tum states and tum computat iple qubit gate dies n for factoring dies tions of quant	l tion. 12 sessions (8 T + 4 L) es, design of 12 sessions (8 T + 4 L) g, Quantum 11 sessions (9 T + 2 L) um			
Topics: Introduction to quar measurements, Post Module 2 Topics: The model of quar quantum circuits. Module 3 Topics: Deutsch-Joz Fourier transform. Module 4 Topics: Comparison information, Bell str List of Laboratory T Lab 1: Use Lab 2: Disp Lab 3: Cons Lab 4: Perfu Lab 5: Impl	Atum computing. Qubits, Blo ulates of quantum mechanic QUANTUM MODEL OF COMPUTATION Atum computation, Quantum QUANTUM ALGORITHMS esa algorithm and Grover's s QUANTUM INFORMATION THEORY & QUANTUM MACHINE LEARNING A between classical and quant ates, Quantum Machine Lean fasks: Qiskit Tools [Module 1] lay and Use System Informa struct Visualizations [Modul orm Operations on Quantum ement BasicAer: Python-bas	Assignment Assignment earch algorithm. Sh Assignment itum information the ming, no cloning th tion [Module 1] e 1] n Circuits [Module sed Simulators [Mo	e qubits, quan sation vs quan Quiz dit gates, mult Case Stu nor's algorithm Case Stu eory, Applica eorem. 2] dule 2]	tum states and tum computat iple qubit gate dies m for factoring dies	tion. 12 sessions (8 T + 4 L) es, design of 12 sessions (8 T + 4 L) g, Quantum 11 sessions (9 T + 2 L) um			
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Topics: Introduction to quar measurements, Post Module 2 Topics: The model of quar quantum circuits. Module 3 Topics: Deutsch-Joz Fourier transform. Module 4 Topics: Comparison information, Bell sta List of Laboratory T Lab 1: Use Lab 2: Disp Lab 3: Cons Lab 4: Perfe Lab 5: Impl Lab 6: Acce Lab 7: Impl	Atum computing. Qubits, Blo ulates of quantum mechanic QUANTUM MODEL OF COMPUTATION Atum computation, Quantum QUANTUM ALGORITHMS Tesa algorithm and Grover's s QUANTUM INFORMATION THEORY & QUANTUM MACHINE LEARNING A between classical and quantates, Quantum Machine Lear asks: Qiskit Tools [Module 1] lay and Use System Informa struct Visualizations [Modul orm Operations on Quantum ement BasicAer: Python-bas tess Aer Provider [Module 3] ement QASM [Module 3]	Assignment Assignment tum information the ming, no cloning th tion [Module 1] le 1] n Circuits [Module Sed Simulators [Module	e qubits, quan cation vs quan Quiz duit gates, mult case Stu nor's algorithm Case Stu eory, Applica eorem. 2] dule 2]	tum states and tum computation iple qubit gate dies n for factoring dies tions of quant	tion. 12 sessions (8 T + 4 L) es, design of 12 sessions (8 T + 4 L) g, Quantum 11 sessions (9 T + 2 L) um			

	Lab 9: Return the Experiment Results [Module 4]
	Lab 10: Compare and Contrast Quantum Information [Module 4]
Target	ed Application & Tools that can be used
1.	Framework- Qiskit
2.	Language- Python
3.	Applications:
	Quantum Circuits
	Quantum Gates
	Quantum Machine Learning Algorithms Project work (Assignment:
Assign	ment:
1001811	• Create quantum circuit functions that can compute the XOR, AND, NAND and OR gates
	using the NOT gate (expressed as x in Qiskit), the CNOT gate (expressed as cx in Qiskit) and the
	Toffoli gate (expressed as ccx in Qiskit).
	• Measure the Bloch sphere coordinates of a qubit using the Aer simulator and plot the
	vector on the Bloch sphere
	• Investigate the relationship between the number of qubits required for the desired
	accuracy of the phase estimation with high probability.
Project	t Work:
	• Create a program that builds an oracle for a given string (e.g. given 01101, will return a
	QuantumCircuit that inverts the phase of the state [01101] and leaves all other states
	unchanged.
	Tackle an open issue in the Qiskit Terra repo.
	Create a program that builds an oracle circuit from a problem (like the PhaseOracle class
	does in the previous page). Assess how the size of your circuits grow with the size of the
Taut D	problem.
I ext Bo	DOK Nielson M. & Chuong I. (2010). Quantum Computation and Quantum Information. 10th
1. An	nielsen, M., & Chuang, I. (2010). Quantum Computation and Quantum Information: 10th
2	McMahon D. Quantum Computing Explained Hoboken N I: Wiley-Interscience : IFFF
Co	mputer Society: 2008.
Refere	nces
1.	Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I:
Ba	sic Concepts, Vol II: Basic Tools and Special Topics, World Scientific. (2004)
2.	Pittenger A. O., An Introduction to Quantum Computing Algorithms (2000).
E book	clink R1:
http:/	//community.qiskit.org/textbook
E DOOK	CIIIK KZ
Mob r	<u>/gltnub.com/Qiskit</u>
webre	Abraham Asfaw and Antonia Corcolos & at al "Learn Quantum Computation Using Oickit"
- 20	Abraham Asiaw and Antonio Corcoles & et al. Learn Quantum Computation Using Qiskit,
	IBM Oiskit Global Summer School 2021: Quantum Machine Learning
htt	ns://giskit.org/events/summer-school/
<u></u>	https://guantum-computing.jbm.com/
•	https://giskit.org/
•	https://presiuniv.knimbus.com/u
Topics	relevant to development of "Employability Skills"
•	Designing Quantum circuits
•	Visualizing Quantum Circuit outputs
L .	Analyzing and Companing Quantum Algorithm Derformance for developing Employability Skille

• Analyzing and Comparing Quantum Algorithm Performance for developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title:							
CSE 3071	Computer Vision			L- P- C	2	2	3	
	Type of Course: Prog	ram Core						
	I neory and Lab Integ	grated Course						
Version No.	1.0							
Course Pre-	Linear algebra, vecto	inear algebra, vector calculus, and probability, Data structures						
requisites								
Anti-requisites	NIL							
Course	This course provides	This course provides an introduction to computer vision, including fundamentals of						
Description	image formation, car	mage formation, camera imaging geometry, feature detection and matching, stered						
	motion estimation and tracking, image classification, scene understanding, and c							
	include finding know	networks. we will a	evelop basic m		or app	aree		
	calibration image st	abilization automate	es, ueptil lett	acking h	ound:	arv do	tection	
	and recognition. We	will develop the int	itions and mat	hematic	s of th	ie met	thods in	
	class. and then learn a	about the difference b	between theory	and prac	ctice in	home	eworks.	
Course Objective	The objective of the o	course is to familiarize	e the learners v	vith the c	concep	ts of		
	Computer Vision ar	nd attain EMPLOYBIL	ITY SKILLS thro	ugh	•			
	EXPERIENTIAL LEARI	NING techniques		C				
Course	On successful comp	oletion of the course	the students s	hall be a	able to):		
Outcomes								
	CO1: To apply mathe	ematical modeling me	ethods for low-,	interme	diate-	and h	igh-	
	level image processin	ig tasks.						
	CO2: To perform sof	tware experiments of	n computer visi	on probl	ems ar	nd con	npare	
	their performance wi	th the state of the ar	l.	ie relatie	nchin	- hotu		
	images and the 2D w	orld	out the geometr	ic relatio	nsnip	sbeiw	reen zD	
		onu.						
Course Content:		<u> </u>	–	•	-			
Module 1	Digital Imag	eProgramming	Data Colle	ection	and	12 ses	ssions	
T T	Processing	Assignment	Analysis			•	<u> </u>	
Image Formation	n, Image Filtering,	Edge Detection, I	Principal Con	ponent	Anal	ysis,	Corner	
Detection SIF1,	Applications: Large	Scale Image Search	•					
	Geometric	Programming	Data Colle	ection	and	10	•	
wodule 2	Computer Vision	Assignment	Analysis			12 ses	SIONS	
Imaga Transform	Computer Vision	actions Comore Co	libration Dan	th from	Store	. T	o View	
Structure from M	lations, Camera Proj	ng	indiation, Dep	ui nom	Stelet), I W	0 view	
	Machine Learning fo	ng. rDrogramming						
Module 3	Computer Vision	Assignment	Data analysi	S		14 ses	ssions	
Introduction to Ma	aching Learning Image	Assignment	t Detection Se	mantic S	ogmor	ntation	 `	
List of Laborate			L'Detection, Se		eginei	πατισι	1.	
1 Simulation and	h y Tasks. I Display of an Imag	e Negative of an In	nade (Rinary &	& Grav S	Scale)			
2. Implementatio	n of Relationships be	etween Pixels	nage (Binary e	x Olay C	icaic)			
3. Implementatio	n of Transformations	s of an Image						
4. Contrast streto	ching of a low contra	st image, Histogran	n, and Histogra	am Equa	alizatio	on		
5. Display of bit p	planes of an Image	-	-	-				
6. Display of FFT	(1-D & 2-D) of an ir	nage	<i></i>					
7. Computation of	of Mean, Standard D	eviation, Correlation	n coefficient of	the give	en Ima	age		
o. Implementatio	n of image Smoothe	ning Filters (Mean a	and iviedian fil	iering of	an in ≏n+ ⊑:	ltore		
10. Image Comp	ression by DCT. DP	CM, HUFFMAN cod	ding	iy Jiaul		1013		

11. Implementation of image restoring techniques

12. Implementation of Image Intensity slicing technique for image enhancement Targeted Application & Tools that can be used:

Text Book

T1 Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.

T2 Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, 2ndEdition, Cambridge University Press, March 2004.

References

R1. R. Bishop; Pattern Recognition and Machine Learning, Springer,2006

R2. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992.

R3. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.

Web references:

https://onlinecourses.swayam2.ac.in/cec20_cs08/preview

Library reference: <u>https://presiuniv.knimbus.com/user#/home</u>

Topics relevant to development of "Employability": Image Smoothening Filters, Image sharpening filters for developing Employability Skills through Experiential Learning Techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE3019	Course Title: Stoc	hastic Decision makin	g	L- T-P-	3	0	0	3
	Type of Course: Th	eory		С	-	-	-	-
Version No.	1.0							
Course Pre- requisites	A course in Statisti Basic familiarity wi relative and absolu	A course in Statistics: STAT-UB 1 or STAT-UB 3 or STAT-UB 103. Basic familiarity with Microsoft Excel: developing and copying formulas with relative and absolute cell addresses, and using the function and chart wizards.						
Anti-requisites								
Course Description	This course introduces the basic concepts, principles, and techniques of decision naking under uncertainty. Students will learn how to model complex business problems that involve risk and uncertainty with the help of spreadsheet models. The course covers analytical models such as Decision Tree, Stochastic Optimization, Simulation & Optimization, and Dynamic Optimization. The course is hands-on. The emphasis will be on model formulation and interpretation of esults, not on mathematical theory. This course emphasizes optimization nodels with uncertain parameter values. In contrast, the DMA course focuses on various deterministic optimization models and Monte Carlo imulation.							
Course Objective	The objective of th Stochastic Decision Learning technique	The objective of the course is to familiarize the learners with the concepts of Stochastic Decision making and attain Employability through Participative Learning techniques.						
Course Out Comes	 On successful completion of the course the students shall be able to: Gain basic knowledge about stochastic processes in the time domain. The student has acquired more detailed knowledge about Markov processes with a discrete state space, including Markov chains, Poisson processes and birth and death processes. Know about queueing systems and Brownian motion, in addition to mastering the fundamental principles of simulation of stochastic processes and the construction of Markov chain Monte Carlo (MCMC) algorithms. formulate simple stochastic process models in the time domain 							
Course Content:	Use data to model travelDemand; Brid hedging strategie Introduction to de R&D project: mana postpone, expand,	and provide qualitative and quantitative analyses of such models. Use data to model currency exchange rates, stock prices, commodity prices, air travelDemand; Brief introduction to Monte Carlo simulation; Optimal financial hedging strategies; Supply contract selection; Airline booking control. Introduction to decision tree; Value of information; Bayesian updateValue an R&D project: managing technology risk; Value a license agreement; Options to postpone, expand, and contract.						
Module 1	Simple static stochastic optimization models	Assignment	Simula Analys	tion/Da is	ata		14 9	Sessions
Use data to mo Brief introducti contract selectio Bayesian update Options to post	del currency exchai on to Monte Carlo on; Airline booking eValue an R&D pro pone, expand, and o	nge rates, stock prices o simulation; Optima control. Introduction oject: managing techn contract.	s, com al fina to de nology	modity ncial h cision t risk; V	pric edgin ree; alue	es, ai ng st Value a lice	r tra rateg e of i ense	velDemand; gies; Supply information; agreement;

Module 2	sequential decision making: decision tree	Assignment	Simulation/Data Analysis	14 Sessions
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Introduction to dynamic programming; Binomial tree; American option pricing; Targeted marketingInventory management at a retail pharmacy; Optimal timing for market entry; Cash management at a retail bank.Moving average; Trends; Seasonality .Introduction to linear programming; Production planning with forecasted demand; Airline revenue management

Module 3	Real options and decision tree	Term paper/Assignment	Simulation/Data Analysis	14 Sessions

Capital budgeting: when projects have uncertain NPVs and uncertain capital usage; Production strategy: managing quality risk of raw materials; Value-at-risk Plant location for a multinational firm: hedging currency exchange risk; Process flexibility: hedging demand risk.Inventory transshipment: managing demand risk; Capacity planning for an electric utility.

List of Laboratory Tasks

Targeted Application & Tools that can be used:

The course is theory based and students will get hands on experience in statistical tools.

Assignment:

Text Book

1. J Medhi, "Stochastic Processes"

References

- 1. A K Basu, "Introduction to Stochastic process"
- 2. Ming Liao, "Applied Stochastic Process"
- 3. Time A Wheeler, Kyle H.Wray, "Algorithms for Decision making"

E-Resources

https://presiuniv.knimbus.com/user#/home

Topics relevant to the "EMPLOYABILITY SKILLS": Combing simulation with linear optimazation, for development of Employability skills through Participative Learning Techniques. This is attained through the assessment components mentioned in the course handout.

Course Code:	Course Title: Artificial Intelligence for Robo	otics	L- P-	3 0		3	
CSE 3076	Type of Course: Theory Only Course		С				
Version No.	1.0						
Course Pre-	Basic Programming Concepts						
requisites							
Anti-	NIL						
requisites							
Course Description	Course Description The course explores the intelligent system structure, working and various levels of representation. The students learn how to identify, differentiate, and categorize a wide range of intelligent system, as well as to evaluate how AI contribute to the design and development of intelligent system design. Also this course offers comprehensive knowledge and professional-level skills focused on developing and deploying software robots. It starts with the basic concepts of Robotic Process Automation. After successful completion of the qualification the candidates shall be employed in the industries for following occupations: RPA Developer, RPA Engineer, RPA Expert.						
Objective	Intelligence for Robotics and attain Methodologies.	Employability	through	Proble	em	Solving	
Course Out Comes	 On successful completion of the course the students shall be able to: CO 1: Define the basic of local search algorithms, various optimization techniques for a given AI algorithm. [Remember] CO 2: Identify the smart intelligent way to represent the knowledge Engineering. [Application] CO 3: Describe RPA, where it can be applied and how it's implemented. [Remember] CO 4: Use different types of variables, Control Flow and data manipulation techniques. 						
Course Content:							
Module 1	Introduction to intelligent systems	Quiz		:	10	Sessions	
Topics:		I I					
Basic Concepts and definitions of AI. Searching: Searching for solutions, Uniformed Search Strategies, Informed Search Strategies, and Heuristic Functions. Local Search Algorithms and Optimization Problems: Hill climbing, simulated annealing, local beam, Genetic algorithms, Constraint Satisfaction Problems, Backtracking Search for CSPs. searching in solution tree- case study: water jug problem. Adversial Search: Games, Optimal Decision in Games, Alpha Beta Pruning, Evaluation Functions, Cutting off search, Games that include an Element of chance. Game programs							
Module 2	Knowledge representations	Quiz		1	0	Sessions	
Topics: First Order Logi Order Logic: Pi	c: Syntax and Semantics, Using First Order Lo ropositional vs. First Order Inference, Unifi	ogic, Knowledge ication and Lifti	Engineeri ng, Resol	ng, Infe ution, f	ren ⁻ orv	ce in First vard and	
Backward Chair	ning.						
Module 3	Introduction To Robotic Process Automation	E Assignment	Design sol to give probler	ution n 1 n	0	Sessions	
Topics:							
Scope and tech	niques of automation, Robotic process autor	mation - What c	an RPA do	o?, Bene	efits	of RPA,	
Components of RPA, RPA platforms, The future of automation. RPA BASICS:							
History of Auto	omation - What is RPA - RPA vs Automatio	on - Processes	& Flowch	arts - P	rog	ramming	
Constructs in I	RPA - What Processes can be Automated	- Types of Bots	s - Work	loads w	hic	h can be	

automated - RPA Advanced Concepts - Standardization of processes - RPA Development methodologies -Difference from SDLC - Robotic control flow architecture - RPA business case - RPA Team - Process Design Document/Solution Design Document - Industries best suited for RPA - Risks & Challenges with RPA - RPA and emerging ecosystem.

Module 4	Rpa Tool Introduction And Basics	Assignment	Design solution to given problem	08	Sessions
T					

Topics:

The User Interface - Variables - Managing Variables - Naming Best Practices - The Variables Panel -Generic Value Variables - Text Variables - True or False Variables - Number Variables - Array Variables -Date and Time Variables - Data Table Variables - Managing Arguments - Naming Best Practices - The Arguments Panel - Using Arguments - About Imported Namespaces - Importing New Namespaces-Control Flow - Control Flow Introduction - If Else Statements - Loops - Advanced Control Flow -Sequences - Flowcharts - About Control Flow - Control Flow Activities - The Assign Activity - The Delay Activity - The Do While Activity - The If Activity - The Switch Activity - The While Activity - The For Each Activity - The Break Activity - Data Manipulation

 Data Manipulation Introduction - Scalar variables, collections and Tables - Text Manipulation - Data Manipulation - Gathering and Assembling Data.

Targeted Application & Tools that can be used:

Targeted application: Web Crawler, Email Crawler, etc.

Tools: UiPath, Power automate, etc.

Project work/Assignment:

Assignment:

Create a sequence that asks the user for his first and last name, and give him choices to order from his favorite snacks, and then displays his answers.

Design a process to Extract Initial name from full name

Design a process to insert integer and decimal value into a string without using + operator.

Design a process to read text from multiple word documents

Text Book

T1 E. Rich and K. Knight," Artificial Intelligence", Tata McGraw Hill, 2013

T2 Alok Mani Tripathi, "Learning Robotic Process Automation", Packt Publishing, 2018

References

R1 E. Charnaik and D.McDermott," Introduction to artificial Intelligence", Pearson Education, 2012.
R2 Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant", Independently Published, 1st Edition 2018.

E book link R1:

https://s3.amazonaws.com/ebooks.syncfusion.com/downloads/robotic-process-automationsuccinctly/robotic-process-automation-succinctly.pdf?AWSAccessKeyId=

AKIAWH6GYCX3TD2TTP24&Expires=1668334212&Signature=3ysYmpkfW8xJnT1yiSy%2FqTq1q9 w%3D

Web resources: https://www.uipath.com/rpa/robotic-process-automation https://puniversity.informaticsglobal.com/login

https://www.fer.unizg.hr/_download/repository/AI-1-Introduction.pdf

Topics relevant to "EMPLOYABILITY SKILLS": Design of assistant bots, Debugging and Exception Handling, Excel Data Tables & PDF - Data Tables in RPA **for developing Employability Skills through Problem Solving methodologies. This is attained through assessment component mentioned in course handout**

Course Code:	Course Title: Software Metrics and Qua	lity						
CSA2003	Management		РС	2	2	2		
	Type of Course: Integrated	L	P- C	2	Z	3		
Version No.	1.0							
Course Pre-requisites	NIL							
Anti-requisites	NIL							
Course Description	This course will focus on the processes	s, princi	ples, a	and te	chniques	of		
	software testing and analysis. It covers a fu	software testing and analysis. It covers a full spectrum of topics from basic						
	principles and underlying theory of testin	principles and underlying theory of testing to organizational and process						
	issues in real-world applications. The em	nphasis	is on	select	ing practi	cal		
	techniques to achieve an acceptable level	l of qual	ity at a	in acce	eptable co	ost.		
	This course will provide software enginee	ering pr	ofessio	onals v	with realis	stic		
	strategies for reliable and cost-effective s	oftware	e testin	ıg.				
Course Objective	The objective of the course is to familia	arize th	e learr	ners w	ith the c	oncepts		
	of Software Metrics and Quality Man	nageme	nt an	d atta	in Emplo	oyability		
	through Experiential Learning techniques	S.						
Course Out Comes	On successful completion of this course t	the stud	lents s	hall b	e able to:			
	To understand software testing as	nd qual	itv ass	urance	e as a			
	fundamental component of software life of	cvcle [K	nowle	dgel				
	To efficiently perform T & OA acti	ivities u	sing m	odern	software	tools		
	[Comprehension]	i i i i i i i i i i i i i i i i i i i	5.1.6	ouern	sorthare			
	• To prepare test plans and schedul	les for a	а Т&О/	A proie	ect [Appli	cation		
Course Content:				. p. oje				
Module 1	Introduction to Quality				1	2 Hours		
Topics:								
Introduction to Quality	: Historical Perspective of Quality, what is	Quality	? (Is it	a fact	or perce	otion?).		
Definitions of Quality. Co	pre Components of Quality, Quality View, Fi	nancial	Aspect	t of Oi	uality. Cus	stomers.		
Suppliers and Processe	es, Total Quality Management (TQM), (Quality	Princi	iples	of Total	Quality		
Management, Quality N	lanagement Through Statistical Process Co	ontrol, C	Quality	Mana	gement [.]	, Through		
Cultural Changes, Contir	nual (Continuous) Improvement Cycle, Qual	lity in D	ifferer	nt Area	as, Bench	marking		
and Metrics, Problem Sc	lving Techniques, Problem Solving Software	e Tools.				C		
Module 2	Software Quality				1	2 Hours		
Topics:								
Introduction, Constrain	ts of Software Product Quality Assessmer	nt, Cust	tomer	is a k	(ing, Qua	lity and		
Productivity Relationshi	, Requirements of a Product, Organisation	Culture	e, Char	acteri	stics of So	, oftware,		
Software Development	Process, Types of Products, Schemes of Crit	cicality [Definiti	ons, P	roblemat	ic Areas		
of Software Developme	ent Life Cycle, Software Quality Manage	ment,	Why S	Softwa	ire Has [Defects?		
Processes Related to S	Software Quality, Quality Management S	System	Struct	ure, F	villars of	Quality		
Management System, In	portant Aspects of Quality Management.							
Module 3	Software Verification and				1	4 Hours		
	Validation							
Topics:			-	-				
Introduction, Verificatio	n, Verification Workbench, Methods of Ve	erificatio	on, Iy	pe, En	tities inv	olved in		
verification, Reviews in	testing lifecycle, Coverage in Verification,	Concer	ns of v	verific	ation, va	lidation,		
Validation Workbench, I	evels of Validation, Coverage in Validation,	Accept	ance I	esting	, Manage	ment of		
verification and validat	ion, Software development verification and		ation a	CTIVITI	es. V-test	iviodei:		
Introduction, V-model f	or software, lesting during Proposal stage	e, Testir	ng dur	ing re	quiremer	it stage,		
liesting during test plan	ning phase, Testing during design phase, Tes	sting du	ring co	aing, \	v v iviodel	, Critical		
Roles and Responsibilitie								
Project work/Assignme	nt: iviention the Type of Project /Assignme	nt prop	osed t	or this	course			
L. Case study on re	at unite solution and validations like IVISTeam	no coft.	Naro a	nnlica	tion			
μ_{2} . Inplementation	or vermication and valuation for any rediting	ILE SUIL	vaie d	hhiird	uun.			

Text Book

T1 Software Testing and Continuous Quality Improvement, William E. Lewis, CRC Press, 3rd,2016. **T2** Software Testing: A Craftsman's Approach, Paul C. Jorgenson, CRC Press, 4th, 2017.

References

R1. P. Ammann and J. Offutt. Introduction to Software Testing. Cambridge University Press, 2008. R2.

https://www.tutorialspoint.com/software_quality_management/software_quality_management_metri cs.htm

https://nptel.ac.in/courses/106105150

https://nptel.ac.in/courses/106101163

Topics relevant to "EMPLOYABILITY SKILLS": Total quality management, software quality management, for development of Employability Skills through Experiential Learning Techniques. This is attained through assessment components mentioned in the course handout.

Course Code:	Course Title: Vulnerability	y Assessment a	nd		3 0)	3
CSF3098	Penetration Testing			L- P- C			
	Type of Course: Theory O	nly Course					
Version No.	1.0						
Course Pre- requisites	CSE3078						
Anti-requisites	NIL						
Course Description	This course explores the to course also covers how vu investigation, and analysis networks	is course explores the tools that can be used to perform information gathering. This furse also covers how vulnerability can be carried out by means of tools or manual vestigation, and analysis of common attacks in data, mobile applications and wireless etworks					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Vulnerability Assessment and Penetration Testing and attain Employability hrough Problem Solving Methodologies.						
Course Out Comes	 On successful completion of the course the students shall be able to: Understand the basic principles for information gathering and detecting vulnerabilities in the system. Determine the security threats and vulnerabilities in SDN networks and web applications. Able to use the exploits in mobile applications and wireless networks Understand the metasploit and metrepreter are used to automate the attacks and penetration testing techniques. 						
Course Content:							
Module 1	Information Gathering, Host Discovery and Evading Techniques	Assignment	Т	heory		9	Sessions
Topics:						-	
Introduction - Terminologies - Categories of Penetration Testing - Phases of Penetration Test -Penetration Testing Reports - Information Gathering Techniques - Active, Passive and Sources of Information Gathering – Approaches, Host discovery - Scanning for open ports and services- Types of Port, Vulnerability Scanner Function, pros and cons - Vulnerability Assessment with NMAP - Testing, SCADA						netration ormation of Port, g, SCADA	
Module 2	Vulnerability Scanner in SDN Networks and Web application	Quiz	Т	heory		10	Sessions
Topics: Nessus Vulnerability Scanner - Safe check – Silent dependencies - Port Range Vulnerability Data Resources, SDN Data plane, Control Plane, Application Plane. SDN security attack vectors and SDN Harderning, Authentication Bypass with Insecure Cookie Handling - XSS Vulnerability - File inclusion							
vullerability - Kell	Mobile Application		Testing a w	ebsile it			
Module 3	Security and wireless network Vulnerability analysis	Quiz	T	heory		11	Sessions
Topics: Types of Mobile A testing methodolo BlackBerry Vulner Exploitation, WLA	Application Key challenges ogy, Android and ios Vulne rabilities - Vulnerability I N and its inherent insecurit	in Mobile Appl erabilities - OW Landscape for ies Bypassing W	ication and ASP mobile Symbian - LAN Authent	Mobile security Exploit tication t	applicati risk - E Prevent uncoveri	on pe xploiti tion - ng hid	netration ng WM - Handheld den SSIDs
MAC Filters Bypas	sing open and shard authei	ntication - Adva	nced WLAN	Attacks	Wireless	eaves	aropping

using MITM session hijacking over wireless – WLAN Penetration Test Methodology.

Module 4	Exploits	Quiz	Theory	8 Sessions
Topics:				
Architecture a	ind Environment- Leve	raging Metasploit on Pe	netration Tests, Understand	ding - Metasploi
Channels, Me	tasploit Framework ar	nd Advanced Environme	nt configurations – Unders	tanding the Soft
Architecture,	Configuration and Lo	cking, Advanced payloa	ds and add on modules G	ilobal datastore
module datas	tore, saved environme	nt Meterpreter.		
Targeted App	lication & Tools that c	an be used:		
This course he	elps the students to un	derstand the threats and	l vulnerabilities using NMAP) .
		Project work / Assign	aont:	
		Project work/Assignin	ient.	
Project Assign	iment:			
Text Book				
1. Rafay	Baloch, Ethical Hacking	g and Penetration Testin	g Guide, CRC Press, 2015. IS	BN : 78-1-4822-
3161-8.		-		
2. Dr. Pa	trick Engebretson, The	Basics of Hacking and P	enetration Testing Ethical H	acking and
Penetratio	on Testing made easy ,	Syngress publications, E	Isevier, 2013. ISBN :978-0-1	2-411644-3.
3. Mayo	r, K.K.Mookey, Jacopo	Cervini, Fairuzan Roslan	, Kevin Beaver, Metasploit T	oolkit for
Penetratio	on Testing, Exploit Dev	elopment and Vulnerabi	lity Research, Syngress publ	ications,
Elsevier, 2	007. ISBN : 978-1-5974	19-074-0		
References				
1. Maste	ering Modern Web Pen	etration Testing By Prak	har Prasad,October 2016 Pa	cktPublishing.
2. SQL Ir	jection Attacks and De	efense 1st Edition, by Jus	tin Clarke-Salt, Syngress Pul	olication
Web resource	es: <u>https://onlinecou</u>	rses.nptel.ac.in/noc19_c	<u>s68/preview</u> - IIT Kharagpu	ır, Prof. Indranil
Sen Gupta				
Topics releva	ant to development	of "EMPLOYABILITY	SKILLS": Exploitation, Pen	etration testing
echniques, fo	or development of Emp	loyability skills through t	he Participative Learning Te	chniques. This i

attained through the assessment components mentioned in course handout.

Course Code:	Course Title: Text Mining And Analytics			3	0	3		
CSE3137	Type of Course: Theory Only Course		L- P- C					
Version No.	1							
Course Pre-	No Prerequisites							
requisites								
Anti-requisites	Nil							
Course Description								
Course Objective	The objective of the course is to familiarize the learners with the concepts of Text Mining And Analytics and attain Employability through Problem Solving Methodologies.							
 Course Out Comes Course Out Comes Course Out Comes Dn successful completion of the course the students shall be able to: Interpret the contribution of text mining to generate new knowledge from natura language text Extract useful information from the textual data using various classifiers and Predictors Identify the various components of a web that can be used for mining process Analyse social media data using appropriate web mining techniques Discover interesting patterns from Social Media Networks using linear methods and models 						n natural fiers and ess hods and		
Course Content:								
Module 1	Text Mining: Overview, Applications and Issues				14	Sessions		
Topics: Early his	tory, Applications, Introduction to Data Mining,	ntro	duction t	o text i	mining,	Need for		
text mining, Challe	enges in text mining, Areas of text mining, Data F	etrie	val, Infoi	rmatior	n Retriev	/al.		
Module 2	TEXT EXTRACTION, CLASSIFICATION, AND CLUSTERING				14	Sessions		
Topics: Automation keyword extraction keywords, Benchi	c keyword extraction from individual documents: n, Candidate keywords, Keyword scores, Adjoini mark evaluation, Evaluating precision and recall,	Intro ng ke Evalu	oduction, ywords, Jating eff	Rapid Extrac iciency	automa ted '.	ntic		
Module 3	Content-based spam email classification using machine-learning algorithms				12	Sessions		
Topics: Introduction, Machine-learning algorithms, Naive Bayes, LogitBoost, Support vector machines, Data preprocessing, Feature selection, Message representation.								
Targeted Application & Tools that can be used:								
Project work/Assignment:								
Assignment:								
Text Book T1 Text Mining T2 Bing Liu, We Edition, 2011.	Applications and Theory, Michael W. Berry Jacob b Data Mining-Exploring Hyperlinks, Contents, and	Koga I Usa	an, 2010 ge Data,	Springe	er, Secoi	nd		

References

R1 Ronen Feldman and James Sanger, The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data, Cambridge University Press, First Edition, 2009.

R3 Web resources:

1. <u>https://www.ibm.com/in-en/topics/text-mining</u>

pu.informatics.global, <u>https://sm-nitk.vlabs.ac.in/</u>

Topics relevant to development of "EMPLOYABILITY SKILLS": Machine learning algorithms, LogitBoost, for development of Employability Skills through Problem solving Techniques. This is attained through the assessment components as mentioned in course handout.

Course Code:	Course Title: Inno	vation Project-Ras	oberry Pi		0	4	2
CSE 1003	Using Python			I - P- C		This includes	
						few lecture	
	Type of Course: S	chool Core & Pract	cal Only.			sessions	
Version No.	1.0						
Course Pre-	NIL						
requisites	NUL						
Anti-requisites	INIL						
Course	The Raspberry Pi	is an amazing single	board compu	ter (SBC)	сара	ble of running I	Linus
Description	and a whole host	of applications. Pyth	ion is a beginn	er-friend	ly pro	gramming lang	uage
	that is used in so	chools, web develo	pment, scient	ific rese	arch,	and in many c	other
	Industries. This co	ourse will enable st	udents in writi	ing own	progr	ams with Pytho	on to
	many more The	nink lights, respond to button pushes, read sensors, log data on the Raspberry Prand					
	coding and impler	any more. The course also others in-depth knowledge of designing, developing, adding and implementing projects using Raspherry Di					
Course Outcomes	On successful con	noletion of this cou	rse the studer	nts shall l	be ab	le to:	
	1. Write a p	rogram in Python.					
	2. Explain th	e main features of	the Raspberry	Pi board			
	3. Demonstr	rate the hardware	interfacing of	the per	ipher	als to Raspber	ry Pi
	system.						
	4. Demonstr	rate the functioning	ng of live var	rious pro	ojects	carried out u	using
	Raspberry Pi sy	ystem.					
Course Content:							
Module 1	Basics of Python,	Quiz	Problem Sol	ving		4 Lah Sessi	ions
	functions	Quiz	FIODIEIII SOI	ving		4 Lab 3633	10115
Concepts will be ta	aught by solving p	roblems through pr	ograms.				
Module 2	Python Programming	Quiz	Problem Sol	ving		4 Lab Sessi	ions
Control statement	s, Lists and Diction	aries, Problem solvi	ng using Pytho	n.			
Concepts will be ta	aught by solving pi	oblems through pr	ograms.				
	Overview of	Project	System Desi	on Task a	and	4 Lab	
Module 3	Raspberry Pi	Development	Analysis	BILLOSK		Session	S
-	,		,				
Topics:							
interface with more	SPIO pins, LED and	switch control. Inst	allation of libra	aries, Pu	iiii Si ator /	SH. Raspberry P	n to Igh
PIP libraries. Ardui	no with Raspberry-	-ni	ike ri camera,	3010011			1811
		pr Ducient		d Cine da			
Module 4		Project	task	id Simula	ition	3 Lab Sessi	ions
Tonics:	AFTSEIVICES	Development	task				
Raspberry Pi inter	act with online AP	I services through	the use of pub	olic APIs	and S	DKs using Firel	base.
Gspread API.			-			0	····,
Node-RED – a prog	gramming tool for v	wiring together hard	ware devices,	MQTT.			
Android/Case stud	ly.						
Targeted Applicat	ion & Tools that ca	n be used:					
Making it a reality	(Raspberry Pi Proje	ects) :					
Projects will includ	le but not limited to	0:					
1) Intelligent hom	e locking system.	nt system					
 Home automat 	ion using RFID	ni systelli.					
o, nome automat	ion using MID.						

4) Real time clock-based home automation.

5) Intelligent Automatic Irrigation System

Professionally Used Software: Raspberry Pi.

Project work/Python Lab Test:

Project work

Python test.

Text Book(s):

1) Ashok Namdev Kamthane, Amit Ashok Kamthane, *"Problem Solving and Python Programming"*, Mc Graw Hill Education, 2018.

Reference(s):

- 1. https://github.com/thibmaek/awesome-raspberry-pi
- 2. <u>MagPi magazine</u>

Topics relevant to development of "Foundation Skills": Basic Concepts of Python-Programming, and Raspberry Pi.

Topics related to development of "Employability Skills": Problem solving, Creative Thinking, Team work, Prototype Development.

Topics related to development of "Entrepreneurship": Effective Communication, Strategic Thinking, Creative Thinking.

Evaluation:	Review-1-20%, Review-2-25%, Python test-25%, Project Expo-30%

Course Code: CSE2029	Course Title Type of Cou Science basl Th Laboratory	e: Web Data Analytics arse: Discipline Electiv cet aeory & Integrated	s ve in data	L-P- C	2	2	3	
Version No.	1.0							
Course Pre- requisites	Python prog	ython programming						
Anti-requisites	NIL							
Course Description	The objective of this course is to provide overview and importance of Web analytics and helps to understand role of Web analytic. This course also explores the effective of Web analytic strategies and implementation. The purpose of this course is to introduce the students to the Web data analytics concept. The course is both conceptual and analytical and is understood with practical knowledge. The course develops critical thinking skills by augmenting the student's ability to develop web data analytical models for various data sets which helps to overcome many problems. The course involves quizzes and assignments							
Course	This course	is designed to impro	ve the lea	rners' I	EMPL	OYAB	ILITY	
Objective	<u>SKILLS</u> by	web analytics and im	proving bi	usiness.				
Course Outcomes	Upon successful completion of this course the students shall be able to: 1. Understand the concept and importance of Web analytics in an organization and the role of Web analytic in collecting, analyzing and reporting website traffic. [Kn owledge level] (2) Identify key tools and diagnostics associated with Web analytics. [Application level] (3) Explore effective Web analytics strategies and implementation and Understand the importance of web analytic as a tool for e-Commerce, business research, and market research. [Application level] (4). Understand web site data optimization.[Application level].							
Course Content:								
Module 1	Introduction to Web Analytics	Quiz	Data Analy	rtics		L-4	, P-2	
Topics: Introduction to We Analytics - A Mod Analytics: Log file in Google Analytic	eb Analytics: el of Analysis e analysis – Pa cs.	Web Analytics Approa s – Context matters – E age tagging – Metrics a	ich – Data Data Contra Ind Dimens	collecti diction sions – 1	on me t – Worl Interact	t hods i king of ing wit	n Web Web h data	

Module 2	Learning about users Through Web Analytics	Assignment	Data Collection, data analysis	L-5,P-2
----------	--	------------	-----------------------------------	---------

Topics: Introduction – Goals and Conversions – Conversion Rate – Goal reports in Google Analytics – Performance Indicators – Analyzing Web Users: Learning about users – Traffic Analysis – Analyzing user content – Click-Path analysis – Segmentation.

Module 3 Web Search Engine Data Analytics Quizzes and assignments Google analytics L-	-6 ,P-3

Topics: Different analytical tools - Key features and capabilities of Google analytics- How Google analytics works - Implementing Google analytics - Getting up and running with Google analytics -Navigating Google analytics – Using Google analytics reports -Google metrics - Using visitor data to drive website improvement- Focusing on key performance indicators-Integrating Google analytics with third-Party applications

Module 4	Qualitative Analysis	Project-based assignment	Reports and analytics	L-9, P-4

Topics:

Lab Usability Testing- Heuristic Evaluations- Site Visits- Surveys (Questionnaires) - Testing and Experimentation: A/B Testing and Multivariate Testing-Competitive Intelligence -Analysis Search Analytics: Performing Internal Site Search Analytics, Search Engine Optimization (SEO) and Pay per Click (PPC)-Website Optimization against KPIs- Content optimization- Funnel/Goal optimization - Text Analytics: Natural Language Processing (NLP)- Supervised Machine Learning (ML) Algorithms-API and Web data scarping using R and Python.

List of Laboratory Tasks:

Lab sheet 1[2 Practical Sessions]

Experiment No. 1:

Level 1:

1. Working concept of web analytics

Level 2:

2. Evaluation with Intermediate metrics, custom metrics, calculated metrics.

3. Collection of web data and other internet data with the help of web analytics

Lab Sheet 2[2 Practical Sessions]

Experiment No. 2:

Level 1:

1. Delivering reports based on collected data

Level 2:

2. Implement the concept of web analytics ecosystem

3. Creation of segmentation in web analytics

Lab Sheet 3[4 practical Sessions] Level 1:

1. Visualization, acquisition and conversions of web analytics data

2. Performing site search analytics

Level 2:

3. Analyze the web analytic reports and visualizations
Lab Sheet 4[4 practical Sessions]

Experiment No. 4:

Level 1:

- 1. Performing visual web analytics
- 2. Assignments and final discussions

Level 2:

3. Web Analytics case studies .

Targeted Application & Tools that can be used: Google analytics

Project work/Assignment:

Web data analytics for website data

Textbook(s):

1.Beasley M, (2013), Practical web analytics for user experience: How analytics can help you understand your users. Newnes, 1st edition, Morgan Kaufmann.

References

1. Sponder M, (2013), Social media analytics: Effective tools for building, interpreting, and using metrics, 1st edition, McGraw Hill Professional.

2. Clifton B, (2012), Advanced Web Metrics with Google Analytics, 3rd edition, John Wiley & Sons.

Topics related to development of "FOUNDATION": Web data Analytics, Google analytics reports.

Topics related to development of "EMPLOYABILITY": performing web data analytics for website data.

Topics related to development of "HUMAN VALUES AND PROFESSIONAL ETHICS": Data collection

					~	-
Course	Course Title: Te	chnical Skills in		0 0	6	3
Code: CSE502	Java		L-T-			
	Open Elective		P-C			
	Type of Course:	Lab Integrated				
	Course					
Version No.	1.0					
	Basic knowledge	of programming a	and data	structu	re	
	concepts.					
Course Pre-requisites						
Anti-requisites	NIL					
	This Course is de	signed for stude	nts who	have p	orior	
	programming ex	perience. It prov	vides as	sistance	e to	
	prepare for plac	ements and exte	ensive e	xposure	e to	
	object-oriented	programming fea	atures.	t helps	to to	
Course Description	develop robust so	olutions for real w	orld app	licatior	ıs.	
Course Objective		_				
	The objective of t	he course is SKIL	L DEVELO	OPMEN	T and	
	EMPLOYABILITY	of students by usi	ng partio	cipative	learr	ning
	techniques.					
Course Out Comes	On successful	completion of	this c	ourse	the	
	students shall b	e able to:				
	1. Summarize t	he Object-orien	ted con	cepts	with	
	example program	1.				
	2. Implement Ar	rays and Strings	to solve	real w	orld	
	problems.					
	3. Apply the con	cept of polymorp	hism &	inherita	ince	
	to solve real time	e problems.				
	4. Illustrate prog	rams on Interface	, Packag	es		
	5. Demonstrate	runtime errors	s using	Excep	tion	
	handling.					
Course Content:						
	Introduction					
Modulo 1	Introduction	Accignment	D	actical	1/	
Woddle 1	to Object-	Assignment	Tack	actical		. Ourc
	oriented		Idsk			Juis
	programming					
Topics:						
Introduction to object oriented p	rogramming, Java	Evolution, How Ja	ava diffe	rs from		
C++, Features of Java,						
Java Environment: Installing Java,	, Java Program Dev	velopment, Java S	Source Fi	le Struc	ture,	
Compilation, Executions, JDK, JVN	<i>Л,</i> JRE.					
Java Tokens: Datatypes, Variables	s, Operators, Cont	rol Statements, C	ommano	l Line		
Arguments.						
Classes, Objects, and Methods: D	efining a class, Aco	cess Specifiers, in	stantiati	ng obje	cts,	
Reference variable, Accessing clas	ss members and m	nethods, construc	tors, me	thod		
overloading, static members,						
static methods, inner class, Wrag	oper class, Auto-bo	oxing and Unboxi	ng.		_	
Module 2	Arrays, Strings	Assignment	Pra	ictical		11
			Task		Ho	ours

Topics:

Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array Strings: Operation on String, Mutable & Immutable String, Creating Strings using String Buffer or StringBuilder.

Assignment: Test 1,Quiz1

Module 3	Inheritance and	Assignment	Practical	12
	Polymorphism		Task	Hours

Inheritance and Polymorphism: Defining a subclass, Types of Inheritance, Method overriding, super keyword, Dynamic method invocation, Dynamic polymorphism, Final, Abstract, this keyword. Forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance.

Module 4	Interface and	Assignment			8
	Package			Practical	Hours
			task		

Topics:

Defining interfaces, extending interfaces, implementing interfaces.

Organizing Classes and Interfaces in Packages, Package as Access Protection, Defining Package, CLASSPATH Setting for Packages, Making JAR Files for Library Packages Import and Static Import, Naming Convention for Packages.

Assignment: Test 2

Module 5	Excention	Assignment	Theory	6	
	Handling	/ Solgrine in	task	Hours	

Topics:

Exception Handling: Introduction to Exceptions, Difference between Exceptions & Errors, Types of Exception, Handling of Exceptions: Use of try, nested try statements, catch, finally, throw, throws, built in exceptions, User Defined Exceptions, Checked and Un-Checked Exceptions

Text Book

Text Books:

1. Cay S Horstmann and Cary Gornell, *"CORE JAVA volume I-Fundamentals"*, Pearson 2016.

2. Cay S Horstmann and Cary Gornell, *"CORE JAVA volume II-Advanced Features"*, Pearson 2017.

References

1. Herbert Schildt, *"The Complete Reference Java 2"*, Tata McGraw Hill Education, 10th Edition 2017.

2. James W. Cooper, *"Java TM Design Patterns – A Tutorial"*, Addison-Wesley Publishers 2000.

Web resources:

1. <u>https://www.udemy.com/course/object-oriented-programming-oops-concepts-in-</u> english/

2. https://archive.nptel.ac.in/courses/106/105/106105191/



	Course Title: T	echnical Skills ir		0 0	6 3
Code: CSE503	Python		I_D		
	Open Elective		C		
	Type of Course	: Lab Integrated	4 `		
	Course				
Version No.	1.0				
	Basic knowledge	e of programmin	g and dat	a structi	ure
	concepts.				
Course Pre-requisites					
Anti-requisites	NIL				
	This Course is d	esigned for stud	ents who	have p	rior
	programming ex	xperience. It pro	ovides as	sistance	to
	prepare for place	cements and ex	tensive e	xposure	to
	Programming in	Python. It help	s to deve	elop rob	ust
Course Description	solutions for rea	ll world applicati	ons.		
Course Objective	The objective of	the course is SK		OPMEN	IT and
	EMPLOYABILITY	of students by i	using part	icipative	elearning
	techniques.				
Course Out Comes	On successful	completion o	f this c	ourse t	the
	students shall	be able to:			
	1. Summarize	the Object-orier	nted cond	ents us	ing
	Python with exa	mple program.			
	2. Implement Li	sts, Tuples, Dicti	onary and	d Strings	s to
	solve real world	problems.		0	
	3. Apply the cor	ncept of polymor	phism &	inherita	nce
	to solve real tim	ne problems.			
	4. Illustrate pro	grams by using P	ython Lib	rary	
	5. Demonstrate	e runtime erro	rs using	Except	ion
	handling.				
Course Content:					
Module 1	Introduction	Assignment	Dr	actical	11
Module 1	to Python	Assignment	Tack	actical	Hours
	and Basics		Task		nours
– ·					
Topics:					
Topics: Introduction to Python program	ming, Python Evol	ution, Features o	of Pytho	on,	
Topics: Introduction to Python program Python Environment: Installing	ming, Python Evol Python, Python Pro	ution, Features o ogram Developm	of Pythc ient, Pyth	on, on Sour	ce File
Topics: Introduction to Python program Python Environment: Installing Structure, Interpretation, Execu	nming, Python Evol Python, Python Pro tions.	ution, Features o ogram Developm	of Pytho lent, Pyth	on, on Sour	ce File
Topics: Introduction to Python program Python Environment: Installing Structure, Interpretation, Execu Python Data Structures & Data	iming, Python Evol Python, Python Pro tions. Types	ution, Features o ogram Developm	of Pythc ient, Pyth	in, on Sour	ce File
Topics: Introduction to Python program Python Environment: Installing Structure, Interpretation, Execu Python Data Structures & Data Looping, I/O Formatting, Functio	iming, Python Evol Python, Python Pro tions. Types ons, Lambda Funct	ution, Features o ogram Developm tions	of Pythc lent, Pyth	on, on Sour	ce File
Topics: Introduction to Python program Python Environment: Installing Structure, Interpretation, Execu Python Data Structures & Data Looping, I/O Formatting, Function	ming, Python Evol Python, Python Pro tions. Types ons, Lambda Funct	ogram Developm cions	of Pythc ient, Pyth	on Sour	ce File
Topics: Introduction to Python program Python Environment: Installing Structure, Interpretation, Execu Python Data Structures & Data Looping, I/O Formatting, Function	iming, Python Evol Python, Python Pro tions. Types ons, Lambda Funct Classes, Files and Excention	ution, Features o ogram Developm tions Assignment	of Pytho ent, Pyth Pra	on, on Sour ctical	ce File
Topics: Introduction to Python program Python Environment: Installing Structure, Interpretation, Execu Python Data Structures & Data Looping, I/O Formatting, Function Module 2	iming, Python Evol Python, Python Pro tions. Types ons, Lambda Funct Classes, Files and Exception	ution, Features o ogram Developm :ions Assignment	of Pythc lient, Pyth Pra Task	on, on Sour ctical	ce File 8 Hours
Topics: Introduction to Python program Python Environment: Installing Structure, Interpretation, Execu Python Data Structures & Data Looping, I/O Formatting, Function Module 2	iming, Python Evol Python, Python Pro tions. Types ons, Lambda Funct Classes, Files and Exception handling	ution, Features o ogram Developm ions Assignment	of Pytho ient, Pyth Pra Task	on, on Sour ctical	ce File 8 Hours
Topics: Introduction to Python program Python Environment: Installing Structure, Interpretation, Execu Python Data Structures & Data Looping, I/O Formatting, Function Module 2	iming, Python Evol Python, Python Pro tions. Types ons, Lambda Funct Classes, Files and Exception handling	iution, Features o ogram Developm ions Assignment	of Pytho eent, Pyth Pra Task	on Sour	ce File 8 Hours
Topics: Introduction to Python program Python Environment: Installing Structure, Interpretation, Execu Python Data Structures & Data Looping, I/O Formatting, Function Module 2 Topics: New Style Classes • Creating Fi	iming, Python Evol Python, Python Pro tions. Types ons, Lambda Funct Classes, Files and Exception handling le handling Mode	ution, Features o ogram Developm tions Assignment s • Reading Files	of Pythc eent, Pyth Pra Task s • Writin	on, on Sour ctical	ce File 8 Hours ending to
Topics: Introduction to Python program Python Environment: Installing Structure, Interpretation, Execu Python Data Structures & Data Looping, I/O Formatting, Function Module 2 Topics: New Style Classes • Creating Fi Files • Handling File Exceptions	iming, Python Evol Python, Python Pro tions. Types ons, Lambda Funct Classes, Files and Exception handling le handling Mode	ution, Features of ogram Developm tions Assignment s • Reading Files	of Pytho eent, Pyth Pra Task 5 • Writin	on Sour ctical g& App	ce File 8 Hours ending to
Topics: Introduction to Python program Python Environment: Installing Structure, Interpretation, Execu Python Data Structures & Data Looping, I/O Formatting, Function Module 2 Topics: New Style Classes • Creating Fi Files • Handling File Exceptions	Iming, Python Evol Python, Python Pro tions. Types ons, Lambda Funct Classes, Files and Exception handling le handling Mode	ution, Features o ogram Developm tions Assignment s • Reading Files	of Pytho eent, Pyth Pra Task	on Sour ctical	8 Hours ending to
Topics: Introduction to Python program Python Environment: Installing Structure, Interpretation, Execu Python Data Structures & Data Looping, I/O Formatting, Function Module 2 Topics: New Style Classes • Creating Fi Files • Handling File Exceptions Classes • Instance Methods • Exceptions	Iming, Python Evol Python, Python Pro tions. Types ons, Lambda Funct Classes, Files and Exception handling le handling Mode Inheritance • Pol	ution, Features of ogram Developm tions Assignment s • Reading Files ymorphism • Ex	of Pythc eent, Pyth Pra Task s • Writin ception (on Sour ctical g& App Classes 8	ce File 8 Hours ending to & Custom
Topics: Introduction to Python program Python Environment: Installing Structure, Interpretation, Execu Python Data Structures & Data Looping, I/O Formatting, Function Module 2 Topics: New Style Classes • Creating Fi Files • Handling File Exceptions Classes • Instance Methods • Exceptions Assignment: Test 1 Quiz1	Iming, Python Evol Python, Python Pro tions. Types ons, Lambda Funct Classes, Files and Exception handling le handling Mode Inheritance • Pol	ution, Features of ogram Developm tions Assignment s • Reading Files ymorphism • Ex	of Pytho eent, Pyth Pra Task s • Writin ception (on Sour ctical g& App Classes 8	ending to & Custom

Module 3	Data	Assignment	Practical	11
	Structures,		Task	Hours
	Collections,			
	generators			
	and Iterators			
List Comprehensions Nestee	d List Comprehensio	ns • Dictionary C	omprehensions	
named tuple() • deque • Chai	nMap • Counter • O	rderedDict		
Iterators • Generators • The F	Functions any and al	I • With Stateme	nt	
Module 4	GUIs, Date and	Assignment		11
	time, Regular		Practical	Hours
	expressions		task	
Topics:				
Components and Events • An	Example GUI • The	root Componen	t • Adding a Butto	on • Entry
Widgets • Text Widgets				
sleep • Program execution tir	ne • more methods	on date/time		
Filter • Map • Reduce • Deco	rators • Frozen set	-		
Split • Working with special c	haracters, date, ema	ails • Quantifiers	 Match and find a 	all
Assignment: Test 2				
Module 5	Threads. API.	Assignment	Theory	10
	Diango		task	Hours
Topics:	J ² 0 ²			
Class and threads • Multi-thre	ading • Synchronizat	tion • Treads Life	cycle	
Introduction • Facebook Mess	enger • Openweath	er	eyele	
Diango Overview • Diango Inst	allation • Creating a	Project • Usage	of Project in dent	h
Discussion • Creating an Appli	cation • Understand	ing Folder Struct		
Text Book				
Text Books:				
1. Python Programming –	A Modular Approa	ch Pearson 2021		
2. Martin C Brown "The C	omplete reference F	Python", McGraw	/ Hill 2021.	
References				
1. Mark Lutz, "Learning P	ython", OReilly 202	1.		
	-			
Web resources:				
1 https://developers.google	.com/edu/python/			
2 https://www.educative.io	/courses/learn-pyth	on-3-from-		
scratch?affiliate_id=507351864	13380224			

Course Code:	Course Title: Problem Solving	g Using C			1	0	4	3
CSE 1004				L- T-P-				
	Type of Course: School Core			С				
	Lab Integrated.							
Version No.	1.0							
Course Pre-	NIL							
requisites								
Anti-requisites	NIL							
Course Description	The course is designed to prov	vide comple	ete knowledge	of C lan	igua	ge.	Stu	dents
	will be able to develop logic	s which w	ill help them	to creat	e pr	ogr	ams	and
	applications in C. Also by lea	rning the b	asic program	ning cor	istru	cts	thev	y can
	easily switch over	U	1 0	C				,
	to any other language in futu	re.						
Course Object	The objective of the course i	s to familia	rize the learn	ers with	the	con	cep	ots of
	Problem Solving Using C an	d attain En	nployability th	nrough F	rob	lem	So	lving
	Methodologies.		I J J J	0				0
	6							
Course Outcomes	On successful completion of th	is course th	e students sha	ll be abl	e to:			
	1. Write algorithms and	to draw flo	wcharts for so	lving pr	oble	ms		
	2. Demonstrate knowle	dge and	develop sim	ple app	lica	tion	s i	n C
	programming constructs	U	1					
	3. Develop and impleme	nt applicati	ons using arra	ays and s	strin	gs		
	4. Decompose a problem	n into fun	ctions and de	velop m	odu	lar	reu	sable
	code							
	5. Solve applications in (C using stri	ictures and U	nion				
	6 Design applications	using Sec	uential and	Randoi	n A	Acce	285	File
	Processing.	using bet	quentiar and	Rundon		1000	000	I IIC
Course Content:								
Module 1	Introduction to C Language	Quiz	Problem Solvi	ing 9 Hr s	5.			
Topics:								
Introduction to Prog	gramming – Algorithms – Pseu	do Code - 1	Flow Chart – (Compila	tion	-E	xec	ution
 Preprocessor Dire 	ctives (#define, #include, #un	idef) - Over	rview of $C - C$	Constant	s, V	aria	bles	s and
Data types – Opera	ators and Expressions – Mar	aging Inpu	it and Output	Operati	ions	_]	Dec	ision
Making and Branch	ing - Decision Making and Lo	ooping.	T					
Module 2	Introduction to Arrays and Strings	Quiz	Problem Solvi	ing 9 Hr s	5.			
Topics:				_		_		
Arrays: Introduction	on – One Dimensional Array	v – Initializ	zation of One	Dimen	sion	al A	Arra	iys –
Example Programs	- Sorting (Bubble Sort, Sele	ection Sort) – Searching	(Linear	Sea	arch) -	Two
Dimensional Array	s – Initialization of Two Di	mensional	Arrays. Exan	ple Pro	gran	ns -	- M	latrix
operations. Strings	: Introduction – Declaring an	d Initializir	ng String Vari	ables –	Rea	ding	g St	rings
from Terminal – W	riting String to Screen – String	g Handling	Functions.					
Module 3	Functions and Pointers	Quiz	Problem Solvi	ing 9 Hr s	5.			
Topics:					~			
Functions: Introdu	ction – Need for User-defined	functions -	- Elements of	User-De	efine	ed		
Functions: declarati	on, definition and function ca	ll–Categori	es of Function	ns – Rec	ursi	on.		
Pointers: Introduct	ion – Declaring Pointer Varial	bles – Initia	alization of Va	ariables -	- Po	inte	r	
Operators – Pointer	Arithmetic – Arrays and Poir	iters – Para	meter Passing	: Pass by	y Va	lue	, Pa	SS
by Reference.			1					
Module 4	Structures and Union	Quiz	Problem Solvi	ing 9 Hr s	5.			
Topics:				_		_	_	

Structures: Introduction	- Defining a Structure – Declaring Structure Variable – Accessing
Structure Members – An	ray of Structures – Arrays within Structures – Union: Introduction –
Defining and Declaring U	Jnion – Difference Between Union and Structure.
Module 5 File h	andling Case Study Problem Solving 9 Hrs.
Topics:	ing a Eile Clasing a Eile Input / Output Operations on Eile Dandam
Files: Defining and Open	ing a File – Closing a File – Input / Output Operations on File – Random
Access Files	
Lab Sheet 1 (Module I)	
Programs using IO Stateme	nts, Conditional Statements and Looping Statements
Lab Sheet 2 (Module II)	r S
Programs using Arrays and	Strings
Lab Sheet 3 (Module III)	
Programs using Functions a	nd Pointers
Lab Sheet 4 (Module IV)	and Unions
Lah Sheet 5 (Module V)	
Programs using Files	
Text Book(s):	
1. E. Balaguruswam	y, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education,
ISBN: 978-93-5316-5	513-0. By
Reference Book(s):	
1. Yashwant	Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
2. ReemaTha	areja, "Programming in C", Oxford University Press, Second Edition,
2016.	
3. Kernighan	, B.W and Ritchie, D.M, "The C Programming language", Second Edition,
Pearson Education	n, 2015
4. Schildt He	erbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th
Edition, 2014.	
5. Stephen (G. Kochan, "Programming in C", Addison-Wesley Professional, 4th
Edition, 2014.	
Web Links and Video Lectu	res:
1. https://nptel.ac.in/	courses/106/105/1061051/1/
2. https://archive.npt	e1.ac.1n/courses/106/104/106104128/
Course Code:	Course Title: Programming in Python 1 0 4 3
CSE1005	
6521005	Type of Course: School Core
	Lab Integrated
Version No.	1.0
Course Pre-requisites	Basic knowledge of Computers and Mathematics
Anti-requisites	NIL
Course Description	The purpose of this course is to enable the students to develop python scripts
	using its basic programming features and also to familiarize the Python IDLE
	and other software's. This course develops analytical skills to enhance the
	programming abilities.
	The associated laboratory provides an opportunity to validate the concepts
	taught and enhances the ability to build real time applications.
Course Object	The objective of the course is to familiarize the learners with the concepts of
	Programming in Python and attain Employability through Problem Solving
	ivietnodologies.

Course O	utcomes	On successful completion of this course the students shall be able to:				
	1. Summarize the basic Concepts of python.					
	Demonstrate proficiency in using data structures.					
	Illustrate user-defined functions and exception handling.					
	4. Identify the various python libraries.					
Course Co	ontent:					
		Basics of Python	Assignment	Dragramming		
would I		programming	Assignment	Programming	14 Classes	
Topics: Da	ata types, operato	ors and Expressions, Ir	nput and Output Stat	ements. Control Structu	res – Selective	
and Repe	titive structures					
		Indexed and				
Module 2			Simple applications	Programming	20 Classes	
		Structures		i rogi di i i i i g		
Topics: St	rings, Lists, Sets, T	Tuples, Dictionaries				
		· · · · · · · · · · · · · · · · · · ·				
		Functions, Exception	Casa study			
Module 3		handling and	Case study	Programming	10 Classes	
		libraries				
Topics: U	ser defined funct	ions, exception handli	ng, Introduction to p	ython built-in libraries		
List of La	boratory Tasks:					
						
Sl. No.	Experiment Nan	ne				
	PROGRAMS ON	OPERATORS AND EXP	RESSIONS			
1	Level - 1 : Basic	programs on Operato	rs and Expressions			
_	Level - 2 : Devel	op applications to solv	ve mathematical equ	ations		
			EC			
2	level - 1 · Basic	programs on Control	structures			
-	Level - 2 : Creat	e applications to solve	the real time proble	ms		
	PROGRAMS ON	SELECTIVE AND REPE	TITIVE STRUCTURES			
_	Level - 1 : Basic	programs on Selective	e and Repetitive stru	ctures		
3	Level - 2 : Create	e applications to solve	the real time proble	ms		
			•			
	PROGRAMS ON	STRINGS				
Л	Level - 1 : Basic	programs on Strings a	and its manipulation			
-	Level - 2 : Devel	op Real world applicat	tions that involves st	ring matching		
	PROGRAMS ON	LISTS, TUPLES and SE	IS slas and Cata			
5	Level - 1 : Basic	programs on lists, Tup	ples and Sets	Pandom access of data		
	Lever - 2. Creati	e applications that inv	olves sequential and	Ranuom access of uata		
	PROGRAMS ON	DICTIONARIES				
	Level - 1 : Basic	programs on dictiona	ries			
6	Level - 2 : Creat	te applications that inv	volves structuring of	data.		
			-			
	PROGRAMS ON	FUNCTIONS				
7	Level - 1 : Basic	programs on Function	าร			
,	Level - 2 : Devel	op Real world applicat	tions using functions			
8	PROGRAMS ON	EXCEPTION HANDLIN	G on hondline			
I	Level - 1 : Basic	programs on exception	on nandling			

	Level - 2: Develop applications that involves exception handling
	BASIC PROGRAMS ON BUILT-IN LIBRARIES
9	Level - 1: Basic programs on python modules
Ē	Level – 2: Develop applications using python libraries
Targete	ed Application & Tools that can be used:
Targete	ed Application : Web application development, AI, Operating systems
Tools: F	Python IDLE, ANACONDA
•	Application Areas:
•	Game Development
•	Scientific and Numeric Applications
	Artificial Intelligence and Machine Learning
•	Software Development
•	Enterprise-level/Business Applications
•	Education programs and training courses
•	Language Development
•	Operating Systems
•	Web Scrapping Applications
•	Image Processing and Graphic Design Applications
Profess	ionally Used Software: Python IDLE, Spyder, Jupyter Notebook, Google Colab
Project	work/Assignment:
Project	Assignment: Developing python scripts using built in methods and functions
Text Bo	poks:
•	Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education, Forth
edit	tion (20 March 2018).
•	Alex Campbell, "Python for Beginners: Comprehensive Guide to the Basics of Programming, Machine
Lea	irning, Data Science and Analysis with Python", August 29, 2021.
•	Charles Dierbach, "Introduction to Computer Science Using Python", Wiley India Edition, 2015.
Referer	nces:
1.	E. Balagurusamy, "Introduction to Computing and Problem Solving Using Python", Tata McGraw-
Hill,	, 2016
2.	Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, 2017
3.	Brady Ellison, "Python for Beginners: A crash course to learn Python Programming in 1 Week
(Pro	ogramming Languages for Beginners)", August 25, 2021.
4.	Python Tutor - Visualize Python, Java, C, C++, JavaScript, TypeScript, and Ruby code execution
5.	https://practice.geeksforgeeks.org/courses/Python-Foundation
Tenier	
	relevant to development of "FOUNDATIONS SKILLS" - Solve the real time problems by analyzing
	ualizing the uata.
- opics i	recent to Tromate Valoes & Filor Essional Errites - Data concetton and its analigement
1	

Course Code:	Course Title: Ope	erating Systems			3	0	0	3
002010_002	Type of Course: P	Program Core and Theo	ory Only	L-T- P- C				
Version No.	1.0							
Course Pre-	CSE2009- Comput	ter Organization, Probl	em solvir	ng using C				
requisites	Students should h hardware, and Co recommended.	nave basic knowledge computer Organization.	on compu Prior pro	iters, comput gramming ex	:er s peri	oftv enc	ware & e in C i	S
Anti-requisites	NIL							
Course	This course intro	duces the concepts o	f operati	ng system o	pera	atio	ns, ope	erating
Description	system structure operating system deadlocks detect enhances the pro	e and its design and s internal algorithms su ion and recovery and blem solving, systems	impleme uch as pro I memor programi	entation. It ocess schedu y manageme ming ability a	cov ling, ent. ind c	ers syr The case	the cl nchroni e cours e studie	assical zation, se also s.
Course Object	The objective of Operating Syste Methodologies.	the course is to fam ms and attain E	iliarize th mployabi	ne learners v i lity througi	vith h P	the Prob	e conce olem S	pts of Solving
Course Out	On successful con	npletion of the course	the stude	ents shall be a	able	to:		
Comes	 Describe the fundamental concepts of operating Systems and case studies. [Knowledge] Demonstrate various CPU scheduling algorithms[Application] Apply various tools to handle synchronization problems.[Application] Demonstrate deadlock detection and recovery methods [Application] 							
Course Content:								
Module 1	Introduction to Operating System	Assignment	Program	ming			9	Hours
Topics:		· · · · · · · · · · · · · · · · · · ·						
Introduction to O types, Operating OS design and im	S , Operating-Syst System Structure, plementation, Ope	em Operations, Opera System Program and i en-source operating sy	ting Syste ts types, stem	em Services, Linkers and	, Sys Loac	sten ders	n Calls , Overv	and its iew of
Module 2	Process Management	Assignment/Case Study	Program	ning/Simulat	ion		11	Hours
Topics: Process Concept, Operations on Processes, Inter Process Communication, Communication in client- server systems (sockets, RPC, Pipes), Introduction to threads - Multithreading Models, Thread Libraries, Threading Issues, Process Scheduling– Basic concepts, Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, SRTF, RR and Priority.								
	Process							
Module 3	Synchronization and Deadlocks	Assignment	Program	ming			11 H	ours
Topics: The Critical-Section Problems of Synch problems, Dining deadlock, Resour Implementation, Deadlock.	on Problem- Pete hronization with S Philosopher's Pr ce allocation Gra Deadlock Avoidar	rson's Solution, Synch emaphore Solution- Pr roblem, . Introduction ph, Methods for han nce and Implementati	ronizatio oducer-C to Dea dling dea on, Dead	n hardware, Consumer Pro dlocks, Nece adlock: Dead llock detectio	Sen bler ssar lock on &	nap m, F ry c c Pr & R	hores, Reader- conditic eventic ecovery	Classic Writer ons for on and y from

Module 4	Memory Management	Assignment	Programming/Simulation	10 Hours
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Topics:

Introduction to Memory Management, Basic hardware-Base and Limit Registers, Memory Management Unit(MMU), Dynamic loading and linking, Swapping, Contiguous and Non-Contiguous Memory Allocation, Segmentation, Paging - Structure of the Page Table – Virtual Memory and Demand Paging – Page Faults and Page Replacement Algorithms, Copy-on-write, Allocation of Frames, Thrashing

Introduction to File system management: File System Interface (access methods, directory structures), File system implementation.

Targeted Application:

Application area is traffic management system, banking system, health care and many more systems where in there are resources and entities that use and manage the resources.

Software Tools:

1. Oracle Virtual Box/VMWare Virtualization software [Virtual Machine Managers]. Used to install and work on multiple guest Operating Systems on top of a host OS.

2. Intel Processor identification utility: This software is used to explain about multi-core processors. It helps to identify the specifications of your Intel processor, like no of cores, Chipset information, technologies supported by the processor etc.

Project work/Assignment

- 1. Demonstrate process concepts in LINUX OS.
- 2. Simulation of CPU scheduling algorithms.
- 3. Develop program to demonstrate use of Semaphores in threads.
- 4. Develop program to demonstrate use of deadlock avoidance algorithms.
- 5. Develop program to demonstrate use of page replacement algorithms.
- 6. Simulation of memory allocation strategies [first fit, best fit and worst fit].

Text Book

1. Silberschatz A, Galvin P B and Gagne G , "Silberschatz's Operating System Concepts", Paperback, Global Edition Wiley, 2019

2. References

- 1. Silberschatz A, Galvin P B and Gagne G, "Operating System Concepts", 10th edition Wiley, 2018.
- 2. William Stallings, "Operating Systems", Ninth Edition, By Pearson Paperback ,1 March 2018.
- 3. Sundaram RMD, Shriram K V, Abhishek S N, B Chella Prabha, "Cracking the Operating System skills", Dreamtech, paperback, 2020
- 4. Remzi H. Arpaci-Dusseau Andrea C. Arpaci-dusseau , "Operating Systems: Three Easy Pieces, Amazon digital Services", September 2018.

E-resources/Weblinks

- 5. https://www.os-book.com/OS9/
- 6. <u>https://pages.cs.wisc.edu/~remzi/OSTEP/</u>
- 7. https://codex.cs.yale.edu/avi/os-book/OS10/index.html

Course Code: CSE2069	Course Title: Cloud Compu Type of Course: Theory and	L- T-P- C	2	0	2	3				
Version No.	2.0			1						
Course Pre- requisites	[1] Data Communication an	d Computer Networks (C	CSE2011)							
Anti-requisites	NIL									
Course Description	This course provides a hands-on comprehensive study of Cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). It dives into all of the details that a student needs to know in order to plan for developing applications on the cloud and what to look for when using applications or services hosted on a cloud.									
Course Objective	The course aims to impart knowledge to students that can provide easy, scalable access to computing resources and IT services. This course is designed to improve the learner's EMPLOYABILITY SKILLS using EXPERIENTIAL LEARNING techniques.									
Course Outcomes	 Upon successful completion of the course, the students shall be able to: 1. Comprehend the significance of Cloud computing technologies 2. Describe appropriate Virtualization techniques to virtualize infrastructures 3. Apply Cloud mechanisms to optimize the QoS parameters 4. Interpret recent technologies on Cloud 									
Course Content:										
Module 1	Introduction to Cloud Services	Assignment	Theory	r (No. o The ab:4	of Hou ory: 6	rs:10 ,			
Topics: A Facility fo Multiple Cores to M Computers, The Eco PaaS, SaaS, Types o	or Flexible Computing, The Social Computing, The Social Computing Machines, From Cluss nomic Motivation for a Centre for Clouds, and Cloud Computed Social Computed Social Computer Social Com	tart of Cloud: The Power sters to Web Sites and Lo alized Data Center, Cloud ing Environments.	Wall and N oad Balanci I Computing	fultij ng, l g Ar	ple C Rack chite	Cores, as of S cture, of Hou	From Server IaaS, Irs:10			
Module 2	Virtualization Techniques	Lab-based Assignments	Theory	(L	The ab:4	ory: 6)	,			
Topics: Basics of V Implementation Leve	irtualization - Types of Virtuels of Virtuelization.	alizations, Taxonomy of	Virtualizatio	on T	echn	iques,	,			
Module 3	QoS and Management	Application Development	Theory	r (L	No. o The .ab:4	of Hou ory: 6)	rs:10 ',			
Topics: Quality of Agreements (SLAs) development in the C	Service (QoS) in the Clo , Specialized Cloud Mecha Cloud	ud, Cloud Infrastructur anisms, Cloud Managen	e Mechanis nent Mecha	sms, anisr	Ser ns, A	vice Applio	Level cation			
Module 4	Security and advancements	Case Study	Case Study	, , L	No. o The .ab:4	of Hou ory: 6	rs:10 ,			
Topics: The Zero T Technologies And T Application develops Case Studies, and Re	Frust Security Model, Ident heir Effect on Security, Proto ment in Cloud, Latest trends ecent Advancements	ity Management, Privil- ecting Remote Access, P. in Cloud Computing, Fo	eged Acces rivacy in a g Computin	ss M Clou 1g, D	lanag d Er Dew (gemer iviron Comp	ıt, AI ment, uting,			
Targeted Application	ns & Tools that can be used:									
Targeted Application Developing applicati	ns: ons on Cloud Platforms via V	Virtual machines								

Cloud Tools:

- VMWare
- Amazon EC2
- Google Compute Engine
- Microsoft Azure
- Cloudsim

Project work/Assignment:

- 1. Automation of performance analysis of students through the Cloud
- 2. Chatbots development using Cloud resources
- 3. Blog creation using Cloud computing

Analysis of Case Studies: When deciding to adopt cloud computing architecture, decide if the cloud is right for your requirements (for the application identified).

Suggested List of Hands-on Activities:

S1. No	Title
1	Install Virtualbox/VMware Workstation with different flavors of Linux or Windows OS on top of windows 11
2	Install a C compiler in the virtual machine created using a virtual box and execute Simple Programs.
3	Install Google App Engine (GAE). Create a "hello world" application and other simple web applications using python/java
4	Use GAE launcher to launch the web applications.
5	Simulate a cloud scenario using CloudSim and run a scheduling algorithm
6	Find a procedure to transfer the files from one virtual machine to another virtual machine.
7	Find a procedure to launch a virtual machine using Openstack
8	Demonstrate Migration, Cloning, and Snapshots within and across VMs
	Demonstrate on the Virtual Environment on hypervisor.
9	b) The backup and restore mechanism.
-	Implement and Evaluate the performance of MapReduce program on word count for different
10	file size.

Text Book(s)

1. Douglas E. Comer, "The Cloud Computing Book: The Future of Computing Explained", Chapman and Hall/CRC; 1st edition, July 2021.

References

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, 2013 edition.

2. Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, "Cloud Computing Concepts, Technology & Architecture", PHI publisher 2013 edition.

3. Anthony T Velte, Toby J Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw-Hill, 2010 edition.

4. David E.Y. Sarna, "Implementing and Developing Cloud Applications", CRC Press, 2018 edition.

5. Manvi, Sunilkumar, and Gopal K. Shyam. "Cloud Computing: Concepts and Technologies". CRC Press, 2021.

Web Resources and Research Articles links:

6. IEEE Transactions on Cloud Computinghttps://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6245519

7. International Journal of Cloud Computing-

https://www.inderscience.com/jhome.php?jcode=ijcc

8. CloudSim Resources- https://javadoc.io/doc/org.cloudsimplus/cloudsim-plus/latest/org/cloudbus/cloudsim/resources/class-use/Resource.html

9. Journal of Network and Computer Networking-

https://www.journals.elsevier.com/journal-of-network-and-computer-applications

Course Code:	Course Title: R Pro	ogramming for Data S	Science	L- P- C	1	4	3		
C3E3035	Turne of Courses D	ogram Coro							
	Lab Integrated Co								
		uise							
Version No.	1.0								
Course Pre-	Nil								
requisites									
Anti-requisites	Nil								
Course	R Programming	Programming for Data Science is designed for inspecting,							
Description	cleansing, transf	forming, and mod	eling data	with	the go	oal of			
	discovering usef	scovering useful information, and supports in decision-making.							
	The course begin	is by covering Data	extraction	, pre-p	rocessin	g, and			
	transformation.	It delivers the bas	ic statistic	s and	taught	in an			
	intuitive way to a	inalysis the data. If	11s course v	will ne	ip the sti	udents			
	o apply the kill	owledge on Data	Analytics	to a v	vide ran	ige of			
Course Objective	applications. The objective of th	e course is to familia	rize the lear	ners wi	ith the co	ncents			
course objective	of R Programming	for Data Science a	and attain I	Fmnlov	a hility th	ncepts			
	Problem Solving N	Aethodologies.			ability	nough			
	0								
Course Out	;								
Comes	On successful com	pletion of the course	the students	s shall b	be able to	:			
	1) Describe the R	programming for I	Data Analyt	tics.[Ki	nowledge	e]			
	2) Generalize the	appropriate visuali	zation metl	nods.[(Compreh	ension]			
	3) Demonstrate t	he various statistica	l testing me	ethods.	[Applica	tion]	• •		
	4) Apply the prob data [Application	ability and complex	aistributio	n lunc	uons ior	the anal	ysis oi		
Course		1							
Content:									
Module 1	Introduction to	Case studies	Programm	ing	8 Sessio	ns			
	R		U	U					
	Programming								
R Studio: Base R	-R Studio IDE-In	troduction to R Pro	jects and R	Mark	down. B	asic R:]	R as a		
calculator-Scripts	and Comments-F	R Variables. Data I/O): Working	Direc	tories-In	nporting	Data-		
Exporting Data-M	fore ways to save-	Data I/O in Base R.	Subsetting	g Data i	n R: Sele	ecting sp	ecific		
elements-Renami	ng Columns-Sub	setting Columns -	Subsetting	Rows	s - Addi	ing/Rem	loving		
Columns-Orderin	g Columns - Orde	ering Rows	_						
Module 2	Data Analysis C	ase studies	Programm	ing	10 Sessi	ons			
Data Summariza	tion: One Quan	titative and Cate	gorical Va	riable.	Data	Classes:	One		
Dimensional Dat	a Classes-Data F	rames and Matrice	es-Lists. D	ata C	leaning:	Dealing	; with		
Missing Data-Str	ings and Recoding	ng Variables. Mani	pulating L	Pata in	K: Ke	shaping	Data-		
Merging Datasets	5. Data Visualizati	Case studies	gplot2- Pl	otting	With Bas	e K			
iviouule 5	Analysis in R	Case studies	Programm	ing	o Sessio	115			
Proportion tests-	Chi squared test-	Fisher exact test-C	Correlation-	T test	-Wilcox	on Ranl	c sum		
tests-Wilcoxon si	gned rank test- O	ne Way ANOVA-	Kruskal Wa	allis Te	est-Linea	ar Regre	ssion-		
Logistic Regressi	on and Generalize	ed Linear Models-P	oisson Reg	ressio	n.		~~~~		
Module 4	Simulations C	ase studies	Programm	ing	10 Sess	ions			
Functions: Writin	g your own functi	on-Loops. Simulati	ons: Standa	ard Pro	bability	Distribu	tions-		
Sampling from	more Complex	Distributions-The	Accept	and F	Reject A	lgorithr	n-The		
Metropolis Hasti	ng Algorithm. R	Markdown: Explor	ratory Ana	lysis-N	Aultiple	Facets-I	Linear		
Models- Grabbing coefficients-Pander-Multiple Models-Data Extraction									

Targeted Applications & Tools that can be used:
Tools:
R Programming
Exp 1.
Level 1:
Level 1.
b multiply may now by 4
b. multiply my num by 4
d combine the two variables my num and my char into a variable called both
u. combine the two variables my num and my char into a variable caned both
f. what is the length of both?
1. What class is both: a = divide b + b h 2, what happens?
g. divide both by 5, what happens?
a create a vector with elements 1, 2, 3, 4, 5, 6 and call it x
b. create another vector with elements 10 20 30 40 50 and call it x
c what happens if you try to add x and y together? why?
d append the value 60 onto the vector \mathbf{x} (hint: you can use the $c(\cdot)$ function)
e add x and y together
f multiply x and y together pay attention to how R performs operations on vectors of the
same length
Exp 2
Level 1:
a. Read in the Youth Tobacco study, Youth Tobacco Survey YTS Data.csv and name
it youth.
b. Install and invoke the readxl package. RStudio > Tools > Install Packages. Type readxl
into the Package search and click install. Load the installed library with library(readxl).
Level 2:
a. Download an Excel version of the Monuments dataset, Monuments.xlsx, from
CANVAS. Use the read_excel() function in the readxl package to read in the dataset and
call the output mon.
b. Write out the mon R object as a CSV file using readr::write_csv and call the file
"monuments.csv".
c. Write out the mon R object as an RDS file using readr::write_rds and call it
"monuments.rds".
Exp 3:
Level 1:
a. Check to see if you have the integers detect by entering the command integers
a. Check to see if you have the inicars dataset by entering the command inicars. b. What class is micars?
c. How many observations (rows) and variables (columns) are in the means dataset?
d Conventcars into an object called cars and rename mpg in cars to MPG. Use rename()
e. Convert the column names of cars to all upper case. Use rename all, and the toupper

command (or colnames).

f. Convert the rownames of cars to a column called car using rownames_to_column. Subset the columns from cars that end in "p" and call it pvars using ends_with().

g. Create a subset cars that only contains the columns: wt, qsec, and hp and assign this object to carsSub. What are the dimensions of carsSub? (Use select() and dim().)

Level 2:

a. Convert the column names of carsSub to all upper case. Use rename_all(), and toupper() (or colnames()).

b. Subset the rows of cars that get more than 20 miles per gallon (mpg) of fuel efficiency. How many are there? (Use filter().)

c. Subset the rows that get less than 16 miles per gallon (mpg) of fuel efficiency and have more than 100 horsepower (hp). How many are there? (Use filter().)

d. Create a subset of the cars data that only contains the columns: wt, qsec, and hp for cars with 8 cylinders (cyl) and reassign this object to carsSub. What are the dimensions of this dataset?

e. Re-order the rows of carsSub by weight (wt) in increasing order. (Use arrange().)

f. Create a new variable in carsSub called wt2, which is equal to wt^2, using mutate() and piping %>%.

Exp 4:

Level 1:

a. How many bike lanes are currently in Baltimore? You can assume that each observation/row is a different bike lane.

b. How many (a) feet and (b) miles of total bike lanes are currently in Baltimore? (The length variable provides the length in feet.)

c. How many types (type) bike lanes are there? Which type (a) occurs the most and (b) has the longest average bike lane length?

Level 2:

a. How many different projects (project) do the bike lanes fall into? Which project category has the longest average bike lane length?

b. What was the average bike lane length per year that they were installed? (Be sure to first set dateInstalled to NA if it is equal to zero.)

c. Numerically and graphically describe the distribution of bike lane lengths (length).

d. Describe the distribution of bike lane lengths numerically and graphically after stratifying them by (a) type and then by (b) number of lanes (numLanes).

Exp 5:

Level 1:

a. Get all the different types of bike lanes from the type column. Use sort(unique()). Assign this to an object btypes. Type dput(btypes).

b. By rearranging vector btypes and using dput, recode type as a factor that has SIDEPATH as the first level. Print head(bike\$type). Note what you see. Run table(bike\$type) afterwards and note the order.

c. Make a column called type2, which is a factor of the type column, with the levels: c("SIDEPATH", "BIKE BOULEVARD", "BIKE LANE"). Run table(bike\$type2), with the options useNA = "always". Note, we do not have to make type a character again before doing this.

Level 2:

a. • Reassign dateInstalled into a character using as.character. Run head(bike\$dateInstalled).

b. Reassign dateInstalled as a factor, using the default levels. Run head(bike\$dateInstalled).

c. Do not reassign dateInstalled, but simply run

head(as.numeric(bike\$dateInstalled)). We are looking to see what happens when we try to go from factor to numeric.

d. Do not reassign dateInstalled, but simply run

head(as.numeric(as.character(bike\$dateInstalled))). This is how you get a "numeric" value back if they were incorrectly converted to factors.

• Convert type back to a character vector. Make a column type2 (replacing the old one), where if the type is one of these categories c("CONTRAFLOW", "SHARED BUS BIKE", "SHARROW", "SIGNED ROUTE") call it "OTHER". Use %in% and ifelse. Make type2 a factor with the levels c("SIDEPATH", "BIKE BOULEVARD", "BIKE LANE", "OTHER").

• Parse the following dates using the correct lubridate functions:

a. "2014/02-14"

b. "04/22/14 03:20" assume mdy

c. "4/5/2016 03:2:22" assume mdy

Exp 6:

Level 1:

a. Count the number of rows of the bike data and count the number of complete cases of the bike data. Use sum and complete.cases.

b. Create a data set called namat which is equal to is.na(bike). What is the class of namat? Run rowSums and colSums on namat. These represent the number of missing values in the rows and columns of bike. Don't print rowSums, but do a table of the rowSums.

c. Filter rows of bike that are NOT missing the route variable, assign this to the object have_route. Do a table of the subType variable using table, including the missing subTypes. Get the same frequency distribution using group_by(subType) and tally() or count().

d. Filter rows of bike that have the type SIDEPATH OF BIKE LANE using %in%. Call it side_bike. Confirm this gives you the same number of results using the | and ==.

e. Do a cross tabulation of the bike type and the number of lanes (numLanes). Call it tab. Do a prop.table on the rows and columns margins. Try as.data.frame(tab) or broom::tidy(tab).

f. Read the Property Tax data into R and call it the variable ${\tt tax}.$

g. How many addresses pay property taxes? (Assume each row is a different address.)

h. What is the total (a) city (CityTax) and (b) state (SateTax) tax paid? You need to remove the \$ from the CityTax variable, then you need to make it numeric. Try str_replace, but remember \$ is "special" and you need fixed() around it.

i. Using table() or group_by and summarize(n()) or tally().

a. How many observations/properties are in each ward (Ward)?

b. What is the mean state tax per ward? Use group_by and summarize.

c. What is the maximum amount still due (AmountDue) in each ward? Use group_by and summarize with 'max'.

d. What is the 75th percentile of city and state tax paid by Ward? (quantile) j. Make boxplots showing CityTax (y-variable) by whether the property is a principal residence (x = ResCode) or not. You will need to trim some leading/trailing white space from ResCode.

Level 2:

a. Subset the data to only retain those houses that are principal residences. Which command subsets rows? Filter or select?

a. How many such houses are there?

b. Describe the distribution of property taxes on these residences. Use

hist/qplot with certain breaks or plot(density(variable)).

b. Make an object called health.sal using the salaries data set, with only agencies (JobTitle) of those with "fire" (anywhere in the job title), if any, in the name remember fixed("string_match", ignore_case = TRUE) will ignore cases.

c. Make a data set called trans which contains only agencies that contain "TRANS".

d. What is/are the profession(s) of people who have "abra" in their name for Baltimore's Salaries? Case should be ignored.

e. What does the distribution of annual salaries look like? (use hist, 20 breaks) What is the IQR? Hint: first convert to numeric. Try str_replace, but remember \$ is "special" and you need fixed() around it.

f. Convert HireDate to the Date class - plot Annual Salary vs Hire Date. Use AnnualSalary ~ HireDate with a data = sal argument in plot or use x, y notation in scatter.smooth. Use the lubridate package. Is it mdy(date) or dmy(date) for this data - look at HireDate.

g. Create a smaller dataset that only includes the Police Department, Fire Department and Sheriff's Office. Use the Agency variable with string matching. Call this emer. How many employees are in this new dataset?

h. Create a variable called dept in the emer data set, dept = str_extract(Agency, ".*(ment|ice)"). E.g. we want to extract all characters up until ment or ice (we can group in regex using parentheses) and then discard the rest. Replot annual salary versus hire date and color by dept (not yet - using ggplot). Use the argument col = factor(dept) in plot.

i. (Bonus). Convert the 'LotSize' variable to a numeric square feet variable in the tax data set. Some tips: a) 1 acre = 43560 square feet b) The hyphens represent a decimals. (This will take a lot of searching to find all the string changes needed before you can convert to numeric.)

Exp 7:

Level 1:

a. Read in the Bike_Lanes_Wide.csv dataset and call is wide.

b. Reshape wide using pivot_longer. Call this data long. Make the key lanetype, and the value the_length. Make sure we gather all columns but name, using -name. Note the NAs here.

c. Read in the roads and crashes .csv files and call them road and crash.

d. Replace (using str_replace) any hyphens (-) with a space in crash\$Road. Call this data crash2. Table the Road variable.

e. How many observations are in each dataset?

f. Separate the Road column (using separate) into (type and number) in crash2. Reassign this to crash2. Table crash2\$type. Then create a new variable calling it road_hyphen using the unite function. Unite the type and number columns using a hyphen (-) and then table road_hyphen.

g. Which and how many years were data collected in the crash dataset?

h. Read in the dataset Bike_Lanes.csv and call it bike.

Level 2:

a. Keep rows where the record is not missing t_{ype} and not missing name and re-assign the output to bike.

b. Summarize and group the data by grouping name and type (i.e for each type within each name) and take the sum of the length (reassign the sum of the length to the length variable). Call this data set sub.

c. Reshape sub using pivot_wider. Spread the data where the key is type and we want the value in the new columns to be length - the bike lane length. Call this wide2. Look at the column names of wide2 - what are they? (they also have spaces).

```
d. Join data in the crash and road datasets to retain only complete data, (using an inner
   join) e.g. those observations with road lengths and districts. Merge without using by
   argument, then merge using by = "Road". call the output merged. How many
   observations are there?
   e. Join data using a full_join. Call the output full. How many observations are
   there?
   f. Do a left join of the road and crash. ORDER matters here! How many observations
   are there?
   g. Repeat above with a right_join with the same order of the arguments. How many
   observations are there?
Exp 8
Level 1:
   a. Plot average ridership (avg data set) by date using a scatterplot.
           a. Color the points by route (orange, purple, green, banner)
          b. Add black smoothed curves for each route
          c. Color the points by day of the week
   b. Replot 1a where the colors of the points are the name of the route (with banner ->
   blue)
         pal = c("blue", "darkgreen","orange","purple")
   c. Plot average ridership by date with one panel per route
Level 2:
   a. Plot average ridership by date with separate panels by day of the week, colored by
   route
   b. Plot average ridership (avg) by date, colored by route (same as 1a). (do not take an
   average, use the average column for each route). Make the x-label "Year". Make the y-
   label "Number of People". Use the black and white theme theme bw(). Change the
   text_size to (text = element_text(size = 20)) in theme.
   c. Plot average ridership on the orange route versus date as a solid line, and add dashed
   "error" lines based on the boardings and alightings. The line colors should be
   orange. (hint linetype is an aesthetic for lines - see also scale_linetype and
   scale_linetype_manual. Use Alightings = "dashed", Boardings = "dashed",
   Average = "solid")
Exp 9
Level 1:
   a. Compute the correlation between the 1980, 1990, 2000, and 2010 mortality data. No
   need to save this in an object. Just display the result to the screen. Note any NAS. Then
   compute using use = "complete.obs".
   b.
          a. Compute the correlation between the Myanmar, China, and United States
          mortality data. Store this correlation matrix in an object called country cor
           b. Extract the Myanmar-US correlation from the correlation matrix.
   c. Is there a difference between mortality information from 1990 and 2000? Run a
```

paired t-test and a Wilcoxon signed rank test to assess this. Hint: to extract the column of information for 1990, use mort\$"1990"

Level 2:

a. Using the cars dataset, fit a linear regression model with vehicle cost (VehBCost) as the outcome and vehicle age (VehicleAge) and whether it's an online sale (IsOnlineSale) as predictors as well as their interaction. Save the model fit in an object called lmfit_cars and display the summary table.

b. Create a variable called expensive in the cars data that indicates if the vehicle cost is over \$10,000. Use a chi-squared test to assess if there is a relationship between a car being expensive and it being labeled as a "bad buy" (IsBadBuy).

c. Fit a logistic regression model where the outcome is "bad buy" status and predictors are the expensive status and vehicle age (VehicleAge). Save the model fit in an object called logfit_cars and display the summary table. Use summary or

tidy(logfit_cars, conf.int = TRUE, exponentiate = TRUE) Or

tidy(logfit_cars, conf.int = TRUE, exponentiate = FALSE) for log odds ratios

Exp 10

Level 1:

• Write a function, sqdif, that does the following:

- a. takes two numbers x and y with default values of 2 and 3.
- b. takes the difference
- c. squares this difference
- d. then returns the final value
- e. checks that x and y are numeric and stops with an error message otherwise

Level 2:

• Try to write a function called top() that takes a matrix or data.frame and a number n, and returns the first n rows and columns, with the default value of n=5.

• Write a function that will calculate a 95% one sample t interval. The results will be stored in a list to be returned containing sample mean and the confidence interval. The input to the functions is the numeric vector containing our data. For review, the formula for a 95% one sample t interval is $x\pm 1.96 * s/\sqrt{n}$.

Exp 11

Level 1:

Simulate a random sample of size n=100

• from

- a. a normal distribution with mean 0 and variance 1. (see morm)
- b. a normal distribution with mean 1 and variance 1. (see rnorm)
- c. a uniform distribution over the interval [-2, 2]. (see runif)

• Run a simulation experiment to see how the type I error rate behaves for a two sided one sample t-test when the true population follows a Uniform distribution over [-10,10]. Modify the function t.test.sim that we wrote to run this simulation by

• changing our random samples of size n to come from a uniform distribution over [-10,10] (see runif).

- performing a two sided t-test instead of a one sided t-test.
- performing the test at the 0.01 significance level.
- choosing an appropriate value for the null value in the t-test. Note that the true mean in this case is 0 for a Uniform(-10,10) population. Try this experiment for

n=10, 30, 50, 100, 500. What happens the estimated type I error rate as n changes? Is the type I error rate maintained for any of these sample sizes?

Level 2:

• From introductory statistics, we know that the sampling distribution of a sample mean will be approximately normal with mean μ and standard error σ/\sqrt{n} if we have a random sample from a population with mean μ and standard deviation σ and the sample size is "large" (usually at least 30). In this problem, we will build a simulation that will show when the sample size is large enough.

a. Generate N=500 samples of size n=50 from a Uniform[-5,5] distribution.

b. For each of the N=500 samples, calculate the sample mean, so that you now have a vector of 500 sample means.

c. Plot a histogram of these 500 sample means. Does it look normally distributed and centered at 0?

d. Turn this simulation into a function that takes arguments N the number of simulated samples to make and n the sample size of each simulated sample. Run this function for n=10, 15, 30, 50. What do you notice about the histogram of the sample means (the sampling distribution of the sample mean) as the sample size increases.

Text Book

1. Introduction to R- Robert Parker, John Mushcelli and Andrew Jaffe, Johns Hopkins University, 2020

References

 Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining Paperback, Glenn J. Myatt and Wayne P. Johnson, Import, 22 July 2014.
 The R Software-Fundamentals of Programming and Statistical Analysis -Pierre Lafaye de Micheaux, Remy Drouilhet, Benoit Liquet, Springer 2013.

Topics relevant to Development skills

Topics relevant to development of "Employability": Real time application development using R Programming Tools.

Topics relevant to "Human Values & Professional Ethics"

Course Code:	Course Title: Appli	ed Machine Learni	ng						
CSE3087	Type of Course: 1] 2]	Program Core Laboratory integra	ted	L- P- C	2 2	2	3		
Version No.	1.0								
Course Pre-	CSE3001 Artificial	Intelligence and Ma	achine	Learnir	ıg				
requisites		0			0				
Anti-requisites	NIL								
Course	Machine Learning	Machine Learning algorithms are the key to develop intelligent systems							
Description	such as Apple's Siri, Google's self-driving cars etc. This course introduces the concepts of the core machine learning techniques such as Regression learning, Bayesian learning, Ensemble learning, Perceptron learning, Unsupervised learning, Competitive learning, learning from Gaussian mixture models and learning to detect outliers. Course lectures covers both the theoretical foundations as well as the essential algorithms for the various learning methods. Lab sessions complement the lectures and enable								
Course	This course is design	hed to improve the le	Parners	'EMPL	OYABI		KILLS'		
Objectives	by using <u>EXPERIENTIAL LEARNING</u> techniques. The supervised hands- on laboratory exercises, assessments and the group projects facilitate this learning process.								
Course Out	On successful comp	letion of the course	the stud	dents sł	nall be a	able to:	:		
	 modeling. [Application] 2] Produce machine learning models with better predictive performance using meta learning algorithms [Application] 3] Create predictive models using Perceptron learning algorithms[Application] 4] Employ advanced unsupervised learning algorithms for clustering, competitive learning and outlier detection[Application] 5] Implement machine learning based intelligent models using Python libraries. [Application] 								
Course Content:									
Module 1	Supervised Learning	Assignment	Progra Keras/	mming 'Sklearı	using n	N of C L - 7	No. lasses P – 12		
L - 7 P - 12Topics: An overview of Machine Learning(ML); ML workflow; types of ML; Types of features, Feature Engineering -Data Imputation Methods; Regression – introduction; simple linear regression, loss functions; Polynomial Regression; Logistic Regression; Softmax Regression with cross entropy as cost function; Bayesian Learning – Bayes Theorem, estimating conditional probabilities for categorical and continuous features, Naïve Bayes for supervised learning; Bayesian Belief networks; Support Vector Machines – soft margin and kernel tricks.No. of Classes L-3 P-4Module 2Ensemble LearningAssignmentProgramming using Keras/SklearnNo. of Classes L-3 P-4Topics: Ensemble Learning – using subset of instances – Bagging, Pasting, using subset ofNo.No									
features -random	patches and randor	n subspaces method	l; Voting	g Classi	fier, Ra	indom	Forest;		
Boosting - AdaBoost, Gradient Boosting, Extremely Randomized Trees, Stacking.									

Module 3	Perceptron Learning	Assignment /Quiz	Programming using Keras/Sklearn	No. of Classes
	0		'	

Topics: **Perceptron Learning** – from biological to artificial neurons, Perceptrons, Linear Threshold Units, logical computations with Perceptrons, common activation functions – sigmoid, tanh, relu and softmax, common loss functions, multi-layer Perceptrons and the Backpropagation algorithm using Gradient Descent.

Module 4	Unsupervised Learning	Assignment	Programming using Keras/Sklearn	No. of Classes L-6 P -6
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Topics: Unsupervised Learning - simple k Means clustering- simple and minibatch; updating centroids incrementally; finding the optimal number of clusters using Elbow method ; Silhoutte coefficient, drawbacks of kMeans, kMeans++ ; Divisive hierarchical clustering _ bisecting k-means, clustering using Minimum Spanning Tree (MST) Competitive Learning - Clustering using Kohenen's Self Organising Maps (SOM), Density Based Spatial Clustering - DBSCAN; clustering using Gaussian Mixture Models (GMM) with EM algorithm ; Outlier Detection methods - Isolation Forest, Local Outlier Factor(LOF)

List of Laboratory Tasks:

Experiment N0 1: Methods for handling missing values

Level 1: Given a data set from UCI repository, implement the different ways of handling missing values in it using Scikit-learn library of Python

Level 2: Implement one of these methods using a custom defined function in Python.

Experiment No. 2: Data Visualization

Level 1 Perform Exploratory Data Analysis for a given data set by creating Scatter Plot, Pair Plot, Count Plot using Matplotlib and Seaborn **Level 2** Create Heat Maps, WordCloud

Experiment No. 3: Regression learning

Level 1 Given a data set from UCI repository, implement the simple linear regression algorithm and estimate the models parameters and the performance metrics. Plot the learning curves.

Level 2 Implement the polynomial regression algorithm. Compare the learning curves of Polynomial and Linear Regression.

Experiment No.4: Logistic regression

Level 1 Write custom code for generating the logistic/sigmoid plot for a given input Level 2 Given a data set from UCI repository, implement the Logistic regression algorithm. Estimate the class probabilities for a given test data set. Plot and analyze the decision boundaries.

Experiment No.5: Bayesian Learning

Level 1 Given a data set from UCI repository, implement a classification model using the Bayesian algorithm

Experiment No.6: Support Vector Machine(SVM)

Level 1 Given data sets from UCI repository, implement a linear SVM and a non-linear SVM based classification model.

Experiment No. 7: Ensemble Learning

Level 1 : Implement Ensemble Learning algorithms such as Bagging, Pasting and Out-of Bag Evaluation

Level 2 : Random Patches and Random Subspace Method

Experiment No. 8: Ensemble Learning

Level 1 : AdaBoost and Gradient Boosting, Stacking

Experiment No. 9: Perceptron Learning

Level 1 : Implement the Perceptron Classifier Level 2 : – An Image Classifier Using the Sequential API of Keras

Experiment No. 10: Unsupervised Learning

Level 1 : K-means – simple and mini-batch. Finding the optimal number of clusters using Elbow method and Silhoutte Coefficient . Compare the inertia of both as k increases. Tuning the hyperparameter 'k' using GridSearchCV.

Level 2 : - Using clustering for Image segmentation and Preprocessing. Kmeans++

Experiment No. 11: Density Based Clustering

Level 1 Implement DBSCAN – clustering using the local density estimation. Perform hard and soft clustering for new instances.

Experiment No. 12: Outlier Detection

Level 1 Outlier Detection using Isolation Forest and Local Outlier Factor

Targeted Application & Tools that can be used :

1. Execution of the ML algorithms will be done using the Google's cloud service namely "Colab", available at <u>https://colab.research.google.com/</u> or Jupyter Notebook.

2. The data sets will be from the bench marking repositories such as UCI machine learning repository available at : <u>https://archive.ics.uci.edu/ml/index.php</u>

3. Laboratory tasks will be implemented using the libraries available in Python such as Scikit learn, matplotlib, seaborn, perceptron and the deep learning framework namely Keras.

Project work/Assignment: Mention the Type of Project/Assignment proposed for this course

Students can be assigned a mini project to develop a machine learning application for reallife problems in various domains such as health care, business intelligence, environmental modeling, etc.

Text Book

There are a number of useful textbooks for the course, but each cover only a part of the course syllabus. Following is an indicative list of textbooks.

1. Aurélien Géron, "Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow", Oreilly, Second Edition, 2019.

2. Andreas C Muller, Sarah Guido, "Introduction to Machine Learning with Python :A Guide for Data Scientists", Oreilly, First Edition, 2018

3. Giuseppe Bonaccorso, "Machine Learning Algorithms: A reference guide to popular algorithms from data science and machine learning", Packt Publishing, 2017.

References In references apart from the books and web links, mention a few standards &Hand books relevant to the Laboratory tasks used by the professionals.

1. Tan P. N., Steinbach M & Kumar V. "*Introduction to Data Mining*", Pearson Education, 2016.

2. <u>https://towardsdatascience.com/machine-learning/home</u>

3. MITopencourseware:<u>https://ocw.mit.edu/courses/6-0002-introduction-to-</u> computational-thinking-and-data-science-fall-2016/resources/lecture-11-introductionto-machine-learning/

4. https://onlinecourses.nptel.ac.in/noc21_cs85/preview

UCG COURSE: Type of Course: Program Core Theory with embedded lab L-P-C 2 2 Version No. 1.0	3 n e analysis plications medicine, defense, bic vision e includes ormation, Imaging, ors, Image storation, ig, Object							
Version No. 1.0 Course Pre- requisites MAT1001- Calculus and Linear Algebra, MAT1002 - Transform Techniques, Partial Differential Equations and their Applications Anti-requisites NIL This Course is an introduction to Robotic vision and image techniques and concepts. Robotic vision has found much wider app not only in the space program, but also in the areas such as r biology, industrial automation, astronomy, law enforcement, intelligence. With the progress made AI Robotics these days, Robo has become an indispensable part of our digital age. This course Fundamentals, Applications, Human Visual Perception, Image Fc Sampling and Quantization, Binary Image, Three-Dimensional Image file formats. Color and Color Imagery: Perception of Color Transformation: Fourier Transforms, Image Enhancement and Res Image Reconstruction, Image Segmentation, Visual based Servoin, detection. Course The objective of the course is to familiarize the learners with the co Robotic Vision Employability through Problem Solving Methodologies. On successful completion of the course the students shall be able to: 1. Explain the fundamentals of Robotic vision and its pr	n e analysis plications medicine, defense, btic vision e includes ormation, Imaging, ors, Image storation, ig, Object							
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Anti-requisitesNILThis Course is an introduction to Robotic vision and image techniques and concepts. Robotic vision has found much wider app not only in the space program, but also in the areas such as r biology, industrial automation, astronomy, law enforcement, intelligence. With the progress made AI Robotics these days, Robo has become an indispensable part of our digital age. This course Fundamentals, Applications, Human Visual Perception, Image Fo Sampling and Quantization, Binary Image, Three-Dimensional Image file formats. Color and Color Imagery: Perception of Color Transformation: Fourier Transforms, Image Enhancement and Res Image Reconstruction, Image Segmentation, Visual based Servoin, detection.Course ObjectiveThe objective of the course is to familiarize the learners with the co Robotic Vision Employability through Problem Solving Methodologies.On successful completion of the course the students shall be able to: 1. Explain the fundamentals of Robotic vision and its pr	e analysis plications medicine, defense, otic vision includes ormation, Imaging, ors, Image estoration, 1g, Object							
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Course ObjectiveThe objective of the course is to familiarize the learners with the co Robotic Vision Employability through Problem Solving Methodologies.On successful completion of the course the students shall be able to: 1. Explain the fundamentals of Robotic vision and its pr Understand final	oncepts of							
On successful completion of the course the students shall be able to: 1. Explain the fundamentals of Robotic vision and its pr								
Course Out Comes[Understanding] 2. Utilize image enhancement techniques in spatial and frequ domain. [Application] 3. Apply the mathematical modeling of image degradation an restoration.[Application] 4. Apply the concept of image segmentation. [Application]	 I. Explain the fundamentals of Robotic vision and its processing. [Understanding] 2. Utilize image enhancement techniques in spatial and frequency domain. [Application] 3. Apply the mathematical modeling of image degradation and restoration.[Application] 4. Apply the concept of image segmentation 							
Course								
Module 1 Introduction to Robotic Assignment Practical C	No. of Classes:8							
Overview of computer vision and its applications in robotics, Introduction to robotic perception and the role of vision sensors, Challenges and limitations of robotic vision systems Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Classification of images, Some Basic Relationships between Pixels, Linear and Nonlinear Operations.								
Module 2 Image Transformation: Assignment Practical	No. of Classes:8							
Image enhancement in spatial domain: Some basic gray level transformations, Histogram p Smoothing and Sharpening spatial filters. Image enhancement in frequency domain: 1D FFT, 2D FFT, Smoothing and Sharpening t domain filters, Homomorphic filtering.	processing,							
Module 3Image RestorationAssignmentFracticalC	No. of lasses:8							
A model of the image restoration and degradation process, Noise models – spatial and properties of noise, some important probability density functions: Gaussian noise, Rayle Gamma noise, exponential, uniform, impulse noise, Periodic noise Restoration in the Pr Noise Only using Spatial Filtering and Frequency Domain Filtering.	frequency eigh noise, resence of							
Module 4 Image Segmentation and Assignment Practical C	No. of Classes:6							
Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation,								

Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing, Some Basic Morphological Algorithms.

Ethical and Social Implications: Ethical considerations in robotic vision applications, Privacy concerns and data protection, Social impact and implications of robotic vision technologies

Lab Experiments are to be conducted on the following topics:-

Lab Sheet 1:

1. Simulation and I	Display of an Image, Negative of an Image (Binary & Gray	Scale(One Lab
a) Red Blue a	and Green and Gray Components	(Level
b) Display (c) Simulation	color Image, find its complement and convert to gray scale on of an Image (Arithmetic & Logic Operation)	e(Level 1) (Level
2. Implementation c	of Relationships between Pixels	(One Lab
a. find	Neighbour of a given Pixel (Level 1)	
b. 4 Po	int Neighbour (Level 1)	
c. 8 Po	(level 1) int Neighbour (Level 2)	
d. Diag	zonal Neighbour(Level 2)	
Lab Sheet 2: 3. Implementation of	of Transformations of an Image	(One Lab
a. Scali	ing & Rotation	(Level
1) b. Gray	y level transformations, power law, logarithmic, negative.	(Level
4. Contrast stre	etching of a low contrast image, Histogram, and Histogram	n Equalization. (One Lab
Session) (Lev 5. Display of bi (Level 2)	el 2) it planes of an Image.	(One Lab Session)
(Level 2)	image intensity slicing technique for image enhanceme	nt(One Lab Session)
Lab Sheet 3: 7. Display of FFT (1 Session) (Level 2)	-D & 2-D) of an image.	(One Lab
8. Computation of n	nean, Standard Deviation, Correlation coefficient of the gi	ven Image. (One Lab
Session) (Level 2) 9. Implementation c Image)	of Image Smoothening Filters(Mean, Median and MinMax	filtering of an
Cassion (Laval 2)		(One Lab
10. Implementation	of image sharpening filters and Edge Detection using Gra	ıdient Filters. (One Lab
Session) (Level 2)		
11. Canny edge dete	ection Algorithm	(One Lab
Session) (Level 2) 12. Image morpholo	gical operations opening closing erosion dilation.	(Two Lab
Sessions) (Level 2) 13. Image segmentat Sessions) (Level 2)	tion by region growing split and merge algorithm.	(Two Lab

Tools/Software Required:

- 1. OpenCV 4
- 2. Python 3.7
- 3. MATLAB

Text Books

1. Rafael C. Gonzalez and Richard E. Woods' "Digital Image Processing", Fourth Edition, Global Edition 2018.

References

1. Perter Corke, "Robotics, Vision and Control: Fundamental Algorithms in MATLAB", 2nd Edition, Springer, 2017

2. Ravishankar Chityala, Sridevi Pudipeddi, "Image Processing and Acquisition Using Python", Taylor & Francis, 2020.

3. Jason M. Kinser, "Image Operators: Image Processing in Python", CRC Press, 2018.

4. TinkuAcharya and Ajoy K. Ray, "Image Processing Principles and Applications", John Wiley and Sons publishers.

Course Code:	Course Title: Data	a Communications	s and						
CSE3155	Computer Networ	·ks		L-T-P-					
				С	3	0	2	4	
	Type of Course: P	rogram Core The	ory–	3-0-2-4					
X 7 • X 7	Laboratory integr	ated							
Version No.	1.0								
Course Pre- requisites	Digital Design								
Anti-requisites	NIL								
Course	The objective of the	he objective of this course is to provide knowledge in data communications							
Description	and computer netw	and computer networks, its organization and its implementation. and gain							
-	practical experience in the installation, monitoring, and troubleshooting of								
	LAN systems		,	C				Č –	
	The associated lab	oratory is designe	d to implen	nent and	sir	nul	ate v	various	
	networks using Cis	co packet tracer, N	S2. All the	lab exerc	ise	s w	ill fo	ocus on	
	the fundamentals of	f creating multiple	networks, to	pologies	anc	l an	alyz	ing the	
	network traffics.								
Course	The objective of the	course is to familiari	ze the learne	rs with th	e c	onc	epts	of Data	
Objective	Communications an	d Computer Netwo	orks and att	tain Emp	loy	abil	ity t	hrough	
	Problem Solving Me	thodologies.							
Course Out	On successful com	pletion of the cours	e, the studer	nts shall	be a	able	e to:		
Comes	1] I								
	llustrate the Basi	c Concepts Of E	Data Comm	unication	n a	nd	Co	mputer	
	Networks.								
	2] Analyze the fund	ctionalities of the D	ata Link La	yer.					
	3] Apply the Kno	wledge of IP Add	lressing and	Routing	g N	lec	hani	sms in	
	Computer Network								
	4] Demonstrate the	working principles	of the Trans	sport laye	er a	nd /	Appl	ication	
	Layer.								
Course									
Content:									
			1						
	Introduction and								
Module 1	Physical Laver-	Assignment	Problem Sc	lving	0	7		A 5	
Module 1	CO1	Assignment	1 IODICIII SC	Jiving	U	,	1455	05	
	001								
Introduction to	Computer Network	ks and Data comm	nunications,	Networ	k (Con	npon	ents –	
Topologies, Trar	nsmission Media – R	eference Models -	OSI Model -	- TCP/IP	Su	ite.			
Physical Layer	-Analog and Digita	ıl Signals – Digital	and Analog	g Signals	- 7	Frai	nsmi	ssion -	
Multiplexing and	d Spread Spectrum.								
	Reference Mode	10							
Module 2	and Data Link	Δ ssignment	Proble	em	7	Cl	2556	2	
Widdule 2	Violute 2 and Data Link Assignment Solving 7 Classes						5		
	Layer – CO2								
Data Link Lover	- Error Detection	d Correction Dar		РС Цат	mi	n a 4	Code	Flow	
Control and Erro	- Enor Detection and	Wait ARO Slidin	a Window M	Multinle		ng ' Pec	2 Pro	tocole	
$CSM\Delta/CD CSM$	$\Delta/C\Delta$ IFFF 802.3	IFFF 802 11 Fthe	g willuow, l ernet	viumpie	AU	.693	5110	100015,	
CSWA/CD,CSWA/CA, IEEE 802.3, IEEE 802.11 Eulemen.									

Module 3	Network Layer – CO 3	Assignment	Problem Solving	10 Classes					
Network Layer Services - Network Layer Services, Switching Techniques, IP Addressing methods- IPv4 IPV6 – Subnetting. Routing, - Distance Vector Routing – RIP-BGP-Link State Routing –OSPF-Multi cast Routing-MOSPF- DVMRP – Broad Cast Routing. EVPN-VXLAN, VPLS, ELAN.									
Module 4	Transport and Application Layer -CO3	Assignment	Problem Solving	10 Classes					
Transport Layers - Connection management – Flow control – Retransmission, UDP, TCP, congestion control, – Congestion avoidance (DECbit, RED) The Application Layer: Domain Name System (DNS), Domain Name Space, SSH, FTP, Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – – SNMP, Web Services, Virtual Networking.									
List of Laboratory 7 Lab sheet -1, M-1, 7 Experiment No 1: Level 1: Study of ba	Fasks: 3 [2 Hours] asic network comm	nands and network	configuration cor	nmands.					
Lab sheet -2, M-1[2 Hours] Experiment No 1: Level 1: Identify and explore Network devices, models and cables. Introduction to Cisco packet tracer. Experiment No. 2: Level 2 – Create various network topologies using a cisco packet tracer.									
Lab sheet -3, M-2,3 [2 Hours] Experiment No. 1: Level 2 - Basic Configuration of switch/router using Cisco packet tracer. Experiment No. 2: Level 2 -Configure the privilege level password and user authentication in the switch/router.									
Lab sheet – 4, M-3 Experiment No. 1: Level 2 - Configure	Lab sheet – 4, M-3 [2 Hours] Experiment No. 1: Level 2 - Configure the DHCP server and wireless router and check the connectivity								
Lab sheet – 5, M-3 [2 Hours] Experiment No. 1: Level 2 - Configure the static routing in the Cisco packet tracer. Experiment No. 2: Level 2 - Configure the dynamic routing protocol in the Cisco packet tracer.									
Lab sheet – 6, M-4 [2 Hours] Experiment No. 1: Configuration of DNS Server with Recursive & Integrative approach in Cisco packet tracer.									
Lab sheet – 7, M-4 Experiment No. 1: Configure the telnet Lab sheet – 8, M-4	[2 Hours] t protocol in the rot 2 Hours]	uter using the Cisco	o packet tracer.						

Experiment No. 1: Level1- Introduction to NS2 and basic TCL program. Lab sheet – 9, M-4 [2 Hours] Experiment No. 1: Level 1: Simulate three node Point to point network using UDP in NS2. Experiment No. 2: Simulate transmission of Ping message using NS2. Lab sheet – 10, M-4[2 Hours] Experiment No. 1: Simulate Ethernet LAN using N-node in NS2. Experiment No. 2: Simulate Ethernet LAN using N-node using multiple traffic in NS2 Lab sheet -11, M-3,4 [2 Hours] Experiment No. 1: Level 1- Introduction to Wire Shark. Experiment No. 2: Level 2- Demonstration of packet analysis using wire shark.

Lab sheet -12, M-1,2,3 [2 Hours] Experiment No. 1: Level 2- Demonstration of switch and router configuration using real devices

Targeted Application & Tools that can be used: Cisco Packet Tracer, Wireshark, and NS2.

Case Study/Assignment: Choose and analyze a network from any organization/Assignment proposed for this course in CO1-CO4

1. **Problem Solving: Choose and appropriate devices and implement various network concepts.**

2. **Programming: Simulation of any network using NS2.**

Text Book

1. Behrouz A. Forouzan, "Data Communications and Networking 5E", 5th Edition, Tata McGraw-Hill, 2017.

2. Andrew S Tanenbaum, Nick Feamster & David J Wetherall, "Computer Networks" Sixth Edition, Pearson Publication, 2022

References

1. "Computer Networking: A Top-Down Approach", Eighth Edition, James F. Kurose, Keith W. Ross, Pearson publication, 2021.

2. William Stallings, Data and Computer Communication, 8th Edition, Pearson Education, 2007.

3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.

E-Resources:

1.https://archive.nptel.ac.in/courses/106/105/106105183/

2. <u>http://www.nptelvideos.com/course.php?id=393</u>

3.<u>https://www.youtube.com/watch?v=3DZLItfbqtQ</u>

4.<u>https://www.youtube.com/watch?v=_fIdQ4yfsfM</u>

5. https://www.digimat.in/keyword/106.html

https://puniversity.informaticsglobal.com/login

Course Code:	Course Title: Datab	base Management S	Systems								
CSE3156		~		L-T-P-C	3	0	2	4			
	Type of Course: 1)	School Core			2	Ŭ					
¥7 • ¥7	2)	Laboratory Integr	rated					I			
Version No.	1.0	1.0									
Course Pre-	NIL	VIL									
requisites	N 777										
Anti-	NIL										
requisites											
Description	design and implementation of database systems. It covers concepts of relational database systems (RDBMS). More emphasis is set on how to design, develop, organize, maintain and retrieve information efficiently. It helps the students to learn and practice data modeling and database designs. The course also introduces the concept of object oriented and object relational databases. The associated laboratory is designed to implement database design using MySQL DATABASE in information technology applications. All the exercises will focus on the fundamentals for creating, populating, sophisticated, interactive way of querying, and simultaneous execution of the										
Course Objective	The objective of the course is to familiarize the learners with the concepts of Database Management Systems and attain Employability through Problem Solving Methodologies.										
Course Out Comes	On successful completion of the course the students shall be able to: 1] Demonstrate a database system using ER model and relational algebra. [Understanding] 2] Build databases using SQL queries query processing. [Applying] 3] Apply the functional dependencies and design the database using normalization. [Applying] 4] Interpret the concept of object-oriented databases and object-relational databases [Understanding]										
Course Content:	se ent:										
Module 1	Introduction to Database Modelling and Relational Algebra (Understanding)	Assignment	Problem S	olving	8	Cl	asse	s			
Topics:				I							
Introduction to	o Database: Schema.	Instance. 3-shema:	architecture	e, physical	an	d lo	ogica	l data			
independence, Data isolation problem in traditional file system, advantages of database over traditional file systems. Entity Relationship (ER) Model, ER Model to Relational Model,											

Examples on ER model. **Relational Algebra** with selection, projection, rename, set operations, Cartesian product, joins (inner and outer joins), and division operator. Examples on Relational Algebra Operations.

Module 2	Fundamentals of SQL and Query Optimization (Applying)	Assignment	Programming	8 Classes

Topics:

SQL Database Querying, DDL, DML, Constraints, Operators, Set Operators, Aggregate Functions, Joins, Views, Procedures, Functions and Triggers.

Database programming issues and techniques: Embedded SQL, Dynamic SQL; SQL / PSM and NoSQL.

Query Optimization: Purpose, transformation of relational expressions, estimating cost and statistics of expression, choosing evaluation plans, linear and bushy plans, dynamic programming algorithms.

Module 3	Relational Database Design & Transaction Management (Applying)	Assignment	Problem Solving	12 Classes			

Topics:

Relational database design: Problems in schema design, redundancy and anomalies, Normal Forms based on Primary Keys-(1NF,2NF, 3NF), Boyce-Codd Normal Form, Multi valued Dependency (Fourth Normal Form), Join Dependencies (Fifth Normal Form), lossy and lossless decompositions, Database De-normalization.

Transaction Management: The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concurrency Control; Performance of locking; Transaction support in SQL; Introduction to crash recovery; 2PL, Serializability and Recoverability; Lock Management; The write-ahead log protocol; Check pointing; Recovering from a System Crash; Media Recovery; Other approaches and interaction with concurrency control.

Module 4	Advanced DBMS Topics (Understanding)	Assignment	Case Study	8 Classes

Topics:

Advanced topics: Object oriented database management systems, Deductive database management systems, Spatial database management systems, Temporal database management systems, Constraint database management systems.

New database applications and architectures such as Data warehousing, Multimedia, Mobility, NoSQL, Native XML databases (NXD), Document-oriented databases, Statistical databases.

List of Laboratory Tasks:

Create Employee, Student, Banking and Library databases and populate them with required data. Do the following experiments of different lab sheets on those databases.

Labsheet-1 [3 Practical Sessions] Experiment No 1: [1 Session]

1. To study and implement the different language of Structured Query Language. Level 1: Perform operations using Data Definition Language and Data Manipulation Language commands including different variants of SELECT on Student DB.

Level 2: Identify the given requirements; valid attributes and data types and Perform DDL and DML operations on a given scenario. [Banking Databases]

Experiment No. 2: [2 Sessions]

2. To study and implement the concept of integrity constraints in SQL.

Level 1: Create tables on Banking database using PRIMARY KEY, NOT NULL, UNIQUE, FOREIGN KEY and demonstrate the working of relational, logical, pattern matching, BETWEEN, IS NULL, IN and NOT IN Special Operators on Student Database.

Level 2: Enforce different types of data and referential integrity constraints. Then try queries with special operators based on the student database. [Banking Database].

Labsheet-2 [3 Practical Sessions]

Experiment No. 3: [1 Session]

3. Implement complex queries in SQL.

Level 1: Implement the conjugate of GROUP BY, ORDER BY and aggregate functions on Banking Database.

Level 2: Implement MySQL DB queries on library database using appropriate clauses and aggregate functions. Also order the data either in ascending and descending order using corresponding clause. [Library databases].

Experiment No. 4: [2 Session]

4. To study and implement different types of Set and Join Operations [2 Slots] Level 1: Demonstrate different types of Set Operations (UNION, UNION ALL, INTERSECT, MINUS) and Join Operations (INNER JOINS, OUTER JOINS, CROSS JOIN, NATURAL JOIN) on two or more tables of Airline Database.

Level 2: Use Set and Join operations to retrieve the data from two or more relations(tables) as per the given scenario. [Airline Database]

Labsheet-3 [2 Practical Sessions]

Experiment No. 5: [2 sessions]

5. To study and implement Views, and Procedures in MySQL DB.

Level 1: Implement MySQL Views, and Procedures in ORACLE DB on Employee database. Level 2: Analyze the requirement and construct views, and Procedures on Mini Project Domain. [Banking Database]

Labsheet-4 [2 Practical Sessions]

Experiment No. 6: [2 Sessions]

6. To study and implement Functions, and Triggers in MySQL DB.

Level 1: Implement Oracle Functions and Triggers in Oracle on Employee database. Level 2: Analyze the requirement and construct Functions and Triggers. [Supply chain Database]

Labsheet-5 [2 Practical Sessions]

Experiment No. 7: [2 Sessions]

To implement the concept of forms and reports.

Level 1: Implement the concept of forms and reports. Level 2: Analyze the schema relationship.

Labsheet-6 [2 Practical Sessions]

Experiment No. 8: [2 Sessions]

Design a mini project based on the databases such as Inventory Management System, University Management System, Hospital Management System, etc.

Level 1: Implement the real time database.

Level 2: Analyze the working of database in real time.

Targeted Application & Tools that can be used:

Application Area: Relational database systems for Business, Scientific and Engineering Applications.

Tools/Simulator used: MySQL DB for student practice.

Also demonstration of ORACLE DB on object-relational database creation and JDBC connection.

Percentage of changes in this version: 50% of changes from earlier version. New topics are highlighted in italic.
Problem Solving: Constructing ER-Diagrams for a given real time requirements, Normalizing the databases, querying the databases using relational algebra.
 Programming: Implementation of any given scenario using MySQL.

Text Book

1] RamaKrishna & Gehrke, "Database Management Systems" 3rd Edition, 2018, McGraw-Hill Education.

2] Avi Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill ,7th Edition, 2019.

3] W. Lemahieu, S. vanden Broucke and B. Baesens, "Principles of Database Management: Practical Guide to Storing, Managing and Analyzing Big and Small Data", Cambridge University Press, 2018.

References

1] Elmasri R and Navathe S B, "Fundamentals of Database System", Pearson Publication, 7th Edition, 2018.

2] M. Kleppmann, "Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems", O'Reilly, 2017.

Topics relevant to development of "FOUNDATION SKILLS": S - Skill

Development: Relational database design using ER- Relational mapping, Implementation of given database scenario using MYSQLDB.

Topics relevant to development of Employability: Develop, test and implement computer databases, creating sophisticated, interactive and secure database applications

Topics relevant to "HUMAN VALUES & PROFESSIONAL ETHICS": Nil

Course Code:	Course Title: Artificial Intelligence and								
CSE3157	Machine Learning		2	0	2	4			
	Type of Course:1]Program Core	L-I-P-C	5	U		4			
	2] Laboratory integrated								
Version No.	1.0								
Course Pre- requisites	Python Programming	Python Programming							
Anti-requisites	NIL								
Course Description Course Objective	This course introduces the basic conce Machine Learning (ML) which is a subs provides important set of techniques and world business and social problems. The machine learning model development us Topics include: Working with Collect Application and Agents of AI; Knowledge and SMA* algorithms; Knowledge repr Knowledge-Based Systems; Knowledge logic and Predicate Logic, Unification and chaining. Introduction to the Machine Learning (M Learning: Concept learning task, Find- Algorithm. Neural and Bayesian Belief ne forward networks, Back propagation algo Support Vector Machines; Supervised Learning - Clu The objective of the course is to familian	NILThis course introduces the basic concepts of artificial intelligence(AI) and Machine Learning (ML) which is a subset of Artificial Intelligence. AI & ML provides important set of techniques and algorithms for solving several real world business and social problems. The objective of this course is to discuss machine learning model development using Python. Topics include: Working with Collections and Data Frames; History, Application and Agents of AI; Knowledge Representation ; Hill Climbing, A* and SMA* algorithms; Knowledge representation - Approaches and Issues, Knowledge-Based Systems; Knowledge representation using Propositional logic and Predicate Logic, Unification and lifting, Forward chaining, Backward chaining. Introduction to the Machine Learning (ML) - Framework, types of ML, Concept Learning: Concept learning task, Find-S algorithm, Candidate Elimination Algorithm. Neural and Bayesian Belief networks – Perceptron, Multi-layer feed forward networks, Back propagation algorithm. Nearest Neighbor techniques, Support Vector Machines; Supervised Learning - Classification & Regression – Algorithms; Unsupervised Learning - Clustering & Association – Algorithms							
	Artificial Intelligence and Machine Lear Solving Methodologies.	The objective of the course is to familiarize the learners with the concepts of Artificial Intelligence and Machine Learning Employability through Problem Solving Methodologies.							

Course	Out	On successful completion of this course the students shall be able to:						
Comes		1. Descril	1. Describe the basic understanding of the AI and concepts of searching					
		for AI problem	s. (KNOWLEDGE)					
		2. Develo	p knowledge base fo	r representing the given real	world data			
		using logic and	reasoning methods.	(Application)				
		3. Apply of	concept learning and	Artificial Neural Network tec	hniques for			
		the given prob	lems. (Application)					
		4. Articul	ate Machine Learning	g model using Supervised and	d l			
		Unsupervised i	earning algorithms.	(Application)				
		domain either	individually or as a n	ort of the team and report th				
		(Application)	individually of as a p		le results.			
Course	Content:	(Application)						
		Introduction to						
Module	1	Artificial Intelligence	Assignment	Programming Activity	15 Hours			
		and Searching						
	Topics:							
	Introducti	on to Artificial Intelliger	ice, Definitions, foun	dation, History and Applicat	ions; Agents:			
	Types of A	gent, Structure of Intelli	gent agent and its fur	nctions, Agents and Environm	ent; Indexing			
	and Heuri	stic functions -Hill Climb	ing-Depth first and B	reath first; A* - SMA* algorit	hms.			
Module	2	Knowledge	Assignment	Programming activity	15 Hours			
	_ 	Representation						
	lopics:							
	Introducti	on to knowledge repres	entation, approaches	s and issues in knowledge re	presentation,			
	Knowledg	e-based agent and its St	ructure, knowledge-	ased Systems; Knowledge re	epresentation			
	using Pr Knowlodg	opositional logic and i	redicate Logic- Firs	st-Order Logic - Syntax and	a semantics,			
	Knowledg	e Engineering - Unincat	ion and inting, Forwa	iru chaining, backwaru chaini	ng			
		Introduction to Machine						
Module	3	Learning & Neural	Assignment	Programming activity	15 Hours			
	Γ	Network						
	Topics:							
	Introducti	on to the Machine Lear	ning (ML) Framework	, types of ML, types of varia	bles/features			
	used in M	Lalgorithms, Concept Le	arning: Concept learr	ning task, Concept learning as	search, Find-			
	S algorithi	n, Candidate Elimination	h Algorithm.					
	Nouralan	d Poliof notworks - Dore	ontron Multi lover f	and forward notworks Pava	cian baliaf			
	neurai an	Pack propagation algori	thm	eed for ward hetworks - Baye	sian beller			
	networks,							
Module	4	Unsupervised Learning	Mini Project	Programming activity	15 Hours			
	Topics:				_00415			
	Supervise	d Learning – Classificati	on & Regression - [Decision Tree Learning Ran	dom Forest -			
	Support '	Vector Machines : Sin	nple Linear Regress	sion Algorithm. Multivariate	e Regression			
	Algorithm	,						
	Unsuperv	ised Learning – Clusteri	ng & Association - K	-Means Clustering algorithm	, Mean-shift			
	algorithm	, Apriori Algorithm, FP-g	rowth algorithm					
	C		Ū.					
	List of Lab	oratory Tasks:						
	Lab shee	t -1						
	A review o	of Python programming	- Anaconda platform	and its installation, Executing	g programs			
	on Jupyte	r IDE/ Colab.						
	Programm	ning exercises on Tuples,	Nested data structu	ires				
	Lab shee	t -2						

Introduction to Numpy, Pandas, Scikit-learn and Visualization techniques.
Dictionaries, dictionary comprehension, Data Frames using Pandas and working with frames
Lab sheet - 3
Search Algorithms – A* & SMA *
Lab sheet -4
Tic-tac-toe game simulation using search and heuristics.
Describe the Sudoku game and represent the actions using First-order / Propositional logic.
Sorting algorithms employing forward chaining.
Lab sheet -5
Find-S Algorithm
Candidate Elimination Algorithm
Back Propagation Algorithm
Lab sheet -6
Support Vector Machines ;
Simple Linear Regression Algorithm
Multivariate Regression Algorithm
Lab sheet -7
K-Means Clustering algorithm
Mean-shift algorithm
Apriori Algorithm
Mini Project / Case Study – Real Time Project
Targeted Application & Tools that can be used: Use of PowerPoint software for lecture slides
and use of Google's Colab cloud service
https://www.tutorialspoint.com/google_colab/index.html for executing and sharing of lab
 exercises.
Project work/Assignment: Mention the Type of Project /Assignment proposed for this course
1] Programming: Implementation of given scenario using Python and Colab.
2] Assignment: Learning courses for 4 Hours from the following link
https://learn.datacamp.com/courses?topics=iviacnine%20Learning
I Chuert L. Duccell and Datas Newsia, Artificial intelligences A. Madern Annuageh, 2nd
1. Stuart J. Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 3rd
edition, Upper Saddle River, Prentice Hall 2021.
2. Tom Mitchell, Machine Learning , First Edition, Tata McGraw Hill India, 2017.
References
1. Giuseppe Bonaccorso, "Machine Learning Algorithms: A reference guide to popular
algorithms from data science and machine learning", Packt Publishing, 2017.
2. Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning Using Python", Wiley, First
Edition 2019.
3. Andreas C Muller, Sarah Guido, "Introduction to Machine Learning with Python :A Guide
tor Data Scientists", Oreilly, First Edition, 2016
4. Elaine Rich, Kevin K and S B Nair, "Artificial Intelligence", 3rd Edition, McGraw Hill
Education, 2017.
5. Pattern Classification 2nd Edition by Richard O. Duda , Peter E. Hart , David G. Stork

Course Code:	Course Title: Medical Image Processing					
		L- T-P-				
CSE 5020	Type of Course: Discipline Elective	С	2	0	2	3
	Theory and Lab Integrated					

Version No.	2.0	20									
Course Pre- requisites	 Python programming language OpenCV library Basics of digital image processing 										
Anti-requisites	NIL	NIL									
Course Description	The course introduces biomedical images such about complete basics of we will be learning a techniques. This course techniques in depth alon	The course introduces the basics to advance the implementation of biomedical images such as MRI, CT, X-ray, etc. Here we will be studying bout complete basics of theical image processing and then moving forward we will be learning about the various filters and feature extraction echniques. This course also teaches the segmentation and restoration echniques in depth along with the practical implementation.									
Course Objective	The objective of the cour PARTICIPATIVE LEAR	he objective of the course is SKILL DEVELOPMENT of student by using ARTICIPATIVE LEARNING techniques.									
Course Outcomes	On successful completion of the course, the students shall be able to: CO 1: understand digital image processing using OpenCV and Python programming language. CO 2: Demonstrate image enhancements for Filter and feature extraction of statistical measurement. CO 3: Implement deep learning techniques for image restoration and segmentation. CO 4: Experiment with soft computing techniques for content-based										
Course Content:											
Module 1	Digital image processing	Assignment	Image proces	sing	Se	10 ssio	ons				
Introduction: What is an image, Digital image, Image resolution, and aspect ratio, components of digital image processing, sampling, and quantization, applications areas, vision fundamentals, CAD systems, research areas of digital image processing. Biomedical image processing: various modalities of medical imaging: breast cancer imaging, mammographic imaging, ultrasound imaging, magnetic resonance imaging(MRI), and breast thermography imaging. Problems with medical images, image enhancement, and other modalities of medical imaging.											
Module 2	Filters and feature extraction	Use case study	Feature extra	ction	Se	10 ssio	ns				
Noise reduction filters for medical imaging: sources of noise and filters used for noise reduction, spatial domain filters, frequency domain filters, practical results. Feature extraction and statistical measurement: selection of features, shape-related features, Fourier descriptors, text analysis.											
Module 3	Image restoration and segmentation	Assignment	Segmentatior	1	8 S	essi	ons				
Medical Image restoration: Image resolution, degradation model, estimation of degradation function, blur model, medical image restoration, blur identification, super-resolution method. Biomedical image segmentation: Broad classification and applications, point detection, line detection, edge detection methods, histogram-based image segmentation, segmentation using split and merge method, region growing method, watershed method, k-means clustering											

method, self-similar fractal method, topological derivative-based segmentation, comparison of segmentation methods.

	Soft computing					
Modulo 4	techniques and	usa anga study	Content	based	imge	10
Module 4	content-based image	use case study	retrieval			Sessions
	retrieval					

Soft computing techniques: Fuzzy-based techniques, Neural network-based techniques ,genetic algorithm-based techniques. **Content-based image retrieval:** Content-based image retrieval (CBIR): Visual connect descriptors, shape similarity measure, relevance feedback, distance measureand s, challenges,**Content-based medical image retrieval (CBMIR):** Challenges in implementation of CBMIR, Practical approaches of CBMIR.

Targeted Application & Tools that can be used:

- Google Collab Pro
- Jupyter Notebook with GPU

Project work/Assignment:

Mini project on feature extraction using deep learning algorithm such as CNN.

Text Book

T1. G.R Sinha, Bhagwati Charan Patel," Medical Image Processing Concepts and Applications", Eastern Economy Edition.2020

References

R1. Geoff Dougherty California State University, Channel Islands" Digital Image Processing for Medical Applications", Cambridge University Press.2019

Weblinks

W1. https://onlinecourses.nptel.ac.in/noc22_bt34/preview

W2. https://www.slideshare.net/AboulEllaHassanien/medical-image-analysis-27297012

Topics relevant to development of "SKILL DEVELOPMENT":Design and development of feature extraction and segmentation algorithm using python programming language.

Topic relevant to HUMAN VALUES & PROFESSIONAL ETHICS": Naming and coding convention for Project Development.

Course Code:	Course Title:Advanced DBMS		2	2	3
CSE3068	Type of Course: Core Theory &Integrated	L-P-C			
	Laboratory				
Version No.	1.0		1		
Course Pre- requisites	[1] Database Management System (CSE20' Basics of DBMS, like, File System and its Schema Architecture and its concepts, Transactions and its concepts, Backup and database skills are learnt.	74) 5 drawbacks, I Relational Al nd Recovery.	Databas gebra, In labo	se Appro Normali oratory N	ach, 3- ization, ⁄IySQL
Anti-requisites	NIL				
Course Description	The purpose of this course is to make the first. Then introduce them with Distribu- concepts. They include the main character of each one of them. Importance and differ transit from RBMS to NoSQL is discussed. parallel and NoSQL are considered and stu The associated laboratory provides a chan- during this course.	students revisi ited, Parallel, istics, advanta rences among th . The striking idied. ce to have han	t RDBI and N ges, an hem ar feature ds-on c	MS trans oSQL da d disadva e noted. 1 es of distr concepts 1	actions atabase antages Need to ibuted, learned

Course Objective	This course is designed to improve the learners' <u>EMPLOYABILITY SKILLS</u> by learning the working on Database using MySOL.							
Course Outcomes	On successful comp 1. Rec (2) Explain advance (3) Illustrate the fe	 n successful completion of this course the students shall be able to: Recall the transactions in RDMS (2) Explain advanced features of distributed, parallel, and NoSQL databases. (3) Illustrate the features in Distributed database 						
	(4) Employ Paralle	(4) Employ Parallel database concepts in real life applications.						
Course Content:								
Module 1	Transactions in RDBMSQuizComprehension based Quizzes and assignments.06Cl							
Topics: RDBMS -Transactic Serial, Non-Serial a Precedency Graph, (on control state diag nd Serializable, Seri Concurrency Control	am, ACID properties alizability-Conflict an – Lock Based and Tin	of transaction, Schedules i nd View, Conflict Serializa ne Stamp Based.	n transactions - bility check by				
Module 2	NoSQL Databases	Programming and Mini Project	Laboratory experiments and Mini Projects on NoSQL Topics using MongoDB/ Casandra.	06Classes				
NoSQL Introduction Free, Simple API, ar and Graph. Transac Scalability with Data Case Study: Mongo	a – Scale Out, Commond Distributed. NoSQ ad Distributed. NoSQL- B abase Sharding, CAP DB/Casandra/ AWS	Duity Hardware, Brief L Architectures/Data ASE for reliable dat theorem. HBase	History, Features – Non-Rel Models - Document, Colum tabase transactions, Achiev	ational, Schema nar, Key-Value, ving Horizontal				
Module 3	Distributed Databases	Assignment	Assignment on main topics of Distributed Databases	06Classes				
Topics: Loosely Coupled, (Distributed Processi and Fragmentation, Distributed Database	Characteristics of D ng, Types – Homoge Fragmentation – Ho es.	istributed Databases, neous and Heterogene rizontal and Vertical	Local and Global view cous, Distributed Data Stora Type, Difference between	of applications, ge – Replication Centralized and				
Module 4	Parallel Databases	Assignment	Assignment on main 06 Cl topics of Parallel Databases	asses				
Topics: Tightly Coupled, Fe Advantages of each between Parallel and Install MONGODB https://www.javatp Create any one of tl	atures of parallel dat of these schemes, A l Distributed Databas point.com/mongodb ne following databas	abases, Shared Memo dvantages and Disadv es. -create-database es.	ory, Shared Disk, Shared Novantages of Parallel Databa	othing Systems. ses, Differences				
Employee, Student, Drop database Create Collection: Ir Drop Collection	University, Banking n MongoDB db.creat	, or Online Shopping eCollection(name,op	tion) is used to create colle	ection.				
List of Laboratory T	asks:(7 X 2= 14 Sessi	ons)						
Level 1: Perform CR Database. Level 2: Do Mongol	UD operations (Inse DB text search on 'Ei	rt, Update, Delete an mployee' Database.	d Query Documents) on 'Si	udent'				
Experiment No. 2: T	ry experiments on N	AongoDB Operators						

Level 1: Perform queries involving MongoDB Query and Projection Operators using 'Student' Database. Level 2: Do queries involving MongoDB update operator on 'Employee' Database. Experiment No. 3:Explore different query modifiers. Level 1: Perform different query modifiers on 'Student' Database. Level 2: Try various query modifiers on 'Employee' Database. Experiment No. 4:Explore Aggregation commands. Level 1: Implement different aggregation commands on 'Student' Database. Level2: Perform various aggregation commands on 'Employee' Database. Experiment No. 5: Explore Authentication commands. Level 1: Try authentication commands on 'Student' Database. Level 2: NA Experiment No. 6:Explore Replication Commands Level 1: Try all replication commands on 'Student' Database. Level2: Implement replication commands on 'Employee' Database. Experiment No.7:Try Sharding Commands. Level1: Explore Sharding Commands on 'Student' Database. Level 2: Implement Sharding Commands on 'Employee' Database.

Targeted Application & Tools that can be used: MongoDB is to be installed and used.

Project work/Assignment:

Each batch of students (self-selected batch mates) will identify projects, such as, Library, Banking, and Reservation etc.,and do it. Concepts of NoSQL, like, CRUD operations, supporting ad hoc queries, indexing flexibility, assisting replication, creating capped collections, and Retrieving data from multiple documents.

Sample Mini Projects:

1. Content Management System

Clubbing the content assets like text and HTML into a single database helps provide a better user experience. MongoDB has an excellent toolset not only for storing and indexing but also for controlling the structure of a content management system. You can easily design a web-based CMS by using the model proposed by "Metadata and Asset Management" in MongoDB. Additionally, you can use "Storing Comments" to model user comments on blog posts.

2. Gaming Project

Data is an essential part of making video games work. Some typical examples of gaming data include player profiles, matchmaking, telemetry, and leaderboards.

The common thread between all games is that they all have a specific goal. And you have to achieve multiple objectives or pay your way out to reach the end goal. This may involve steps like watering your plants, growing vegetables, serving food in a restaurant, and so on.

Textbook(s):

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, 1st Edition, 2019(Wiley Publications).

2. Stefano Ceri, Giuseppe Pelagatti, Distributed Databases: Principles and Systems,, 2017(McGraw Hill Education).

References

1. Elmasri R and Navathe S B, "Fundamentals of Database System",7th Edition, 2017(Pearson Publication).

2. Pivert. NoSQL Data Models: Trends and Challenges, 1st edition(Wiley).

Topics related to development of "FOUNDATION": Transaction, CRUD Operations, Replication, and Sharding

Topics related to development of "EMPLOYABILITY": Project implementations in software, batch wise presentations

Topics related to development of "HUMAN VALUES AND PROFESSIONAL ETHICS": Team Dynamics during Mini Project Development.

Course Code: CSE3070	Course Title: Advanced C	omputer Networks	5 L- P- C	3 0	3					
Version No.	1.0									
Course Pre-	CSE-2011-Data communica	E-2011-Data communication and Computer Networks- $TCP\!/IP$ $Protocol$								
requisites	Suite, IEEE 802.x, VLA	te, IEEE 802.x, VLAN, Ipv4 Addresses, IpV6 address								
Anti-requisites	NIL	L								
Course Description	This course emphasizes the design aspects. This cours network layers, switching network traffic and schedul with current internet techn	his course emphasizes the advanced concepts of computer networks and their esign aspects. This course will explore the design aspects of physical and etwork layers, switching basics, logical design and management aspects, etwork traffic and scheduling, performance of WIFI AND WIMAX network along ith current internet technology like 5G and Software Defined Network.								
Course Objective	This course goal is to provid computer networking topic in computer networks.	his course goal is to provide an advanced background on relevant and recent omputer networking topics and to have a comprehensive and deep knowledge n computer networks.								
Course Outcomes	 Upon successful completion of the course the students shall be able to: Understand the physical network technology and design of WAN. Understand switching networks, routing in packet switching networks with different routing algorithms. Demonstrate the Modeling of network traffic and networking protocols. Understand the principles of new generation of computer networks, alternative infrastructures and SDN. 									
Course Content:										
Module 1	PHYSICAL NETWORK DESIGN	Assignment	Theory	No. of Classes:1	0					
Topics: Remote Acc and Enterprise Netw	cess Technologies and Devic orks – Core networks, distri	es – Modems and D ibution networks and	SLs – SLIP and Pl d access networl	PP - WAN ks	Design					
Module 2	SWITCHING BASICS	Assignment	Theory	No. of Classes:1	2					
Topics: Circuit switcl Cell switching – Lab Loop resolution, Spa line blocking – Back	hing, Message switching and el switching – L2 switching anning tree algorithms – Cu pressure – Switch design go	d Packet switching – Vs L3 switching – V t through and Store als	Datagrams and LANs – Switchin and forward sw	Virtual cir g and Brid vitches – H	cuits – Iging – ead of					
Module 3	LOGICAL DESIGN AND MANAGEMENT	Assignment	Theory	No. of Classe	es:10					
Topics: VLSM, OSF modeling, RTS/CTS n 802.16 protocol – sy	PF and BGP – VPN –RMON nodeling, Modeling 802.11e, stem and user performance	and SNMP, Model , Performance, 802.1 e.	ing 802.11 proto 1e HCCA Perforr	ocol – Bas nance. Mo	ic DCF deling					
Module 4	NETWORK TRAFFIC, SCHEDULING and Alternative Infrastructures	Assignment	Case Study	No. of Classe	es:12					

r	
Topics	: Modeling network traffic – Flow traffic models – Continuous time modeling, Discrete time
mode	ing, Pareto traffic distribution, Destination traffic. Scheduling algorithms – Analysis Alternative
Infrast	ructures (Active networks, Software defined network. Network Security and wireless and
Mobil	e networks, 5G cloudification.
Target	ted Application & Tools that can be used:
1.	CISCO Packet Tracer,
2.	Whireshark
Projec	t work/Assignment:
1.	Design LAN WAN and assign IP Address.
2.	Configure the WAN topology using routing protocols
3.	Design Wireless network in college campus.
Sugge	sted List of Hands-on Activities:
1.	Perform a case study on VLSM
2	Using CISCO Packet Tracer design a LAN with 50 PCV and configure it with suitable IP
2.	Idressing and routing protocols
3	DO a case study on an SDN for an Enternrise
J. ⊿	Perform a case study on 5G Cloudification
4.	renorm a case study on 50 cloudification.
Toyt B	rock
	Jarry L. Beterson & Bruce S. Davie "Computer Network: A System Approach" Morgan
1. Ka	Larry L. Peterson & Bruce S. Davie, Computer Network. A System Approach, Morgan
No 2	Jochan Schiller "Mehile Communications" Dearson Addison Wesley, 2/o. 2010
Ζ.	Jochen Schner, Wobile Communications, Pearson Addison-wesley, 279, 2010.
_	
Refere	ences
1.	Behrouz A. Forouzan, "TCP/IP Protocol Suite", McGraw- Hill, 4/e, 2015.
2.	James F. Kurose, Keith W. Ross, "Computer Networking", Pearson, 2016.
3.	Charles M. Kozierok, "The TCP/IP Guide", No starch press, 2018.
4.	Computer Networking: A Top-Down Approach, James F. Kuros and Keith W. Ross, Pearson,
6t	h Edition,2012
5.	A Practical Guide to Advanced Networking , Jeffrey S. Beasley and PiyasatNilkaew, Pearson,
3r	d Edition,2012
6.	Computer Networks , Andrew S. Tanenbaum, David J. Wetherall, Prentice, 5th Edition, 201
Web	Resources and Research Articles links:
1	Journal of Network and Computer Networking-
h	ttps://www.journals.elsevier.com/journal-of-network-and-computer-applications
	tips, , www.journuis.eisevier.com/journul of network and computer applications
1	

Course Code:	Course Title:								
CSE 3071	Computer Vision				2	2	3		
	Type of Course: Prog	gram Core		L- P- C					
	Theory and Lab Inte	grated Course							
Version No.	1.0				1				
Course Pre-	Linear algebra, vecto	r calculus, and probat	bility. Data st	ructures					
requisites									
Anti requisites	NU								
Anti-requisites									
Course	This course introd	uces computer visio	on, including	g fundai	menta	als of	image		
Description	formation, camera i	ormation, camera imaging geometry, feature detection and matching, stereo,							
	motion estimation a	and tracking, image c	classification,	scene u	under	standir	ng, and		
	deep learning with	neural networks.	We will de	velop b	asic	metho	ods for		
	applications that inc	lude finding known r	models in im	ages, de	epth r	ecover	ry from		
	stereo, camera calib	pration, image stabilized	zation, autoi	mated a	lignm	ent, tr	acking,		
	boundary detection	, and recognition.	We will de	velop t	he ir	ntuitio	ns and		
	mathematics of the r	nethods in class, and t	then learn ab	out the o	differe	ence b	etween		
	theory and practice i	n HomeWorks.							
Course Objective	The objective of t	he course is SKILL	DEVELOPMI	ENT of	stude	ent by	/ using		
	PARTICIPATIVE LEAR	NING TECHNIQUES <mark>.</mark>							
Course	On successful com	pletion of the course	the student	s shall b	e abl	e to:			
Outcomes				o onun e	c uci	0 101			
	CO1: Apply mathema	atical modeling metho	ods for low i	intermed	diate-	and hi	gh-		
	level image processi	ng tasks.	, , ,				0		
	CO2: Perform softwa	are experiments on co	mputer visio	n proble	ms ar	nd com	pare		
	their performance w	ith the state of the ar	t.						
	CO3: Describe the ge	ometric relationships	between 2D	images	and t	he 3D	world.		
		•		U					
Course Content:									
Madada 1	Digital Image	Programming	Data Coll	ection	and	10	•		
Module 1	Processing	Assignment	Analysis			12 ses	sions		
Image Formation	n. Image Filtering.	Edge Detection. Pri	incipal Con	ponent	Anal	lvsis.	Corner		
Detection SIFT.	Applications: Large	Scale Image Search).	I · · ·		J ,			
, , , , , , , , , , , , , , , , , , , ,	Geometric								
Module 2	Techniques ir	Programming	Data Coll	ection	and	12 ses	sions		
	Computer Vision	Assignment	Analysis			12 505	510115		
Image Transform	nations Camera Pr	jections Camera (Calibration	Donth f	rom	Storag			
View Structure f	rom Motion Object	Tracking	zanoration,	Deptil I	10111	SIEIE), 1w0		
	Machina Learning for	Decommina							
Module 3	Commuter Vision	Programming	Data analys	is		14 ses	sions		
	Computer vision	Assignment							
Introduction to M	achine Learning, Imag	ge Classification, Obje	ct Detection,	Semant	ic Seg	menta	ition.		
List of Laborate	ory Tasks:								
1. Simulation and	d Display of an Imag	ge, Negative of an Ir	mage (Binaı	y & Gra	iy Sca	ale)[Te	ext		
Wrapping Break]2.	Implementation of F	Relationships betwee	en Pixels[Te	xt Wrapp	ing Br	eak]3.			
Implementation of Transformations of an Image[Text Wrapping Break]4. Contrast stretching of a									
low contrast ima	ge, Histogram, and	Histogram Equaliza	tion[Text Wra	pping Bro	eak]5.	Displ	ay of		
bit planes of an I	mage[Text Wrapping	Break]6. Display of F	FT (1-D & 2	-D) of a	n ima	age[Te	xt		
Wrapping Break]7.	Computation of Me	an, Standard Deviat	ion, Correla	tion coe	efficie	nt of t	he		
given Image[Text	Wrapping Break]8. Im	plementation of Ima	age Smooth	ening Fi	Iters	(Mear	1 and		
Median filtering o	of an Image)[Text Wr	apping Break]9. Imple	mentation o	t image	shar	pening	J .		
filters and Edge	Detection using Gra	dient Filters[Text Wra	apping Break]	10. Imag	ge Co	ompre	ssion		
by DCT, DPCM, HUFFMAN coding[Text Wrapping Break]11. Implementation of image restoring									

techniques[Text Wrapping Break]12. Implementation of Image Intensity slicing technique for image enhancement

Targeted Application & Tools that can be used: Matlab

Project work/Assignment:

Text Book

T1 Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.

T2 Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, 2ndEdition, Cambridge University Press, March 2004.

References

R1. R. Bishop; Pattern Recognition and Machine Learning, Springer,2006

R2. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992.

R3. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.

Web references:

https://onlinecourses.swayam2.ac.in/cec20 cs08/preview

Library reference: <u>https://presiuniv.knimbus.com/user#/home</u>

Topics relevant to development of "Employability": Topics relevant to "HUMAN VALUES &PROFESSIONAL ETHICS"":

Course Code:	Course Title: Applied	Artificial Intelligence									
CSE3005	Type of Course: Prog	ram Core & Theory On	ly	L- P- C	3	0	3				
Version No.	1.0										
Course Pre- requisites	Course Pre- CSE3001: Artificial Intelligence and Machine Learning equisites										
Anti-requisites	Nil										
Course	Applied Artificial Intel	ligence is an advanced-	level cou	rse desi	ned to	build ur	oon the				
Description	foundational knowle engineering. This cou understanding of AI t the future of AI-drive examples, and case st their application in so	foundational knowledge of artificial intelligence (AI) and its applications in engineering. This course aims to provide engineering students with an in-depth understanding of AI techniques, algorithms, and emerging trends that are shaping the future of AI-driven engineering systems. Through theoretical concepts, practical examples, and case studies, students will explore cutting-edge AI methodologies and their application in solving complex engineering problems									
Course Objectives	This course is design PROBLEM SOLVING N	ed to improve the lea 1ethodologies.	rners' EN	/IPLOYAI	BILITY S	KILLS b	y using				
Course Out Comes	 Prese Out On successful completion of the course the students shall be able to: Explain AI techniques and algorithms in engineering domains. [Understand] Solve problems in AI using search methods and constraint satisfaction. [Apply] Apply logic methods for problem-solving using Resolution. [Apply] 										
Course						.66.71					
Content:											
Module 1	Search	Quiz Tests	Program	ming As	signme	nt L:	: 12				
 Introduction: Solving Problems by Searching. Problem-solving agents. Formulating problems. Uninformed Search Algorithms: Breadth-first search. Depth-first search. Uniform cost search. Applications in pathfinding in games. Heuristic Search Algorithms: Heuristics. Greedy best-first search. A* search. Difference between Uniform cost search and A* search. Adversarial Search Algorithms: Game tree. Minimax algorithm. Alpha-beta pruning. Ideal ordering and worst ordering. Extensions of Minimax algorithm for multiplayer games (MaxN) and stochastic provide the search. 											
Module 2	Knowledge-Based Logic Representation	Quiz Tests				L:	12				
Representation, Reasoning, and Logic. Prepositional Logic. First-Order Logic. Syntax and Semantics. Inference Rules. Propositional and First-Order Resolution. Applications for solving story problems using Resolution.											
Module 3	Constraint Satisfaction Problems	Quiz Tests	Program	ming As	signme	nt L	.:7				
Constraints. Def Problem structu Timetable sched	inition of a CSP. Exam re and problem decor uling as a real-world e	mples of Constraint Sa nposition. Backtracking xample.	atisfaction g. Backtra	n Proble Icking he	ems. An euristics	rc consi 5. Local	stency. search.				
Module 4	Uncertainty in Al	Quiz Tests	Program Assignm	ming ents		L	:7				
Jncertainty in AI. Revision of Probability Basics and Bayes Theorem. Bayesian Networks. Hidden Warkov Models. Sub-problems in HMM and their solutions – Forward probability and Viterbi Algorithm. Case study of sequence labeling using HMM for part-of-speech tagging and named entity recognition.											

Targeted Application & Tools that can be used : Applications:

Game playing, knowledge representation, solving story problems, timetable scheduling, sequence labeling in NLP.

Tools:

1. Google Colab

2. IDEs (in case they are solving them using C/C++ or Java) like Visual Studio, Netbeans, Eclipse, etc.

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

1. Students will be given programming assignments to implement AI algorithms

2. Students may work with real or simulated datasets and be asked to explore and analyze the data, extract meaningful insights, and visualize the results using appropriate tools.

3. Students are also recommended to watch NPTEL videos, register for corresponding NPTEL courses, etc.

Text Book

1. Stuart J. Russell and Peter Norvig, "Artificial intelligence: A Modern Approach", 4th edition, 2022. Pearson Education.

2. Lavika Goel, "Artificial Intelligence: Concepts and Applications", 1st Edition. 2021.Wiley. References

References

1. Deepak Khemani, "A First Course in Artificial Intelligence", First Edition Sixth Reprint (2018). Tata McGraw Hill.

NPTEL Courses (and other video links):

1. Mausam (IIT Delhi), "An Introduction to Artificial Intelligence". – Link: <u>https://nptel.ac.in/courses/106102220</u>. Useful for the full course.

 Deepak Khemani (IIT Madras), "Artificial Intelligence: Search Methods for Problem-Solving". – Link: <u>https://nptel.ac.in/courses/106106226</u>. Useful for Module 1.

3. Deepak Khemani (IIT Madras), "Artificial Intelligence: Knowledge Representation and Reasoning". – Link: <u>https://nptel.ac.in/courses/106106140</u>. Useful for Module 2.

4. Deepak Khemani (IIT Madras), "AI: Constraint Satisfaction" – Link: <u>https://nptel.ac.in/courses/106106158</u>. Useful for Module 3.

5. IJCAI 2020 Talk by Eugene Freuder. Link: <u>https://ijcai20.org/excellence-research-award-session/</u>. This will serve as a motivation for the Module 3.

Course Code:	Course Title: Op for Machine Lea	timization Techniqu rning	les		3	0	3
CSE3009				L-P-C			
	Type of Course:	Program Core& The	eory				
Version No.	1.1						L
Course Pre-requisites	Fluency with rea	soning and analysis	using	linear alg	ebra a	nd prob	ability
Anti-requisites	NIL	literity then yeron i	o pren				
Course Description	The course aims to equip students with advanced techniques and methods in optimization that are tailored to large-scale statistics and machine learning problems. A number of prominent developments in first-order optimization methods in the convex, nonconvex, stochastic, and distributed settings are explored in this course. Upon completing the course, students are expected to be able to better formulate an optimization method under problem constraints (for example, convexity, smoothness, and sparsity), and to select an efficient optimization method under problem constraints (for example, online, distributed, and memory cost). The course aims to equip students with advanced techniques and methods in optimization methods in the convex, nonconvex, stochastic, and distributed settings are explored to be able to better formulate an optimization methods are tailored to large-scale statistics and machine learning problems. A number of prominent developments in first-order optimization methods in the convex, nonconvex, stochastic, and distributed settings are explored in this course. Upon completing the course, students are expected to be able to better formulate an optimization methods in the convex, nonconvex, stochastic, and distributed settings are explored in this course. Upon completing the course, students are expected to be able to better formulate an optimization problem by exploiting desired structural properties (for example, convexity, smoothness, and sparsity), and to select an efficient optimization method under problem constraints (for example, online, distributed, and memory cost).						
Course Objective	This course is de by using PROBLE	signed to improve th M SOLVING Methoo	he leai dologie	rners' EM es.	IPLOY/	ABILITY S	KILLS
Course Out Comes	On successful co	mpletion of the cou	irse the	e student	s shall	be able	to:
	 Understand standard supervised and unsupervised machine learning tasks as optimization problems [Understand] Understand key definitions relating to convex functions, convex sets, and convex optimization [Understand] Implement first-order and stochastic first-order solvers for convex optimization problems. [Application] Apply machine learning techniques to real world problems. [Application] 						
Course Content:							
Module 1	Fundamentals of ConvexAssignmentProgramming Task8 SessionsAnalysis						
Topics: Review of basic linear algebra and probability, convex sets and functions – Strong and weak duality, constraint qualifications, Optimality conditions for machine learning problems (regressions, SVM, etc.)							

Assignment: Quiz on optimality conditions for machine learning problems.

Module 2	First order and	Assignment	Data Collection/Excel	14	
	Higher Order			Sessior	าร
	Methods				

Topics:

First Order Methods : Gradient descent convergence analysis – Convergence analysis for momentumbased acceleration methods: Heavy-ball, multistep, Nesterov, FISTA, etc. – Convergence speedup with conjugacy – Convergence analysis for sub-gradient methods – Stochastic (sub) gradient descent (convergences in probability and distribution, almost sure convergence, parallelism, applications in deep learning, etc.)

Higher-Order Methods – Newton's method: convergence analysis (exact/inexact step-sizes, selfconcordance), applications in regressions – Quasi-Newton Theory (Secant methods), convergence proofs for BFGS/DFP, L-BFGS in machine learning

Assignment: Different first order methods and their types with examples.

ed Assignmen	nt Programming/Data	10
ion &	analysis	Sessions
and	Task	
	ed Assignmer :ion & and	ed Assignment Programming/Data ion & analysis and Task

Topics:

I¹ -regularized sparse optimization for machine/statistical learning: compressed sensing, LASSO, logistic regression, etc. – Structured sparsity optimization for machine/statistical learning: low-rank matrix completion, nuclear norm regularization, inverse covariance inference, atomic norm regularization, etc.

Dual decomposition and decentralization – Method of multipliers and ADMM methods: convergence analysis and proofs – Proximal operators and proximal methods – Design and analysis of distributed algorithms

Assignment: Design of distributed algorithms with examples.

	J			
Module 4	Nonconvex Optimization in Machine Learning	Assignment	Programming/Data analysis Task	8 Sessions

Topics:

Coordinate descent methods and convergence analysis – Special structured nonconvex optimization – Optimization landscape – Saddle point escape

Assignment: Design of nonconvex optimization algorithms and their usage.

Targeted Application & Tools that can be used: Google Colab

Project work/Assignment:

Creating a classification system using Machine Learning methods (Stochastic Gradient Descent, Naïve bayes Classifier, etc.) using standard datasets like Iris Recognition Dataset etc.

Text Book

T1. A. Beck, First-Order Methods in Optimization, MOS-SIAM Series on Optimization, 2017. T2. S. Bubeck, Convex Optimization: Algorithms and Complexity, Foundations and Trends in Optimization, 2015.

T3. F. Bach, "Learning with Submodular Functions: A Convex Optimization Perspective", Foundations and Trends in Machine Learning, Now Publishers Inc., 2013.

References

R1. S. Boyd, N. Parikh, and E. Chu, "Distributed optimization and statistical learning via the alternating direction method of multipliers", Foundations and Trends in Machine Learning, Now Publishers Inc.
R2. Y. Nesterov, "Introductory Lectures on Convex Optimization: A Basic Course," Springer, 2004.
R3. M. Bazarra, H.D. Sherali, and C.M. Shetty, "Nonlinear Programming: Theory and Algorithms," John Wiley & Sons, 2006.

http://192.168.1.10/cgi-bin/koha/opacdetail.pl?biblionumber=11708&query_desc=ti%2Cwrdl%3A%20MACHINE%20LEARNING

Topics relevant to development of "SKILL":

Gradient descent convergence analysis, Quasi-Newton Theory (Secant methods), LASSO, Logistic Regression,

Coordinate descent methods and convergence analysis

Topics relevant to development of "ENVIRONMENT AND SUSTAINABILITY SKILLS": NIL

Course Code:	Course Title: Reinfo	rcement Learning					
CSE3011	Type of Course: 1] 2]	Program Core Laboratory integrated		L- P- C	2	2	3
Version No.	1.0					1	<u></u>
Course Pre- requisites	CSE3001: Artificial I	ntelligence and Machine	Learnin	g			
Anti-requisites	NIL						
Course Description	For both engineers and researchers in the field of Computer science, it is common to develop models of real-life situations and develop solutions based on those models. It is of utmost importance to come up with innovative solutions for scenarios that are highly stochastic. The objective of this course, is to introduce different reinforcement learning techniques which is a promising paradigm for stochastic decision making in the forthcoming era. Starting from the basics of stochastic processes, this course introduces several RL techniques that are as per the industry standard. With a good knowledge in RL, the students will be able to develop efficient solutions for complex and challenging real-life problems that are highly stochastic in pature						
Course Objectives	This course is design using EXPERIENTIAL	ned to improve the <u>LEARNING</u> techniques.	learner	s ' <u>EMPI</u>	<u>OYABI</u>	LITY SKI	<u>LLS</u> ' by
Course Out Comes	 On successful completion of the course the students shall be able to: Apply dynamic programming concepts to find an optimal policy in a gaming environment [Applying] Implement on-policy and off-policy Monte Carlo methods for finding an optimal policy in a reinforcement learning environment. [Applying] Utilize Temporal Difference learning techniques in the Frozen Lake RL environment [Applying] Solve the Multi-Armed Bandit (MAB) problem using various exploration- 						
Course Content:							
Module 1	Introduction to Reinforcement Learning	Assignment	Program OpenAl environ	nming us Gym ment	ing the	e N of C L-5	lo. lasses P – 6
Topics : Elemen Applications of I RL, Policy and it: functions of RL - environments, S Programming -V Scope	ts of RL, Agent, envir RL, Markov decision s types, episodic and - value and Q functio solving MDP using Be Yalue iteration and pc	onment Interface, Goals process (MDP), RL enviro continuous tasks, return ns, model-based and mo Ilman Equation, Algorith licy iteration, Example :	and rew onment and diso odel-free ms for o Frozen	vards, RL as a MD count fa learning ptimal p Lake pro	platfo P, Mat ctor, fu g, type olicy u blem,	rms, hs essent Indamen Is of RL sing Dyn Limitatio	tials of tal amic ns and
Module 2	Monte-Carlo(MC) methods	Assignment	Program OpenAl environ	nming us Gym ment	ing the	e N of C L-5	lo. lasses P-6
Topics: Monte types of MC pre policy MC contro method.	Carlo methods, predi diction, examples , in ol, MC with epsilon-g	ction and control tasks, I cremental mean update reedy policy, off-policy N	Monte C s, Monte AC contr	Carlo pre e Carlo C rol. Limit	diction Control ations	: algoritl : algorith of MC	າm, າm, on-

	Temporal Difference(TD)	Assignment (Quiz	Programming using the	No.
iviodule 3	Difference(TD)	Assignment / Quiz	openal Gym	
Tonics: Tompo	_Learning ral_difference_learnin	g: TD Prediction TD (Control : On-nolicy TD cor	L-7 P-0
computing the opposite the policy using Q le and TD methods	optimal policy using S arning, Examples, Diff	SARSA, Off-policy TD ofference between SARSA	control – Q learning, comp A and Q-learning, Compari	buting optimal ison of DP, MC
			Programming using the	No.
Module 4	Multi-Armed Bandit	Assignment	OpenAl Gym	of Classes
	(IMAB) problem		environment	L-6 P -4
Topics: Unders exploration, upp advertisement H Learning(DRL) A List of Laborator 1 .Software Setu Basic sin	tanding the MAB prof ber confidence bound banner for a web si Igorithm – Deep Q Ne ry Tasks: up : installalling Anaco pulations of some gar	blem, Various explorat and Thompson samplir te, Contextual bandit twork (DQN) onda, OpenAl Gym an ping environments in (tion strategies – epsilon-gr ng, Applications of MAB - fi s, introduction to Deep F d Universe.	eedy, softmax nding the best Reinforcement
2 Working with	Gym environments t	o create agents with r	andom policy	
2.1 Crea	te the Frozen Lake G	M environment and e	explore the states, action, t	ransition
probabil	lity, reward functions	and generating episod	es.	
2.2 Cre	ate an agent for the C	Cart-Pole environment	using a random policy and	record the
game				
3. Finding the o	ptimal policy for the	agent using Dynamic I	Programming	oration
3.1 Com method	pute the optimal poli	cy for the Frozen Lake	Environment using value it	eration
3.2 Com method	pute the optimal poli	cy for the Frozen Lake	Environment using policy in	teration
4. Implementin	g Monte Carlo predic	tion method using bla	ckjack game	
4.1 Ever	y-visit MC prediction			
4.2 First	-visit MC prediction	I shall a share a share a	and the second	
5. Implementing	3 on-policy MC contro	oi method using the ep	oslion-greedy policy for the	віаскјаск
6. Implementing	g Temporal Difference	e prediction for the Fro	ozen lake environment for	a random
policy				
7. Computing th	e optimal policy using	g on-policy TD control	- SARSA	
8. Computing tr 9 Multi-Armed	Bandit problem	ig on-policy TD contro	n – Q-learning	
9.1 Crea	iting a MAB in Gym			
9.2 Com	pute the best arm usi	ng various exploration	strategies such as epsilon-	greedy and
softmax	exploration method.		C .	
10. Application	of MAB – Finding the	best advertisement b	anner for a web site using	MAB
Targeted Applic	ation & Tools that ca	n be used :		
1. Executio	on of the RL algorithm	ns will be done using th	ne environments provided	by OpenAl's
Gym and Gy	mnasium of Farama F	oundation in "Colab",	available	
at <u>https://c</u>	<u>olab.research.google.</u> ory tasks will be imple	<u>com/</u> or Jupyter Noted	100K. ossary, librarios available ir	Buthon
Project work/As	signment: Mention t	he Type of Project /As	signment proposed for the	is course
		ine type of Floject / As	Significant proposed for the	
Students can be the RL algorithm	given group assignmo	ents to develop differe	ent gaming environments a	nd implement
Text Book				
1 Pichard	C Sutton and Andro	w G Parta "Painfard	comont Loorning: An Intro	duction" MIT

2. Sudharshan Ravichandiran, "Deep Reinforcement Learning with Python", Packt Publishers, Second Edition, 2020

References

1. Laurra Graesser and Wan Loon Keng, "Foundations of Deep Reinforcement Learning", Pearson, 2022

2. <u>https://www.udemy.com/course/artificial-intelligence-reinforcement-learning-in-python/</u>

Course Code:	Course Title: Time Se	eries Analysis		L- P- C	2	2	3
CSE 3012	Type of Course: Labo	ratory Integrated					
Version No.	1						
Course Pre- requisites	CSE 3001 Artificial Int	elligence and Mach	ine Learning				
Anti-requisites							
Course Description	The course will provide a basic introduction to modern time series analysis. This course teaches time-series analysis and the methods used to predict, process, and recognize sequential data. The objective of the course is to give students a better understanding of the concepts and the tools in time series analysis. The course develops a comprehensive set of tools and techniques for analyzing various forms of time series and for understanding the current literature in applied time series econometrics. This course covers time series regression and exploratory data analysis, ARMA/ARIMA models, model identification/estimation/linear operators, Fourier analysis, spectral estimation and state space medels.						
Course Objective	This course is desig EXPERIENTIAL LEARN Peer Learning and gro	ned to improve t ING techniques. Lec oup projects on real	he learners turers on th time applica	"EMPLO e Time S ations.	DYIBILIT eries Ar	Y SKILLS alysis fac	" by using cilitates the
Course Out Comes	 On successful completion of the course the students shall be able to: Understand basic concepts in time series analysis and forecasting. [Understand] Understand the use of time series models for forecasting and the limitations of the methods. [Understand] Develop time series regression models. [Application] Compare with multivariate times series and other applications. [Comprehension] 						
Course Content:							
Module 1	INTRODUCTION OF TIMESERIES ANALYSIS	Assignment	Data Collection/I	nterpret	ation	+P[2	L[6] Sessions
Topics: Introduction to Models for tim Nature and use	Time Series and Fore the series analysis-Autors s of forecasting-Forec	ecasting -Different t ocorrelation and Pa asting Process-Data	types of data artial autoco for forecast	a-Interna orrelation ing – Res	al struct n. Exam sources	ures of t ples of ⊺ for forec	ime series- Fime series asting.
Graphical Displa - Use of Data Forecasting- Ev	ays -Time Series Plots - Transformations and aluating and Monitori	Plotting Smoothed Adjustments-Gen ng Forecasting Mod	Data - Nume neral Appro el Performa	erical Des ach to nce.	scription Time So	n of Time eries Mo	Series Data deling and
Module 2	TIME SERIES REGRESSION MODEL	Assignment/Quiz	Cas	e studies	5	+P[3]	L[6] Sessions
Topics: Introduction - Regression- Pre Regression - Ge Exponential Sm	Least Squares Estima diction of New Obser neralized and Weight oothing-First order ar	ition in Linear Regr vations - Model Ade red Least Squares- R nd Second order.	ession Mod equacy Chec egression M	els - Sta king -Va lodels fo	atistical riable S r Gener	Inferenc election I al Time S	e in Linear Methods in Series Data-
Module 3	AUTOREGRESSIVE INTEGRATED MOVING AVERAGE (ARIMA) MODELS	Quiz	Cas	e studies	5	+P[2]	L[10] Sessions

Autoregressive Moving Average (ARMA) Models - Stationarity and Invertibility of ARMA Models - Checking for Stationarity using Variogram- Detecting Nonstationarity - Autoregressive Integrated Moving Average (ARIMA) Models - Forecasting using ARIMA - Seasonal Data - Seasonal ARIMA Models- Forecasting using Seasonal ARIMA Models Introduction - Finding the "BEST" Model - Example: Internet Users Data- Model Selection Criteria - Impulse Response Function to Study the Differences in Models - Comparing Impulse Response Functions for Competing Models .

	MULTIVARIATE			
Module 4	TIME SERIES MODELS AND FORECASTING	Assignment	Case studies	L[8] +P[1] Sessions

Topics:

Multivariate Time Series Models and Forecasting - Multivariate Stationary Process- Vector ARIMA Models - Vector AR (VAR) Models - Neural Networks and Forecasting -Spectral Analysis - Bayesian Methods in Forecasting.

List of Laboratory Tasks:

- 1. Loading, Preprocessing and Handling Time series data.
- 2. Fitting and plotting by Modified Exponential Curve.
- 3. Estimating and eliminating trend using Aggregation, Smoothing and Polynomial Fitting.
- 4. Eliminating Trend and Seasonality via Differencing and Decomposition.
- 5. Fitting of Trend using Moving Average Method.
- 6. Forecasting by Exponential Smoothing, ARIMA.
- 7. Forecasting by Seasonal autoregressive integrated moving average model (SARIMA).
- 8. Develop Time series model using Multivariate Analysis models via Canonical Correlation
- 9. Develop Time series model using Multivariate Analysis models via Structural Equation Modeling.
- 10. Develop Time series model using Inter Dependence Techniques via Factor Analysis.
- 11. Develop Time series model using Inter Dependence Techniques via Cluster Analysis.

Targeted Application & Tools that can be used

Target Applications:

- HealthCare Industries.
- Manufacturing Industries.
- Cyber Security.
- Smart Intelligent systems.

Tools:

- Python
- R
- MATLAB
- XLSTAT
- Tableau
- Qlik Sense

Project work/Assignment:

Assignment:

- Predicting changes in the thickness of Ozone layer based on its time-series data from 1926 2016.
- Examine the South African GDP on a period from 1960 to 2016. Our data contains 226 observations and has been obtained from OECD Statistics.
- Developing an ARIMA model to forecast the monthly Australian gas production level for the next 12 months.

Text Book

- T1 Douglas C. Montgomery, Cheryl L. Jen , Introduction To Time Series Analysis And Forecasting, 4th Edition, Wiley Series In Probability And Statistics, 2019. <u>https://b-ok.cc/book/2542456/2fa941</u>
- **T2** Dr. Avishek Pal, Dr. Pks Prakash, Master Time Series Data Processing, Visualization, And Modeling Using Python, 2019.

https://b-ok.cc/book/3413340/2eb247

T3 John Wiley & Sons , Time Series Analysis And Forecasting By Example ,Technical University Of

Denmark, 2021. https://b-ok.cc/book/1183901/9be7ed

References

R1 Peter J. Brockwell Richard A. Davis Introduction To Time Series And Forecasting Third Edition.(2016).

R2 Multivariate Time Series Analysis and Applications William W.S. Wei Department of Statistical Science Temple University, Philadelphia, PA, SA This edition first published 2019 John Wiley &

Sons

Ltd.

R3 Time Series Analysis by James D Hamilton Copyright © 2020 by prince town university press.

E book link R1: https://b-ok.cc/book/2802612/149485

E book link R2: <u>https://b-ok.cc/book/3704316/872fbf</u>

E book link R3: https://b-ok.cc/book/3685042/275c71

Web resources:

- 1. <u>https://www.coursera.org/learn/practical-time-series-analysis</u>
- 2. <u>https://ocw.mit.edu/courses/economics/14-384-time-series-analysis-fall-2013/download-</u>

course-materials/

3. <u>https://swayam.gov.in/nd1_noc19_mg46/preview</u>

Topics relevant to development of "Skill Development":

- 1. Systematic variation in time series data
- 2. Autoregressive Models
- 3. Exponential smoothing models or esms
- 4. Generating forecasts on time series

Topics relevant to development of "Employability Skills"

- 1. Time series analysis to Monitor and access water resources.
- 2. Remote Sensing time series analysis for Crop Monitoring.
- 3. Satellite Image Time series Analysis.
- 4. Waste Monitoring and Analysis.

Course Code: CSE3017	Course Title: Autonomous Navigation and Vehicles Type of Course : Theory	L-P-C	3	0	3		
Version No.	1.1						
Course Pre- requisites	 Real-time embedded programming Optimal estimation and control Linear algebra 						
Anti-requisites	NIL						
Course Description	Overview of technologies vehicles includir machine learning, localization, mapping communication and security. Hands-on imp and navigation algorithms on both simulated This course covers the mathematical fo	ng sensors , object olementation and physion oundations	, sensition detect on of r cal mo and	ng algo ion, tr obotic bile pla state-ot	orithms, racking, sensing atforms. f-the-art		

	plementations of algorithms for vision-based navigation of autonomous hicles (e.g., mobile robots, self-driving cars, drones). It culminates in a tical review of recent advances in the field and a team project aimed at vancing the state-of-the-art.						
0	Topics include: Autonomous driving technologies ov Recognition and Tracking, Localization with GNSS, Vi Perceptions In Autonomous driving, Deep learning in Auto Perception, Prediction and Routing, Decision planning and o	verview, Object sual Odometry, nomous Driving control					
Objective	by using PROBLEM SOLVING Methodologies.	SILITY SKILLS					
	On successful completion of the course the students shall	be able to:					
	1. Understand the Autonomous system's and its requir algorithm, sensing, object recognition and tracking of a system. [Understand]	ements. Explain an Autonomous					
Course Out Comes	 Do the error analysis of Localization systems and u techniques,[Analyze] Explain, plan and control the traffic behavior, and sh lane level routing and create simple algorithms. [Application 4. Explain Plan and control motion, choose proper cl automotive vehicles and understand the cloud platform.[App 	all be able to do all be able to do a] ient systems for plication]					
Course Content:							
Module 1		12 Sessions					
Introduction to autonomous driv Autonomous driv Production, Deep error analysis, sa precise point po Odometry, Visua	autonomous driving: Autonomous driving technologying algorithms: Sensing, Perception. Object Recognition ying client system, driving cloud platform, Robot Operating So learning Model Training, Localization with GNSS: GNSS of tellite based augmentation systems, real time kinematic and obsitioning, Visual Odometry: Stereo Visual Odometry, Mol Inertial Odometry, Dead Reckoning and Wheel Odometry.	ogies overview, and Tracking: bystem, HD Map overview, GNSS lifferential GPS, onocular Visual					
Module 2		8 Sessions					
Perceptions In Sterio, Optical fl Convolutional N	Autonomous driving: Introduction, Datasets, Detection low and Scene flow. Deep learning in Autonomous Drivie eural Networks, Detection, Semantic segmentation, Stereo an	, Segmentation, ing Perception: nd optical flow.					
Module 3		10 Sessions					
Prediction and prediction as clas weighted directed	Routing: Planning and control overview, Traffic predic ssification, Vehicle trajectory generation, Lane level routing d graph for routing, typical routing algorithms, routing graph	tion: Behaviour : Constructing a cost.					
Module 4		08 Sessions					
Decision planni Reinforcement I Driving: Operation Introduction, infr	ng and control: Behavioral decisions, Motion planning, F Learning Based Planning and Control, Client systems for ng systems and computing platform Cloud platform for Auto- rastructure, simulation.	eedback control or Autonomous nomous driving:					
Targeted Applic	cation & Tools that can be used:						
Applications: O	bstacle Avoidance, Path Planning, Autonomous Vehicles.						
Tools: MIDGUA	RD A Simulation platform for Autonomous Vehicle naviga	tion.					
Project Work/A	ssignment:						
1. Develop a syst	em that avoids obstacles in the path.						

2. To develop a cloud based autonomous navigation, what are the parameters should be considered, draw a framework for the navigation system.

Text Book

T1: Shaoshan Liu, Liyun Li, Jie Tang, Shuang Wu, Jean-Luc, Creating Autonomous Vehicle Systems Morgan & Claypool Publishers 2nd Edition, 2019

T2: Ronald K. Jurgen Autonomous Vehicles for Safer Driving SAE International Edition, 2019

References

R1. Hod Lipson, Melba Kurman Driverless: Intelligent Cars and the Road ahead MIT Press. 1st Edition, 2016

R2. Markus Maurer, J. Christian Gerdes, Barbara Lenz Autonomous Driving: Technical, Legal and Social Aspects 1st Edition, 2016

R3. Hannah YeeFen Lim, Autonomous Vehicles and the Law: Technology, Algorithms and Ethics ,Edward Elgar Publishing. 1st Edition, 2018

Web Resources: <u>http://pu.informatics.global</u>

Topics relevant to development of "Employability":

Deep Learning Models, Convolutional Neural Networks, Vehicle trajectory generation, Decision planning, Reinforcement learning.

	T				r				
Course Code:	Course Title: Digita	I Health and Imaging	L	P- C	3	0	3		
CSE3018	Type of Course: Program Core& Theory Only								
Version No.	1.0								
Course Pre- requisites	CSE3008: Machine Learning Techniques								
Anti-requisites	-								
Course	This course will give	This course will give an overview of digital health and its impact on healthcare							
Description	Image enhancement informatics, Health c	mage enhancement techniques, filtering, and restoration. Medical Imaging, health nformatics, Health data analytics and predictive modeling.							
Course Objectives	This course is design PROBLEM SOLVING I	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.							
Course Out Comes	On successful completion of the course the students shall be able to: L.Understand the role of digital health's impact in ethical and legal considerations. Understand] 2. Apply Machine learning techniques for medical image analysis. [Application] 3. Apply Computer-aided detection and diagnosis in medical imaging. Application]								
Course	4. Арріу пеанії цага	analytics and predictive	mouenne	s. [App i	cation				
Content:									
Module 1	Introduction to Digital Health and Digital Image	Assignment	Theory			L	: 8		
Introduction to I Overview of digi health monitorin Digital Image Pro Digital image re restoration. Imag	Digital Health tal health and its imp og devices, Ethical and ocessing Fundamenta presentation and pro ge segmentation and	act on healthcare, Introd I legal considerations in als: operties, Image enhance feature extraction	duction to digital her ement teo	teleme alth. chnique	dicine, v s, Imag	wearabl e filteri	es, and ng and		
Module 2	Medical Imaging Modalities	Assignment	Case stud assigned where th world sce propose solutions	dies can to stud ey anal enarios Al-base	be ents, yze real and d	- L:	10		
Medical Imaging imaging, comput and nuclear med cardiology)	g Modalities: Principle ed tomography (CT), licine imaging, Imagin	es and applications of var and magnetic resonance g modalities for specific	rious med e imaging healthcai	lical ima (MRI) , re doma	aging m Ultraso ains (e.g	odalitie und ima g., radiol	s. X-ray aging logy,		
Module 3	Image Analysis in Healthcare	Assignment /Quiz	Research reviewing papers of publication application	iing and g acade r indust ons on s ons	mic ry specific	L: Al	:12		
Image registratic treatment plann in medical image	on and fusion techniq ing, Computer-aided e analysis.	ues, Quantitative image detection and diagnosis	analysis f in medica	or disea al imagir	ise diag ng, Mac	nosis ar hine lea	id arning		

Health Informatics and Electronic Health Records, Introduction to health informatics and electronic health records (EHR), EHR systems and interoperability, Data privacy, security, and regulatory considerations in health informatics.

Module 4	Digital Health Applications and Innovations	Assignment	Students may work with real or simulated datasets and be asked to explore and analyze the data, extract meaningful insights, and visualize the results using appropriate tools.	L: 10
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Mobile health (mHealth) applications and remote patient monitoring, Health data analytics and predictive modeling. Artificial intelligence and machine learning in digital health. Emerging technologies and trends in digital health.

Targeted Application & Tools that can be used:

Applications: Quantitative image analysis for disease diagnosis, Mobile health (mHealth Tools: TensorFlow, PyTorch, Computer-aided detection

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Assignments can involve researching and reviewing academic papers or industry publications on specific AI applications in engineering / Students may be given programming assignments to implement AI algorithms / Case studies can be assigned to students, where they analyze real-world scenarios and propose AI-based solutions / Students may work with real or simulated datasets and be asked to explore and analyze the data, extract meaningful insights, and visualize the results using appropriate tools.

Text Book

- 1. "Digital Health: Scaling Healthcare to the World" by Paul Sonnier-2020
- 2. Digital Image Processing" by Rafael C. Gonzalez and Richard E. Woods
- 3. "Biomedical Signal and Image Processing" by Kayvan Najarian and Robert Splinter

References

- 1. Lavika Goel, Artificial Intelligence: Concepts and Applications, Wiley, 2021..
- 2. "Introduction to Health Informatics" by Mark S. Braunstein
- 3. <u>https://talentsprint.com/course/ai-digital-health</u>
- 4. https://www.udemy.com/topic/medical-imaging/

Course Code:	Course Title: Stochastic Decision Making				
CSE3019	Type of Course: Program Core& Theory Only	L- P- C	3	0	3
Version No.	1.0				
Course Pre- requisites	MAT1003: Applied Statistics				
Anti-requisites	-				
Course Description	Stochastic Decision Making is an advanced-level cou foundational knowledge of artificial intelligence engineering. This course aims to provide engineer understanding of Stochastic techniques, algorithms, shaping the future of Agent-driven engineering concepts, live examples, and case studies, stude building intelligent agents methodologies and complex partially observable environment.	rse desig (AI) and ing stude and emo systems. ents will their ap	ned to d its a ents wi erging f Throu explore oplicati	build up applicati th an ir crends t gh theo e cuttir on in	oon the ons in h-depth hat are oretical ng-edge solving

Course Objectives	This course is desig PROBLEM SOLVING	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies.					
Course Out Comes Course Content:	On successful comp 1. Understand the r solving [Understand 2. Apply dynamic Sy environment. [Appl i 3. Implementation c decision in the real t 4. Apply various P [Application]	letion of the course the ole of knowledge-base ling] stem concepts to find a ication] of various detection te time environment [App roject Scheduling stra	e students shall be able to: d agents and Apply logic in p an optimal policy in partially echniques and hypothesis for plication] ategies to solve the decisio	problem- observable taking the on problem.			
Module 1	Intelligent Agents and Searching Techniques	Assignment	Theory	L : 10			
Introduction - agents - Utility observable vs. continuous, Sir Searching Tec Problems - Rea Uniform cost so	Structure of Intelligen y-based agents - Agen partially observable ngle agent vs. multiage hniques: Solving Prol al-world problems - Se earch - Depth-first sea	t Agents - Agent progra ts and Environments - · Deterministic vs. sto nt olems by Searching - arching for Solutions - rch - Depth-limited sea	ams - Simple reflex agents - Properties of task environn ochastic. Static vs, dynamic, Problem-Solving Agents - Search Strategies - Breadth- rch -	Goal-based nents - fully Discrete vs. Formulating first search -			
Module 2	Dynamic Systems	Assignment	Case studies can be assigned to students, where they analyze real- world scenarios and propose AI-based solutions	L: 10			
Dynamic Progr scenario tree , and Stochastic Recourse Prob General Ontolo Problem Reduc Reducing the C	ramming - Decision T Stochastic Dynamic F Objective values. lems - Outline of Struc ogy - The Grocery Shop ction: Finding a Frame, complexity of Feasibilit	Trees - Deterministic D Programming, Markow ture - Knowledge Engir ping World. Removing Unnecessar y Tests	ecision Trees , Stochastic De vitz' model Comparing the E neering - The Electronic Circu y Columns, Removing Unnec	ecision Trees Deterministic uits Domain - essary Rows,			
Module 3	Detection and decisions	Assignment /Quiz	Researching and reviewing academic papers or industry publications on specific AI applications	L:10			
Detection and MAP detection Pearson rule, T Hypothesis tes Binary hypothe Feasibility in N Investment Exa	decisions : Decision cr a, Binary detection wit The min-max detection sting : Sufficient statist eses with IID observation letworks: The un-capacity ample	iteria and the maximur h a minimum-cost crite rule cics with $M \ge 2$ hypothe ons, citated case, Generatin	n a posteriori probability crit erion, The error curve and tl eses, More general minimum g Relatively Complete Recou	erion, Binary he Neyman– -cost tests, irse, An			
Module 4	Project Estimation and Scheduling	Assignment	Students may work with real or simulated datasets and be asked to explore	L: 10			

	and analyze the data,	
	extract meaningful	
	insights, and visualize the	
	results using appropriate	
	tools.	

Project Estimation : Introduction - The squared-cost function, Other cost functions. MMSE estimation for Gaussian random vectors- Scalar iterative estimation, The vector space of random variables; orthogonality MAP estimation and sufficient statistics

Project Scheduling : PERT as a Decision Problem , Introduction of Randomness, Bounds on the Expected Project Duration, Series reductions, Parallel reductions, Disregarding path dependences, Arc duplications ,Using Jensen's inequality,

Targeted Application & Tools that can be used:

Applications: Object detection, image classification, Sentiment analysis, language translation, Speech recognition, speaker identification, emotion recognition, Personalized product recommendations etc.

Tools: OpenCV, TensorFlow, PyTorch, NLTK (Natural Language Toolkit), OpenAI Gym

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Assignments can involve researching and reviewing academic papers or industry publications on specific AI applications in engineering / Students may be given programming assignments to implement AI algorithms / Case studies can be assigned to students, where they analyze real-world scenarios and propose AI-based solutions / Students may work with real or simulated datasets and be asked to explore and analyze the data, extract meaningful insights, and visualize the results using appropriate tools.

Text Book

- 1. Peter Kall, Stein W. Wallace, "Stochastic Programming," Springer 2020
- 2. Robert G. Gallager, "Stochastic Processes Theory for Applications", Cambridge University Press 2019

References

1. Lavika Goel, Artificial Intelligence: Concepts and Applications, Wiley, 2021.

2. Laurra Graesser and Wan Loon Keng, "Foundations of Deep Reinforcement Learning", Pearson, 2022

3. <u>https://www.udemy.com/course/artificial-intelligence-reinforcement-learning-in-python/</u>

Course Code:	Course Title: Business Intelligence and					
CSE3088	Analytics	- P- C	3	0	3	
	Type of Course:1] Theory					
Version No.	1.0					
Course Pre-	CSE1002: Programming using Python					
requisites	CSE2012: Database Management Systems					
Anti-requisites	NIL					
Course	The purpose of the course is to instill a strong f	oundatio	on o	f sci	ientific	
Description	process orientation that is the cornerstone o	of effec	tive.	Bı	usiness	
	Intelligence (BI) is a set of architectures, theorie	es, metł	nodo	logi	es and	
	technologies that transform structured, semi-struc	tured an	id u	nstru	ictured	
	data into meaningful and useful information.	Students	s wi	ill a	ınalyze	
	enterprise data requirements to develop queries, re	eports ar	nd b	uild	OLAP	
	cubes that use business analytics to answer complex business questions.					

Course Objective	This course is designed to in using PROBLEM SOLVING	prove the learner G Methodologies.	s' EMPLOYABILITY	SKILLS by		
Course Out Comes	 On successful completion of this course the students shall be able to: Discuss the impact of Business Intelligence (BI) theories, architectures, and methodologies on the organizational decision making process.[Comprehension] Analyse the differences between the structured, semi-structured and unstructured data types to leverage the best technologies.[Application] Develop Ad hoc queries, reports, spread sheets, dashboards and mobile BI applications.[Application] Using business analytics to answer complex business questions using data from a variety of sources, such as data files and relational/NoSQL databases.[Knowledge] 					
Course Content:						
Module 1	An Overview of Business Intelligence, Analytics (Comprehension)	Assignment		10 Hours		
Topics:						
A Framework for	Business Intelligence (BI).	Intelligence Cre	eation Use and BI	Governance.		
Transaction Process	sing Versus Analytic Proce	essing. Successfu	I BI Implementation	n. Analytics		
Overview. Diter mut	Business Reporting Visual	-5.				
Module 2	Analytics and Business	Assignment		10 Hours		
	Performance (Knowledge)					
Management Busine Different Types of (Performance Dashbo Scorecards. Six Sign	ess Reporting Definitions and Charts and Graphs. The Eme pards. Business Performance na as a Performance Measure	nd Concepts. Dat rgence of Data V Management. Per ment System.	a and Information V isualization and Visua formance Measureme	isualization. al Analytics. nt. Balanced		
Module 3	Big Data and Analytics (Application)	Assignment		10 Hours		
Topics: Definition of Big Da Big Data and Data V Stream Analytics.	ata. Fundamentals of Big Dat Warehousing. Big Data Vende	a Analytics. Big I ors. Big Data and	Data Technologies. Data Technologies. Data Stream Analytics. Ap	ata Scientist. plications of		
Module 4	Emerging Trends and Future Impacts (Application)	Assignment		10 Hours		
Topics: Location-Based Analytics for Organizations. Analytics for Consumers. Recommendation Engines. The Web 2.0 Revolution and Online Social Networking. Cloud Computing and BI. Impacts of Analytics in Organizations: An Overview. Issues of Legality, Privacy, and Ethics. The Analytics Ecosystem.						
Targeted Application & Tools that can be used: Anaconda/Google Colab, Google Data						
Studio, Deep Note						
Project work/Assi course	gnment: Mention the Ty	pe of Project /As	ssignment proposed	1 for this		
1. Gain an imm	nersive understanding of the r	practices and proce	esses used by a junior	or associate		
data analyst in their	day-to-day job	protection and protection				
2. Learn key an	nalytical skills (data cleaning,	analysis, & visual	lization) and tools (spi	read sheets,		
SQL, R programmin	g, Tableau)					

Text Book

1. C. Albright and W. L. Winston "Business Analytics: Data Analysis & Decision Making ", Cengage Learning India Pvt. Ltd ; Sixth Edition, September 2019

2. S. Christian, and L.Wayne, "Business Analytics: Data Analysis and Decision Making with MindTap". Second Edition, September 2022

References

R1. Ramesh Sharda, Dursun Delen, Efraim Turban "Analytics, Data Science, & Artificial Intelligence (10th ed.). Upper Saddle River, NJ: Pearson. ISBN- 9781292341552, Second Edition 6 March 2020

R2. Jose, J. and Lal, S.P. :Introduction to Computing & problem solving with Python, Khanna Book Publishing First edition 2019

R3. B. Mt Wan "Data Analytics using Python ", 9th Edition, published by Pearson Education 2020.

R4. Ramesh Sharda "Business Intelligence Analytics And Data Science A Managerial Perspective" 4Th Edition , Pearson India, April 2019.

Web links

R1. http://owl.english.purdue.edu/owl/resource/560/01/

R2. <u>http://myregisapp.regis.edu/Citrix/StoreWeb/</u>

R3. <u>https://in.coursera.org/courses?query=business%20intelligence</u>

R4. https://www.coursera.org/learn/business-intelligence-data-analytics

R5. https://www.udemy.com/course/business-intelligence-and-data-analytics/

Topics relevant to development of "Employability": Business Intelligence, Big Data Analytics, Data Scientist.

Course Code:	Course Title: Cognitive Science &	L- P- C	3	0	3
Version No					
Course Pre-	CSE3008 [,] Machine Learning Techniques				
requisites					
Anti-requisites	NII				
Anti-requisites	Overview of biological structure and artificia	networ	k son	cing alo	orithms
Course Description	machine learning, localization. Hands-on implem algorithms on both simulated and physical pl mathematical foundations and state-of-the-art ir cognitive analysis. It culminates in a critical revie and a team project aimed at advancing the Reaso	n network entation of atforms. T mplement ew of recent oning.	r, sen of cogn This cc ations nt adva	itive reconstruction of algoriances in	oritinis, cognition vers the ithms for the field
Course Objective	This course is designed to improve the learners PROBLEM SOLVING Methodologies.	' EMPLOY	ABILITY	' SKILLS	by using
Course Out Comes	 On successful completion of the course the 1. Understand the different neural network 2. Understand cognition systems and its register 3. Apply dynamic System concepts Neuroeconomics. [Application] 4. Apply Cognitive Science in Learning and 	students < models. quirement in Cog I Reasonin	shall [L ss. [L gnitive g. [App	be able Indersta Indersta Scien Dicatior	to: and] and] ce and]
Course Content:					
Module 1			8	Sessio	ns
Introduction to Bio Process of Synaptic Memory (Biologica Trace Theory, Reco Artificial Neural N Perceptron: Least I Bayesian Network,	Diogical Neuron: Structure of Neuron, Action Pote c Transmission, Stimulate the synaptic vesicle, <i>De</i> al Basis): Theories of Memory Formation, System onsolidation Theory, etwork: Models of single neurons, Different neu mean square algorithm, Learning curves, Learning Degree of Belief, Conditional Probability, Bayes'	ential, Proc polarization Consolida ral netwo grates, Pe s Rule	cess of on of th ation T rk moc rceptro	Action F <i>ne neurc</i> Theory, I lels. Sing	otential, on, Multiple- gle Layer
Module 2			1	2 Sessi	ons
Cognitive Archited Applied Cognitive Psychology, Notion Processes, Working Study of the Nervo Neuropsychology,	ture: Fundamental Concepts, Cognitive View, Science, Interdisciplinary Nature of Cognitive of Cognitive Architecture, Global View of the o g Memory, and Attention. Neuroscience: Brain a bus System, Organization of the Central Nervous Computational Neuroscience,	Computer Science Cognitive nd Cogniti System, I	s in Co , Natu Archite on, Int Neural	ognitive re of (ecture, (roductio Represo	Science, Cognitive Cognitive on to the entation,
Module 3			1	.0 Sessi	ons
MODELSANDT Symbol System, No Systems, Applying Neuroeconomics: I Strategies for Brair	DO LS : The Physical Symbol System Hypothesis :I eural based Models of Information Processing. g Dynamical Systems. Neuroeconomics: Perce Bayes in the Brain n Mapping, Studying Cognitive Functioning: Techr	ntelligent Cognitive ption as hiques fror	Action Science a Bay n Neur	and the e and D yesian I roscienc	e Physical ynamical Problem, e
Application: Max	dole of Language Learning Language Learning	in Nour		WORKS	Pavociar
Language Learning, Language Acquisition, Natural Language Processing, Semantics. Neural Network Models of Children's Physical Reasoning, Cognitive Science and the Law, Autonomous Vehicles: Combining Deep Learning and Intuitive Knowledge,					

Targeted Application & Tools that can be used:

Applications: Behavior-Based Robotics

Tools: SHAKEY's Software, Logic Programming in STRIPS and PLANEX

Project Work/Assignment:

1. Develop a Model for Cognition and Knowledge Representation

2. Develop a Model for Biorobotics- Insects and Morphological Computation

Text Book

T2: José Luis Bermúdez, COGNITIVE SCIENCE | Publishers 3rd Edition, Cambridge University Press, 2020

T2: Shaoshan Liu, Liyun Li, Jie Tang, Shuang Wu, Jean-Luc, COGNITIVE SCIENCE Publishers 3rd Edition, Cambridge University Press,2020

References

R1. Hod Lipson, Melba Kurman Driverless: Intelligent Cars and the Road ahead MIT Press. 2^{nd} Edition, 2019

R2. Markus Maurer, J. Christian Gerdes, Barbara Lenz Autonomous Driving: Technical, Legal and Social Aspects 12n Edition, 2020

R3. Hannah YeeFen Lim, Autonomous Vehicles and the Law: Technology, Algorithms and Ethics ,Edward Elgar Publishing. 2nd Edition, 2019

Web Resources: https://www.cambridge.org/highereducation/books/cognitive-science/

Topics relevant to development of "Employability":

Deep Learning Models, Convolutional Neural Networks, Vehicle trajectory generation, Decision planning, Reinforcement learning.

Course Code: CSE3108 Course Title: Expert Systems L.P.C 3 0 3 Version No. 1.1 Course Pre-requisites CSE3008: Machine Learning Techniques Anti-requisites NIL Course Pre-requisites NIL Expect Solution to expert systems, which is an integral part of the computer science curriculum. In this course, we learn how theory and application are presented. Students are provided with the various tools language which the can use to develop systems of their own. By integrating theory with a full functional means of applying that theory to real-world situations, students will gain an appreciation for the role played by expert systems in today's world. Course Objective This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies. Course Out Comes On successful completion of the course the students shall be able to: [1] Understand the various AI programming knowledges. [2] Apply the expert system techniques for specific task completion. [3] Design and Develop expert systems using appropriate knowledge-based tools. Course Content: Introduction to AI programming languages, Bind search strategies, Breadth-first – Depth-first – Heuristic sear techniques Hull Climbing – Best first – A Algorithms A0 ⁺ algorithm – game trees, Nin-max algorithms, game playing – Allpha-beta pruning. Knowledge representation Sines predicate logic – logic programming Same playing. Allpha-beta pruning. Knowledge representation Sines predicate logic – logic programming Same playing. Allpha-beta pruning. Knowledge representation Sines predicate logic – logic pro							
L2E3108 Type of Course: Program Core& Theory Only L-P-C 3 0 3 Version No. 1.1 Course Pre-requisites CSE3008: Machine Learning Techniques	Course Code:	Course Title: Exp	ert Systems		2		2
Only Only Version No. 1.1 Course Pre-requisites CSE3008: Machine Learning Techniques Anti-requisites NIL Course Description This course is an introduction to expert systems, which is an integral part of the computer science curriculum. In this course, we learn how theory and applications complement each other. Both theory and application arr presented. Students are provided with the various tools language which the can use to develop systems of their own. By integrating theory with a full functional means of applying that theory to real-world situations, students will gain an appreciation for the role played by expert systems in today's world. Course Objective This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies. Course Out Comes On successful completion of the course the students shall be able to:	CSE3108	Type of Course:	Program Core& Theo	ry L-P-C	3	0	3
Version No. 1.1 Course Pre-requisites CSE3008: Machine Learning Techniques Anti-requisites NIL Course Description This course is an introduction to expert systems, which is an integral part of the computer science curriculum. In this course, we learn how theory and applications complement each other. Both theory and application are presented. Students are provided with the various tools language which they can use to develop systems of their own. By integrating theory with a full functional means of applying that theory to real-world situations, students will gain an appreciation for the role played by expert systems in today's world. Course Objective This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies. Course Out Comes On successful completion of the course the students shall be able to:		Only	5				
Course Pre-requisites CSE3008: Machine Learning Techniques Anti-requisites NIL Course Description This course is an introduction to expert systems, which is an integral part of the computer science curriculum. In this course, we learn how theory and applications complement each other. Both theory and application ar presented. Students are provided with the various tools language which the can use to develop systems of their own. By integrating theory with a full functional means of applying that theory to real-world situations, students will gain an appreciation for the role played by expert systems in today's world. Course Objective This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies. Course Out Comes On successful completion of the course the students shall be able to: [1] Understand the various AI programming knowledges. [2] Apply the expert system techniques for specific task completion. [3] Design and Develop expert systems using appropriate knowledge-based tools. Course Content: Introduction to AI programming languages, Blind search strategies, Breadth-first – Depth-first – Heuristic sear techniques Hill Climbing – Best first – A Algorithms AO* algorithm – game tress, Min-max algorithms, game playing – Alpha-beta pruning. Knowledge representation issues predicate logic – logic programming Semantit tools Module 2 Expert System Assignment Tools 14 Sessio Introduction to Expert System, Achitecture of expert systems. Expert System sof showledge rep	Version No.	1.1					
Anti-requisites NIL Course Description This course is an introduction to expert systems, which is an integral part of the computer science curriculum. In this course, we learn how theory and applications complement each other. Both theory and application are presented. Students are provided with the various tools language which the can use to develop systems of their own. By integrating theory with a fully functional means of applying that theory to real-world situations, students will gain an appreciation for the role played by expert systems in today's world. Course Objective This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies. Course Out Comes On successful completion of the course the students shall be able to: [1] Understand the various AI programming knowledges. [2] Apply the expert system techniques for specific task completion. [3]Design and Develop expert systems using appropriate knowledge-based tools. Course Content: Introduction to AI programming language, Bilnd search strategies, Breadth-first – Depth-first – Heuristic sea techniques fill Climbing – Best first – A Algorithms AO* algorithm – game trees, Min-max algorithms, game playing – Alpha-beta pruning. Knowledge representation issues predicate logic – logic programming Semantic nets-frames and inheritance, constraint propagation; Representing Knowledge using rules, Rules-based deduction systems. Module 2 Expert System Assignment Tools 14 Sessio Introduction to Expert Systems knowledge representations in expert systems. Expert System Tools: Techniques of knowledge representations in expe	Course Pre-requisites	CSE3008: Machi	ne Learning Techniqu	Ies			
Course Description This course is an introduction to expert systems, which is an integral part of the computer science curriculum. In this course, we learn how theory and application are presented. Students are provided with the various tools language which the can use to develop systems of their own. By integrating theory with a full functional means of applying that theory to real-world situations, students will gain an appreciation for the role played by expert systems in today's world. Course Objective This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies. Course Out Comes On successful completion of the course the students shall be able to: (1) Understand the various AI programming knowledges. (2) Apply the expert system techniques for specific task completion. (3) Design and Develop expert systems using appropriate knowledge-based tools. Course Content: Introduction to AI programming languages, Bilnd search strategies, Breadth-first – Depth-first – Heuristic sea techniques Hill Climbing – Best first – A Algorithms AO* algorithm – game tress, Min-max algorithms, game tplaying – Alpha-beta pruning, Knowledge representation issues predicate logic – logic programming semantit nets- frames and inheritance, constraint propagation; Representing Knowledge using rules, Rules-based deduction systems. Module 2 Expert System Assignment Tools 14 Sessio Introduction to Expert Systems, Anchitecture of expert systems. Expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems. <td>Anti-requisites</td> <td>NIL</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Anti-requisites	NIL					
Course Objective This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies. Course Out Comes On successful completion of the course the students shall be able to: [1] Understand the various AI programming knowledges. [2] Apply the expert system techniques for specific task completion. [3] Design and Develop expert systems using appropriate knowledge-based tools. Course Content: Introduction to AI programming languages, Blind search strategies, Breadth-first – Depth-first – Heuristic sear techniques Hill Climbing – Best first – A Algorithms AO* algorithm – game tress, Min-max algorithms, game playing – Alpha-beta pruning. Knowledge representation issues predicate logic – logic programming Semantic nets- frames and inheritance, constraint propagation; Representing Knowledge using rules, Rules-based deduction systems. Module 2 Expert System Assignment Tools 14 Session Introduction to Expert Systems, Architecture of expert system, Representation and organization of knowledge Basics characteristics, and types of problems handled by expert systems. Tools 14 Session Module 2 Expert System facilities, stages in the development of expert systems. Expert Systems, stages in the development of expert systems. Expert Systems, stages in the development of expert systems.	Course Description	This course is an computer science applications cor presented. Stude can use to deve functional means gain an appreciat	This course is an introduction to expert systems, which is an integral part of the computer science curriculum. In this course, we learn how theory and applications complement each other. Both theory and application are presented. Students are provided with the various tools language which they can use to develop systems of their own. By integrating theory with a fully functional means of applying that theory to real-world situations, students will gain an appreciation for the role played by expert systems in today's world.				
Course Out Comes On successful completion of the course the students shall be able to: [1] Understand the various AI programming knowledges. [2] Apply the expert system techniques for specific task completion. [3] Design and Develop expert systems using appropriate knowledge-based tools. [3] Design and Develop expert systems using appropriate knowledge-based tools. Course Content: Introduction to AI programming knowledges. Programming Task 12 Sessions knowledges Introduction to AI programming languages, Blind search strategies, Breadth-first – Depth-first – Heuristic seat techniques Hill Climbing – Best first – A Algorithms AO* algorithm – game tress, Min-max algorithms, game playing – Alpha-beta pruning. Knowledge representation issues predicate logic – logic programming Semantic nets- frames and inheritance, constraint propagation; Representing Knowledge using rules, Rules-based deduction systems. Module 2 Expert System Assignment Tools 14 Session sizes characteristics, and types of problems handled by expert systems. Expert System Tools: Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems. 16 Session	Course Objective	This course is desi PROBLEM SOLVIN	gned to improve the l G Methodologies.	learners' EMPL	OYABII	ITY SKILLS	by using
Course Content: Introduction to Al programming knowledges Programming Task 12 Sessions Introduction to Al programming languages, Blind search strategies, Breadth-first – Depth-first – Heuristic sear techniques Hill Climbing – Best first – A Algorithms AO* algorithm – game tress, Min-max algorithms, game playing – Alpha-beta pruning. Knowledge representation issues predicate logic – logic programming Semantic nets- frames and inheritance, constraint propagation; Representing Knowledge using rules, Rules-based deduction systems. Module 2 Expert System tools Assignment Tools 14 Session Introduction to Expert Systems, Architecture of expert system, Representation and organization of knowledge Basics characteristics, and types of problems handled by expert systems. Expert System Tools: Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems. Module 3 Building an expert Assignment Programming 16 Session	Course Out Comes	On successful completion of the course the students shall be able to: [1] Understand the various AI programming knowledges. [2] Apply the expert system techniques for specific task completion. [3] Design and Develop expert systems using appropriate knowledge-based tools.					
Module 1Introduction to AI programming knowledgesCase studyProgramming Task12 SessionsIntroduction to AI programming languages, Blind search strategies, Breadth-first – Depth-first – Heuristic sear techniques Hill Climbing – Best first – A Algorithms AO* algorithm – game tress, Min-max algorithms, game playing – Alpha-beta pruning. Knowledge representation issues predicate logic – logic programming Semantic nets- frames and inheritance, constraint propagation; Representing Knowledge using rules, Rules-based deduction systems.Module 2Expert System toolsAssignmentTools14 SessionIntroduction to Expert Systems, Architecture of expert system, Representation and organization of knowledge Basics characteristics, and types of problems handled by expert systems.Tools14 SessionExpert System Tools: Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems.Module 3Building an expertAssignmentProgramming16 Session	Course Content:						
Introduction to AI programming languages, Blind search strategies, Breadth-first – Depth-first – Heuristic sear techniques Hill Climbing – Best first – A Algorithms AO* algorithm – game tress, Min-max algorithms, game playing – Alpha-beta pruning. Knowledge representation issues predicate logic – logic programming Semantic nets- frames and inheritance, constraint propagation; Representing Knowledge using rules, Rules-based deduction systems.Module 2Expert System toolsAssignmentTools14 SessioIntroduction to Expert Systems, Architecture of expert system, Representation and organization of knowledge Basics characteristics, and types of problems handled by expert systems.Tools14 SessioExpert System Tools: Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems.Introduction for expert systems.16 SessioModule 3Building an expertAssignmentProgramming16 Sessio	Module 1	Introduction to A programming knowledges	l Case study	Programming	Task	12 Se	essions
Module 2Expert System toolsAssignmentTools14 SessioIntroduction to Expert Systems, Architecture of expert system, Representation and organization of knowledg Basics characteristics, and types of problems handled by expert systems.Expert System Tools: Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems.Module 3Building an expertAssignmentProgramming16 Sessio	Introduction to AI programming languages, Blind search strategies, Breadth-first – Depth-first – Heuristic search techniques Hill Climbing – Best first – A Algorithms AO* algorithm – game tress, Min-max algorithms, game playing – Alpha-beta pruning. Knowledge representation issues predicate logic – logic programming Semantic nets- frames and inheritance, constraint propagation; Representing Knowledge using rules, Rules-based deduction systems.						
Introduction to Expert Systems, Architecture of expert system, Representation and organization of knowledg Basics characteristics, and types of problems handled by expert systems.Expert System Tools: Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems.Module 3Building an expertAssignmentProgramming16 Sessio	Module 2	Expert System tools	Assignment	Tools		1	.4 Sessions
Module 3 Building an expert Assignment Programming 16 Sessio	 Introduction to Expert Systems, Architecture of expert system, Representation and organization of knowledge, Basics characteristics, and types of problems handled by expert systems. Expert System Tools: Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems. 						
	Module 3 Building an expert Assignment Programming 16 Sessions						

Building an Expert System: Expert system development, Selection of the tool, Acquiring Knowledge, **Building process.** Problems with Expert Systems: Difficulties, common pitfalls in planning, dealing with domain experts, difficulties during development. **Targeted Application & Tools that can be used:** Al related tools and knowledge based tools for expert system. **Project work/Assignment:** Assignment 1:Task on FuzzyCLIPS. Assignment 2: Back-propagation algorithm for training Neural Networks (NN) **Text Book**

- T1.Elain Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill, New Delhi.
- T2. Introduction to Expert Systems, Jackson P., 3rd edition, Addison Wesley, ISBN 0-201-87686-8
- T2.Waterman D.A., "A Guide to Expert Systems", Addison Wesley Longman

References

R1. Stuart Russel and other Peter Norvig, "Artificial Intelligence – A Modern Approach", Prentice-Hall, R2.Patrick Henry Winston, "Artificial Intelligence", Addison Wesley,

R3.Patterson, Artificial Intelligence & Expert System, Prentice Hall India, 1999.

R4.Hayes-Roth, Lenat, and Waterman: Building Expert Systems, Addison Wesley,

R5.Weiss S.M. and Kulikowski C.A., "A Practical Guide to Designing Expert Systems", Rowman & Allanheld, New Jersey

Weblinks:

https://onlinelibrary.wiley.com/journal/14680394 https://www.youtube.com/watch?v=11nzrNkn9D8

https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=1223875&site=ehost-<u>live&ebv=EB&ppid=pp_xiii</u>

https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&site=ehost-<u>live</u>

Course Code:	Course Title: Wireless Se	ensor Networks	L- P- C	3 0	3
CSE3072	1.0				
Version No.					
Course Pre-	CSE-236 Principles of Dat	ta Communication	s and Computer	Network	S
requisites					
Anti-requisites	NIL				
Course Description	This course examines wireless cellular, ad hoc and sensor networks, covering topics such as wireless communication fundamentals, medium access control, network and transport protocols, uni cast and multicast routing algorithms, mobility and its impact on routing protocols, application performance, quality of service guarantees, and security. Energy efficiency and the role of hardware and software architectures may also be presented for sensor networks.				
Course Objective	The objective of the PARTICIPATIVE LEARNI	course is SKILL ING TECHNIQUES	DEVELOPMEN	⊺ of stu	dent by using
Course Out Comes	 On successful completion of the course the students shall be able to: Explain the basics of the Wireless systems. Describe different protocols being used by wireless networks including ABR and MANETS. Illustrate the Fundamental Concepts and applications of ad hoc and wireless sensor networks. Interpret the WSN routing issues by considering related QoS measurements. 				
Course Content:					
Module 1	Overview of Wireless Sensor and Adhoc Networks	Assignment	Data Interpreta	tion	08 Sessions
Topics:					
Introduction, Sensor	Network Technology ba	ckground, Elemen	ts of basic Sense	or Netwo	rk Architecture,
Survey of Sensor Ne	etworks, Network Chara	cteristics and Cha	llenges, Applica	tions of \	Wireless Sensor
Networks, Range of	Applications, Category 2	WSN Applications	– Home Contro	ol, Industr	ial Automation,
Medical Application	s, Category 1 WSN Ap	plications – Sens	or and Robots	, Reconfi	gurable Sensor
Networks, Highway I	Monitoring, Military App	lications, Civil and	Environmental	Engineeri	ng Applications,
Wildfire Instrumentation, Habitat Monitoring, Nanoscopic Sensor Applications, Introduction to Cellular					
and Adnoc Networks	s, issues in Adhoc Networ	кs – Routing, Mult Г	icasting, QoS, Se	ecurity, Sc	calability.
Module 2	Wireless Transmission Technology and MAC Protocols for Adhoc	Assignment	Basics ar Interpretat	nd tion	13 Sessions
Topics:					
Introduction, Radio Technology Primer – Propagation and Modulation, Propagation and					
Modulation impair	rments, Available Wire	eless Technologie	es, Campus A	pplicatio	ns, MAN/WAN
Applications, Mediu	m Access Control Proto	ocols – Fundamer	itals, Performai	nce Requ	irements, MAC
Protocols for WSNs	-schedule based Protoco	ois and Kandom A	ccess based Pro	LOCOIS, Se	ensor MAC case
study, issues in Des	Signing WAC Protocol to	or Aanoc Network	s - Bandwidth	erriciency	, dos support,
Synchronization, erro	prone proadcast chan	nei, iviobility of noo	les.		
Module 3	Routing Protocols for Adhoc and WSN	Quiz	Questions	Set	9Sessions
Topics:					

Background, Data Dissemination and gathering, Routing challenges, Network Scale and Time-Varying Characteristics, Routing Strategies, characteristics of an ideal Routing Protocol for Adhoc Networks, WSN Routing Techniques, Classifications of Routing Protocols, Table-driven and on-demand Routing Protocols, Routing Protocols with efficient flooding mechanism.
	Demonstration of WSN					
Module 4	Adhoc Network using	Quiz	Questions Set	8 Sessions		
	Simulators					
Topics:						
GloMoSim Simulator	, TOSSIM, OMNeT++ and	d other recent avai	ilable simulation tools (N	1ATLAB wireless		
module, NS2, etc).						
Targeted Application	n & Tools that can be use	ed:				
This course helps the	e students to understand	the concepts relat	ed to Wireless Sensor and	d Adhoc and		
networks.by using si	mulation tools in several	educational associ	ations and research hubs	. For this		
reason, the study of	existing experimental too	ols for analyzing the	e behavior of WSNs has b	ecome		
essential, with wirele	ess sensor networks that	include NS-2, OMN	leT++, Prowler, OPNET, a	nd TOSSIM.		
	Projec	t work/Assignmen	t:			
Project Assignment:						
1. Resource All	ocation Robust to Traffic	and Channel Varia	tions in Multihop Wireles	s Networks.		
2. Evaluation N	lodels for the Nearest Clo	oser Routing Proto	col in Wireless Sensor Ne	tworks		
Assignment:						
1]Define Wireless Se	nsor Networks? Explain i	n brief about the A	Applications of Wireless S	ensorNetworks		
2] Discuss the advan	tages and applications of	sensor networks?				
3] Discuss the design	considerations of physic	al layer and transc	eiver?			
Text Book						
T1: Kazem Soharby,	Daniel Minoli and Taieb	Znati, Wireless Se	nsor Networks: Technolo	gy,		
Protocols and Applic	ations, Wiley Publication	n, 2016, ISBN : 978	8-81-265-2730-4			
T2: C. Siva Ram Mur	thy and B. S. Manoj, Adh	oc Wireless Netwo	orks – Architecture and F	Protocols,		
Pearson Publication,	, 2013. ISBN: 978-81-317	-0688-6				
References						
1: Jagannathan Sara	ngapani, Wireless Adhoo	and Sensor Netw	orks – Protocols, Perforn	nance and		
Control, CRC Press 2	017, e-book ISBN: 97813	315221441				
2: Chai K. Toh, Ad Ho	oc Mobile Wireless Netw	orks: Protocols an	d Systems, Prentice Hall	Publisher		
2007, ISBN : 0-13-00	7617-4					
3: https://networksi	mulationtools.com/glon	nosim-simulator-p	rojects/			
R4 : http://vlabs.iitk	gp.ac.in/ant/8/					
Case study						
link:https://www.aca	ademia.edu/33109763/A	_Case_Study_on_I	Mobile_Adhoc_Network_	Security_for_H		
ostile_Environment						
E book link : http://	www.tfb.edu.mk/amarko	oski/WSN/Kniga-w	03.pdf			
E book link : https://	referenceglobe.com/Col	legeLibrary/library	_books/20180301073312	adhoc2-		
ilovepdf-compressed	l.pdf					
Web resources: http	os://archive.nptel.ac.in/c	ourses/106/105/1	<u>06105160/</u> - IIT KGP, Prof	SUDIP		
MISHRA						
Web resources: http	s://www.digimat.in/npte	el/courses/video/10	06105160/L22.html - IIT	KGP, Prof.		
SUDIP MISHRA						
Topics relevant to	development of "Skill	Development":Su	stainable development	tools, Integrity		
Availability Concept	s Policies, procedures,	Guidelines, infrast	tructure-less wireless n	etwork that is		
deployed in a large n	deployed in a large number of wireless sensors.					

Course Code: CSE3073	Course Title: Gam Development	e design and		L-P-C	2	2	3	
	Type of Course: Pro	ogram Core						
Version No.	1.0							
Course Pre-	Nil							
requisites								
Anti-requisites	NIL	-						
Course Description	The Game Design ar focuses on teaching Students will learn mechanics, and ga programming. Thro and refine their ga instructor and thei game engines, and t will culminate in a their completed ga	nd development co students how to game design col ame balance, an ughout the cours me prototypes, r r peers. Topics c the creation of sim final project whe me prototypes to	ourse is a design, d ncepts sind the k se, stude receiving covered i aple 2D ar ere stude the class.	hands-c levelop, uch as p basics o nts will feedbac nclude nd 3D ga nts will	on learn and tes blayer f game work ir ck and prototy me pro presen	ing experi at game pr engageme e art, sou n teams to guidance ping tools totypes. The t and den	ence that ototypes. nt, game und, and o develop from the s, sample he course nonstrate	
CourseObjective	This course is de USING EXPERIE	signed to develo	op ENT IING Te	REPRE	ENEUF es.	RIAL SK	ILLS by	
Course OutComes	At the end of the c CO1 Recall the ele CO2Distinguish be CO3 Employ the co	At the end of the course the student should be able to: CO1 Recall the elements of Game Mechanics. CO2Distinguish between several types of prototypes. CO3 Employ the concepts to create prototypes of games.						
CourseContent:	Game mechanics, structures.Uses ar stages of prototyp	emergence and prime importance of ing, identifying ke	orogressi prototyp ey feature	on, reso ping, dis es, create	urce m tinct ty e funct	echanics, pes of pr oning pro	feedback ototypes, totypes.	
Version No.	1.0							
Module 1	Game Mechanics	Assignment	Evolut protot	ion of yping		Class	No.of ses:12	
Topics: Introduction to Gan emergence and pro in levels, feedback	ne Mechanics, distir ogression, Resource structures and sen	nct types of game mechanics and niotics.	e mechar economi	nics and ies, leve	applica el desig	ntions, cor	icepts of ogression	
Module 2	Designing	Case Study	Import	ance of		C	No.of	
Topics: Introduction to prot as paper, physical, p core game and com	L otyping, uses and in playable, art and sou plete game prototyr	nportance of proto nd prototypes, inf pes.	otyping. I	Distinct to Distinct to Distinct to	types o ty and	f prototyp high-fideli	es such ty code,	
Module 3	Creating and Testing Prototypes	Assignment	Prepar protot game	e physic ype of a	al popula	r No. ofCl	asses:20	
Topics: Documentation_ide	ntifving key feature	s stages of proto	tyning te	esting an	d feed	hack appl	ication of	

Documentation, identifying key features, stages of prototyping, testing and feedback, application of different prototyping techniques such as paper, physical, playable, art and sound prototypes, interface, code, low fidelity and high-fidelity prototyping techniques to create functioning prototypes. **Targeted Application & Tools that can be used:** Algodoo

Project work/Assignment:

- 1. 2D Platformer Design
- 2. Game Development
- 3. UI/UX Design

Textbook(s):

1. Jeremy G. Bond, "Introduction to Game Design, Prototyping, and Development", 2nd Edition, Addison-Wesley Professional, 2017.

References

1. Ennio De Nucci, Adam Kramarzewski, "Practical Game Design : Learn the Art of Game Design Through Applicable Skills and Cutting-edge Insights", Packt Publishing, 2018.

2. Ernest Adams, "Fundamentals of Game Design", Pearson Education, 2012. Weblinks:

<u>https://learn.unity.com/</u> <u>https://starloopstudios.com/rapid-game-prototyping-why-is-it-important-in-game-</u> <u>development/</u>[Text Wrapping Break]

3 0	3						
computa Jiate to a vanced ehind In Is using g & thre nory mo D proces	tation and advanced memory nstruction g dynamic read leve nodels for essors like						
):							
 Discuss the concept of parallelism, virtualization, and memory optimization. Interpret the practices to explore Instruction level parallelism with pipe lining and reducing the cost & hazards using dynamic scheduling. Explain the intuition behind multiprocessing & thread level parallelism using shared, distributed and directory-based memory models for synchronization and consistency. 							
10	0 Classes						
for Perf y Technc	rformance iology and						
ı 9	Classes						
nstraint ranch Pr nitations	its, Out of Prediction s of ILP.						
9 (Classes						
	9						

Module 4	Data Le Parallelism	evelAssignment	Analysis,	Data Collection	9 Classes
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Topics:

Introduction, Vector Architecture, SIMD Instruction Set Extensions for Multimedia, Graphics Processing Units, GPU Memory Hierarchy, Detecting and Enhancing Loop- Level Parallelism Case Study: Nvidia Maxwell.

Targeted Application & Tools that can be used:

Targeted employment sector is processor manufacturing and memory chip fabrication vendors like Intel, AMD, Motorola, NVidia, Samsung, Micron Technology, western Digital etc. Targeted job profiles include Memory circuit design and verification engineers, Physical system design engineer, System programmer, Fabrication engineer etc.

Tools:

- Virtual Lab, IIT KGP
- Tejas Java Based Architectural Simulator, IIT Delhi

Project work/Assignment:

Case Study:

- Memory Hierarchies in Intel Core i7 and ARM Cortex-A8
- Dynamic Scheduling in Intel Core i7 and ARM Cortex-A8

Term Assignments:

• Comparative analysis of instruction set architecture (ISA) of CISC and RISC processors

Carry out a thorough analysis of the internal organization and Instruction set Architecture of stateof the art CISC processors like VAX, PDP-11, Motorola 68k, Intel's x86 and the best in the market RISC architectures including DEC Alpha, ARC, AMD 29k, Atmel AVR, Intel i860, Blackfin, i960, Motorola 88000, MIPS, PA-RISC, Power, SPARC, SuperH, and ARM too.

• A short survey of the recent trends in advanced Cache memory optimization

Study and analyze few important present day cache memory optimization techniques the levels used, the mapping technique employed, read and write policies, coherency and consistency scenarios etc.

Text Book

1. J.L. Hennessy and D.A. Patterson, "Computer Architecture: A Quantitative Approach", 6th Edition, Morgan Kauffmann Publishers, November 2021.

References

1. J.P. Shen and M.H. Lipasti, "Modern Processor Design: Fundamentals of Superscalar Processors", 2nd Edition paperback imprint, McGraw-Hill Higher Education, 2013.

2. D.B. Kirk and W.W. Hwu, "Programming Massively Parallel Processors", 3rd Edition, Morgan Kauffmann Publishers, November 2016.

Topics relevant to development of "FOUNDATION SKILLS": Pipelining, CISC and RISC processors, Static and Dynamic scheduling

Topics relevant to "HUMAN VALUES & PROFESSIONAL ETHICS": Collaboration and Data collection for Term assignments and Case Studies.

Course Code:	Course Title: Real Time Operating Systems	L- P- C	3	0	3		
CSE3085	Type of Course:Theory		0	Ŭ	0		
Version No.	1						
Course Pre-	NIL						
requisites	NIT						
Anti-requisites							
Course Description	The Real-time Operating Systems program is an en- document included in the master's educational progra- of skills and competencies related to the study of the systems, as well as real-time systems. Real-time Op formation of competencies aimed at obtaining embedded operating systems, and the acquisit competencies in installing, configuring and debuggin This course is designed to develop ENTREPRE	ducation am, prov features erating S theoreti tion of ng opera NEURIA	al and a ides for of embe Systems cal kno praction ting systems AL SKI	the active the active the active edded of a state of the active edded of the active ed	lological quisition perating ed at the e about ills and by using		
	EXPERIENTIAL LEARNING Techniques.						
Course Out Comes	 Course Out Comes Explain the fundamentals of Real time systems and the classifications. Understand the concepts of System control and the suitable computer hardware requirements for real-time applications. Describe the operating system concepts and techniques applicab for real time systems. Apply deadlock detection and prevention algorithms to solve the given problem 						
Course Content:							
Module 1			8	Sessio	ns		
Introduction Re Introduction to Op threading concepts	eal Time Operating System perating System: Computer Hardware Organization, 1 s, Processes, Threads, Scheduling	BIOS an	d Boot	Proces	s, Multi-		
Module 2			8	Sessio	ns		
BASICS OF REAL-TIME CONCEPTS Terminology: RTOS concepts and definitions, real-time design issues, examples, Hardware Considerations: logic states, CPU, memory, I/O, Architectures, RTOS building blocks, Real-Time Kernel							
Module 3			8	Sessio	ns		
PROCESS MANAGEMENT Concepts, scheduling, IPC, RPC, CPU Scheduling, scheduling criteria, scheduling algorithms Threads: Multi-threading models, threading issues, thread libraries, synchronization Mutex: creating, deleting, prioritizing mutex, mutex internals							
Module 4			8	Sessio	ns		
INTER-PROCES deadlock, priority	S COMMUNICATION: Messages, Buffers, main inversion.	lboxes,	queues	, sema	phores,		
PIPES MEMORY overlays, block/pa	Y MANAGEMENT: - Process stack management, r ge management, replacement algorithms, real-time g	run-time arbage c	buffer ollectio	size, sv n	vapping,		
Text Book 1. J. 2. Ja	J Labrosse, "MicroC/OS-II: The Real –Time Kernel" ne W. S. Liu, "Real-time systems", Prentice Hall, 20	", Newne 00.	es, 2002	2.			

References

1. W. Richard Stevens, "Advanced Programming in the UNIX® Environment", 2nd Edition, Pearson Education India, 2011.

2. Philips A. Laplante, "Real-Time System Design and Analysis", 3rd Edition, John Wley& Sons, 2004

3. Doug Abbott, "Linux for Embedded and Real-Time Applications", Newnes, 2nd Edition, 2011.

Web resources:<u>http://pu.informatics.global</u>

Topics relevant to development of "Skill Development":Threads: Multi-threading models, threading issues, thread libraries, synchronization

Course Code:	Course Title: Software	Architecture						
CSE3089				L-T-P- C	3	0	0	3
	Type of Course: Theory	Only						
Version No.	2.0							
Course Pre- requisites	Software Engineering and Object-oriented Analysis and design							
Anti-requisites	NIL							
Course	This course deals with ba	asic concepts and prin	ciples rega	ording sof	tware	e archi	itectu	re and
Description	software design. It start	s with discussion on i	mportance	of Archi	tectu	res, de	esign i	ssues,
	followed by coverage of	blowed by coverage on design patterns. It then gives an overview of architectural						
	structures and styles. F	Practical approaches	and meth	ods for (creati	ng an	d ana	lysing
	software architecture is	presented. The empl	hasis is on	the inter	actior	n betw	veen q	juality
	attributes and software	architecture. Studen	ts will also	gain exp	erien	ce wit	th exa	mples
	in design pattern applica	ation and case studies	s in softwa	re archite	ecture	2.		
Course	This course is designed	to improve the learn	ers' EMPLO	OYABILIT	Y SKI	LLS by		
Objective	using PARTICIPATIVE LE	ARNING techniques						
Course Out	COURSE OUTCOMES:	On successful compl	etion of th	e course	the			
Comes	students shall be	able to:						
	CO1. Describe the impo	rtance of software are	chitecture	in large-s	cale s	oftwa	are	
	systems.			-				
	CO2.Understand the ma	jor software archited	tural-styles	s, design-	patte	rns, ai	nd	
	frameworks.		•		•	-		
	CO3. Distinguish the qua	lity attributes of a Sys	stem Archi	tecture.				
	CO4.Identify the approp	, priate architectural pa	ttern(s) foi	a given	scena	rio		
Course Content:	, , , , , , , , , , , , , , , , , , , ,	· · · · ·		0				
Module 1	Introduction	Quiz	Introducti	on on S/V	ΝA	08 9	Sessio	ns
Topics: The Ar	chitecture Business Cycl	e: Software processe	s and the a	architecti	ure bi	usines	s cycl	<u>a</u> :
What makes	a "good" architecture.	Influence of softwar	e archited	ture on	orga	nizatio	on-hot	h
business and	technical Architectural	natterns reference	models ar	nd refere	nce	archite		ς.
Architectural	structures and views.							.,
/ a chitectului a	Architectural Styles and							
Module 2	Case Studies	Quiz	Design			07	Sess	ions
Topics: Architec	tural styles; Four Archite	ectural Designs for t	he KWIC S	System; I	Pipes	and f	filters;	Data
abstraction and	object-oriented organiza	tion; Event-based, im	plicit invoc	ation; La	yered	l syste	ems; S	ervice
oriented archite	cture, Hypertext style, I	Repositories; Interpre	eters; Hete	erogeneo	us ar	chited	tures.	Case
Studies: Keyword	d in Context, Mobile Rob	ot system.	1					
Module 3	Quality: Functionality and architecture	Quiz	Quality At	tributes		09	Sess	ions
Topics: Architec	ture and quality attribu	tes; System quality	attributes;	Quality	attrik	oute s	scenar	ios in
practice; Busine	ss qualities; Introducing	tactics; Availability t	actics; Mo	difiabilit	y taci	tics; P	erforr	nance
tactics, Security	tactics. Quality Model, Ap	plication of The Cust	omized Qu	ality Mo	del to	a Cas	e Stuc	ły
Module 4	Architectural patterns and styles	Seminar	Architectu	iral styles	5	17	Sessio	ons
Topics: Archit	ectural Patterns: Introdu	iction: From Mud to	Structure	: Lavers	Pine	s and	Filter	S.
Blackboard, Di	istributed Systems: Broke	er. Design Patterns: St	ructural de	composi	tion:	Whole	e – Par	t;
Organization of	of work: Master – Slave:							-,
Model View (Controller and Reflection	patterns. Introduction	on to Servi	ce Orien	ted A	rchite	cture.	Three
Types of Service-	Oriented Architecture	•					,	
Targeted Applica	ation & Tools that can be	e used:						
Multiple integra	tions with other major a	rchitecture software	(ArchX. Ar	chisoft. F	Build	softwa	are. A	stena
Bouwsoft. Team	leader. Total Synergy, etc	.) and export opportu	inities with	google	Irive	dronh	ox. an	d CSV
formats allow th	is tool to be widely and c	omfortably used in th	ne industrv		-)	~	,	
Professionally us	sed software-Slack. Goo	ogle calendar, outlook	email . an	d others.				
Quiz and Semina	ar	~ , , , , , , , , , , , , , , , , , , ,	,					

Quiz on topics from the module 1,2 and 3. Seminar topics will be given to students to present in the class

Text Book

1. T1.Software Architecture in Practice–LenBass,PaulClements,RickKazman,2ndEdition,Pearson Education, 2019.

T2.Pattern-OrientedSoftwareArchitecture,ASystemofPatterns-Volume1–FrankBuschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal, John Wiley and Sons, 2019.

T3.MaryShawandDavidGarlan:SoftwareArchitecture-PerspectivesonanEmergingDiscipline, Prentice-Hall of India, 2007.

References

R1.DesignPatterns-ElementsofReusableObject-OrientedSoftware–E.Gamma,R.Helm,R.Johnson,J. Vlissides:, Addison- Wesley, 1995.

E-Resources

W1. WebsiteforPatterns: http://www.hillside.net/patterns/

Topics relevant to the development of SKILLS:

Casestudy on Architectural styles

ModelViewPresenter(MVP) Architecture

Course Code: CSE 2028	Course Title: Stati Data Science Type	stica of (ll Founda Course: In	tion of tegrated	L-P-C	2	2	3
Version No.	1				I			
Course Pre- requisites	Basic knowledge at learning.	out	mathemati	cal operatio	ons and stat	istics,	, Macł	nine
Anti-requisites								
Anti-requisites Course Description Course Objective	This course is inten field of data scienc statistics with the l simple explanation, machine learning th multiple regression generalized linear n learning and factor topics. This course is desig <u>SKILLS</u> by using r	ded f e and nelp Thi neory n, ko node mode mode	for those d d are look of insight s course g v, methods ernel lear ls and qua dels, princ to improve world PRC	evelopers w ing for conc ful content ives in dep , and algori ning, spars si-likelihood cipal compo e the learner DBLEM-SC	ho are interiors based exert th introduct thms for d e regressi d, covarian onent analy 's <u>EMPLO</u>	restect ation rcises, ction t ata sc on, s ce ysis at DYAI nethoo	l in en on the o stati ience. sure s nd oth	tering the e topic of pples and istics and It covers creening, her related $\underline{\mathbf{Y}}$ es.
Course Out Comes	On successful com 1. Identify the s (Knowledge) 2. Apply logica Dimensional Infe 3. Classify the n unsupervised le 4. Demonstrate data science app	pleti statis al thi erence releva arnin diffe licat	on of the tical conce nking, solve. (Applica ant topics i ng (Compre- erent types ions. (App	course the septs in the fi we the problection) n statistics and ehension) of data class lication)	students shi ield of data em in conta nd supervis sification re	hall b a scier ext of sed les eal -wo	e able ace. High arning orld pr	to: & oblems of
Course Content:								
Module 1	Multiple and Nonparametric Regression	Ass	signment	Data Collection	/Interpreta	tion	10	Sessions
Topics: Introduct	ion. Multiple Linear	Re	gression -	The Gauss	s-Markov	Theor	rem. S	Statistical
Tests Weighted L	east-Squares, Box-Co	ox Ti	ansformat	ion, Model	Building a	nd Ba	asis Ex	pansions
- Polynomial Reg Variance Tradeoff Path Kernel Ridg	gression, Spline Reg , Penalized Least Sq e Regression	ression	on, Multij 5, Bayesiai	ole Covaria n Interpretat	tes, Ridge ion, Ridge	Regr Regr	ression ession	n - Bias- Solution
Module 2	High Dimensional Inference	Cas	se studies	Case s	studies / Ca	ase let	10	Sessions
Topics: Inference in linear regression - Debias of regularized regression estimators, Inference in generalized linear models, Test of linear hypotheses, Numerical comparison - Asymptotic efficiency, Statistical efficiency and Fisher information, Linear regression with random design, Partial linear regression, Gaussian graphical models - Inference via penalized least squares, Sample size in regression and graphical models, General solutions.								
Module 3	Mathematics of mach learning	ine	Quiz		Case studi	es		10 Sessions
Topics: Bayesian modelling and Gaussian processes, randomized methods, Bayesian neural networks: approximate inference, variational autoencoders, generative models, applications. Recurrent neural networks, backpropagation through time, Long short term memory networks, neural Turing machines, machine translation, Restricted Boltzmann Machin								
Module 4	Advanced Neural Networks		Quiz		Case studi	ies		10 Sessions

Convolutional neural network, Prediction of data using Convolutional Neural Networks, Generative adversarial networks-Deep learning in Sequential Data, RNN(Recurrent Neural Networks) & LSTM(Long Short Term Memory), GRU(Gated Recurrent Unit), Sentiment Analysis, Recommender systems.

List of Laboratory Tasks:

Experiment No 1: Working with Numpy arrays

Level 1: Basic Statistics, Copying, & Subsetting, Indexing, Flattening,

Level 2: Dealing with Missing Values, and filling with missing values

Experiment No. 2: Working with Pandas data frames

Level 1: Descriptive Statistics, Basic statistical functions

Level 2: Statistical functions, Aggregations

Experiment No. 3: Develop python program for Basic plots using Matplotlib

Level 1: Plot, Line, Scatter Plot, Pie Charts, Bars, Histogram, Box Plots

Level 2: Time Series, Categorical Data, and Text Data

Experiment No. 4: Develop python program for Frequency distributions

Level 1: student dataset , pollution dataset

Level 2: stack market dataset

Experiment No. 5: Develop python program for Variability

Level 1: Statistical values

Level 2: Probability Distributions and Pipes

Experiment No. 6: Develop python program for Normal Curves

Experiment No. 7: Develop python program for Correlation and scatter plots

Experiment No. 8: Develop python program for Correlation coefficient

Experiment No. 9 : Develop python program for Simple Linear Regression

Experiment No. 10: Apply and explore various plotting functions on UCI data sets, Normal curves, Density and contour plots, Correlation and scatter plots

Targeted Applications & Tools that can be used:

- Data Analysis
- Data classification
- Data Exploration
- Data Clustering

Tools:

Python with statistical packages

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

• After completion of each module a programming-based Assignment/Assessment will be conducted.

• A scenario will be given to the students to be developed as a series of Program/ Application.

• On completion of Module 2 and Module 4, students will be asked to develop a Mini Project using python.

Text Book

T1 Fan, Jianqing, Runze Li, Cun-Hui Zhang, and Hui Zou. *Statistical foundations of data science*. CRC press, 2020.

T2 Alan Agresti, Maria Kateri "Foundations of Statistics for Data Scientists With R and Python" 2021

References Books

R1. James, G., Witten, D., Hastie, T.J., Tibshirani, R. and Friedman, J. (2013). *An Introduction to Statistical Learning with Applications in R*. Springer, New York.

R2. Hastie, T.J., Tibshirani, R. and Friedman, J. (2009). *The elements of Statistical Learning: Data Mining, Inference, and Prediction* (2nd ed). Springer, New York.

R3. Buehlmann, P. and van de Geer, S. (2011). *Statistics for High-Dimensional Data: Methods, Theory and Applications*. Springer, New York.

E book link 1.W. N. Venables, D. M. Smith and the R Core Team, https://www.ebooksdirectory.com/details.php?ebook=1791

Web link:

- 1. https://www.udemy.com/course/statistics-for-data-science-and-business-analysis(Udemy)
- 2. <u>https://www.coursera.org/learn/foundations-of-data-science(Coursera)</u>

Topics relevant to the development of "Foundation Skills":

• Data Exploration using Python and R Programming. **Topics relevant to the development of "Employability Skills":** Statistical Data Analysis and exploration using Python and R Programming.

Course Code:	Course Title: Machine Visio	n						
UG COURSE: CSE3013	Type of Course: Discipline e embedded lab	elective Theory with	L-P-C	2	2	3		
Version No.	1.0							
Course Pre~	MAT1003 Applied Statistics	3						
requisites	CSEZU48 RODOTIC VISION							
requisites	NIL							
Course Description	mplementation of computer vision systems and technologies for visual berception and analysis. This course provides an in-depth understanding of the undamental principles, algorithms, and applications of machine vision. The Machine Vision course covers a wide range of topics related to computer rision, image processing, and pattern recognition. It combines theoretical concepts with hands-on practical exercises to provide students with a comprehensive understanding of machine vision techniques. Introduction to Machine Vision, Image Acquisition and Preprocessing, Image Segmentation and reature Extraction, Object Detection and Recognition, Machine Vision Systems and Applications.							
Course Object	The objective of the course is Vision and attain Employabilit	to familiarize the learner y through Problem Solvin	s with the g Methode	conce ologies	pts of N	1achine		
Course Out Comes	On successful completion of the course the students shall be able to: 1. Gain a solid understanding of the fundamental principles and concepts underlying machine vision systems, including image processing, computer vision algorithms, and pattern recognition techniques. [Knowledge] 2. Acquire knowledge of various machine vision algorithms and techniques used for tasks such as image acquisition, preprocessing, segmentation, feature extraction, object detection, tracking. 3. Ability to Implement Machine Vision Systems Develop the skills to design, implement, and evaluate machine vision systems using programming languages and libraries commonly used in the field, such as MATLAB, OpenCV, Python, TensorFlow, or PyTorch. [Application] 4. Gain hands-on experience through lab exercises, projects, and assignments that involve implementing and experimenting with machine vision algorithms and systems. [Application] 5. Develop teamwork and communication skills by working on group projects and effectively presenting findings and results related to machine vision							
Course Content:								
Module 1	Introduction to Machine Vision	Assignment	Practical		N Cla	o. of sses:8		
Overview of ma Challenges and	chine vision and its application limitations in machine vision	ns, Basic components of a	machine	vision s	ystem,			
Module 2	Image Acquisition and Preprocessing	Assignment	Practical		N Clas	o. of ses:14		

Image formation and acquisition methods, Image enhancement techniques, Noise reduction and image denoising.

Image Segmentation and Feature Extraction: Thresholding techniques

- Edge detection algorithms
- Region-based segmentation
- Feature extraction methods

Module 3	Object Detection and Recognition	Assignment	Practical	No. of Classes:8
Object detect Machine lear	ion algorithms (e.g., template r	natching, Haar case d recognition	ades),Feature-based ob	ject recognition,
Module 4	Machine Vision Systems and Application	Assignment	Practical	No. of Classes:8
• Indus	strial machine vision systems	I		
RoboMediSurveAugn	tics and autonomous systems cal imaging and healthcare app eillance and security systems nented reality and virtual reality	plications y applications		
Lab Experi Lab Sheet 1. Image L	iments are to be conduct t 1: Loading and Display: Load an image from a file	ed on the follow	ring topics:~	
0	Display the loaded image	using the imshow f	unction(Or	ne Lab Session)
2. Image A	rithmetic Operations:	C	`	· · · ·
0	Perform addition, subtraction	ion, and multiplica	tion of images using b	asic arithmetic
0	perations.			
0	Display the results of each	operation using th	e imshow function	(One Lab
S	ession)	T		
S. Implement Session)	ation of Transformations of an	Image		One Lab
a. b. 4. Contr Lab Session)	Scaling & Rotation Gray level transformations, j rast stretching of a low contrast	oower law, logarith image, Histogram,	mic, negative. and Histogram Equaliza	ation(One
Lab Sheet	t 2:			
5. Edge	Detection:			
a	. Apply edge detection algo	rithms (e.g., Sobel	, Canny) to detect edg	es in the
b o	nage. Display the edge-detected riginal. (One Lab Session)	images using imsh	ow and compare then	n with the
6. Imag	e Restoration:			
a 1	. Introduce noise (e.g., Gau	ssian, salt and pep	per) to the image usir	ng functions
b to	A Apply suitable restoration or remove the noise.	techniques (e.g., 1 Session)	nedian filtering, Wier	ter filtering)
7. Imag	e Segmentation:	r		
a b c o	 Convert the image to gray Perform thresholding usin Display the segmented im- riginal. 	scale using the rgb ig a suitable thresh age using imshow a (One Lab Sessic	² gray function. 10ld value to segment 1nd compare it with th 20) (Level 2)	the image. 1e
Lab Sheet	t 3 :		· •	
8. Fea	ature Extraction:			
a	. Texture feature extraction	using methods like	e Gray-Level Co-occu	rrence Matrix
(GLCM) or Local Binary Patte	erns (LBP).	-	

b. Shape feature extraction (e.g., area, perimeter, eccentricity) using region properties.

c. Color feature extraction using color histograms or color moments. (Two Lab Session) (Level 2)

Lab Sheet 4: (Group Project)

9. Object Detection and Recognition:

• Haar cascade object detection (e.g., face detection or object detection using pre-trained classifiers).

• Feature-based object detection using techniques like Speeded-Up Robust Features (SURF) or Scale-Invariant Feature Transform (SIFT).

• Deep learning-based object detection using Convolutional Neural Networks (CNNs) or You Only Look Once (YOLO) algorithm.

10. Optical Character Recognition (OCR):

a. Preprocessing of text images (e.g., binarization, noise removal, or skew correction).

b. Text localization using techniques like connected component analysis or Stroke Width Transform (SWT).

c. Character recognition using machine learning algorithms like Support Vector Machines (SVM) or Convolutional Neural Networks (CNNs).

11. Gesture Recognition:

a. Hand segmentation using techniques like background subtraction or skin color detection.

b. Feature extraction from hand regions (e.g., finger counting, hand shape descriptors).

c. Classification of gestures using machine learning algorithms (e.g., k-Nearest Neighbors or Support Vector Machines).

Tools/Software Required :

1. OpenCV 4

- 2. Python 3.7
- 3. MATLAB

Text Books

1. "Machine Vision: Theory, Algorithms, Practicalities" by E.R. Davies 4th edition 2005

References

2. "Computer Vision: Algorithms and Applications" by Richard Szeliski 2nd edition 2022.

3. Ravishankar Chityala, Sridevi Pudipeddi, "Image Processing and Acquisition Using Python", Taylor & Francis, 2020.

Course Code: CSE 3038	Course Title: Applied Data Science Type of Course: Program Core Theory and Laboratory Integrated	L-P-C	2	2	3
Version No	1.0				
Course Pre- requisites	knowledge of statistics and Machine learning				
Anti- requisites	-				

Course Descripti on	This course introduces the core concepts of Data Science followed by programming using R. This course has the theory and lab component which emphasizes on understanding and programming right from Basics to Visualization, and analysis in R. It helps the student to explore data by applying these concepts and also for effective							
	problem solving, visualizing and analyzing.							
Course Objective s	This course is designed to improve PROBLEM-SOLVING methodologie	e the learner's EMPLOYABILITY es.	SKILLS by usir	ng real-world				
Course Out Comes	 On successful completion of the course, the students shall be able to: 1. Discuss the process involved in Data Science (Knowledge) 2. Apply suitable models using machine learning techniques and analyze their performance (Application) 							
	3. Analyze the performance of th4. Demonstrate the different meproblems (Application)	ne model and the quality of the	e results (App rategies to rea	llication) 1-world				
Course Content:								
Module 1	Introduction to Data Science	Assignment	Case Studies	10 Sessions				
Concept Dimension	Learning: Formulation of Hypoth n – Hypothesis elimination – Car PREPARING MODEL USING	hesis – Probabilistic Approxin adidate Elimination Algorithm	mately Correc	t Learning - VC				
2	K	Assignment	g	10 505510115				
Topics: Regression and Rando	n Models- Linear and Logistic Mod om Forest, Clustering Models – K l	lel, Classification Models – Dec Means and Hierarchical cluster	cision Tree, Na ing	üve Bayes, SVM				
Module 3	Performance Evaluation	Assignment	Programmin g	8 Sessions				
Model Ev Function a Evaluation	aluation Techniques: Hold out, cr and Error: Mean Squared Error, F n criteria: Accuracy, F1 score – S	ross-validation - Prediction E Root Mean Squared Error – M Sensitivity – Specificity – AU	rrors: Type I, Iodel Selection C	Type II - Loss n and				
Module 4	Applications of Data Science	Case Study	Programmin g	8 Sessions				
Predictive series fore	Modeling: House price prediction casting: Weather Forecasting Reco	n, Fraud Detection Clustering: ommendation engines: Produc	Customer Seg	mentation Time ation.				
List of La Experime La Ra La	boratory Tasks: nt No 1: Create an array and per- evel 1: Basic Statistics, Copyin, eshaping, Resizing, evel 2: Sorting, Swapping, and E	erform the following operation g, Slicing & Subsetting, Indo Dealing with Missing Values	ons on it exing, Flatten	ing,				
Experime Lo D	evel 1: Descriptive Statistics, In ealing with Missing Data	dexing & ReIndexing, Rena	ming, Iterations	on, Sorting,				

Level 2: Statistical functions, Window functions, Aggregations Experiment No. 3: Create an R Data frame and perform the following operations on it Level 1: Group by Operations, Merging/Joining, Concatenation, Level 2: Time Series, Categorical Data, and Text Data **Experiment No. 4:** Using R graphics perform the following Level 1: Plot, Line, Scatter Plot, Pie Charts, Bars, Histogram, Box Plots. Level 2: 3D Pie Charts, 3D Scatter Plot, GG Plot **Experiment No. 5:** Using R Statistics perform the following Level 1: Max & Min, Mean Median Mode, Subgroup Analyses, Level 2: Probability Distributions and Pipes **Experiment No. 6:** House rent prediction using linear regression **Experiment No. 7:** Analysis of tweet and retweet data to identify the spread of fake news **Experiment No. 8:** Perform analysis of power consumption data to suggest minimizing the usage Experiment No. 9: Agricultural data analysis for yield prediction and crop selection on Indian terrain data set **Experiment No. 10**: Behavioural analysis of customers for any online purchase model **Targeted Applications & Tools that can be used:** Data Exploration • Data classification • Data Analysis Tools: • R Studio Project work/Assignment: Mention the Type of Project /Assignment proposed for this course • After completion of each module a programming-based Assignment/Assessment will be conducted. A scenario will be given to the students to be developed as a series of Program/ Application. On completion of Module 2 and Module 4, students will be asked to develop a Mini Project using R. **Text Book** 1. The Essentials of Data Science, Knowledge Discovery Using R, Graham J Williams, CRC Press, 2017 2. HadleyWickhmen, Garrette Grolemund, R for Data Science: Import, Tidy, Transform, Visualize and Model Data, OReilly, 2017 3. Build A Career in Data Science, March 2020, by Emily Robinson, Jacqueline Nolis References Books 1. R for Data Science by Hadley Wickham & Garrett Grolemund, Reference, 2017 2. Practical Data Science CookBook, APRESS Publications, 2018 Web Links: 1. <u>https://www.coursera.org/learn/introducton-r-programming-data-science</u> (Coursera) 2. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE _BASED&unique_id=DOAJ_1_02082022_1773 (E-Library Resource) 3. https://onlinecourses.nptel.ac.in/noc22_cs32/preview (NPTEL) Topics relevant to the development of "Foundation Skills": • Data Exploration R Programming. Topics relevant to the development of "Employability Skills": • Data Analysis and Visualization using R Programming.

Course Code: CSE3076	Course Title:Artificial Intelligencefor RoboticsL- P- CType of Course:Theory Only Course	0	3							
Version No.	1									
	-									
Course Pre-requisites										
Anti-requisites	-									
Course Description	The course "Artificial Intelligence for Robotic Theory" aims to provide students with a deep understanding of the theoretical foundations and advanced concepts in artificial intelligence (AI) as they apply to robotics. The course delves into the theoretical underpinnings of AI algorithms, models, and methodologies used in robotic systems, enabling students to analyze and develop novel AI solutions for complex robotic tasks. Through a combination of lectures, discussions, and theoretical exercises, students will explore key AI theories and their applications in robotics. Students will also critically analyze research papers and gain insights into the current state-of-the-art in AI for robotics.									
Course Objective	The objective of the course is skill development of s Participative Learning techniques	The objective of the course is skill development of student by using Participative Learning techniques								
Course Out Comes	 On successful completion of the course the students shall be able to: Summarize the basics of artificial intelligence and its application in the context of robotics. [Understanding] Infer the fundamental concepts and components of robotics, including robot anatomy and the systems engineering approach. [Understanding] Apply the knowledge of image recognition processes and techniques, including image processing, convolution, artificial neurons, and convolutional neural networks. [Appling] Apply the knowledge about how to build a system which detects objects and speech using driftnet techniques. [Appling] 									
Course Content:										
Module 1	Foundation for Robotics and AI	8 Sessi	ions							
Topics: The basic principle of rob OODA (Observe- Orient- Introducing the robot and Robot control systems and soft real-time control.	otics and AI: Introduction to AI, the example prob Decide- Act) loop, Artificial intelligence and advan development environment, Software components (l a decision-making framework, The robot control sy	lem – clean up nced robotics ' ROS, Python, 'stem – a contr	this room, Fechniques, and Linux), ol loop with							
Module 2	Robot Design Process	10 Ses	sions							
Topics: Introduction to what is a robot, Robot anatomy – robots made of A systems engineering-based approach to robotics, Subsumption architecture, Use cases (The Problem Part-1, Problem Part-2), Subsumption architecture: Storyboard – put away the toys, Decomposing hardware needs, Breaking down software needs.										
Module 3	Object Recognition Using Neural Networks	10 Ses	sions							
Fopics: The image recognition pro process – step by step, I network process, Build the	cess, Technical requirements, The image recognitio mage processing, Convolution, Artificial neurons toy/not toy detector	n training and , The convolu	deployment ition neural							
Module 4	Robot speech recognition	10 Ses	sions							
Topics: Introduction to Teaching a Robot to Listen, teaching a Robot to Listen, Robot speech recognition, Robot speech recognition, Intent, Mycroft, Demo of speech recognition.										
Targeted Application & 7Application Area:	Fools that can be used:									

Resource Allocation, Finance and Economics (Risk Analysis and Consumption Assessment), Fraud Detection, Image Segmentation, Dimensionality Reduction, Gene Expression Analysis, Recommender System, Image reconstruction, Large Scale Surveillance.

Tools:

Anaconda Navigator Python Packages

Project work/Assignment:

Assignment:

Train a system to recognize the speech.

Train a system to recognize the object.

Text Book

T1. Artificial Intelligence for Robotics by Francis X. Govers, Released August 2018, Publisher(s): Packt Publishing, ISBN: 9781788835442.

References

R1. Introduction to AI Robotics Robin R. Murph, ISBN 0-262-13383-0 (hc.: alk. paper)

R2. Introduction to AI Robotics, Second Edition by Robin R. Murphy, ISBN 9780262348157 E book link

R1: https://doc.lagout.org/science/0_Computer%20Science/8_Electronics%20%26%20Robotics/Int roduction%20to%20AI%20Robotics%20-%20Murphy%20R.R.pdf

Topics relevant to development of "Skill Development": Object Detection, Speech Recognition

Course Code: CSE3095	Course Title: Cloud Securit Type of Course: Discipline Computing Basket Theory	y Elective in Cloud	L- P- C	3	0	3
Version No.	1.0					
Course Pre- requisites	[1] Cloud Computing and S	ervices (CSE322)				
Anti-requisites	NIL					
Course Description	This course provides groun landscape, architectural princ architecture and explores the	d-up coverage on the ciples, and techniques. guiding security for In	high-leve It describe frastructure	el conc es the (e and S	cepts o Cloud s Softwar	f cloud security es.
Course Objective	This course is designed to i by using <u>EXPERIENTIAL</u>	mprove the learners' <u>LEARNING</u> techniqu	EMPLOY les.	ABIL	<u>ITY S</u>	KILLS
Course Outcomes Course	On successful completion of 1. Describe fundamen 2. Explain cloud co challenges [Comprehension 3. Discuss cloud compu 4. Apply infrastructure enviroment. [Application].	this course the students ntals of cloud compu- omputing security n]. nting software security security and data secur	s shall be a ting [Knov architectu essentials rity in clou	ble to: wledge re an [Comp d comp]. d ass orehens outing	ociated sion].
Content:						
Module 1:	Fundamentals of Cloud	Ouiz	Knowledg	ge base	ed G	10
	Computing		Quiz		Se	ssions
Platforms and T Framework, Clor Infrastructure as a Module 2:	Cloud Security Cloud Computing as a Service (Sa Service (IaaS), Cloud Deploy Cloud Security Challenges and Cloud Security	ng Architecture: Clor SaaS), Cloud Platforn ment Models, Expecte Quiz	ad Deliver n as a Se ed Benefits Compreh- based Qu	ry Moo rvice ension iz	dels, T (PaaS),	The SPI Cloud 10 ssions
Topics: Socurity	Policy Implementation Com	utor Socurity Incident	Paspansa	Toom	Virtuo	lization
Security Manage	ement. Architectural Conside	rations, Identity Man	agement a	and Ac	ccess (Control,
Module 3	Cloud Computing Software Security Essentials	Assignment	Batch-wis Assignme	se ents	9 S	essions
Topics: Cloud In	nformation Security Objective	es, Cloud Security Se	rvices, Sec	cure C	loud S	oftware
Requirements, C	Cloud Security Policy Imple	mentation, Secure Cl	oud Softv	vare T	esting,	Cloud
Computing and B	Susiness Continuity Planning/L	Assister Recovery.	Det al. and			
Module 4:	and Data Security	Presentation	Assignme Presentati	se ent and ions	9 S	essions
Topics: Infrastru	ucture Security: The Network	Level, The Host Leve	el, The App	olicatio	n Leve	1.
Data Security :	Aspects of Data Security, Data	Security Mitigation, I	Provider Da	ata and	its Sec	curity.
Targeted Applic	ation & Tools that can be use	ed: Use of CloudSim	simulator	•		
Project work/As	signment:					
Survey on Cloud	i Service r roviuers					
1. Rajkuma <i>Computing</i> ", 2. Roland L	ar Buyya, Christian Vecchio McGraw Hill Education, Ju Krutz and Russell Dean Vines Computing" Wiloy Publishi	la, and Thamarai Sel ly 2021. s, " <i>Cloud Security - A</i>	vi, "Maste Comprehe	ering (nsive (Cloud Guide te	0

References

1. Sushil Jajodia, Krishna Kant, Pierangela Samarati, Anoop Singhal, Vipin Swarup, Cliff Wang, "Secure Cloud Computing", Springer, ISBN 978-1-4614-9278-8 (eBook).

2. John Rittinghouse and James Ransome, "Cloud Computing, Implementation, Management and Security", CRC Press, 2010.

3. Tim Mather, Subra Kumaraswamy and Shahed Latif", "Cloud Security and Privacy – An Enterprise Perspective on Risks and Compliance", Oreily Publication, 2009.

Topics related to development of "FOUNDATION": Cloud computing architecture, Security policy implementation.

Topics related to development of "EMPLOYABILITY": Infrastructure security and Data security.

Course Code:	Course Title: Malwar	re Analysis			I_ D_			
CSE3102	Type of Course: Discip Basket	oline Elective i	n Cyber Secur	ity	C	3	0	3
Version No.	1.0							
Course Pre- requisites	Have the knowledge	of Cryptograpl	ny and Netwo	ork Securi	ty			
Anti-requisites	NIL							
Course	The purpose of the	e course is to	o explore m	alware a	analysis	s to	ols	and
Description	techniques in depth. an organization's abil security incidents, a foundation for rever system and network other tools useful for	chniques in depth. Understanding the capabilities of malware is critical to n organization's ability to derive threat intelligence, respond to information ecurity incidents, and fortify defenses. This course builds a strong bundation for reverse-engineering malicious software using a variety of ystem and network monitoring utilities, a disassembler, a debugger, and ther tools useful for turning malware inside-out						
Course	To study the fundamen	tals of malware	s.					
Objective	To know about differen To know how to work o To learn, analyze and d	o know about different malicious programs and their behavior o know how to work on linux systems. o learn, analyze and demonstrate network hacking tools						
Course	On successful comple	tion of this co	urse the stud	ents shal	l he ah	le to	·.	
OutComes	 Understanding the nature of malware, its capabilities, and how it is combated through detection and classification. Apply the methodologies and tools to perform static and dynamic analysis on unknown executables. Analyze scientific and logical limitations on society's ability to combat malware Apply techniques and concepts to unpack, extract, decrypt, or bypass new anti analysis techniques in future malware samples. 							
Course								
Content:	Introduction to							
Module 1	MALWARE ANALYSIS (Application)		Assignment	Program activity	ming		н	12 ours
Topics:								
Introduction to	malware, OS securit	ty concepts, r	nalware thre	ats, evol	ution	of n	nalv	ware,
malware types	viruses, worms, root	tkits, Trojans,	bots, spywa	are, adw	are, lo	ogic	bo	mbs,
malware analysi	is, static malware ana	lysis, dynamic	malware ana	lysis.				
Module 2	Static Analysis (Application)		Assignment	Program activity	ming		н	11 ours
Topics:								
X86 Architecture Simple Instructio Offsets. Antiviru File Headers ar Architecture	e- Main Memory, Instr ons, The Stack, Condit is Scanning, Fingerprir nd Sections, The Stru	ructions, Opco ionals, Branch nt for Malware Icture of a Vin	des and Endia ing, Rep Instru , Portable Exe rtual Machine	inness, O uctions, C ecutable I e, Revers	peranc Main File Foi seEngir	ls, R Met mat neer	egis hoc t, Tł ing-	sters, d and ne PE - x86
Module 3	Dynamic Analysis (Application)		Assignment	Program activity	ming		Н	11 ours

Topics:

Live malware analysis, dead malware analysis, analyzing traces of malware- system-calls, apicalls, registries, network activities. Anti-dynamic analysis techniques anti-vm, runtimeevasion techniques, , Malware Sandbox, Monitoring with Process Monitor, Packet Sniffing with Wireshark

Module 4	Malware Functionality and Detection Techniques (Comprehension)	Assignment	Programming activity	12 Hours
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Topics:

Downloader, Backdoors, Credential Stealers, Persistence Mechanisms, Privilege Escalation, Covert malware launching- Launchers, Process Injection, Process Replacement, Hook Injection, Detours, APC injection.

Signature-based techniques: malware signatures, packed malware signature, metamorphic and polymorphic malware signature Non-signature based techniques: similarity-based techniques, machine-learning methods, invariant inferences

Targeted Application & Tools that can be used: eCMAP (Certified Malware Analysis Professional)

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

 Problem Solving: Choose an appropriate data structure and implementation of programs.

2. Programming: Implementation of given scenario using Java

Text Book

1. Michael Sikorski and Andrew Honig, 2012: "Practical Malware Analysis", No Starch Press.

References

1. Jamie Butler and Greg Hoglund, 2005: "Rootkits: Subverting the Windows Kernel", Addison-Wesley.

2. Dang, Gazet and Bachaalany, 2014: "Practical Reverse Engineering", Wiley.

3. Reverend Bill Blunden, 2012: "The Rootkit Arsenal: Escape and Evasion in the Dark Corners of the System" Second Edition, Jones& Bartlett.

Course Code:	Course Title: E-Business and Marketing	0	2
CSE3136	Analytics P- 5 Type of Course: Theory Only Course C	0	3
Version No.	1 0		<u> </u>
Course Pre-	NIL		
requisites			
Anti-requisites	NIL		
	This course describes the basic principles of e-business te the completion of this course, students should have a good we of e- business concepts applications technologies (chnologi orking kr	es. Upon nowledge
Course Description	infrastructure, technology required for e-business, e-business marketpla B2B e- business, E-business strategy, e-procurement, custor management and service implementation and optimization understand any kind of marketing analytics.	nce, e-Co mer rel	ommerce, ationship ability to
Course Objective	This course is designed to improve the learner's EMPLOYABILIT real-world PROBLEM-SOLVING methodologies.	Y SKILLS	by using
Course Out Comes	 On successful completion of the course, the students sh 1. Demonstrate the strategy of E-Business and component parts (Knowledge). 2. Identify records according to manager maintaining database and processing software (Kno 3. Identify the ethical, social and security issu systems (Knowledge). 4. Apply the basic concepts and technologies of business management information systems (Apple) 	all be alt l identify ment po wledge) es of inf used in lication).)le to: 7 the olicy by Cormation the field
	Course Content:		
Module 1: E-BU	SINESS – An Introduction	10 Sess	sions
Introduction, E- B etc. Comparise – major B to B, I model, Peer to- commerce, web	Commerce – definition, History of E-commerce, types of E on of traditional commerce and e-commerce. E-Commerce B to C model, Consumer-to-Consumer (C2C), Consumer-to Peer (P2P) model – emerging trends. Advantages/ Disa auctions, virtual communities, portals, e-business revenue	-Comme business -Busines dvantago models.	erce B to s models ss (C2B) es of e-
Module 2: MA	RKETING ANALYTICS	10 Ses	sions
Introduction to Measure, Marketi Strategies- Geogr Evolution of soc analytics. E-Com	Marketing Analytics-Marketing Budget and Marketin ing Metrics and its application- Financial Implications of var raphical Mapping, Data Exploration, Market Basket Analy ial media-Understanding Science of social media, Web a inmerce and marketing B to B and B to C marketing and bran	ig Perfo rious Ma sis, Hist nalytics, ding stra	ormance arketing cory and Search ttegies.
Module 3: SEC	URITY THREATS OF E-BUSINESS	09 Ses	sions
Security threat Decryption, Pro servers Encrypt networks, policie	ts – An area view – implementing E-commerce security tecting client computers E-Commerce Communication ch ion, SSL protocol, Firewalls, Cryptography methods, V es and procedures, E-payment systems – An overview. B to	– encry annels a PNs, pro o C payr	/ption – and web otecting, nents, B

to B payments. Types of E- payment system, Secure Electronic Transaction (SET) protocol. RFID Concepts.

Module 4: E-BUSNESS MARKETING TECHNOLOGIES **09** Sessions Introduction to R-Programming, Statistical models in R, Simple programs using R. Algorithms using MAP Reduce, Linear and Logistic Regression modelling, Clustering techniques. Case studies: Social network analysis- Text analysis-marketing analysis. Text Book Beginner's Guide for Data Analysis using R Programming, Jeeva Jose Khanna Book 1. Publishing; 1st edition, 2018. K. M. Shrivastava, Social Media in Business and Governance, Sterling Publishers 2. Private Limited, 2013 References Christian Fuchs, Social Media a critical introduction, SAGE Publications Ltd, 2014 1. Bittu Kumar, Social Networking, V & S Publishers, 2013 2. 3. Avinash Kaushik, Web Analytics - An Hour a Day, Wiley Publishing, 2007 TakeshiMoriguchi, Web Analytics Consultant Official Textbook, 7th Edition, 2016 4. Web resources: https://onlinecourses.nptel.ac.in/noc19_mg54/preview https://onlinecourses.nptel.ac.in/noc20_mg30/preview https://www.coursera.org/learn/foundations-of-digital-marketing-and-ecommerce

Topics relevant to development of "Employability skill Development": Web auctions, E-Business revenue model, RFID concept, CRM system. Web analytics and search analytics

Course Code: CSE3137	Course Title: Te	xt Mining and Analytics					
	Type of Course:	Discipline Elective					
				L-P-C	3	0	3
Version No.	1.0						
Course Pre-							
requisites	Basic knowled	ge of Python and ma	chine lear	rning			
Anti-requisites	Nil						
Course	This course cove	ers the major technique	s for minin	g and an	alyzi	ing text	data
Description	to discover intended decision-making Learning Metho	eresting patterns, extra g, with an emphasis on ods	act useful statistical	knowled approach	ge, a es a	and sup Ind Mac	port hine
Course Obiective	This course is	designed to improve	the learne	rs' EMP	LO	YABIL	ITY
,	SKILLS by us	ing EXPERIENTIAL	LEARNI	NG tech	niqu	les.	
Course Out	On successful	completion of the cour	rse the stu	dents sh	911 k	e able i	to
Comes	 Apply various pre-processing techniques to clean and prepare text data for analysis. [Application] Demonstrate the fundamental concepts and techniques of natural language processing (NLP) and text mining. [Application] Develop the techniques for document summarization to extract key information from text data. [Application] Apply sentiment analysis to identify and understand the sentiment expressed in the text. [Application] Interpret text mining techniques in interdisciplinary contexts, such as social sciences, healthcare, finance, and marketing. [Application] 						
Course Content:							
Module 1	Introduction to Text mining	Assignment	Knowledg	e, Quizze	s	()7 Hours
Topics:							
Text mining techn Fundamental of tex including tokeniza stemming, Hand-c retrieval.	niques and their a at mining and analy ation and lemmat on practice: Text p	applications ytics, Introduction to prej tization, Text and char preprocessing, text class	processing acter N-gr ification, s	technique cams, Sto entiment	es, T pwo ana	[°] ext norr ord rem lysis, in	nalization oval, and formation
Module 2	Natural Language Processing	Assignment	Knowledg	e, Quizze	es	08	3 Hours
Introduction to N	LP:						

Tokenization, part-of-speech tagging, syntactic parsing, named entity recognition, and semantic analysis

	Text	Case study	Application, Quizzes	
Madula 2	Classification			00 Hours
wiodule 5	and Sentiment			09 Hours
	Analysis			

Topics:

Text classification techniques and sentiment analysis:

feature extraction, feature selection, and various classification algorithms using different Machine learning and Deep Learning techniques such as SVM, Decision tree, Random Forest, CNN, LSTM.

Module 4 Nodule 4 Search Engines	Case study	Application, Quizzes	09 Hours
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Topics:

Information retrieval techniques for text-based search engines:

Basic concepts, components of an information retrieval system, retrieval models. Query formulation, query optimization, query expansion techniques. Web Search Engines: Crawling and indexing techniques, web ranking algorithms (e.g., PageRank), search engine architectures. Multimedia Retrieval: Image and video retrieval, content-based and metadata-based approaches. Evaluation Metrics.

	Text AnalyticsCa	se study	Application Quizzes	07 Hours
Module 5	for Social Media	se stady	rippileation, Quilles	
	and Web Data			

Topics:

Text analytics techniques for social media and web data:

Mining and analyzing text data from platforms like Twitter, Facebook, and web pages

[Blooms 'level selected: Application]

Targeted Application & Tools that can be used:

Natural Language Processing (NLP) Libraries: NLTK, SpaCy, Stanford NLP Text Classification Tools: Scikit-learn, TensorFlow, Keras Social Media Analytics Tools: Twitter API, Facebook Graph API, YouTube Data API

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

1. Develop a project where they collect social media data from platforms like Twitter or Facebook and perform sentiment analysis to determine the overall sentiment (positive, negative, or neutral) of the collected data

2. Develop a text classification model that can automatically categorize news articles into different topics or classes such as sports, politics, entertainment, etc

3. Develop a project where they build a system that can identify named entities (such as person names, locations, organizations) in a given text and extract relations between them Text Book

1. C. D. Manning, H. Schütze, and P. Raghavan, "Text Mining and Analytics: From Text Data to Knowledge Graphs," Cambridge University Press, 2021.

2. G. Chakraborty, M. Pagolu, and S. Garla, "Text Mining and Analysis: Practical Methods, Examples, and Case Studies Using SAS," CRC Press, 2014.

3. "Speech and Language Processing" by Daniel Jurafsky and James H. Martin, published by Pearson. The latest edition is the 3rd edition, published in 2020.

References

1. S. Weiss, N. Indurkhya, T. Zhang, and F. Zhang, "Text Mining: Predictive Methods for Analyzing

Unstructured Information," Springer, 2015.

2. G. Sholomitsky and Y. Reiter, "Introduction to Text Analytics: Language Technology for Information

Access and Management," Morgan & Claypool Publishers, 2019.

3. S. M. Weiss, N. Indurkhya, T. Zhang, and F. Damerau, "Text Mining: Predictive Methods for Analyzing Unstructured Information," Springer, 2004.

4. S. Bird, E. Klein, and E. Loper, "Natural Language Processing with Python," O'Reilly Media, 2009

5. D. Sarkar, "Text Analytics with Python: A Practical Real-World Approach to Gaining Actionable Insights from Your Data," Apress, 2020

Web Resources and Research Articles:

1. https://www.datacamp.com/courses/text-mining-with-r

2. https://www.nltk.org/book/

3. https://libguides.wellesley.edu/c.php?g=992506&p=7181108

4. http://www.acadmix.com/eBooks_Download

Course Code: CSE3106	Course Title: Robotic Proce Type of Course: Theory / P	ss Automation Systems ractical	5 L- P- C	2	4	4
Version No.	1.0					
Course Pre- requisites	NIL					
Anti-requisites	NIL					
Course Description	The Step into Robotic Proce RPA to students. The cours takes a use-case approach. and how it's solved in a no skills that enable the stude (Academic Alliance Edition)	ss Automation (RPA) cou e assumes no prior kno It begins by defining a on-RPA environment. Th ents to create a robot to automate the solutio	urse is inte owledge o real-world he course using free on.	nded t f RPA. , gene goes o e UiPat	o intr The ric pr on to th so	oduce course oblem teach ftware
Course Objective	The objective of the cours Robotic Process Automation	se is to provide a known.	wledge ar	id app	licati	ons of
Course Outcomes	 Upon successful completion of the course the students shall be able to: Illustrate the intuition about Robotic Process Automation Technology and the underlying logic/structure related to RPA [Remember]. Demonstrate the RPA Methodologies for Control Flow and data manipulation techniques [Apply]. Apply appropriate RPA Tools for the automation Process [Apply]. Utilize of various automated tools and its modern workflow automations [Apply]. 					
Course Content:						
Module 1	RPA Foundations	Remember		8 S	essio	ns
Emergence of Robotic from Automation, Def Application areas of I and key consideratior Introduction to Robot details of RPA tools, T RPA platform.	c Process Automation (RPA), fining Robotic Process Auton RPA, How Robotic Process A ns. tic Process Automation Tools Types of Templates, User Int	Evolution of RPA, Future nation & its benefits, Wh Automation works, RPA s, Basic components in a serface, Domains in Acti	e of RPA, D hat RPA is f developm in RPA pla vities, Wo	ifferer Not, Ty Ient m tform, rkflow	ntiatin pes o ethoo Insta Files	ng RPA If Bots, dology Illation in the
Module 2	RPA Methodologies	Apply		7 Se	essior	าร
Process Components Arguments, Imports P Activities. Example of actions to perform an	and Activities: User Interface Panel and User Events. App I f Automate login to your (w operation, scraping data fro	e Automation Activities, ntegration, Recording, S veb)Email account, reco om website and writing	System Ac craping, S ording mon to CSV.	tivities elector use an	s, Var r, Wo d key	iables, rkflow /board
Module 3	Intelligent Automation	Apply		7 Se	essior	าร
Data Manipulation, A and Image Automatio Logging, Extensions, F	Automation of Virtual Machi on, PDF Automation, Comput Project Organization	nes, Introduction to Na er Vision, Programming	tive Citrix , Debuggir	Autom Ig, Erro	natior or Hai	ו, Text ndling,
Module 4	DEPLOYING AND MAINTAINING THE BOT	Apply		8 Se	essior	าร
Creation of Server - L Connecting a Robot Managing packages - Sense - Bot Insight - Transactional Analytic	Jsing Server to control the Rob to Server - Deploy the Rob Uploading packages - Deletin cs - Operational Analytics List Of	oots - Creating a provisi ot to Server - Publishir ng packages - Meta Bot Laboratory Tasks	ion Robot ng and ma Designer -	from t anaging - Meta	the So g upo Bot v	erver - Jates - with AI
	Но	ours)				
Lab Sheet 1: (6 Hrs)			tool			
petup and Configure a	a KPA tool and understand t	ne user interface of the	t00I:			

- 1. Create a Sequence to obtain user inputs display them using a message box.
- 2. Create a Flowchart to navigate to a desired page based on a condition.
- 3. Create a State Machine workflow to compare user input with a random number.

Lab Sheet 2: (6 Hrs)

Build a process in RPA platform using Automation Activities.

- 1. Create an automation process using key System Activities, Variables and Arguments.
- 2. Also implement Automation using System Trigger

Lab Sheet 3: (6 Hrs)

Automate login to (web)Email account.

Lab Sheet 4: (6 Hrs)

Recording mouse and keyboard actions to perform an operation Scraping data from website and writing to CSV

Lab Sheet 5: (6 Hrs)

Different ways of Error Handling in RPA platform

1. Browse through the log files related to a RPA Project

Suggested List of Hands-on Activities:

1. Scrape the number of GitHub repositories for the top technologies in today's market.

2. Extract data from an excel file, according to a specific condition and store it in another excel file.

3. Segregate emails based on the email ID in respective folders present in the Outlook folder t Book(s)

Text Book(s)

 Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath by Alok Mani Tripathi, Packt Publishing, Mumbai, 2018

2. Tom Taulli, "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems", Apress publications, 2020.

3. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: Packt Publishing Release Date: March 2018 ISBN: 9787788470940

4. Robotic Process Automation A Complete Guide - 2020 Edition Kindle Edition.

References:

1. Richard Murdoch, "Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant" (1st Edition), Independently published, 2018. ISBN 978-1983036835.

2. A Gerardus Blokdyk, "Robotic Process Automation Rpa A Complete Guide ", 2020.

3. Frank Casale, Rebecca Dilla, Heidi Jaynes and Lauren Livingston, "Introduction to Robotic Process

4. Automation: A Primer.

5. EMC education services. Information Storage and Management: Storing, Managing,

and Protecting Digital Information in Classic, Virtualized, and Cloud Environments, Wiley, 2012.

Web Resources and Research Articles links:

1. IEEE Transactions on Robotic Process

Automation- https://ieeexplore.ieee.org/abstract/document/9114349

2. NPTEL Course on "Robotics, IIT Bombay by Prof. B. Seth, Prof. C. Amarnath, Prof. K. Kurien Issac, Prof. P.S. Gandhi, Prof. P. Seshu <u>https://nptel.ac.in/courses/112101098</u>

- 3. <u>https://www.uipath.com/rpa/robotic-process-automation</u>
- 4. <u>https://www.uipath.com/rpa/robotic-process-automation</u>

Course Code:	Course Title: Software Metrics and C	Quality				
CSA2003	Management			2	2	2
	Type of Course: Integrated		L- P- C	2	Z	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course will focus on the proces	ses, prin	ciples, a	and te	chniques	of
	software testing and analysis. It covers	a full spe	ctrum o	ftopic	s from ba	isic
	principles and underlying theory of te	sting to o	rganiza	tional	and proc	ess
	issues in real-world applications. The	emphasi	s is on	select	ing practi	cal
	techniques to achieve an acceptable le	evel of qua	ality at a	in acce	eptable co	ost.
	This course will provide software engi	neering p	rofessio	onals v	vith realis	stic
	strategies for reliable and cost-effective	/e softwai	re testir	ıg.		
Course Objective	The objective of the course is to fan	niliarize t	he leari	ners w	ith the c	oncepts
	of Software Metrics and Quality M	Managem	ent an	d atta	in Emplo	oyability
	through E xperiential Learning techniq	ues.				
Course Out Comes	On successful completion of this cour	se the stu	idents s	hall b	e able to:	
	 To understand software testin 	g and qua	ality ass	urance	e as a	
	fundamental component of software I	ife cycle [Knowle	dge]		
	• To efficiently perform T & QA	activities	using m	odern	software	tools
	[Comprehension]				_	_
	 To prepare test plans and sche 	edules for	a T&Q/	A proje	ect [Appli	cation]
Course Content:						
Module 1	Introduction to Quality				12	2 Hours
Topics:						
Introduction to Quality:	Historical Perspective of Quality, what	is Qualit	y? (Is it	a fact	or perce	eption?),
Definitions of Quality, Co	re Components of Quality, Quality View	, Financia	I Aspec	t of Qı	uality, Cus	stomers,
Suppliers and Processe	s, Total Quality Management (TQM), Quality	/ Princi	iples	of Total	Quality
Management, Quality M	anagement Through Statistical Process	Control,	Quality	Mana	gement	Through
Cultural Changes, Contin	ual (Continuous) Improvement Cycle, C	Quality in	Differer	nt Area	as, Bench	marking
and Metrics, Problem Sol	ving Techniques, Problem Solving Softw	are Tools	•			
Module 2	Software Quality				12	2 Hours
Topics:						
Introduction, Constraint	s of Software Product Quality Assess	ment, Cu	stomer	is a ł	King, Qua	lity and
Productivity Relationship	, Requirements of a Product, Organisat	ion Cultu	re, Char	acteri	stics of So	oftware,
Software Development P	rocess, Types of Products, Schemes of	Criticality	Definiti	ions, P	roblemat	ic Areas
of Software Developme	nt Life Cycle, Software Quality Mana	agement,	Why S	Softwa	re Has [Defects?
Processes Related to Se	oftware Quality, Quality Managemen	it System	Struct	ure, l	Pillars of	Quality
Management System, Im	portant Aspects of Quality Managemen	t				
Module 3	Software Verification and Validation				14	4 Hours
Topics:						
Introduction. Verification	. Verification Workbench. Methods of	f Verificat	ion. Tv	pe. Er	tities inv	olved in
verification. Reviews in t	esting lifecycle. Coverage in Verification	on. Conce	rns of V	Verific	ation. Va	lidation.
Validation Workbench. Le	evels of Validation. Coverage in Validati	on. Accep	tance T	esting	. Manage	ment of
Verification and Validation	on. Software development verification	and valid	lation a	ctiviti	es. V-test	Model:
Introduction. V-model fo	or software. Testing during Proposal st	age. Test	ing dur	ing re	auiremen	nt stage.
Testing during test planni	ng phase. Testing during design phase.	Testing di	uring co	ding.	/V Model	. Critical
Roles and Responsibilities	S.			6,		,
Project work/Assignmen	t: Mention the Type of Project /Assign	ment pro	posed f	or this	course	
1. Case study on rea	al time software applications like MSTea	am				
2. Implementation	of verification and validation for any rea	altime sof	tware a	pplica	tion.	

Text Book

T1 Software Testing and Continuous Quality Improvement, William E. Lewis, CRC Press, 3rd,2016. **T2** Software Testing: A Craftsman's Approach, Paul C. Jorgenson, CRC Press, 4th, 2017.

References

R1. P. Ammann and J. Offutt. Introduction to Software Testing. Cambridge University Press, 2008. R2.

https://www.tutorialspoint.com/software_quality_management/software_quality_management_metri cs.htm

https://nptel.ac.in/courses/106105150

https://nptel.ac.in/courses/106101163

Topics relevant to "EMPLOYABILITY SKILLS": Total quality management, software quality management, for development of Employability Skills through Experiential Learning Techniques. This is attained through assessment components mentioned in the course handout.

Course	Course Title: Storage Area Network	S		3	0	3
Code: 20			L-P-C			
54	Type of Course: Program Core					
Version	1.0					
NO.	Pasias of Computer Naturales					
Course Pro-	Basics of Computer Networks					
requisites						
Anti-	NII					
requisites						
Course	The objective of this course i	s to help students underst	and the l	cnowle	dge g	ap in
Descriptio n Course Out Comes	understanding varied component virtual environments. It provides enable you to make more inform ISM builds a strong understandir learn advanced concepts, technolo features, and benefits of Intellige as FC-SAN,IP-SAN, NAS, Object such as backup, replication, and an and the emerging field of cloud of and principles which are further i On successful completion of the court 1. Identify key challenges in mana technologies and virtualization Knowledge 2. Illustrate the storage infrastruct activities Comprehension 3. Define backup, recovery, disas replication. Knowle	s of modern information sto- comprehensive learning of st led decisions in an increasing of underlying storage tech ogies, and products. You will nt Storage Systems; storage r ct-based and unified storage; rchive; the increasingly critica computing. This unique, oper llustrated and reinforced with se the students shall be able to aging information and analyze di ure, Storage network Technolog ter recovery, business continuity edge	rage infras corage tech gly comple nologies a learn abou networking business c al area of in n course for EMC exa ifferent stor	tructure nology x IT er nd prep it the ar ; techno ontinui formati ocuses (mples. age netw	e, incl , whic nviror pares y rchited ologie ity sol ion sec on con	luding luding th will ment. you to ctures, s such utions curity; ncepts
	4. Define information security an	d identify different storage virtu	alization			
	technologies. Knowledg	2				
Course Content:						
Version	1.0					
No.						
Module 1	Introduction to Storage System	Assignment	Comprehe Quizzes	nsion,	N Clas	o. of ses:8
Topics: Introducti Virtualizat Storage. D on Disk Pe Provisioni	ion to Information Storage: Evolution of ion and Cloud Computing. Data Center ata Protection: RAID: RAID Implemen erformance. Intelligent Storage Systems ng Storage Networking	of Storage Architecture, Data Ce Environment: Application, Ho tation Methods, RAID Techniqu : Components of Intelligent Stor Assignment	enter Infrastr st (Compute les, RAID I rage System Comprehe	ucture,), Conr evels, F , Storag ension,	nectivit RAID I ge	ty, Impact
wodule 2	Technologies	-	Quizzes		Clas	ses:8
Topics: Fibre Cha Architectu Network A	nnel Storage Area Networks: Con re, Zoning, FC SAN Topologies, Virt Attached Storage: Components of NA	nponents of FC SAN, FC ualization in SAN.IP SAN ar .S, NAS I/O Operation, NAS	connectivi nd FCoE: i File-Shar	ty, Fib SCSI, F ing Pro	ore Ch FCIP, l tocols	nannel FCoE. , File-
Level Virt	ualization					
Module 3	Backup, Archive and Replication	Assignment			No Clas	o. of ses:8

Application, C	uiz
zes	

Topics:

Introduction to Business Continuity: Information Availability, BC Terminology, BC Planning Lifecycle, Failure Analysis, BC Technology Solutions. **Backup and Archive:** Backup Methods, Backup Topologies, Backup Targets, Data Deduplication for Backup, Backup in Virtualized Environments, Data Archive. **Local Replication:** Replication Terminology, Uses of Local Replicas, Local Replication Technologies, Local Replication in a Virtualized Environment. **Remote Replication:** Remote Replication Technologies, Three-Site Replication, Remote Replication and Migration in a Virtualized Environment.

Module 4	Cloud Computing	puting Assignment Com		No. of
			Quizzes	Classes:8

Topics:

Cloud Enabling Technologies, Characteristics of Cloud Computing, Benefits of Cloud Computing, Cloud Service Models, Cloud Deployment Models, Cloud Computing Infrastructure, Cloud Challenges and Cloud Adoption Considerations. Virtualization Appliances: Black Box Virtualization, In-Band Virtualization Appliances, Outof-Band Virtualization Appliances, High Availability for Virtualization Appliances, Appliances for Mass Consumption. Storage Automation and Virtualization: Policy-Based Storage Management, Application-Aware Storage Virtualization, Virtualization-Aware Applications

Module 5	Securing and Managing	Assignment	Knowledge,	No. of
	Storage Infrastructure		Quizzes	Classes:8

Topics:

Securing and Storage Infrastructure: Information Security Framework, Risk Triad, Storage Security Domains, Security Implementations in Storage Networking, Securing Storage Infrastructure in Virtualized and Cloud Environments. Managing the Storage Infrastructure : Monitoring the Storage Infrastructure, Storage Infrastructure Management activities, Storage Infrastructure Management Challenges, Information Lifecycle management, Storage Tiering

List of Laboratory Tasks:

Targeted Application & Tools that can be used:

SID Tool(Cisco SAN Insights Discovery Tool)

SAN Congestion Innovation with Cisco DIRL(Dynamic Ingress Rate Limiting)

Project work/Assignment:

1.Cloud storage for accessing file over internet though SAN

Creating and storing daily backup of multiple machine over SAN. Or creating disk-less clients and use one server for processing and one server for storage and access all over network

Textbook(s):

1. Information Storage and Management, Author :EMC Education Services, Publisher: Wiley ISBN: 9781118094839

2. Storage Virtualization, Author: Clark Tom, Publisher: Addison Wesley Publishing Company ISBN : 9780321262516

References

1. Robert Spalding: "Storage Networks The Complete Reference", Tata McGraw-Hill, 2011.

2. Marc Farley: Storage Networking Fundamentals – An Introduction to Storage Devices, Subsystems,

Applications, Management, and File Systems, Cisco Press, 2005.

3. Richard Barker and Paul Massiglia: "Storage Area Network Essentials A Complete Guide to understanding and Implementing SANs", Wiley India, 2006.

- Udemy: <u>https://www.udemy.com/course/storageintro/</u> c;
- SANFOUNDRY Online training : <u>https://www.sanfoundry.com/san-storage-area-networks-training/</u>

Course Code: CSE3016	Course Title: CSE Fuzzy Logic Type of Course: I Basket Tł	3016 Neural Networ Discipline Elective in neory Course	'ks and AI & ML	L-P-C	3	0	3
Version No.	1.2						
Course Pre-	NIL						
requisites							
Anti-requisites	NIL						
Course Description	This course aims to introduce the basic concepts of Neural Networks and Fuzzy Logic. Neural networks reflect the behavior of the human brain, allowing computer programs to recognize patterns and solve common problems in the fields of AI, machine learning, and deep learning. Fuzzy Logic is a method of reasoning that resembles human reasoning. The approach of Fuzzy Logic imitates the way of decision-making in humans that involves all intermediate possibilities between digital values YES and NO. This course introduces						
Course Objective	This course is des using EXPERIENT	igned to improve the IAL LEARNING techni	student's ques.	EMPLC	YABII	LITY SF	KILLS by
Course Outcomes	 On successful completion of this course the students shall be able to: Define the concept of Neural Networks. [Knowledge] Define the ideas behind most common learning algorithms in Neural Network. [Knowledge] Discuss the concepts of Fuzzy Sets and Relations. [Comprehension] Demonstrate the Fuzzy logic concepts and its applications. [
Course Content:							
Module 1	Introduction to Neural Network	Quiz	Single La	yer Per	ceptro	n 90	Classes
Topics: Introduction to NN: History, Artificial and biological neural networks, Artificial intelligence and neural networks. Neurons and Neural Networks: Biological neurons, Models of single neurons, Different neural network models. Single Layer Perceptron: Least mean square algorithm, Learning curves, Learning rates, Percentron							
Module 2	Multilayer Perceptron	Quiz	Multilaye	r Perce	ptron	10	Classes
Topics: Multilayer Perceptron: The XOR problem, Back-propagation algorithm, Heuristic for improving the back-propagation algorithm, Some examples. Radial-Basis Function Networks: Interpolation, Regularization, Learning strategies. Kohonen Self-Organising Maps: Self-organizing map, The SOM algorithm, Learning vector quantization.							
Module 3	r uzzy Sets, Operations and Relations	Quiz	Fuzzy Op	eration	S	10	Classes
Topics: Fuzzy Sets: Crisp Properties, Repres Fuzzy Operations: Unions, Combinati Fuzzy Relations: Relations.	Sets - an Overvie sentations of Fuzzy Operations on Fu ons of Operations, Binary Fuzzy rela	w, Fuzzy Sets - Defin v Sets, Extension Princ uzzy Sets - Fuzzy Com , Aggregation Operatic ations, Fuzzy Equival	aition and piples of Fu plements ons. lence Rela	Examp izzy Se , Fuzzy ations,	oles, α ts. Inters Fuzzy	- Cuts section Comp	and its s, Fuzzy patibility

Module 4	Fuzzy Logic and Fuzzy Logic Controller	Assignment	Developing Fuzzy Log Controller	^{ic} 10 Classes
Fuzzy Logic: Classi Hedges, Inference and Quantified Pro Fuzzy Controllers: Defuzzification Mo	cal Logic, Multival from Conditional positions. An Overview, Fuz dule, An Example.	lued Logic, Fuzzy Prop Fuzzy Propositions, C zification Module, Fuz	oositions, Fuzzy Quantifi onditional and Qualified zy Rule Base, Fuzzy Infe	ers, Linguistic l Propositions erence Engine,
Targeted Applica 1. Python Lib 2. Matlab (Ne	tion & Tools that raries and Softwa ural Network Too	c an be used: re (Eg., Tensorflow , So lbox, Fuzzy Logic Too	cikit-Learn etc.) lbox)	
Students will have they will have to in	to do group assignplement the solu	gnments for Modules tion to particular prob	2 & 4. As a part of thein olems.	· assignments,
1. Haykin, Sin 2011. https:/ Learning-Machines 2. George J. Ki Hall of India, 2015. <u>https://www.taapplications/o</u>	non. " <i>Neural netw</i> //www.pearson.cc s-3rd-Edition/P20 lir and Bo Yuan, "F <u>vorldcat.org/title,</u> <u>clc/505215200</u>	orks and learning mad om/en-us/subject-cata 00000003278/978013 uzzy Sets and Fuzzy Log /fuzzy-sets-and-fuzzy-	<i>chines</i> ", 3/E. Pearson Ec alog/p/Haykin-Neural-N 33002553 <i>gic- Theory and Applicat</i> elogic-theory-and-	ucation India, letworks-and- <i>ions</i> ", Prentice
References: 1. Shivananda https://www.wiley 2. Timothy J. https://onlinel 3. Kumar S., " 2017. https://www approach/oclc/566 4. Fakhreddir design: theory, tool Weblinks https://www.p	am, Deepa S, " <i>Prin</i> yindia.com/princi Ross, " <i>Fuzzy Logic</i> library.wiley.com/ <i>Neural Networks -</i> w.worldcat.org/tit 955342 ne O. Karray, and C s, and applications	ciples of Soft computin ples-of-soft-computin with Engineering App doi/book/10.1002/9 A Classroom Approact le/neural-networks-a Clarence W. De Silva. ". S". Pearson Education,	g", N Wiley India, 3rd Ed g-3ed.html <i>lications</i> ", Third Edition 781119994374 h", Tata McGraw Hill, 2n -classroom- Soft computing and intel 2009.	dition, 2018. , Wiley, 2011. d Edition <i>ligent systems</i> and-
Intelligent-Syst Topics related to d batch wise present	tems-Design-Theo levelopment of "E cations.	<u>pry-Tools-and-Applica</u> MPLOYABILITY": Assi	<u>tions</u> gnment implementatior	ıs in software,

Course Code: CSE 3050	Course Title: Software Project Management Type of Course: School Core	L- P- C	3	0	3		
Version No.	2.0						
Course Pre- requisites	Software Engineering						
Anti-requisites	NIL						
Course Description	he objective of this course is to provide the fundamentals concepts of Software roject planning approaches and methodologies. he objective of this course is to provide the fundamentals standards of software evelopment and management. his course covers the roles and functions of project management and the rocess of project life cycle. he objective of the course is to understand the need and techniques for nanaging users and user.						
--	---	--	---	---	--	--	--
Course Out Comes	On successful completion 1] Describe the Softwar Estimation. (Knowledge 2] Identify the requiren application(Comprehen 3] Understand People m 4] Apply an appropria principles involved in so	n successful completion of this course the students shall be able to: Describe the Software Project Management, Software Project Effort and Cost stimation. (Knowledge) Identify the requirements, analysis and appropriate design models for a given oplication(Comprehension) Understand People management (Knowledge) Apply an appropriate planning, scheduling, evaluation and maintenance					
Course Objectives	The objective of this of procedures of initiation guidance of the project goals within the set score	The objective of this course are the successful development of the project's procedures of initiation, planning, execution, regulation and closure as well as the guidance of the project team's operations towards achieving all the agreed upon					
Module 1	Project Management Fundamentals	Assignment	Identification of Cost Estimation	12 Sessions			
Introduction to So – scope, objectiv artifacts. Risk Ma Management – to evm. Project Clos	ftware Project Managem e, size and factors. So anagement : Perform T echniques. Project Mor ure – closure steps	ent – all life cy oftware Projec he risk analys nitoring and (cle activities, Project Initiation ct Effort and Cost Estimatio is for the given case study. Control – measuring task, s	Management on – cocomo, Configuration status report,			
Module 2	Software Life Cycle Management	Assignment	Apply the testing concepts using Programing	10 Sessions			
Introduction to S Management – 1 techniques. Softv Verification, valid types and techniq	Software Life-Cycle Mar requirement and mana vare Construction – re ation, strategy, automat ues	nagement – l agement. Sof eviews, walkt ion and monit	ife cycle process. Software tware Design Management hrough, inspections. Softwa coring. Product Release and M	Requirement – standards, re Testing – Iaintenance –			
Module 3	People Management		Comparison of CMO, ISO IEEE standards	, 08 Sessions			
Introduction to Pe organizational str Supplier Managen	Introduction to People Management – people, team and supplier management. Team Management – organizational structure, team effectiveness. Customer Management – expectation and negotiation. Supplier Management – agreement and communication.						
Module 4	Software Engineering Management and Tools	Assignment	Apply the testing concepts using Programing	10 Sessions			
Introduction to Software Process Standards and Process Improvement – CMM, ISO, IEEE. Software Project Management Tools Introduction – tools application, cost and effectiveness. Project Management and Software Life-Cycle Tools – life cycle and project management templates. Software Project Templates – WBS and monitoring tools. Software configuration management- SCM process, SCM Tools (GitHub). Targeted Application & Tools that can be used: Selenium, GitHub, CASE Tools							

Project work/Assignment: Mention the Type of Project /Assignment proposed for this	
course	

- 1. Identification of Cost Estimation
- 2. Apply the testing concepts using Programing
- 3. Comparison of CMO, ISO, IEEE standards
- 4. Installing Selenium/GitHub software and exploring the functionality

Text Book

1] Bob Hughes, Mike Cottere, Rajib Mall, "Software Project Management", 5th Ed, Tata McGraw Hill, References

1] Ashfaque Ahmed, "Software Project Management: a process-driven approach",Boca Raton, : CRC Press, 2012

2] Ramesh, Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2005.

Foundation Skills: Students can able to learn the fundamental foundation skills in this course such as initiation, planning, execution, regulation and closure as well as the guidance of the project team's operations.

Course Code:	Course Title: System Mon	itoring		3	0	3	
CSE 3051	Type of Course: Theory on	ly	L- P- C				
Version No.	1						
Course Pre-	Agile Structures and Frame	eworks					
requisites							
Anti-requisites	NA						
Course Description	This course is intended for understanding the principles of automation and the application of tools for the analysis and testing of software. The automated analysis encompasses both approaches to automatically generate a very large number of tests to check whether programs meet requirements, and also means by which it is possible to prove that software meets requirements and that it is free from certain commonly- occurring defects, such as divide-by-zero, overflow/underflow, deadlock, race- condition freedom, buffer/array overflow, uncaught exceptions, and several other commonly-occurring bugs that can lead to program failures or security problems. The iearner will become familiar with the fundamental theory and applications of such approaches, and apply a variety of automated analysis techniques on example programs.						
Course Objective	The objective of the cours	se is skill development of	students	s by usi	ng Par	ticipative	
Course Out Comes	 On successful completion of the course the students shall be able to: Understand testing in DevOps. Learn its approaches to testing. Understand to design test cases. 						
Course Content:	Course Content:						
Module 1	NEED OF SYSTEM MONITORING	Assignment			8 Ses	sions	
Topics:							
Predicting system	load - Failure prevention – A	Anomalies				-	
Module 2	TENETS OF SYSTEM	Assignment			8 Ses	sions	

Topics:

Identifying as many problems as possible - Identifying problems as early as possible - Generating as few false alarms as possible – Automation

Module 3	CORE COMPONENTS OF MONITORING TOOLS	S Assignment		8 Sessions
Topics: Alerts – (Graphs - Logs			
Module 4	INTELLIGENTLY MONITORING THE RIGHT METRICS IN EACH	Assignment		8essions
Topics : Layer 0:	The Application - Layer 1:	: The Process - Laye	2: The Server - Laye	er 3: The Hosting
Provider - Layer	4: External Dependencies -	- Layer 5: The User		
Module 5	MONITORING STRATEGIES	Quiz	8	3 Sessions
Topics : Mo Improvement	nitor potential faulty entitie	es - Monitor existing	faulty entities - Tunir	ng and Continuous
Targeted Applica Jenkins, Docker	ition & Tools that can be u	ised		
	Proje	ect work/Assignmer	it:	
Assignment:				
Text Book 1. Building 2. Continuc Automation	a Monitoring Infrastructur ous Delivery: Reliable S - by Jez Humble (Author),	e with Nagios - by D Software Releases David Farley (Autho	avid Josephsen. 2016 through Build, Test r), Martin Fowler (Fo	, and Deployment reword). 2017
References				
1. Instant Nag	gios Starter - by Michael G	uthrie, Packt Publisl	ning Limited (23 May	2016)
Web resources W1. <u>https://pres</u>	:: siuniv.knimbus.com/user#/	<u>/home</u>		
Topics relevant t	o the development of "Ski	Il Development": P	redicting system load	- Failure prevention

Course Code: CSE3073	Course Title: Game Design and Development	LPC	0	2	2
	Type of Course: Discipline Elective	L-P-C	2	2	3
Version No.	1.0				
Course Pre- requisites	CSE 2001 - Data Structures and Algorithms Specific Topics to be included	& C# Pro	gramm	ling	
Anti-requisites	NIL				

Course Description	The course helps lead development games. practice of game mak about basic operation process, learners will own design from initia	The Specializatio The Specializatio ing. From a techn using latest Unity write a complete al concept up to th	he necessary skills to n focuses on both the nical standpoint, learner 2021 game engine. In C game script and prop ne first playable prototy	design and theory and rs will learn Game Design osal of their pe.
Course Object	The course will give a with an emphasis on u production. And this c game art principles, is pre-production and pu	well-rounded kr understanding and ourse will cover v ncluding knowled roduction enviror	nowledge in the Game I d applying techniques in vith a solid grasp of the f dge of game engine tech uments.	Development video game fundamental nnology and
Course Out Comes	On successful complet 1. Recognize Gan 2. Identify the UI 3. Illustrate Game 4. Produce Game	tion of the course ne Preproduction of Unity Game Er eObject Behaviour using Unity Gam	the students shall be ab and Design Process. Igine and its Work Flow r using C# Script. e Engine.	le to:
Course Content:				
Module 1	Essentials of Game Design	Assignment	Memory recall quiz from Introduction to Game and its basics and Practical components for Preproduction	No. of Classes:8
Topics: Introduc Design Tools- (chance, and ur Play- Preproduc	tion to Game ~ Basic E Constraint~ Direct and certainty~ Decision-n tion-Logo ~ backgroun	lements of Play- B d indirect actions taking and Feedb d	asic elements of games- s- Goals-Challenge- Sk back-Abstraction-Theme	Basic Game ill, strategy, e-Context of
Module 2	The Kinds of Play & Working with Unity API	Assignment	Quiz based on Play Categories and Lab Experiments on Unity Engine API	No. of Classes: 12
Topics: The Kind based play, Ga Experience -Intr C# , Game Theo – Lightning -Bu Tool bar- Scene Console Windov	ds of Play - Competitive mes of chance and coduction to fundamer ry, Unity Interface- To ilding Platform and Pro View-Game View-Hie: w-Status Bar -Game Ol	e play, Cooperative uncertainty, Wh itals of game, Stor ols- Windows – C oject Preferences. rarchy Window-F bjects.	e play, Skill-based play, imsical play, Role-play cytelling - basic program Game Objects, Compone Unity Editor Interface: I Project Window-Inspect	Experience- ying, Player nming using ents, Camera Main Menu- or Window-
Module 3	Game Design Process and Working with Game Object in Unity	Assignment	Experiments based on Unity API and basic Operation	No. of Classes:12
Topics: Iterativ Evaluate Game strategy, chance games, Unity T Mono Behavior Tags- Colliders,	e Game Design Pr Design Values: Expe , and uncertainty - Intr ools Materials and Te Class-Mono Behavior I Collisions, Triggers- P	ocess – Concep erience – Theme – roduction to Vect xtures, Game Ob Methods / Messag Physics, Physic Ma	otualize~ Prototype~ F Point of view – Challe ors, Game design - The jects, Components- Scri es - Rotations, Translation aterial, Texture, Shader -	laytest and enge - Skill, structure of pting: Unity ons - Layers, - Lighting.
Module 4	Game Prototyping, Evaluation and Game Development	Assignment	Game prototyping and Unity Programming	No. of Classes:12
Topics: Game Pr and sound proto UI: Working w Programming	ototyping: Paper proto otypes - Core game pro ith UI & Menus Gan	otypes - Physical P ototypes - Comple ne development, A	rototypes Playable proto te game prototypes, Eva sset Management, Adva	otypes ~ Art luation – Inced Unity
Lab Experiment	s are to be conducted c	on the following to	opics: ~	

Lab Experiments are to be conducted on the following topics: ~

- 1. Introduction to Preproduction
- 2. Introduction to Unity Game Engine API
- 3. Unity Game Objects its properties
- 4. Grouping Object in Environment
- 5. Multiple Game Objects
- 6. Object Mono Behavior
- 7. Object Transform
- 8. Get Component Method
- 9. Prefabs
- 10. Translating Game Objects
- 11. Textures
- 12. Unity Physics
- 13. Player Movement
- 14. Camera Movement
- 15. Player Control
- 16. Character Controller
- 17. UI
- 18. Game Development

Mini Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Building a 2D/3D Game

Text Books

1. Colleen Macklin, John Sharp, Games, Design and Play A Detailed Approach to Iterative Game Design, Pearson Education, Inc. 2016

- 2. Ernest Adams, "Fundamentals of Game Design", Pearson Education, 2012
- 3. Ethan Ham, Tabletop Game Design for Video Game Designers, 2016 Taylor & Francis

References

- 1. Jeff W Murray, "2D Unity", William Pollock 2015,
- 2. Alan Thorn, "Learn Unity for 2D Game Development", Tia 2017.
- 3. Unity API, Documentation 2021.

Course Code:	Course Title: E-Commerce223
	L-P-C
CSE3126	Type of Course: Program Core
Version No.	1.0
Course Pre- requisites	Web Technology
Anti-requisites	NIL
Course Description	This course caters the knowledge of real time ecommerce platforms, their architecture, structure and workflow. It also provides sufficient hands on to build a own e commerce platform and host.
Course objectives	The objective of the course is skill development of student by using Participative Learning techniques.
Course Out Comes	On successful completion of this course the students shall be able to:1. Understand the concepts of an E-commerce (Knowledge).

	2. Acquire the knowledge about existing e-commerce applications (comprehension).
	 Build own e-commerce application (Application) Deploy e-commerce application (Application).
Course content:	
	Introduction to F Assignment Survey & Sessions

 Module 1
 Introduction to E-Commerce
 Assignment
 Survey
 8 Sessions

 Topics: Introduction to Electronic Commerce: Meaning, nature and scope; Business application of

ecommerce; Global trading environment and adopting of e -commerce, evolution of World Wide Web, future of Web.

Assignment: Perform a survey of state-of-art e-commerce platforms

Module 2	Website design	Assignment	Case Study	9 Sessions
Tonics. Web sites	as market place. Role	e of web site in $B2C$	e -commerce: Web site str	ategies. Web

Topics: Web sites as market place; Role of web site in B2C e -commerce; Web site strategies; Web site design principles; push and pull approaches; Alternative methods of customer communication such as e -mail, BBA; E-mail etiquette and e-mail security.

Assignment: Write a case study of any B2C business application

Module 3	Business Models of E-Commerce	Assignment	Case Study	10 Sessions

Topics: B2B, B2C, B2G and other models of e - commerce; Applications of e-commerce to supply chain management; Product and service digitisation; Remote servicing, procurement and online marketing and advertising; Applications to Customer Relationship Management. Business to Consumer E-Commerce Applications: Cataloging, Order planning and order generation; Cost estimation ad pricing; Order receipt and accounting; Order selection and prioritization; Order scheduling, fulfilling and delivery, Order billing, Post sales services.

Assignment: Write a case study of any B2B and B2G business application

Module 4	E-Payment System	case study	Programming	g Task	9 Sessions
Toming, Trungs	f	a ala an d'annuan arr		ana dit aanda	ann ant a and a

Topics: Types of payment systems –e-cash and currency servers, e-cheques, credit cards, smart cards; electronic purses and debit cards; Operational, credit and legal risk of e - payment, Risk management options for e-payment systems, Set standards.

Assignment: Develop one online e-commerce platform for online tutorial

List of Laboratory Tasks:

1. **Level 1:** Understand the work flow of various e-commerce applications (Amazon, flipkart, myntra, etc.)

Level 2: create a web page of your college.

- 2. **Level 1:** Develop a web page for user login
- Level 2: Develop a web page for registration
- 3. **Level 1:** Develop a home page of website consisting of navigation menus.
- Level 2: Develop a home page of website consisting of navigation menus as links.
- 4. **Level 1:** Develop a home page of website consisting of vertical navigation panel. **Level 2:** Develop a page to navigate a page with user credentials and verify.
- 5. **Level 1:** Build multiple web pages and link them to home page.
- Level 2: Embed relevant videos of recommended in home page.
- 6. **Level 1**: Create a small website for online grocery.
- Level 2: Create a cart of products and navigate to pay portal.
- 7. **Level 1:** Build a small B2B website (Shopify)
- Level 2: Build a small B2B website (eBay)
- 8. **Level 1:** Build a small B2C business transaction (Amazon).
- Level 2: Build a small B2C business transaction (Flipkart).
- 9. **Level 1:** Create simple customer to customer (eBay like e-commerce application).
- Level 2: Create simple customer to customer (big Basket like e-commerce application).
- 10. **Level 1:** Write a case study on security issues in e-commerce.
- Level 2: Write a case study on risk management in e-commerce.

Targeted Application & Tools that can be used: Xamp server, Notepad, Visual studio, MySQL

Project work/Assignment:

Design a website to showcase working of 4 types of e-commerce (B2B, B2C, C2B and C2C business transactions.

Textbook(s):

- 1. Sushila Madan (2022), E-Commerce, Scholar Tech Press
- 2. S.J. P.T. Joseph (2019), E-COMMERCE : An Indian Perspective, PHI

3. Laudon, Kenneth C. and Carol Guercio Traver (2002) E -commerce: business, technology, society. (New Delhi: Pearson Educatin).

4. Awad, Elias M. (2007), Electronic Commerce: From Vision to Fulfillment (New Delhi: Pearson Education).

References

1. Kalakota, Ravi and Marcia Robinson (2001). Business 2.0: Roadmap for Success (New Delhi: Pearson Education).

2. Smith, P.R. and Dave Chaffey (2005), eMarketingeXcellence; The Heart ofeBusiness (UK: Elsevier Ltd.)

- <u>https://onlinecourses.nptel.ac.in</u>
- <u>https://onlinecourses.swayam2.ac.in</u>
- http://182.72.188.195/cgi-bin/koha/opac-

detail.pl?biblionumber=4125&query_desc=kw%2Cwrdl%3A%20e%20commerce

• <u>http://182.72.188.195/cgi-bin/koha/opac-</u>

detail.pl?biblionumber=14338&query_desc=kw%2Cwrdl%3A%20e%20commerce

Course Code:	Course Title: Advanced Java Programming				
CSE3146	Type of Course:1] School Core	L- P- C	1	4	3
	2] Laboratory integrated				
Version No.	1.0				
Course Pre- requisites	[1] Problem Solving Using Java (CSE1001) [2] [System (CSE2074) [3] Web Technology (CSE2006)	Database	Mai	nage	ment
	Basic Knowledge about DBMS, Knowledge on Core Java Client-server Architecture, HTML	(OOPs F	Princi	ples),
Anti-requisites	NIL				
Course Description	INIL The purpose of this course is to introduce the students to Java Advanced API enhanced by Design Patterns and SOLID Principles. The course is both conceptual and analytical and is understood with JDK 8 software & IntelliJ IDE. This course develops critical thinking skills by augmenting the student's ability to develop distributed model for control of various modern management systems like banking management system, student information management system, , Library Management System etc. with the necessary API for communication with database enhanced by the current industrial approach of Java's SOLID principle and design patterns. This course also involves essential core java concepts like multithreading, file handling, event handling etc.				
Course Objectives	This course is designed to improve the learners' EMPLOYABILI EXPERIENTIAL LEARNING techniques.	TY SKILLS	by us	sing	

	Please add as per what the course	covers in the crit	teria1 NAAC Template.	
Course Outcomes	On successful completion of this 1. Explain the benefits of I applications. 2. Understand Concurrent 3. Apply Communication m 4. Implement Web MVC ap 5. Test JPA Implementation	s course the stu Design-Pattern Programming u pechanisms of Ja pplication using n using Hiberna	idents shall be able to: & SOLID principle in ja using Java Multi-Threac ava with DBMS. Servlet and JSP Techno te.	ava based ling. ology.
Course			•••	
Content:				•
Module 1	Multi- Threading (Comprehension)	Assignment	Knowledge Ability	11 Hours
Topics:				
Multi-Thread	ing in Java: Understanding Threads, I	Needs of Multi-Tl	hreaded Programming ,T	hread Life-
Cycle, Thread F —DeadLock, Th	Priorities ,Synchronizing Threads, Inter e Executor Framework.	Communication	of Threads ,Critical Facto	r in Thread
Module 2	Input & Output Operation in Java (Comprehension)	Assignment	File Operations	11 Hours
Capabilities ,U Files, Buffer a Observer and C	nderstanding Streams, Working with I nd Buffer Management, Read/Write Observable Interfaces.	File Object, File Operations with	I/O Basics, Reading and File Channel, Serializin	Writing to g Objects,
Module 3	Collection and Database programming using JDBC (Comprehension)	Assignment	Data Storage	12 Hours
Topics: Collection - T Understanding Database Prog Using JDBC, Co	he Collection Framework : Collections Hashing, Uses of ArrayList & Vector , C ramming using JDBC - Introduction to J nnecting to non-conventional Databas	of Objects , Colle Comparable and IDBC, JDBC Drive es.	ection Types, Sets , Seque Comparator Interfaces. ers & Architecture, CRUD	ence, Map, operation
Module 4	Distributed Programming with Servlet (Application)	Assignment	Distributed Programming	11 Hours
Topics:				
			6 Mar. 1	
Servlet - Web	o Application Basics, Architecture a	nd challenges o	of Web Application, Int	roduction

HTTP Requests and Responses: Handling HTTP GET requests and POST request, Session Tracking, Simple Servlet Program to fetch database records

Module 5	Distributed Programming with JSP (Application), Introduction to Spring Framework (Application)	Distributed Programming	11 Hours

Topics:

JSP - Introduction to JSP, Creating simple JSP Programs, How JSP is processed, JSP Scripting Constructs, Predefined Variables, JSP Directives, Simple JSP Program to fetch database records. Spring CORE, Overview of Spring, Spring Architecture, bean life cycle, Java and XML Configuration on Spring, Spring Different Modules.

Spring JPA, JPA Specification, Classes and Interfaces, Object Relational Mapping using JPA, JPA implementation with Hibernate, Simple JPA-Hibernate program to Create Database schemas.

List of Laboratory Tasks:

Labsheet -1 [4 + 1 Practical Sessions]

Experiment No 1:

Level 1: Demonstration of Thread Class and Runnable Interface.

Level 2 – Implementation of Producer-Consumer Problem.

Labsheet -2 [3 +1 Practical Sessions]

Experiment No. 1:

Level 1 – Usages of Java.io.* package.

Level 2 – File operations with a case study.

Labsheet – 3 [3 +1 Practical Sessions]

Experiment No. 1:

Level 1 – Practicing classes and methods in java.util.collection.

Level 2 – Scenario based questions to apply all collections. [Group wise]

Labsheet – 4 [3 + 1 Practical Sessions]

Experiment No. 1:

Level 1 – JDBC complete Demonstration with Student Database Level 2 – Implementation of Student Information Management (Standalone). [Group wise]

Labsheet – 5 [3 + 1 Practical Sessions]

Experiment No. 1:

Level 1 – Web page creation using HTML, Dynamic web page using java.servlet and JDBC Level 2 – Implementation of Student Information Management (WEB based). [Group wise]

Labsheet – 6 [3 + 1 Practical Sessions] Experiment No. 1:

Level 1 – Web page creation using HTML, Dynamic web page using java.servlet, JSP and JDBC

Level 2 – Implementation of Student Database using JPA Hibernate

Targeted Application & Tools that can be used: Java 8 / MYSQL 8 / Eclipse /IntelliJ (IDE)

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Build a Standalone database application using Java Swing as Front End. Indicative areas include; TimeTable Management, Student Expense Tracker, Important Mail Fetcher, etc.

Build a real time database application using J2EE as Front End. Indicative areas include; health care, education, industry, Library, Transport and supply chain, etc.

Text Books

1. Cay S Horstmann and Gary Cornell, "CORE JAVA volume II-Advanced Features, 9th Edition.

References

1. Herbert Schildt, "*Java 2: The Complete Reference*", Tata McGraw-Hill Education,6^h Edition.

2. Y.Daniel Liang, "Introduction to Java programming Comprehensive Version", Pearson Education, 10th Edition.

3. Core and Advanced Java Black Book, Dream Tech Press.

4. Spring in Action , Graig Walls, 5th Edition

5. Java Persistence with Hibernate , Christian Bauer & Gavin King, 2nd Edition

6. https://www.youtube.com/watch?v=JGNTYXkVCVY&list=PLd3UqWTnYXOkTSBCBNyyhx o jxlY uTWA&index=2

Course Code:	Course Title: Front-e	end Full Stack					
CSE3150	Development			I - P- C	2	2	3
					2	2	J
Version No.	1.0						
Course Pre-	NI						
requisites							
Anti-requisites							
Course Description	This intermediate c	This intermediate course enables students to perform front-end full stack					
	development, with	emphasis on en	nployabil	ity skills.	The c	ourse cov	/ers
	key technologies ar	nd architectures	that enab	oles the stu	udent to	o design	and
	implement front-en	d. On successful	complet	ion of this	s course	e, the stuc	lent
	shall be able to put	rsue a career in	full-stacl	k develop	ment.	The stude	ents
	shall develop strong	g problem-solvii	ng skills	as part of	this co	urse.	TILC 1
Course Objectives	This course is desig	ned to improve to VING Mathed	the learne	ers' EMPL	ΟΥΑΒΙ	LITY SK	ILLS by
	using FRODLEW SC		Jiogles.				
Course Outcomes		ation of the second		اممهم مامما	لمممار		
Course Outcomes	1] Describe the fun	damontals of Do	wOne and	Eront on		to: tack dava	lonmont
	[Comprehension]		vops and	Front-end		Lack ueve	iopment.
	21 Illustrate developr	ment of a respons	ive web	[Annlicatio	nl		
	3] Apply concepts of	Angular is to dev	elon a we	b front-en	d. [Ann	lication	
	4] Apply concepts of	Angular.js to dev	elop a we	b front-en	d. [App	lication]	
Course Content:							
	Fundamentals of						
Module 1	DevOps and Web	Project	Programi	ming		04 5	Sessions
	Development	-	_	-			
Topics:							
Introduction to Agile	e Methodology; Scrun	n Fundamentals;	Scrum Ro	oles, Artifa	cts and	Rituals; [)evOps –
Architecture, Lifecyc	e, Workflow & Princi	ples; DevOps Too	ls Overvie	ew – Jenkir	ns, Dock	er, Kuber	netes.
Review of GIT source	e control. HTML5 – Sy	ntax, Attributes, I	Events, W	eb Forms	2.0 <i>,</i> We	b Storage	, Canvas,
Web Sockets; CSS3 –	Colors, Gradients, Te	xt, Transform	сı.				
Assignment: Develop	a website for manage	ging HR policies of	f a depart	ment.			
Module 2	Responsive web	Project	Programi	ming		03 S	essions
Tonics:	uesign						
BootStrap for Respon	nsive Web Design: Jav	aScript – Core svi	ntax. HTM	11 DOM. of	niects o	lasses. As	vnc: Aiax
and iQuery Introduct	tion	doonpe core sy			5,000,0	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	yne, rijan
Assignment: Design	and develop a webs	ite that can activ	ely keep	track of e	ntry-exi	it informa	tion of a
housing society.			, .				
Modulo 2	Fundamentals of	Project	Drogram	mina		00 5	ossions
would 5	Angular.js		FIUgrann	ning		08.3	essions
Topics:							
Setting up Developm	ent & Build Environ	ment: Node.js an	d NPM; I	ntroductio	n to Ty	peScript;	Working
with OOP concepts	with TypeScript; Ang	gular Fundamenta	uls; Angu	lar CLI; Ir	ntroduct	tion to Ty	peScript;
Debugging Angular	applications; Compo	onents & Databi	nding in	Depth; A	ngular	Directive	s; Using
Services & Depende	ncy injection; Angu	ar Kouting; Obs	ervables;	nanaling	rorms	in Angul	ar Apps;
Components: Angul	n using ripes, Makin ar Modules & Optir	nizing Angular	Anne De	valoving a	$\Delta n \alpha$	lar App	Angular
Animations. Adding	Offline Canabilities	with Service Wor	kers Uni	t Testing i	n Anou	lar Anns <i>I</i>	Jasmine
Karma)	Cinne Cupuolinies			i i ostilig l	gu	in ripps (, asimino,

Karma). Assignment: Develop a software tool to do inventory management in a warehouse.

				I	
Modul	e 4	Fundamentals of React.js	Project	Programming	15 Sessions
Topics	:				
Overvi	iew of React.j	s.; Reactive Program	ming; React Con	nponents; Render Method; Virt	ual DOM and
Bandw	vidth Salvation	i; Two Distinct Ways	of Initializing a H	React Class; States & Life Cycle	es; Component
Mount	ing; Node.js &	2 NPM; JSX Walkthro	ough; React Testin	ng.	
Assign	ment: Develo	op a web-based applic	ation to book mov	vies/events (like bookmyshow).	
Target	ed Applicatio	n & Tools that can be	used:		
Applica used b Profes	ation Area is t y all applicati sionally Used	o Design and Analyzi on developers. Software: GCC comp	ng the efficiency biler.	of Algorithms. This fundament	al course is
Projec	t work/Assign	ment:			
1.	Problem Sol	ving: Design of Algori	ithms and implen	nentation of programs.	
2.	Programmin	g: Implementation o	f given scenario ι	ısing Java.	
Text B	ook:				
T1.	Fender, Youn	g, "Front-end Fundan	<i>nentals",</i> Leanpub	, 2015	
T2.	Northwood, of a Modern I	Chris, "The Full Stack Full Stack Web Develo	Developer: Your E oper", APress, 201	Essential Guide to the Everyday 8	Skills Expected
Refere	nces:				
R1.	Flanagan D S,	"Javascript : The Def	<i>initive Guide"</i> 7th	Edition. 7th ed. O'Reilly Media;	2020.
R2.	Alex Libby, Ga	aurav Gupta, and Aso	j Talesra. <i>"Respon</i>	sive Web Design with HTML5 a	nd CSS3
	Essentials", P	ackt Publishing, 2016			
R3.	Duckett J Rup	pert G Moore J. <i>"Java</i>	ascript & Jquery :	Interactive Front-End Web Deve	lopment.";
۱	Wiley; 2014.				
R4.	Greg Sidelnik	ov, "React.js Book_ Le	earning React Javo	aScript Library", 1 edition, Scrat	ch-River Tigris
L	LC 2016				
R5.	Web Referen	ce:			
	https://www.	youtube.com/watch?	v=JGNTYXkVCVY	<u>&list=PLd3UqWTnYXOkTSBCBN</u>	<u>yhxo_jxlY_uT</u>
	WA&index=2				

Course Code:	Course Title: J	ava Full Stack Developn	nent				
CSE3151				L- P- C	2	2	3
Version No.	1.0						
Course Pre-	Nil						
requisites							
Anti-requisites	CSE3152 .NET I	Full Stack Development					
Course	This advance	ed level course enab	oles students	to per	form fu	all sta	ack
Description	development	elopment using Java, with emphasis on employability skills. The key					
	technologies	mologies used for Full Stack development is based on either Java					
	technology or	nology or .NET technology. In this course, the focus is on using Java,					
	and the related	l technologies/tools lik	e Java EE, Ja	va Persist	ence, H	liberna	ate,
	Maven, Sprin	g Core, etc. On succ	essful compl	etion of	this co	urse,	the
	student shall	be able to pursue a c	career in full	-stack de	velopm	ent. T	he
Course Objectives	students shall	develop strong proble	m-solving ski	IIIs as pai	T OF this	S COURS	se.
Course Objectives	PROBLEM SC	I VING Methodologies	learners EMPI			ILLS	by using
	I ROBLEWI SC	L VII (O Methodologies	•				
Course Outcomes	On successful (completion of the cours	a tha students	chall bo	able to:		
course outcomes	11 Practice the	use of lava for full star	k developmen	t [Annlica	able to.		
	21 Show web a	polications using Java F	F. [Application	י <u>ו</u> אקאייני יו	lionj		
	3] Solve simple	applications using Java	a Persistence a	nd Hiber	nate (Ar	plicati	ionl
	4] Apply conce	pts of Spring to develop	o a Full Stack a	pplicatio	n. [Appli	cation]
	5] Employ aut	omation tools like Ma	aven, Seleniur	n for Fu	I Stack	devel	opment.
	[Application	n]					
Course Content:							
		1					
Module 1	Introduction	Project	Programmin	g		Se	03 essions
Topics:	1						
Review of Java; Ad	avanced concep	ts of Java; Java generics	s; Java IO; Ne	w Feature	es of Jav	a. Unit	t Testing
tools.	-	-					_
Modulo 2	Java EE Web	Project	Drogrammin	a			05
	Applications	FTOJECT	FTOgrammin	Б		Se	essions
Topics:							
Introduction to E	clipse & Tomc	at; JSP Fundamentals;	Reading HTN	AL form	Data w	vith JS	P; State
Management with	I JSP; JSP Stand	lard Tag Library - Core	& Function T	ags; Serv	let API	Funda	mentals;
ServietContext, Se	ssion, Cookies; F	Request Redirection Tec	nniques; Buildi	ng MVC A	pp with	Servle	ts & JSP;
Assignment: Devel	egrating JDBC w	vith MVC App	cies of a depar	tmont			
Assignment. Deve				unent.			
	Persistence	Project					06
Module 3	using IPA and	Toject	Programmin	g		Se	essions
	Hibernate						
Topics:							
Fundamentals of Ja	ava Persistence	with Hibernate; JPA for	Object/Relatio	nal Mapp	ing, Que	erying,	Caching,
Performance and	Concurrency; F	irst & Second Level C	aching, Batch	Fetching,	Optimi	stic Lo	ocking &
Versioning; Entity	Relationships, Ir	nheritance Mapping & F	Polymorphic Q	ueries; Q	uerying	databa	ise using
JPQL and Criteria A	NPI (JPA)					_	
Assignment: Design housing society	n and develop	a website that can acti	vely keep trac	k of entr	y-exit in	format	tion of a
Module 4	Spring Core	Project	Programmin	g		Se	10 essions

Topics:

Spring Core, Spring MVC, Spring Boot REST API; Understanding Spring Framework; Using Spring MVC; Building a Database Web App with Spring and Hibernate o Spring AOP (Aspect Oriented Programming); Implementing Spring Security; Developing Spring REST API; Using Spring Boot for Rapid Development Assignment: Develop a software tool to do inventory management in a warehouse.

Module 5	Automation tools	Project	Programming	06 Sessions

Topics:

Introduction to Automation Tools; Apache Maven: Maven Fundamentals, Software Setup - Commandline and Eclipse, pom.xml and Directory Structure, Multi-Module Project Creation, Scopes, Dependency Management, Profiles; Functional/BDD Testing using Selenium, Selenium Fundamentals and IDE, Selenium WebDriver, Installation and Configuration, Locating WebElements, Driver Commands, WebElement Commands

Assignment: Illustrate the use of automation tools in the development of a small software project. Targeted Application & Tools that can be used:

Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers.

Professionally Used Software: Eclipse, NetBeans, Hibernate, Selenium, Maven, GIT.

Project work/Assignment:

- 1. Problem Solving: Design of Algorithms and implementation of programs.
- 2. Programming: Implementation of given scenario using Java.

Text Book:

T1. Fender, Young, "Front-end Fundamentals", Leanpub, 2015

References

R1. Soni, Ravi Kant. "Full Stack AngularJS for Java Developers: Build a Full-Featured Web Application from Scratch Using AngularJS with Spring RESTful.", Apress, 2017.

R2. Mardan, Azat. "Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB.", Apress, 2015

Course Code:	Course Title: .N	NET Full Stack Developm	ent				
CSE3152				L- P- C	2	2	3
Version No.	1.0				l I		
Course Pre- requisites	Nil						
Anti-requisites	CSE3151 Java F	ull Stack Development					
Course	This advance	d level course enab	les students	to per	form f	ull st	ack
Description	development u	using .NET, with empl	nasis on emp	loyabilit	y skills	. The l	key
	technologies u	used for Full Stack d	levelopment	is based	on ei	ther Ja	ava
	technology or	chnology or .NET technology. In this course, the focus is on using .NET					
	and the related	d technologies/tools li	ke C#, ASP	.NET, Ei	ntity Fr	amew	ork
	Core, etc. On s	successful completion	of this course	e, the stuc	lent sha	all be a	ble
	to pursue a ca	reer in full-stack deve	elopment. Tl	ne studer	its shal	l deve	lop
	strong problem	n-solving skills as part	of this cours	se.			
Course Objectives	This course is d PROBLEM SO	esigned to improve the le LVING Methodologies.	earners' EMP	LOYABII	LITY SI	KILLS	by using
Course Outcomes	On successful c 1] Practice the	n successful completion of the course the students shall be able to:] Practice the use of C# for developing a small application [Application]					
	2] Show web ap 3]Solve simple 4] Apply concep	Show web applications using Entity Framework. [Application] Solve simple web applications that use SQL and ASP.NET [Application] Apply concepts of ASP NET to develop a Full Stack application. [Application]					
Course Content:							
Module 1	C# Programming for Full Stack Development	Project	Programmin	5		Se	10 essions
Topics:			1				
.NET Framework F	undamentals, Vi	isual Studio IDE Fundan	nentals, C# La	anguage F	eatures	, Work	king with
arrays and collect	ions, Working	with variables, operato	ors, and expr	essions, I	Decisior	n and	iteration
statements, Manag	ging program flo	ow and events, Workin	g with classe	es and me	ethods,	OOP c	oncepts,
Properties, Auto I methods, Sealed Cl Data validation and	mplemented, D asses/Methods, working with da	Delegates, Anonymous Partial Classes/Method ata collections including I	Methods and s, Asynchrond LINQ, Handlin	d Anonym ous progra g errors a	nous Ty amming nd exce	pes, E and th ptions,	xtension reading, Working
Assignment: Devel	on a small annlig	nework cation for managing libra	any using C#				
	Entity						
Module 2	Framework Core 2.0	Project	Programmin	3		Se	06 essions
Topics: Entity Framework (the EDM; Working Operations; Perform Assignment: Develo	Core 2.0 Code F With Stored Pr mance Optimiza op an applicatio	irst Approach; Introduct ocedures; Advanced En tion; Data Access with A n for managing HR polic	ion To Entity tity Framewo DO.NET ies of a depar	Framewo rk - DbCo tment.	ork and ontext [EDM; (EF6]; A	Querying .dvanced
Module 3	ASP.NET	Project	Programmin	5		Se	06 essions
Topics: ASP.NET Core, AS SQL using MS SQI MVC & Layouts;	SP.Net Core 3.1 L, Working With	MVC, ASP.NET Core n Data In Asp.Net, Razor	Middleware r View Engin	and Requ e, State M	est pipe anagem	line, R nent In	eview of Asp. Net

Assign	ment: Deve	lop a web applic	cation to mark	entry/exit o	of guests in a building.	
Modul	le 4	ASP.NET	Project		Programming	08 Sessions
Topics	:	1				I
Introdu	uction To Mo	dels, Validation	s In Asp.Net M	IVC, Authe	entication and Authorization In	n Asp.Net MVC,
Advan	ced Asp. Net	t MVC - Ajax A	ction Link In	MVC, Adv	anced Asp.Net MVC - Ajax	Forms In MVC,
Micros	soft Testing I	Framework – Un	nit Testing the .	NET Appl	ication	
Assign	ment: Deve	lop a software to	ool to do inven	tory manag	gement in a warehouse.	
Target	ed Application	on & Tools that	can be used:			
Profes	sionally Use	d Software: Vis	ual Studio			
Projec	t work/Assig	nment:				
1.	Problem So	olving: Design o	f Algorithms a	nd implem	entation of programs.	
2.	Programm	ing: Implementa	ation of given	scenario u	sing .NET.	
Text B	ook:					
T1.	Fender, You	ng, "Front-end I	- Fundamentals	, Leanpub,	2015	
T2.	Valerio De S	Sanctis, "ASP.NE	T Core 5 and	Angular: F	Full-stack web development v	with .NET 5 and
	Angular 11"	, 4th Edition, Pa	ackt, 2021.			
Refere	ences					
R1.	Benjamin Pe	erkins, Jon D. Rei	id, "Beginning	C# and .NE	<i>T</i> ", Wiley, 2021 Reid, 2021.	
R2.	Piotr Gankie	wicz, "Full Stack	.NET Web Dev	velopmenť	", Packt Publishing, 2017.	
R3.	Tamir Dresh	er, Amir Zuker, S	Shay Friedmar	n, "Hands-C	On Full-Stack Web Developme	nt with ASP.NET
	Core", Pack	t Publishing, 202	18.			
R4.	Dustin Met	zgar, <i>"Exploring</i>	g .NET core wi	th microse	rvices, ASP.NET core, and Er	ntity Framework
	Core", Manr	ning, 2017.				

Course Code:	Course Title: Front-	end Full Stack	(
CSE390	Development				0	А	2		
				L- I - C	Ŭ	-	2		
Version No.	1.0								
Course Pre-	Nil								
requisites									
Anti-requisites	NIL	NIL							
Course Description	This intermediate	course enable	s students	to perform	n front-	end full s	tack		
	development, with	emphasis on	n employal	oility skill	s. The	course co	vers		
	key technologies a	nd architectu	res that en	ables the s	student	to design	and		
	implement front-end. On successful completion of this course, the student shall be able to pursue a career in full-stack development. The						the		
							The		
	students shall dev	ents shall develop strong problem-solving skills as part of this							
Course Objectives	course.								
Course Objectives	This course is design	hea to improve	e the learne	ers Eiviplo	YABILII	Y SKILLS DY	/ using		
	PROBLEIVI SOLVING	wiethodologie	25.						
Course Outcomes	On successful comp	letion of the o	course the	students sl	nall be a	able to:			
	1] Describe the fun	damentals of	DevOps ar	nd Front-ei	nd full s	stack deve	lopment.		
	[Comprehension]							
	2] Illustrate a basic	web design us	sing HTML,	CSS< Javas	script. [/	Applicatio	n]		
	3] Illustrate develop	pment of a res	ponsive w	eb. [Applic	ation]		_		
	4] Apply concepts o	f Angular.js to	o develop a	web front	-end. [/	Application	າ]		
Course Content:									
Module 1	Fundamentals of DevOps	Project	Program	nming		04 9	sessions		
Topics:									
Introduction to Agile	Methodology; Scrur	n Fundamenta	als; Scrum I	Roles, Artif	acts and	d Rituals; I	DevOps –		
Architecture, Lifecycl	e, Workflow & Princi	ples; DevOps 1	ools Overv	iew – Jenk	ins, Doc	ker, Kuber	netes.		
Review of GIT source	control.								
Module 2	Web Design &	Project	Program	nming		03 5	essions		
	Development	roject	i i ogi di			000	23510115		
Topics:									
HTML5 – Syntax, Att	ributes, Events, Web	Forms 2.0, W	eb Storage,	, Canvas, V	Veb Soc	kets; CSS3	– Colors,		
Gradients, Text, Tran	storm; a a wobsite for manag	ting UD policio	c of a dona	rtmont					
Assignment: Develop			s of a depa	runent					
Module 3	design	FIOJECI	Program	nming		08 S	essions		
Topics:	Ū								
BootStrap for Respor	nsive Web Design; Jav	aScript – Core	syntax, HT	ML DOM, o	objects,	classes, As	sync; Ajax		
and jQuery Introduct	ion								
Assignment: Design	and develop a webs	ite that can a	ctively kee	p track of	entry-e	kit informa	ation of a		
housing society									
Module 4	Fundamentals of	Project	Program	nming		15 S	essions		
	Angular.js	-	Ũ	0					
lopics:	ant & Davild Environ			Turkun das aki	an ta T		Wartsing		
with OOP concepts	with TypeScript: And	ment. Node.js jular Fundame	entals. Ano	ular CI I.	Introduc	ypescript,	meScript.		
Debugging Angular	applications: Comp	onents & Dat	tabinding i	n Depth:	Angula	· Directive	es: Using		
Services & Depende	ency Injection: Angu	lar Routing: (Observables	s; Handling	g Forms	s in Angu	lar Apps:		
Output transformatio	n using Pipes; Makin	g Http Reques	sts; Authen	tication &	Route F	Protection;	Dynamic		
Components; Angula	ar Modules & Optir	nizing Angula	ar Apps; I	Deploying	an Ang	ular App;	Angular		
Animations; Adding	Offline Capabilities v	with Service V	Vorkers; Ui	nit Testing	in Ang	ular Apps	(Jasmine,		
Karma). Overview of	f React.js								

Assignment: Develop a software tool to do inventory management in a warehouse.

Targeted Application & Tools that can be used:

Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers.

Professionally Used Software: GCC compiler.

Project work/Assignment:

- 1. Problem Solving: Design of Algorithms and implementation of programs.
- 2. Programming: Implementation of given scenario using Java.

Text Book:

- T1. Fender, Young, "Front-end Fundamentals", Leanpub, 2015
- T2. Northwood, Chris, "The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer", APress, 2018

References:

- R1. Flanagan D S, "Javascript : The Definitive Guide" 7th Edition. 7th ed. O'Reilly Media; 2020.
- R2. Alex Libby, Gaurav Gupta, and Asoj Talesra. *"Responsive Web Design with HTML5 and CSS3 Essentials"*, Packt Publishing, 2016
- R3. Duckett J Ruppert G Moore J. *"Javascript & Jquery : Interactive Front-End Web Development.";* Wiley; 2014.
- R4. Web Reference:

https://www.youtube.com/watch?v=JGNTYXkVCVY&list=PLd3UqWTnYXOkTSBCBNyyhxo_jxlY_uT WA&index=2

Course Code: CSE391	Course Title: Ja	ava Full Stack Developm	ent	L- P- C	0	4	2
Version No.	1.0						
Course Pre-	Nil						
requisites							
Anti-requisites	CSE392 .NET Fu	SE392 .NET Full Stack Development					
Course	This advance	d level course enabl	es students	to per	form f	ull sta	ack
Description	development u	using Java, with empha	asis on empl	oyability	v skills.	The k	key
	technologies 1	hnologies used for Full Stack development is based on either Java					
	technology or	hnology or .NET technology. In this course, the focus is on using Java,					
	and the related	d the related technologies/tools like Java EE, Java Persistence, Hibernate,					
	student shall	g Core, etc. On succe be able to pursue a ca	ssiul comple	stack de	uns co	oent T	une The
	students shall	develop strong problem	n-solving ski	lls as pai	t of thi	s cours	se.
Course Objectives	This course is d	esigned to improve the le	earners' EMPI		Y SKILL	S by usi	ing
	PROBLEM SOLV	/ING Methodologies.				,	0
		-					
Course Outcomes	On successful c	ompletion of the course	the students	shall ho	ahla ta:		
course outcomes	1] Practice the	use of Java for full stack	development	t [Applica	tion]		
	2] Show web a	pplications using Java EE	. [Application]			
	3] Solve simple	applications using Java	Persistence a	nd Hiber	nate [A	pplicati	on]
	4] Apply conce	pts of Spring to develop	a Full Stack a	pplicatio	n. [Appl	ication]
	5] Employ aut	omation tools like May	ven, Seleniur	n for Fu	I Stack	develo	opment.
Course Courtourt	Application						
		Ι	1				
Module 1	Introduction	Project	Programming	B		Se	03 ssions
Topics:	L	I					
Review of Java; Ad	lvanced concept	ts of Java; Java generics;	Java IO; Nev	v Feature	es of Jav	va. Unit	t Testing
tools.			1				
Module 2	Java EE Web Applications	Project	Programming	B		Se	05 ssions
Topics:							
Introduction to E	clipse & Tomca	at; JSP Fundamentals;	Reading HTN	1L form	Data v	vith JS	P; State
Management with	JSP; JSP Stand	ard Tag Library - Core	& Function T	ags; Serv	let API	Fundai	mentals;
ServletContext, Ses	sion, Cookies; R	equest Redirection Tech	niques; Buildi	ng MVC A	pp with	Servle	ts & JSP;
Complete App - Int	egrating JDBC w	vith MVC App	as of a donard	mont			
Assignment: Dever			es of a depart	inent.			
	Persistence	Project					06
Module 3	using JPA and		Programming	3		Se	ssions
	Hibernate						
Topics:							
Fundamentals of Ja	va Persistence v	with Hibernate; JPA for O	bject/Relatio	nal Mapp	ing, Que	erying,	Caching,
Performance and	Concurrency; F	irst & Second Level Ca	ching, Batch	Fetching,	Optim	istic Lo	ocking &
IPOL and Critoria A	kelationships, Ir pi (ipa)	ineritance wapping & Po	nymorphic Qi	leries; Qi	uerying	uataba	se using
Assignment: Desig	n and develop	a website that can activ	ely keep trac	k of entr	y-exit ir	nformat	ion of a
housing society	1	Γ	1				
Module 4	Spring Core	Project	Programming	8		Se	10 ssions

Topics:

Spring Core, Spring MVC, Spring Boot REST API; Understanding Spring Framework; Using Spring MVC; Building a Database Web App with Spring and Hibernate o Spring AOP (Aspect Oriented Programming); Implementing Spring Security; Developing Spring REST API; Using Spring Boot for Rapid Development Assignment: Develop a software tool to do inventory management in a warehouse.

Module 5	Automation tools	Project	Programming	06 Sessions

Topics:

Introduction to Automation Tools; Apache Maven: Maven Fundamentals, Software Setup - Commandline and Eclipse, pom.xml and Directory Structure, Multi-Module Project Creation, Scopes, Dependency Management, Profiles; Functional/BDD Testing using Selenium, Selenium Fundamentals and IDE, Selenium WebDriver, Installation and Configuration, Locating WebElements, Driver Commands, WebElement Commands

Assignment: Illustrate the use of automation tools in the development of a small software project. Targeted Application & Tools that can be used:

Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers.

Professionally Used Software: Eclipse, NetBeans, Hibernate, Selenium, Maven, GIT.

Project work/Assignment:

- 1. Problem Solving: Design of Algorithms and implementation of programs.
- 2. Programming: Implementation of given scenario using Java.

Text Book:

T1. Fender, Young, "Front-end Fundamentals", Leanpub, 2015

References

R1. Soni, Ravi Kant. "Full Stack AngularJS for Java Developers: Build a Full-Featured Web Application from Scratch Using AngularJS with Spring RESTful.", Apress, 2017.

R2. Mardan, Azat. "Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB.", Apress, 2015

Course Code:	Course Title: .N	NET Full Stack Developm	ent					
CSE392				L- P- C	0	4	2	
Version No.	1.0	1.0						
Course Pre- requisites	Nil							
Anti-requisites	CSE391 Java Fu	ll Stack Development						
Course	This advance	d level course enab	les students	to per	form f	ull sta	ack	
Description	development u	using .NET, with empl	asis on emp	loyabilit	y skills	. The k	cey	
	technologies u	used for Full Stack d	evelopment	is based	on ei	ther Ja	iva	
	technology or	.NET technology. In th	his course, th	ne focus i	s on us	ing .N	ET	
	and the related	nd the related technologies/tools like C#, ASP.NET, Entity Framework						
	Core, etc. On s	Core, etc. On successful completion of this course, the student shall be able						
	to pursue a ca	reer in full-stack deve	elopment. Th	ne studer	its shal	l devel	lop	
	strong problem	n-solving skills as part	of this cours	se.			1	
Course Objectives	This course is de	esigned to improve the l	earners' EMP	LOYABILI	FY SKILL	S by usi	ing	
	PROBLEM SOLV	ING Methodologies.				,	0	
Course Outcomes	On successful c	ompletion of the course	the students	s shall be	able to:	:		
	1] Practice the	use of C# for developing	g a small appl	ication [A	pplicati	ion]		
	2] Show web ap	oplications using Entity	Framework. [Applicati	on]			
	3]Solve simple web applications that use SQL and ASP.NET [Application]							
	4] Apply concer	ots of ASP.NET to develo	op a Full Stacl	k applicat	ion. [Ap	plication	on]	
Course Content:								
	C#							
Madula 1	Programming	Draiast	Drogrammin	-			10	
wodule 1	for Full Stack	Project	Programming	5		Se	ssions	
	Development							
Topics:								
.NET Framework F	undamentals, Vi	isual Studio IDE Fundam	nentals, C# La	anguage F	eatures	, Work	ing with	
arrays and collect	ions, Working	with variables, operato	rs, and expr	essions, I	Decisior	n and i	iteration	
statements, Manag	ging program fl	ow and events, Workin	g with classe	es and me	ethods,	OOP c	oncepts,	
Properties, Auto I	mplemented, D	elegates, Anonymous	Methods and	d Anonyn	10us Ty	vpes, Ex	xtension	
methods, Sealed Cl	asses/Methods,	Partial Classes/Method	s, Asynchron	ous progra	amming	; and th	reading,	
Data validation and	working with da	ata collections including I	INQ, Handlin	g errors a	nd exce	ptions, '	Working	
with Files, Unit Tes	ting – Nunit fran	nework						
Assignment: Devel	op a small applic	cation for managing libra	ary using C#.					
	Entity						06	
Module 2	Framework Core 2.0	Project	Programming	8		Se	ssions	
Topics:								
Entity Framework	Core 2.0 Code F	irst Approach; Introduct	ion To Entity	Framewo	ork and	EDM; C	Juerying	
the EDM; Working	With Stored Pr	ocedures; Advanced En	tity Framewo	ork - DbCo	ontext [!	EF6]; A	dvanced	
Operations; Perfor	mance Optimiza	tion; Data Access with A	DO.NET					
Assignment: Devel	op an applicatio	n for managing HR polic	ies of a depar	tment.				
Module 3	ASP.NET	Project	Programming	3		Se	06 ssions	
Topics:								
ASP.NET Core, AS	SP.Net Core 3.1	MVC, ASP.NET Core	Middleware a	and Requ	est pipe	line, Re	eview of	
SQL using MS SQI	L, Working With	n Data In Asp.Net, Razon	r View Engin	e, State M	anagem	ent In A	Asp. Net	
MVC & Layouts;								

Assigr	ment: Deve	lop a web applic	cation to mark	entry/exit o	of guests in a building.		
Modu	le 4	ASP.NET	Project		Programming	08 Sessions	
Topics	:	•		1			
Introdu	uction To Mo	dels, Validation	s In Asp.Net M	VC, Authe	entication and Authorization l	n Asp.Net MVC,	
Advan	ced Asp. Ne	t MVC - Ajax A	ction Link In	MVC, Adv	anced Asp.Net MVC - Ajax	Forms In MVC,	
Micros	soft Testing I	Framework – Un	nit Testing the .	NET Appl	ication		
Assigr	ment: Deve	lop a software to	ool to do inven	tory manag	gement in a warehouse.		
Target	ed Applicati	on & Tools that	can be used:				
Profes	sionally Use	d Software: Vis	ual Studio				
Projec	t work/Assig	nment:					
1.	Problem So	olving: Design o	f Algorithms a	nd implem	entation of programs.		
2.	Programming: Implementation of given scenario using .NET.						
Text B	ook:						
T1.	Fender, Young, "Front-end Fundamentals", Leanpub, 2015						
T2.	Valerio De S	Sanctis, "ASP.NE	T Core 5 and	Angular: F	Full-stack web development	with .NET 5 and	
	Angular 11"	, 4th Edition, Pa	ackt, 2021.				
Refere	ences						
R1.	R1. Benjamin Perkins, Jon D. Reid, "Beginning C# and .NET", Wiley, 2021 Reid, 2021.						
R2.	R2. Piotr Gankiewicz, "Full Stack .NET Web Development", Packt Publishing, 2017.						
R3.	Tamir Dresh	er, Amir Zuker, S	Shay Friedmar	n, "Hands-C	On Full-Stack Web Developm	ent with ASP.NET	
	Core", Pack	t Publishing, 201	18.				
R4.	Dustin Met	zgar, <i>"Exploring</i>	g .NET core wi	th microse	rvices, ASP.NET core, and E	ntity Framework	
	Core", Manr	ning, 2017.					

Course Code:	Course Title: 1	Theory of Computation	on						
CSE2018	-				2		0	2	
	Type of Course	Program Core & The	eory	L- 1- P-C	3	0	0	3	
	Only								
Version No.	2.1					1			
Course Pre-requisites	MAT 2004 - Dis	crete Mathematical S	Structure	es					
Anti-requisites	NIL								
Course Description	The purpose of Theory of Computation Course is to enable the								
	students to a	appreciate the stud	dy of	formal la	inguag	e ar	nd the	e	
	correspondence between language classes and the automata that is								
	recognized. Analytical ability is required for the students to analyze								
	and develop a	utomata. The cours	e is bot	h concept	ual and	d ana	lytica	1	
	in nature. It in	poses fair knowled	ige of M	lathematic		com	puting	5	
	nundamentals.	Ine course dev	velops	ELAD mol	ai uii	IIKIII) Notuv	g and lont to	1	
analytical skills. The simulation using JFLAP m			and strip	no na	rsing	The) 2		
	visualize the automata construction and string parsing. The assignment work given based on simulation helps the students to				- -				
	build any co	intext free gramm	ar and	Turing	Machi	ne fo	or the	2 2	
Language.				-					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Computational language models and attain applevebility through Participation								
	Learning techni	innes	u attain t	empioyaon	ity the	Jugn	r ai tici	patre	
Learning teeninques.									
Course Outcomes On successful completion of the course the students shall be able to:									
	[Understand]				itions.				
	CO2: Construct different types of Finite Automata with its simulation			on.					
	[Apply] CO3: Develop the Simplified Grammars in CNF and GNF forms. [Apply]								
	CO4: Solve the	.04: Solve the Push Down Automata and Turing machine problems for a							
Course Content:	given lang	guage. [Apply]							
course content.									
	Introduction								
Module 1	to Automata	Assignment	Problem	n Solving		0	6 Sessi	ions	
	Theory								
Topics:									
Introduction to Automata 1	Theory, Basic defi	initions: Languages, g	grammaı	r and auto	mata, I	Repre	sentat	ion of	
automata, Language recogr	Einito	is of Automata Theor	ry.			1	1 Socci	ions	
Module 2	Automata	Assignment	Problen	n Solving		1.	+ 3033	0115	
Topics:									
Basic concepts of Finite au	tomata, DFA -D	efinitions of DFA, De	eterminis	stic Accept	ers Tra	ansitio	on Gr	aphs,	
Languages and DFA's, Regular Languages, NFA- Definition of a Non deterministic Accepter, Languages and									
NFA's, Equivalence of Deterministic and Nondeterministic Finite Accepters, Reduction of the Number of									
States in Finite Automata, ϵ -NFA - Definition of ϵ -NFA, Conversion of ϵ -NFA to DFA.									
	Regular								
Module 3	Expressions &	Assignment Problem Solving					ما 14	ssions	
	Grammar						14 90		
Topics:									

Formal Definition of a Regular Expression, Connection between Regular Expressions and Regular Languages: Regular Expressions denote Regular Languages; Pumping Lemma for regular languages, Context Free Grammars- Examples of Context-Free Languages, Left most and Right most Derivations, Derivation Trees, Ambiguity in Grammars, Pumping lemma for CFL, Grammar Simplification, CNF and GNF.

Module 4	Push down Automata and Turing Machine	Assignment	Problem Solving	12 Sessions
----------	--	------------	-----------------	-------------

Topics:

Definition of a Pushdown Automaton, Language Accepted by a Pushdown Automaton, Pushdown Automata for Context-Free Languages, Deterministic Pushdown Automata, Definition of a Turing Machine, Turing Machines as Language Accepters.

Assignment: Solve Different FA Design Techniques to solve various problems to construct FA (any 3 may be included)

Targeted Application:

Application Area is to Design and Analyzing the efficiency of compilers. This fundamental course is used by all application developers.

Project work/Assignment:

Problem Solving: Design different FA Design techniques, Regular Expressions

Text Book:

1. Peter Linz, "An introduction to Formal Languages and Automata", 6th Edition, Jones and Bartlett Publications, 2018.

References

- 1. Aho, Ullman and Hopcroft, "Theory of Computation", 3rd Edition, Pearson India, 2008
- 2. Michael Sipser, "Theory of Computation", 3rd Edition, Cengage India, 2014
- 3. NPTEL Link-https://onlinecourses.nptel.ac.in/noc21_cs83/preview

4. JFLAP simulator - https://www.jflap.org/jflaptmp/		
Catalogue prepared by	Mr. Jinesh V.N.	
Recommended by the	(BOS NO: 15 th. BOS held on 26 / 03 /2022)	
Board of Studies on		
Date of Approval by the	(Academic Council Meeting No. , Dated / /)	
Academic Council		

Ittagalpura, Rajanukunte, Yelahanka, Bengaluru 560 119