

PROGRAMME REGULATIONS & CURRICULUM

2022-26

PRESIDENCY SCHOOL OF COMPUTER SCIENCE & ENGINEERING

BACHELOR OF TECHNOLOGY (B.TECH.) COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

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PRESIDENCY SCHOOL OF COMPUTER SCIENCE ANDENGINEERING

Program Regulations and Curriculum

2022-2026

BACHELOR OF TECHNOLOGY (B.Tech.) in

Computer Science and Engineering

(Artificial Intelligence and Machine Learning)

B. Tech. [CAI]

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-24.5/SOCSE04/CAI/2022-26

Resolution No.05 of the 24th Meeting of the Academic Council held on 03rd August 2024, and ratified by the Board of Management in its 24th Meeting held on 05th August, 2024.

AUGUST-2024

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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 computing-based pedagogy, integrating theory and practice.
- Attract and nurture world-class faculty to excel in Teaching and Research, in the realm of Computing Sciences.
- Establish state-of-the-art computing facilities, for effective Teaching and Learning experiences.
- Promote Interdisciplinary Studies to nurture talent for global impact.
- Instill 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 2022-2026.
- 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 2022-2026 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 Course-title, 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. "DAC" means, the Departmental Academic Committee;
- u. "Dean" means the Dean / Director of the concerned School;
- v. "Dean" means the Dean of the concerned School;
- w. "Degree Program" includes all Degree Programs;
- *x.* "Degree Program" includes all Degree Programs;
- y. "Department" means the Department offering the degree Program(s) / Course(s) / School offering the concerned Degree Programs / other Administrative Offices;
- z. "Discipline" means specialization or branch of B.Tech. Degree Program;
- aa. "HOD" means the Head of the concerned Department;
- *bb.*"L-T-P-C" means Lecture-Tutorial-Practical-Credit refers to the teaching learning periods and the credit associated;
- cc. "MOOC" means Massive Open Online Courses;
- dd. "MOU" means the Memorandum of Understanding;
- ee. "NPTEL" means National Program on Technology Enhanced Learning;
- *ff.* "Parent Department" means the department that offers the Degree Program that a student undergoes;
- gg."Program Head" means the administrative head of a particular Degree

Program/s;

- *hh.*"*Program Regulations" means the Bachelor of Technology Degree Program Regulations and Curriculum, 2022-2026;*
- *ii.* "Program" means the Bachelor of Technology (B.Tech.) Degree Program;
- *jj.* "PSOE" means the Presidency School of Engineering;
- kk. "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;
- *mm.* "Section" means the duly numbered Section, with Clauses included in that Section, of these Regulations;
- nn."SGPA" means the Semester Grade Point Average as defined in the Academic Regulations, 2021;
- oo. "Statutes" means the Statutes of Presidency University;
- pp."Sub-Clause" means the duly numbered Sub-Clause of these Program Regulations;
- *qq.*"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;
- rr. "SWAYAM" means Study Webs of Active Learning for Young Aspiring Minds.
- ss. "UGC" means University Grant Commission;
- tt. "University" means Presidency University, Bengaluru; and
- uu. "Vice Chancellor" means the Vice Chancellor of the University.

5. Program Description

The Bachelor of Technology Degree Program Regulations and Curriculum 2022-2026 are subject to, and, pursuant to the Academic Regulations. These Program Regulations shall be applicable to the following ongoing Bachelor of Technology (B.Tech.) Degree Programs of 2022-2026 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;
- Bachelor of Technology in Computer Science and Technology (Big Data), abbreviated as B.Tech. Computer Science and Technology (Big Data);
- Bachelor of Technology in Computer Science and Engineering (Block Chain), abbreviated as B.Tech. Computer Science and Engineering (Block Chain);
- 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);

- Bachelor of Technology in Computer Science and Engineering (Internet of Things), abbreviated as B.Tech. Computer Science and Engineering (Internet of Things);
- Bachelor of Technology in Computer Science and Engineering (Data Science), abbreviated as B.Tech. Computer Science and Engineering (Data Science);
- 8. 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 consideration

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 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 **Error! Reference source not found.** 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.Error! Reference source not found. 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 as a Computer Engineering Professional with innovative skills and moral and ethical values

PEO2. Engage in lifelong learning through research and professional development

PEO3. Serve as a leader in the profession through consultancy, extension activities and/ or entrepreneurship

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:

- **PSO1: Employability:** Develop technical, managerial, and problem-solving skills for employability and career growth.
- **PSO2: Research:** Apply theoretical knowledge to real-world challenges, fostering research and innovation.
- **PSO3: Entrepreneurship:** Cultivate entrepreneurship, teamwork, and ethical AI/ML solutions for industrial and societal impact.

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 Statelevel 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 University are listed in the following Sub-Clauses:

- 10.1.1Admission 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%).
- 10.1.2Provided 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.
 - 10.1.3All 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.
 - 10.1.4The 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.
 - 10.1.5Provided 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.

10.1.7All 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 concerned B.Tech Program through Lateral Entry. Further, the *Minimum Credit Requirements* for the award of the B.Tech. Degree in the concerned Program 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, 2024-2028, 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 Science and Engineering (Artificial Intelligence and Machine Learning) 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 Science and Engineering (Artificial Intelligence and Machine Learning)for a student who joins the Program through the provision of the Lateral Entry, shall be "N – M" Credits.

10.1.8Further, 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 2^{nd} year (3^{rd} Semester) of the B.Tech. Program of the 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. / B.E. / B.S., 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 2.3.1, 2.3.2 and 2.3.3.

- 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 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:
 - 11.5.1The 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;
 - 11.5.2The 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 12.5) 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 **Error! Reference source not found.**) 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 Components and Weightage													
q	Credit	Percent		CA		Mid-	Term	End	-term	Dro	vie	Tot		
S. No	ure [L- T-P-C]	age/ Marks	Theory	, Pra	ctic al	Theo ry	Practi cal	Theo ry	Practi cal	C	ле t	al	Exam Conducted by	
1	3-0-0- 3	Percent age	25%	-	-	25%	-	50%	-	-		100 %	Mid-Term & End Term by CoE	
		Marks	50		-	50	-	100	-	-		200	-	
2	2-0-2- 3	Percent age	12.50%	, 12	.50 %	12.5 0%	12.50 %	25%	25%		-	100 %	Mid-Term & End Term by CoE * Except for full	
		Marks	25	2	25	25	25	50	50		-	200	stack courses	
3	1-0-4- 3	Percent age	-	25	5%	10%	40 %	5%	20%		-	100 %	Mid-Term & End Term by School	
		Marks	-	2	25	10	40	5	20		-	100		
4	2-0-4- 4	Percent age	12.50%	, 12	. 50 %	10%	15%	20%	30%		-	100 %	*Mid-Term & End Term by CoE	
		Marks	25	2	25	20	30	40	60		-	200	-	
5	0-0-4- 2	Percent age	-	50)%	-	-	-	-	50	%	100 %	Project evaluated by IC	
		Marks	-	5	0	-	-	-	-	5	0	100	at School level	
6	0-0-2- 1	Percent age	-	10	0%	-	-	-	-	-		100 %	Only CA at School Level	
		Marks	-	1	00	-	-	-	-		-	100		
7	3-0-2- 4	Percent age	12.50%	, 12	.50 %	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	Percentag e	25 %	-	:	25%	-	50%	-	-	1	00%	Mid-Term & End Term by CoE	
		2	Marks	50	-		50	-	100	-	-	:	200	-

12.5 Assessment Components and Weightage

*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 **Error! Reference source not found.** 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 re-appear 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 Clause 12.6.1, 12.6.2) 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. – Note: These are covered in Academic Regulations

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 Error! Reference source not found.) 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 13.3 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 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 13.3 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 **Error! Reference** source not found..

Tabl Cr	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 (17.Error! Reference source not found.), shall not be included in the calculation of the CGPA.

PART B: PROGRAM STRUCTURE

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

The B.Tech. (Computer Science and Engineering (Artificial Intelligence and Machine Learning)) Program Structure (2022-2026) totalling 162 credits. Table 7 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.

Table 3: B.Tech. . Computer Science and Engineering (ArtificialIntelligence and Machine Learning) 2022-2026: Summary of MandatoryCourses and Minimum Credit Contribution from various Baskets

Baskets	Credit Contribution
SCHOOL CORE	61
PROGRAM CORE	60
DISCIPLINE ELECTIVE	30
OPEN ELECTIVE	9
TOTAL CREDITS	Min. 160

In the entire Program, the practical and skill based course component contribute to an extent of approximately 57% out of the total credits of 160 for B.Tech. Computer Science and Engineering (Artificial Intelligence and Machine Learning) program of four years' duration.

15. Minimum Total Credit Requirements of Award of Degree

As per the AICTE guidelines, a minimum of 160 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 a 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 (Course Code, Course Name, Credit Structure (LTPC), Contact Hours, Course Basket, Type of Skills etc., as applicable).

	Table 3.1 : List of So	chool Cor	e		
S.No	Course Name	L	Т	Р	С
1	Calculus and Linear Algebra	3	0	2	4
2	Optoelectronics and Device Physics	2	0	2	3
2	Flowerts of Flootropics Engineering	2	0	2	
	Elements of Electronics Engineering	3	0	2	4
4	Figlish	1	0	2	2
5	Introduction to soft skills	0	0	2	1
	Innovative Projects - Arduino using	U U	Ŭ		
6	Embedded 'C'	0	0	4	2
7	Environmental Science	1	0	2	0
8	Applied Statistics	1	0	2	2
9	Basic Engineering Sciences	2	0	0	2
10	Engineering Graphics	2	0	0	2
11	Problem Solving using JAVA	1	0	4	3
12	Technical English/ Advanced English	1	0	2	2
13	Soft Skills for Engineers	0	0	2	1
14	Kali Kannada / Thili Kannada	1	0	0	1
	Transform Techniques, Partial				
15	Differential Equations and Their	3	0	0	3
15	Applications Brogramming in Puthon	1	0	1	2
10		2	0	4	3
10		0	0	2	4
10	Numerical Matheda far Engineera	0	0	2	1
19	Austitude Taxining Internet dista	1	0	2	2
20	Aptitude Training - Intermediate	0	0	2	1
21	Innovative Projects Using Raspberry Pi	-	0	-	1
22	Logical and Critical Thinking	0	0	2	1
	Mastering Object-Oriented Concepts				
23	in Python	0	0	2	1
24	Aptitude for Employability	0	0	2	1

25	Data Structure and Web Development with Python	0	0	2	1	
26	Capstone Project	-	-	-	4	
27	Preparedness for Interview	0	0	2	1	
28	Internship	-	-	-	8	
	Total No. of Credits					
					1	

	Table 3.2 : List of Program	n Core Co	ourses					
S.	Course Name	L	Т	Р	С			
No								
1	WebTechnologies	2	0	2	3			
2	Design and Analysis of Algorithms	3	0	0	3			
3	Computer Organization and Architecture	3	0	0	3			
4	Operating Systems	3	0	0	3			
5	Data Communications and Computer Networks	3	0	0	3			
6	Database Management Systems	2	0	2	3			
0	Cloud Computing	2	0	2	3			
8	Software Engineering	3	0	0	3			
9	Digital Design	2	0	2	3			
10	Discrete Mathematical Structures	3	0	0	3			
11	Theory of Computation	3	0	0	3			
12	Artificial Intelligence and Machine Learning	2	0	2	3			
13	Cryptography and Network Security	3	0	0	3			
14	Data Handling and Visualization	2	0	2	3			
15	Fundamentals of Data Analytics	3	0	0	3			
16	Neural Networks and Fuzzy Logic	3	0	0	3			
17	Applied Machine Learning	2	0	2	3			
18	Fundamentals of Natural Language Processing	3	0	0	3			
19	Deep Learning Techniques	3	0	0	3			
20	Reinforcement Learning	2	0	2	3			
Total No. of Credits								

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, 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, 2021). The same shall be prescribed in the Course Handout.

18.1 Internship

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

- **18.1.1.1** The Internship shall be in conducted in accordance with the Internship Policy prescribed by the University from time to time.
- 18.1.1.2 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 Internship to a student;
- **18.1.1.3** 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 2.6.1.2 above.
- 18.1.1.4 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.

18.1.1.5 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 Project Work

A student may opt to do a Project Work for a period of 4-6 weeks in an Industry / Company or academic / research institution or the University Department(s) as an equivalence of Internship during the Semester Break between 4th and 5th Semesters or 6th and 7th Semesters or during the 5th / 6th / 7th Semester as applicable, subject to the following conditions:

- **18.2.1.1** The Project Work shall be approved by the concerned HOD and be carried out under the guidance of a faculty member.
- **18.2.1.2** The student may do the project work in an Industry / Company or academic / research institution of her / his choice subject to the above mentioned condition (Sub-Clause 2.6.2.1). Provided further, that the Industry / Company or academic / research institution offering such project work confirms to the University that the project work will be conducted in accordance with the Program Regulations and requirements of the University.

18.3 Capstone Project

A student may undergo a Capstone Project for a period of 12-14 weeks in an industry / company or academic / research institution in the 7^{th} / 8^{th} Semester as applicable, subject to the following conditions:

- **18.3.1.1** The Capstone Project shall be in conducted in accordance with the Capstone Project Policy prescribed by the University from time to time.
- 18.3.1.2 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;

- **18.3.1.3** 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 2.6.3.2 above.
- 18.3.1.4 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.
- **18.3.1.5** 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.

18.4 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:

18.4.1.1 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 2.6.4.1). 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 Courses under various Specialisations / Stream Basket

Table 3.3: Discipline Electives Courses/Specialization Tracks – Minimum of 12credits is to be earned by the student in a particular track and overall 30credits.

Track 1 – Artificial Intelligence and Machine Learning Basket

	1			1	
1	Optimization Techniques for Machine Learning	3	0	0	3
2	Artificial Intelligence in Practice	2	0	2	3
3	Time Series Analysis	2	0	2	3
4	Advanced Natural Language Processing	2	0	2	3
5	Autonomous Navigation and Vehicles	3	0	0	3
6	Digital Health and Imaging	3	0	0	3
7	Stochastic Decision Making	3	0	0	3
8	Business Intelligence and Analytics	3	0	0	3
9	Cognitive Science & Analytics	3	0	0	3
10	Expert Systems	3	0	0	3
11	Generative Al	2	0	2	3
12	Business Intelligence and Analytics	3	0	0	3
Track	2 – Big Data Basket		•	•	•
1	Data Mining	3	0	0	3
2	Domain Specific Predictive Analytics	3	0	0	3
3	Data Warehousing and its Applications	3	0	0	3
4	No SQL Databases	2	0	2	3
5	Big Data Technologies	2	0	2	3
6	Mining Massive Datasets	2	0	2	3
7	Web Intelligence and Analytics.	2	0	2	3
8	Streaming Data Analytics	2	0	2	3
9	Information Visualization	2	0	2	3
10	Big Data Security and Privacy.	3	0	0	3
Track	3 - Block Chain Basket		•	•	•
1	Blockchain for Public Sector	3	0	0	3
2	Crypto Currency Technology	3	0	0	3
3	Emerging Areas in Blockchain	3	0	0	3
4	Industry Use Cases using Blockchain	3	0	0	3
5	Foundations of Blockchain Technology	3	0	0	3
6	Blockchain Technology and Applications	3	0	0	3
7	Smart Contract and Solidity	2	0	2	3
8	Distributed Ledger Technology	2	0	2	3
9	Blockchain Security and Performance	2	0	2	3
Track	(4 – Data Science Basket				
1	Statistical Foundations of Data Science	2	0	2	3
2	Web Data Analytics	2	0	2	3
3	R programming for Data Science	1	0	4	3
4	Applied Data Science	2	0	2	3
5	Social Media Analytics	2	0	2	3
6	E-Business and Marketing Analytics	3	0	0	3
7	Text Mining and Analytics	3	0	0	3
Track	5 – DevOps Basket				

1	Agile Structures and Frameworks	3	0	0	3			
2	Applied DevOps	2	0	2	3			
3	Automated Test Management	2	0	2	3			
4	Build and Release Management	3	0	0	3			
5	Development Automation	2	0	2	3			
6	DevOps Tools Internals	2	0	2	3			
7	Software Project Management	3	0	0	3			
8	System Monitoring	3	0	0	3			
Track 6 – IoT Basket								
1	Introduction to Fog Computing	3	0	0	3			
2	Big Data Analytics for IoT	1	0	4	3			
3	Wireless Communication in IoT	3	0	0	3			
4	Privacy and Security in IoT	3	0	0	3			
5	Mobile Application for IoT	3	0	0	3			
6	IoT: Architecture and Protocols	3	0	0	3			
7	IoT Platforms and Application Development	2	0	2	3			
8	Industrial Internet of Things (IIoT)	3	0	0	3			
9	Internet of Medical Things (IoMT)	3	0	0	3			
Track	7 – General Basket							
1	Go Programming	3	0	0	3			
2	Computer Graphics	3	0	0	3			
3	Advanced Java Programming	1	0	4	3			
4	Programming in C++	1	0	4	3			
5	Advanced Database Management Systems	2	0	2	3			
6	Introduction to Bioinformatics	3	0	0	3			
7	Advanced Computer Networks	3	0	0	3			
8	Computer Vision	2	0	2	3			
9	Wireless Sensor Networks	3	0	0	3			
10	Game Design and Development	3	0	0	3			
11	Microprocessors and Microcontrollers	3	0	0	3			
12	Mobile Application Development	1	0	4	3			
13	Compiler Design	2	0	2	3			
14	Parallel Computing	3	0	0	3			
15	Quantum Computing	3	0	0	3			
16	Digital Image Processing	2	0	2	3			
1/	Object Oriented Analysis and Design	3	0	0	3			
18	Advanced Computer Architecture	3	0	0	3			
19	Software Quality Assurance	2	0	2	3			
20	Real Time Operating System	3	0	0	3			
21	Information Theory and Coding	3	0	0	3			
22	Software Architecture	3	0	0	3			
23	5G Networking	3	0	0	3			
24	Programming in C# and .NET	1	0	4	3			
25	Distributed Systems	3	0	0	3			
I rack	8 - Information Science & Engineering Basket	_		-	_			
	System Software	3	0	0	3			
2	Information Retrieval	3	0	0	3			

3	Enterprise Network Design	3	0	0	3
4	Operating System with Linux Internals	2	0	2	3
5	Pattern Recognition	2	0	2	3
6	Search Engine Optimization	3	0	0	3
7	Service Oriented Architecture	3	0	0	3
8	E-Commerce	3	0	0	3
Track	9 – Information Science & Technology Basket				
1	Storage Area Networks	3	0	0	3
2	Information Systems Audit	3	0	0	3
3	Web 2.0	2	0	2	3
4	Cloud Computing and Virtualization	3	0	0	3
5	Firewall and Internet Security	2	0	2	3
6	Mobile Networking	2	0	2	3
7	Information Security and Management	3	0	0	3
8	Human Computer Interaction	3	0	0	3
9	Infrastructure Management	3	0	0	3
10	Network Management Systems	3	0	0	3

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

Tabl	e 3.7 : Ope	n Elective Courses Baskets: Minimun	۱C	red	lits	to	be earne	ed from t	this Ba	sket i	s 12
SI. No.	Course Code	Course Name	L	т	Ρ	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
Cher	nistry Bas	ket									
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	ES	-	-	-
Civil	Engineeri	ng Basket									
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	-	-	-	-

			-	-	-	-	-			1	
4	CIV2002	Occupational Health and Safety	3	0	0	3	S	-	-	-	-
5		Sustainable Materials and Green	З	0	Λ	З	FМ	_	_	_	_
5	CIV2005	Buildings	5	U	U	5					
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	3	0	0	3	EN	-	-	-	-
9	CIV2044	Geospatial Applications for	2	0	2	3	EM	-	-	-	-
10	CIV2045	Environmental Meteorology	З	0	0	З	S	-	-	_	_
11	CIV3046	Project Problem Based Learning	3	0	0	3	S	-	_	-	_
11	0103040	Sustainability for Professional	5	Ū		5	5				
12	CIV3059	Practice	3	0	0	3	EN	-	-	-	-
Com	merce Bas	ket					1			1	
1	COM2001	Introduction to Human Resource 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	3	0	0	3	F	-	-	-	-
, Com	nuter Scie	nce Basket (not to be offered for		U	U	5	•				
CSF	Departme	nt students)									
1		Programming in Java	2	Δ	2	З	S/FM	_	_	_	_
2	CSE2002	Social Network Analytics	2 2	0	0	ך ג	S	GS	_	_	_
2	CSE2003	Python Application Programming	2	0	2	ך א	S/ FM	-	_	_	_
5	C3L2004		2	0	2	5		-	-	-	-
4	CSE2005	Web design fundamentals	2	0	2	3	57 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 Social Media	3	0	0	3	S/ EM/EN	-	-	-	-
7	CSE3113	Computational Complexity	3	0	0	3	S/ EM/EN	-	-	-	-
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	-	-	-	-
Deci	an Backot								l		
1	DES1001	Sketching and Painting	0	0	2	1	s	_	_	_	_
2	DES1001	Innovation and Croativity	2	0	<u>∠</u>	2	5	_	_		_
2	DEC1101	Introduction to UV decign	<u>ک</u> ۱	0	2	2	r C		[-	
3	DECITO	Introduction to lowellow Making	1	0	∠ ``	∠ ``	3 C	-		[
+ 5	DEC1124	Spatial Stories	1	0	∠ ``	∠ ``	<u>с</u>				
5 6	DES1124	Spatial Stories	1	0	2	2	з с	-	-	-	-
0	DES1125	Posign Thinking	1	0	2	2	3 C	-	-	-	-
/	DES2001	Design Inniking	3 1	0	0	с С	<u>с</u>	-	-	-	-
Ø	DE21003		1	U	<u> </u>	<u> </u>			-	-	-
9	DES1004	Choices in Virtual Fashion	1	0	2	2	F	ES, GS, HP	-	-	-
10	DES1005	Fashion Lifestyle and Product Diversity	1	0	2	2	F	ES, GS, HP	-	-	-
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	-	-	-	-

	r		r –	1	1	1	1				1
15	DES2089	3D Modeling for Professionals	1	0	4	3	S	-	-	-	-
16	DES2090	Creative Thinking for Professionals	3	0	0	3	S	-	-	-	-
17	DES2091	Idea Formulation	3	0	0	3	S	-	-	-	-
Electrical and Electronics Basket							-				
1	EEE1002	IoT based Smart Building Technology	3	0	0	3	S	-	-	-	-
2	FFF1003	Basic Circuit Analysis	3	0	0	3	S	-	-	-	-
2	LLLIUUU	Fundamentals of Industrial	5	Ŭ	Ŭ	5	5				
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	-	-	-	-
Elect	ronics 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	-	-	-	-
4	ECE3097	Smart Electronics in Agriculture	3	0	0	3	F/EM	-	-	-	-
5	ECE3098	Environment Monitoring Systems	3	0	0	3	F/FM	_	-	-	-
6	ECE3102	Consumer Electronics	3	0	0	3	F/FM	_	-	-	-
•	2023102			Ŭ	Ŭ		S/F/				
7	ECE3103	Product Design of Electronic	3	0	0	3	EM /	-	-	-	-
		Equipment	-	-	-	-	EN				
8	ECE3106	Introduction to Data Analytics	3	0	0	3	F/EM	-	-	-	-
9	ECE3107	Machine Vision for Robotics	3	0	0	3	É/EM	-	-	-	-
Enali	ish Basket		-	-	-	-	.,				
1	ENG1008	Indian Literature	2	0	0	2	-	GS/ HP	-	-	-
2	ENG1009	Reading Advertisement	3	0	0	3	S	-	-	-	-
3	ENG1010	Verbal Aptitude for Placement	2	0	2	3	S	_	-	-	-
4	ENG1011	English for Career Development	3	0	0	3	S	_	-	-	-
5	ENG1012	Gender and Society in India	2	0	0	2	-	GS/ HP	-	-	-
6	ENG1013	Indian English Drama	3	0	0	3	-	-	-	-	-
7	ENG1014	Logic and Art of Negotiation	2	0	2	3	-	_	-	-	-
-		Professional Communication Skills	<u> </u>	-	-						
8	ENG1015	for Engineers	1	0	0	1	-	-	-	-	-
DSA	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	-	-	-	-
Kann	lada Baske	et									
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	3	0	0	3	S	-	-	-	-
8	KAN2007	Katha Sahithya Sampada	3	0	0	3	S	-	-	-	-
9	KAN2008	Ranga Pradarshana Kala	3	0	0	3	S	-	-	-	-
Fore	ign Langua	age Basket		_	_	_					
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	Basket										
1	LAW1001	Introduction to Sociology	2	0	0	0	2	F	HP	-	-

									HP/G		
2	LAW2001	Indian Heritage and Culture	2	0	0	0	2	F	S	-	-
3	LAW2002	Introdcution to Law of Succession	2	0	0	0	2	F	ПГ/О С	-	-
Л	1 1/1/2003	Introduction to Company Law	2	0	0	0	2	F	<u>Ј</u>	_	_
4 C		Introduction to Contracts	2	0	0	0 2		і ПD		-	-
5		Introduction to Conv Dights Law	2	0	0	2			-	-	-
0	LAW2005	Introduction to Copy Rights Law	2	0	0	2			-	-	-
/	LAW2006	Introduction to Criminal Law	2	0	0	2		HP	-	-	-
8	LAW2007	Introduction to Insurance Law	2	0	0	2		HP	-	-	-
9	LAW2008	Introduction to Labour Law	2	0	0	2		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	-	-	-
12	I AW2011	Introduction to Personal Income	2	0	0	2	F	нр	_	_	_
12	6/002011	Тах	2	Ŭ	Ŭ	2	1				
13	LAW2012	Introduction to Real Estate Law	2	0	0	2	F	HP	-	-	-
14	LAW2013	Introduction to Trademark Law	2	0	0	2	F	HP	-	-	-
15	LAW2014	Introduction to Competition Law	3	0	0	3	F	HP	-	-	-
16	LAW2015	Cyber Law	3	0	0	3	F	HP	-	-	-
17	LAW2016	Law on Sexual Harrassment	2	0	0	2	F	HP/GS	-	-	-
18	LAW2017	Media Laws and Ethics	2	0	0	2	F	HP/GS	-	-	-
Math	ematics B	asket						, <u>,</u>			
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	-	-	-	-
ر ۲	MAT2042	Probability and Bandom Processes	2	0	0	ך ר	S S	_	_	_	_
5	MAT2042	Elements of Number Theory	3	0	0	ך ג	S	_	_	_	_
5		Mathematical Modelling and	5	0	0	5	5				
6	MAT2044		3	0	0	3	S	-	-	-	-
Mack	anical Pa	kot					I	I			
Mech	nanical Bas	sket					I	I			
Mech 1	MEC1001	Fundamentals of Automobile	3	0	0	3	F	-	_	-	-
Mech 1	MEC1001	Fundamentals of Automobile Engineering	3	0	0	3	F	-	-	-	-
Mech 1 2	MEC1001	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink	3	0	0	3	F S/EM	-	-	-	-
Mech 1 2 3	MEC1001 MEC1002 MEC1003	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing	3 3 1	0 0 0	0 0 4	3 3 3	F S/EM S	-	-	-	
Mech 1 2 3 4	MEC1001 MEC1002 MEC1003 MEC2001	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems	3 3 1 3	0 0 0	0 0 4 0	3 3 3 3	F S/EM S F	- - - ES	-	- - -	- - - -
Mech 1 2 3 4 5	MEC1001 MEC1002 MEC1003 MEC2001 MEC2002	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research &	3 3 1 3 3	0 0 0 0	0 0 4 0	3 3 3 3	F S/EM S F	- - - ES -	- - -	- - -	
Mech 1 2 3 4 5	MEC1001 MEC1002 MEC1003 MEC2001 MEC2002	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management	3 3 1 3 3	0 0 0 0	0 0 4 0	3 3 3 3 3	F S/EM S F F	- - - ES -	- - - -	- - - -	- - - -
Mech 1 2 3 4 5 6	MEC1001 MEC1002 MEC1003 MEC2001 MEC2002 MEC2003	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management	3 3 1 3 3	0 0 0 0	0 4 0 0	3 3 3 3 3	F S/EM S F F S/ EM/	- - - ES -	-		
Mech 1 2 3 4 5 6	MEC1001 MEC1002 MEC1003 MEC2001 MEC2002 MEC2003	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management	3 3 1 3 3 3	0 0 0 0	0 0 4 0 0	3 3 3 3 3 3	F S/EM S F F S/ EM/ EN	- - ES -	-	- - - -	- - - - -
Mech 1 2 3 4 5 6	MEC1001 MEC1002 MEC1003 MEC2001 MEC2002 MEC2003	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management	3 3 1 3 3 3	0 0 0 0	0 0 4 0 0	3 3 3 3 3	F S/EM S F F S/ EM/ EN	- - ES -	-	- - - - - MEC	- - - -
Mech 1 2 3 4 5 6 7	MEC1001 MEC1002 MEC1003 MEC2001 MEC2002 MEC2003 MEC2004	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management Six Sigma for Professionals	3 3 1 3 3 3 3	0 0 0 0 0	0 4 0 0 0	3 3 3 3 3 3 3 3	F S/EM S F F S/ EM/ EN S/EM	- - ES -	-	- - - - - MEC 200	- - - - -
Mech 1 2 3 4 5 6 7	MEC1001 MEC1002 MEC1003 MEC2001 MEC2002 MEC2003 MEC2004	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management Six Sigma for Professionals	3 3 1 3 3 3 3	0 0 0 0 0	0 0 4 0 0 0	3 3 3 3 3 3	F S/EM F F S/ EM/ EN S/EM	- - ES - -	-	- - - - - 200 8	- - - - -
Mech 1 2 3 4 5 6 7 8	MEC1001 MEC1002 MEC1003 MEC2001 MEC2002 MEC2003 MEC2004	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management Six Sigma for Professionals Fundamentals of Aerospace	3 3 1 3 3 3 3	0 0 0 0 0	0 0 4 0 0 0 0	3 3 3 3 3 3 3 3 3	F S/EM S F S/ EM/ EN S/EM	- - ES - -	-	- - - - - 200 8	- - - -
Mech 1 2 3 4 5 6 7 8	MEC1001 MEC1002 MEC1003 MEC2001 MEC2002 MEC2003 MEC2004 MEC2005	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management Six Sigma for Professionals Fundamentals of Aerospace Engineering	3 3 1 3 3 3 3 3	0 0 0 0 0 0	0 4 0 0 0 0	3 3 3 3 3 3 3 3	F S/EM F F S/ EM/ EN S/EM	- - ES - -	-	- - - - MEC 200 8 -	- - - - -
Mech 1 2 3 4 5 6 7 8 9	MEC1001 MEC1002 MEC1003 MEC2001 MEC2002 MEC2003 MEC2004 MEC2005 MEC2006	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management Six Sigma for Professionals Fundamentals of Aerospace Engineering Safety Engineering	3 3 1 3 3 3 3 3 3	0 0 0 0 0 0 0	0 0 4 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3	F S/EM S F S/ EM/ EN S/EM F S/EM	- - ES - -	-	- - - - 200 8 -	- - - - -
Mech 1 2 3 4 5 6 7 8 9 10	MEC1001 MEC1002 MEC1003 MEC2001 MEC2002 MEC2003 MEC2004 MEC2005 MEC2006 MEC2007	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management Six Sigma for Professionals Fundamentals of Aerospace Engineering Safety Engineering Additive Manufacturing	3 3 1 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0	0 0 4 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	F S/EM S F S/ EM/ EN S/EM F S/EM F/EM	- - ES - - - - ES -	-	- - - - 200 8 - - -	- - - - - - - -
Mech 1 2 3 4 5 6 7 8 9 10 11	Anical Bas MEC1001 MEC1002 MEC1003 MEC2001 MEC2002 MEC2003 MEC2004 MEC2005 MEC2006 MEC2007 MEC3069	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management Six Sigma for Professionals Fundamentals of Aerospace Engineering Safety Engineering Additive Manufacturing Engineering Optimisation	3 3 1 3 3 3 3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0	0 4 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	F S/EM S F S/ EM/ EN S/EM F S/EM F/EM S/EM	- - ES - - - - ES - ES -	- - - - - - - -	- - - - 200 8 - - - - -	- - - - - - - -
Mech 1 2 3 4 5 6 7 8 9 10 11 12	Anical Bas MEC1001 MEC1002 MEC1003 MEC2001 MEC2002 MEC2003 MEC2004 MEC2005 MEC2006 MEC2007 MEC3069 MEC3070	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management Six Sigma for Professionals Fundamentals of Aerospace Engineering Safety Engineering Additive Manufacturing Engineering Optimisation Electronics Waste Management	3 3 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0	0 4 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	F S/EM S F S/ EM/ EN S/EM F S/EM F/EM S/EM F/S	- - ES - - - - ES - ES - ES	- - - - -	- - - - - 200 8 - - - - - - -	- - - - - - - - -
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Mech 1 2 3 4 5 6 7 8 9 10 11 12 13 14	Amical Bas MEC1001 MEC1002 MEC1003 MEC2001 MEC2002 MEC2003 MEC2004 MEC2005 MEC2007 MEC3069 MEC3071 MEC3072	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management Six Sigma for Professionals Fundamentals of Aerospace Engineering Safety Engineering Additive Manufacturing Engineering Optimisation Electronics Waste Management Hybrid Electric Vehicle Design Thermal Management of Electronic Appliances	3 3 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 <t< td=""><td>F S/EM S F S/ EM/ EN S/EM F S/EM F/EM S/EM S/EM S/EM</td><td>- - ES - - - - ES - ES ES - - ES -</td><td>- - - - - - - - - - - - - - - -</td><td>- - - - - 200 8 - - - - - - - - - - -</td><td>- - - - - - - - - - - - - - - - - - -</td></t<>	F S/EM S F S/ EM/ EN S/EM F S/EM F/EM S/EM S/EM S/EM	- - ES - - - - ES - ES ES - - ES -	- - - - - - - - - - - - - - - -	- - - - - 200 8 - - - - - - - - - - -	- - - - - - - - - - - - - - - - - - -
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Mech 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	Anical Bas MEC1001 MEC1003 MEC2001 MEC2002 MEC2003 MEC2004 MEC2005 MEC2006 MEC2007 MEC3070 MEC3071 MEC3072 MEC3007	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management Six Sigma for Professionals Fundamentals of Aerospace Engineering Safety Engineering Additive Manufacturing Engineering Optimisation Electronics Waste Management Hybrid Electric Vehicle Design Thermal Management of Electronic Appliances Sustainable Technologies and	3 3 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	F S/EM S F S/ EM/ EN S/EM F S/EM S/EM S/EM S/EM S/EM S/EM	- - ES - - - - - ES - - - ES - - ES - - - ES - - - -	- - - - - - - - - - - - - - - - - -	- - - - - 200 8 - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - - -
Mech 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	Anical Bas MEC1001 MEC1003 MEC2001 MEC2002 MEC2003 MEC2004 MEC2005 MEC2006 MEC2007 MEC3007 MEC3071 MEC3072 MEC3070 MEC3071	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management Supply Chain Management Six Sigma for Professionals Fundamentals of Aerospace Engineering Safety Engineering Additive Manufacturing Engineering Optimisation Electronics Waste Management Hybrid Electric Vehicle Design Thermal Management of Electronic Appliances Sustainable Technologies and Practices Industry 4.0	3 3 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	F S/EM S F S/ EM/ EN S/EM S/EM F/EM S/EM S/EM S/EM S/EM	- ES - - - - - - ES - ES - ES - - ES - - - -	- - - - - - - - - - - - - - - - - - -	- - - - - 200 8 - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - - -
Mech 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 Detr/	Anical Bas MEC1001 MEC1003 MEC2001 MEC2002 MEC2003 MEC2004 MEC2005 MEC2006 MEC2007 MEC3007 MEC3071 MEC3072 MEC3071 MEC3071	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management Six Sigma for Professionals Fundamentals of Aerospace Engineering Safety Engineering Additive Manufacturing Engineering Optimisation Electronics Waste Management Hybrid Electric Vehicle Design Thermal Management of Electronic Appliances Sustainable Technologies and Practices Industry 4.0	3 3 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 <td< td=""><td>F S/EM F S/EM/ EN S/EM F S/EM F/EM S/EM F/S S/EM S/EM S/EM S/EM S/EM</td><td>- ES - - - - - - ES - - ES ES - - - ES - - - -</td><td>- - - - -</td><td>- - - - - 200 8 - - - - - - - - - - - - - - - - - -</td><td>- - - - - - - - - - - - - - - - - - -</td></td<>	F S/EM F S/EM/ EN S/EM F S/EM F/EM S/EM F/S S/EM S/EM S/EM S/EM S/EM	- ES - - - - - - ES - - ES ES - - - ES - - - -	- - - - -	- - - - - 200 8 - - - - - - - - - - - - - - - - - -	- - - - - - - - - - - - - - - - - - -
Mech 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 Petro 1	Amical Bas MEC1001 MEC1002 MEC1003 MEC2001 MEC2002 MEC2003 MEC2004 MEC2005 MEC2006 MEC2007 MEC3070 MEC3071 MEC3072 MEC3071 MEC3071 MEC3071 MEC3071 MEC3071 MEC3071 MEC3071	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management Six Sigma for Professionals Fundamentals of Aerospace Engineering Safety Engineering Additive Manufacturing Engineering Optimisation Electronics Waste Management Hybrid Electric Vehicle Design Thermal Management of Electronic Appliances Sustainable Technologies and Practices Industry 4.0 Ket	3 3 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3		0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3	F S/EM S F S/EM/ EN S/EM S/EM F/EM S/EM S/EM S/EM S/EM S/EM	- - ES - - - - - ES - ES - ES - - ES - - - ES - - - -	-	- - - - - 200 8 - - - - - - - - - - - - - -	
Mech 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 Petro 1 2	Amical Bas MEC1001 MEC1002 MEC1003 MEC2001 MEC2002 MEC2003 MEC2004 MEC2005 MEC2006 MEC2007 MEC3007 MEC3070 MEC3071 MEC3072 MEC3007 MEC3071 MEC3072 MEC3201 MEC3201 DEUM Bas PET1011	Fundamentals of Automobile Engineering Introduction to Matlab and Simulink Engineering Drawing Renewable Energy Systems Operations Research & Management Supply Chain Management Six Sigma for Professionals Fundamentals of Aerospace Engineering Safety Engineering Additive Manufacturing Engineering Optimisation Electronics Waste Management Hybrid Electric Vehicle Design Thermal Management of Electronic Appliances Sustainable Technologies and Practices Industry 4.0 ket Energy Industry Dynamics	3 3 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3		0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	F S/EM S F S/ EM/ EN S/EM S/EM F/S S/EM S/EM S/EM S/EM S/EM S/EM	- - ES - - - - - ES - ES - ES - - ES - - - ES - - - -		- - - - - 200 8 - - - - - - - - - - - - - - - - - -	

Physics 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	PHY1007	Physics of Nanomaterials	3	0	0	3	FC				
6	PHY1008	Adventures in nanoworld	2	0	0	2	FC				
7	PHY2001	Medical Physics	2	0	0	2	FC	ES			
8	PHY2002	Sensor Physics	1	0	2	2	FC / SD				
9	PHY2003	Computational Physics	1	0	2	2	FC				
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	agement B	asket- I	-	-	-						
1	MGT2007	Digital Entrepreneurship	3	0	0	3	S/EM/E	-	-	-	-
2	MGT2015	Engineering Economics	З	0	0	З	S	-	-	-	-
2	11012015		5	0	0	5	S/FM/				
3	MGT2023	People Management	3	0	0	3	EN	HP	-	-	-
Mana	agement B	lasket- II			I						
1	MGT1001	Introduction to Psychology	З	0	0	З	F	НР	_	-	-
2	MGT1001	Business Intelligence	2	0	0	ך ג	FN	-	_	_	-
2	MGT1002	NGO Management	2	0	0	ך ג	S	_			
J 1	MGT1003	Eccontials of Loadorship	2	0	0	2				_	_
4	MG11004		5	0	0	5	C/EM/	03/ TF	-	-	-
5	MGT1005	Cross Cultural Communication	3	0	0	3	EN	HP	-	-	-
6	MGT2001	Business Analytics	3	0	0	3	S/ EM/EN	-	-	-	-
7	MGT2002	Organizational Behaviour	3	0	0	3	F	HP	-	-	-
8	MGT2003	Competitive Intelligence	3	0	0	3	S	-	-	-	-
9	MGT2004	Development of Enterprises	3	0	0	3	S/EM/E N	-	-	-	-
10	MGT2005	Economics and Cost Estimation	3	0	0	3	S/EM	-	-	-	-
11	MGT2006	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	MGT2010	Managing People and Performance	3	0	0	3	S/EM/E N	HP/GS	-	-	-
15	MGT2011	Personal Finance	3	0	0	3	F	-	-	-	-
16	MGT2012	E Business for Management	3	0	0	3	S/EM	-	-	-	-
			_	_	-	_	EN /	GS/HP/			
17	MGT2013	Project Management	3	0	0	3	EM	ES	-	-	-
18	MGT2014	Project Finance	3	0	0	3	EN / EM	HP	-	-	-
19	MGT2016	Business of Entertainment	3	0	0	3	EM/ EN	-	-	-	-
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	ΗΡ	-	-	1
22	MGT2019	Sales Techniques	3	0	0	3	S/EM/ EN	НР	-	-	-
23	MGT2020	Marketing for Engineers	3	0	0	3	S/EM/ EN	НР	-	-	-
24	MGT2021	Finance for Engineers	3	0	0	3	S/EM/ EN	НР	-	-	-
25	MGT2022	Customer Relationship Management	3	0	0	3	S/EM/ EN	НР	-	-	-
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Media Studies Basket											
1	BAJ3050	Corporate Filmmaking and Film Business	0	0	4	2	EM	НР	-	-	-
2	BAJ3051	Digital Photography	2	0	2	3	EM	HP	-	-	-
3	BAJ3055	Introduction to News Anchoring and News Management	0	0	2	1	EM	-	-	-	-
Rese	arch URE	Basket									
1	URE2001	University Research Experience	-	0	-	3					
2	URE2002	University Research Experience	-	0	-	0					

21.List of MOOC (NPTEL) Courses for B.Tech. Computer Science and Engineering (Artificial Intelligence and Machine Learning) with 12 weeks

21.1 NPTEL - Open Elective Courses for B. Tech. Computer Science and Engineering (Artificial Intelligence and Machine Learning)

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

SEME STER-								
1								
S. NO.	COURSE	COURSE NAME	CREDI T STRU CTUR E					BASK ET
	CODE							
			L	Т	Р	С	CONTAC T HOURS	
1	MAT1001	Calculus and Linear Algebra	3	0	2	4	5	Scho ol Core
2	PHY1002	Optoelectronics and Device Physics	2	0	2	3	4	Scho ol Core
3	ECE1001	Elements of Electronics Engineering	3	0	2	4	5	Scho ol Core
4	ENG1001/ ENG1002	Foundation of English/ Technical English	1	0	2	2	3	Scho ol Core
5	PPS1001	Introduction to soft skills	0	0	2	1	2	Scho ol Core
6	CSE1002	Innovative Projects - Arduino using Embedded 'C'	0	0	4	2	4	Scho ol Core
7	CHE1018	Environmental Science	1	0	2	0	3	Scho ol Core
		TOTAL	10	0	1 6	1 6	26	
SEME STER- 2			~~					
S. NO.	COURSE	COURSE NAME	CREDI T STRU CTUR E					BASK ET
	CODE		L	Т	Р	С	CONTAC T HOURS	

								Scho
1							3	ol
	MAT1003	Applied Statistics	1	0	2	2		Core
			-		_	_		Prog
2							4	ram
	FCF2007	Digital Design	2	0	2	3		Core
	LCL2007		2	0	2	5		Scho
3							2	ol
	CIV1008	Basic Engineering Sciences	2	0	0	2	-	Core
	CI V 1000	Busic Englicering Sciences	2	0	U	2		Scho
4							2	ol
-	MEC1006	Engineering Graphics	2	0	0	2	-	Core
	IVILC1000		2	0	0	2		Scho
5							5	ol
	CSE1006	Problem Solving using IAVA	1	0	4	3	5	Core
	CSL1000		1	0	-	5		Scho
6	ENGLOOOL						3	ol
Ŭ	ENG1002/ ENG2001	Technical English/ Advanced English	1	0	2	2	5	Core
	11102001	Teennear English/ Advanced English	1	0	2	2		Prog
7							3	ram
-	CSE2014	Software Engineering	3	0	0	3	· ·	Core
	COLLOTT	Software Engineering	3	Ū	0	5		Scho
8							2	ol
_	PPS1002	Soft Skills for Engineers	0	0	2	1		Core
	1101002				_	-		Scho
9							1	ol
	KAN1001/	Kali Kannada / Thili Kannada	1	0	0	1		Core
					1	1	25	
		TOTAL	13	0	2	9	25	
SEME								
STER-								
3			CDEDI					
								DACK
5.			STRU					BASK
NO.	COLIDOR		CTUR					EI
	COURSE	COUKSE NAME	Е				CONTAC	
	CODE		т	T	р	C		
	CODE			1	r	C	11100113	Scho
1		Transform Techniques, Partial					2	
-	MAT1002	Differential Equations and Their	2	0	0	2	5	Core
	WIA 11002	Applications	3	0	U	3		Scho
2							5	
<u> </u>	CSE1005	Programming in Dython	1	0	Л	2	5	Core
	CSE1005		1	U	4	3		Scho
2							5	
	CSE2001	Data Structures and Algorithms	2	0	2	1	5	Core
1	C5E2001	Data Subcluics and Argonumus	3	10	4	4		

								Prog
4		Data Communications and Computer					3	ram
	CSE2011	Networks	3	0	0	3		Core
								Prog
5							3	ram
	CSE2009	Computer Organization and Architecture	3	0	0	3		Core
								Prog
6							3	ram
	MAT2004	Discrete Mathematical Structures	3	0	0	3		Core
								Prog
7		Artificial Intelligence and Machine					4	ram
	CSE3001	Learning	2	0	2	3		Core
								Disci
							2	pline
o	CSEXXX						5	Elect
	X	Discipline Elective - I	3	0	0	3		ive
				_				Scho
9							2	ol
	PPS4002	Introduction to Aptitude	0	0	2	1		Core
		moment			1	2	31	
CENTE		TOTAL	21	0	0	6		
SEIVIE								
JIER-								
			CREDI					
			т					
S								BASK
S. NO.			STRU					BASK FT
S. NO.	COURSE	COURSE NAME	I STRU CTUR E					BASK ET
S. NO.	COURSE	COURSE NAME	STRU CTUR E				CONTAC	BASK ET
S. NO.	COURSE	COURSE NAME	I STRU CTUR E	Т	Р	С	CONTAC T HOURS	BASK ET
S. NO.	COURSE	COURSE NAME	I STRU CTUR E L	Т	Р	С	CONTAC T HOURS	BASK ET Scho
S. NO.	COURSE	COURSE NAME	I STRU CTUR E L	Т	Р	С	CONTAC T HOURS 3	BASK ET Scho ol
s. NO. 1	COURSE CODE MAT2003	COURSE NAME	I STRU CTUR E L	Т 0	P 2	<u>с</u>	CONTAC T HOURS 3	BASK ET Scho ol Core
S. NO. 1	COURSE CODE MAT2003	COURSE NAME Numerical Methods for Engineers	I STRU CTUR E L	Т 0	P 2	C 2	CONTAC T HOURS 3	BASK ET Scho ol Core Prog
S. NO. 1	COURSE CODE MAT2003	COURSE NAME Numerical Methods for Engineers	I STRU CTUR E L	Т 0	P 2	C 2	CONTAC T HOURS 3	BASK ET Scho ol Core Prog ram
S. NO. 1 2	COURSE CODE MAT2003 CSE2007	COURSE NAME Numerical Methods for Engineers Design and Analysis of Algorithms	I STRU CTUR E L 1	T 0 0	P 2 0	C 2 3	CONTAC T HOURS 3 3	BASK ET Scho ol Core Prog ram Core
s. NO. 1 2	COURSE CODE MAT2003 CSE2007	COURSE NAME Numerical Methods for Engineers Design and Analysis of Algorithms	I STRU CTUR E L 1	T 0	P 2 0	<u>C</u> 2 3	CONTAC T HOURS 3 3	BASK ET Scho ol Core Prog ram Core Prog
S. NO. 1 2 3	COURSE CODE MAT2003 CSE2007	COURSE NAME Numerical Methods for Engineers Design and Analysis of Algorithms	I STRU CTUR E L 1 3	T 0	P 2 0	C 2 3	CONTAC T HOURS 3 3	BASK ET Scho ol Core Prog ram Core Prog ram
s. NO. 1 2 3	COURSE CODE MAT2003 CSE2007	COURSE NAME Numerical Methods for Engineers Design and Analysis of Algorithms Database Management Systems	I STRU CTUR E L 1 3	T 0 0	P 2 0	C 2 3 3	CONTAC T HOURS 3 3 4	BASK ET Scho ol Core Prog ram Core Prog ram Core
s. NO. 1 2 3	COURSE CODE MAT2003 CSE2007 CSE2074	COURSE NAME Numerical Methods for Engineers Design and Analysis of Algorithms Database Management Systems	I STRU CTUR E L 1 3 2	T 0 0	P 2 0	C 2 3 3	CONTAC T HOURS 3 3 4	BASK ET Scho ol Core Prog ram Core Prog ram Core Prog
s. NO. 1 2 3 4	COURSE CODE MAT2003 CSE2007 CSE2074	COURSE NAME Numerical Methods for Engineers Design and Analysis of Algorithms Database Management Systems	I STRU CTUR E L 1 3	Т 0 0	P 2 0	C 2 3 3	CONTAC THOURS 3 3 4 3	BASK ET Scho ol Core Prog ram Core Prog ram Core Prog ram
s. NO. 1 2 3 4	COURSE CODE MAT2003 CSE2007 CSE2074	COURSE NAME Numerical Methods for Engineers Design and Analysis of Algorithms Database Management Systems Operating Systems	I STRU CTUR E L 1 3 2 3	т 0 0	P 2 0 2	C 2 3 3	CONTAC T HOURS 3 3 4 3	BASK ET Scho ol Core Prog ram Core Prog ram Core Prog ram
s. NO. 1 2 3 4	COURSE CODE MAT2003 CSE2007 CSE2074 CSE2010	COURSE NAME Numerical Methods for Engineers Design and Analysis of Algorithms Database Management Systems Operating Systems	I STRU CTUR E L 1 3 2 3	т 0 0 0	P 2 0 2	C 2 3 3	CONTAC THOURS 3 3 4 3	BASK ET Scho ol Core Prog ram Core Prog ram Core Prog ram Core Prog ram
S. NO. 1 2 3 4 5	COURSE CODE MAT2003 CSE2007 CSE2074 CSE2010	COURSE NAME Numerical Methods for Engineers Design and Analysis of Algorithms Database Management Systems Operating Systems	I STRU CTUR E L 1 3 2 3	Т 0 0 0	P 2 0 2	C 2 3 3	CONTAC THOURS 3 3 4 3 3	BASK ET Scho ol Core Prog ram Core Prog ram Core Prog ram Core Prog ram
s. NO. 1 2 3 4 5	COURSE CODE MAT2003 CSE2007 CSE2074 CSE2010	COURSE NAME Numerical Methods for Engineers Design and Analysis of Algorithms Database Management Systems Operating Systems Neural Networks and Fuzzy Logic	I STRU CTUR E L 1 3 2 3 3	T 0 0 0 0	P 2 0 2 0	C 2 3 3 3 3	CONTAC THOURS 3 3 4 3 3 3	BASK ET Scho ol Core Prog ram Core Prog ram Core Prog ram Core Prog ram
S. NO. 1 2 3 4 5	COURSE CODE MAT2003 CSE2007 CSE2074 CSE2010 CSE3016	COURSE NAME Numerical Methods for Engineers Design and Analysis of Algorithms Database Management Systems Operating Systems Neural Networks and Fuzzy Logic	I STRU CTUR E L 1 3 2 3	T 0 0 0 0	P 2 0 2 0	C 2 3 3 3 3	CONTAC THOURS 3 3 4 3 3 3	BASK ET Scho ol Core Prog ram Core Prog ram Core Prog ram Core Prog ram Core Prog ram
S. NO. 1 2 3 4 5 6	COURSE CODE MAT2003 CSE2007 CSE2074 CSE2010 CSE3016	COURSE NAME Numerical Methods for Engineers Design and Analysis of Algorithms Database Management Systems Operating Systems Neural Networks and Fuzzy Logic	I STRU CTUR E L 1 3 2 3 3	т 0 0 0 0	P 2 0 2 0	C 2 3 3 3	CONTAC THOURS 3 3 4 3 3 3 3	BASK ET Scho ol Core Prog ram Core Prog ram Core Prog ram Core Prog ram Core Prog ram

7							Л	Disci pline
	CSEXXX X	Discipline Elective - II	2	0	2	3	4	Elect ive
8	XXXXXX X	Open Elective – I (Management Basket)	3	0	0	3	3	Ope n Elect ive
9	PPS4004	Aptitude Training - Intermediate	0	0	2	1	2	Scho ol Core
10	ECE2011	Innovative Projects Using Raspberry Pi	-	0	-	1	0	Scho ol Core
		TOTAL	19	0	1 0	2 5	29	
SEME STER- 5								
S. NO.	COURSE	COURSE NAME	CREDI T STRU CTUR E					BASK ET
	CODE		L	Т	Р	С	CONTAC T HOURS	
1	CSF2026	Data Handling and Visualization	2	0	2	3	4	Prog ram Core
2	CSE3087	Applied Machine Learning	2	0	2	3	4	Prog ram Core
3	CSE3078	Cryptography and Network Security	3	0	0	, ,	3	Prog ram Core
4	CSE2018	Theory of Computation	3	0	0	3	3	Prog ram Core
5	CSE3343	Cloud Computing	2	0	2	3	4	Prog ram Core
6	CSEXXX X	Discipline Elective - III	3	0	0	, ,	3	Disci pline Elect ive
7	CSEXXX X	Discipline Elective - IV	3	0	0	3	3	Disci pline Elect ive

								Scho
8							2	ol
	PPS4006	Logical and Critical Thinking	0	0	2	1		Scho
9							2	ol
	CSE3216	Mastering Object-Oriented Concepts in Python	0	0	2	1	-	Core
		TOTAL	18	0	1 0	2 3	28	
SEME					-			
STER-								
6			CPEDI					
c			T					BVCK
NO.			STRU					ET
	COURSE	COURSE NAME	E					
							CONTAC	
	CODE		L	Т	Р	С	T HOURS	
4							A	Prog
1	CSE2011	Deinforgement Learning	2	0	2	2	4	Core
	CSESUIT		2	0	Z	3		Prog
2		Fundamentals of Natural Language					3	ram
	CSE3014	Processing	3	0	0	3		Core
								Prog
3							3	ram
	CSE3010	Deep Learning Techniques	3	0	0	3		Core
4							Д	ram
	CSE2067	Web Technologies	2	0	2	3	•	Core
								Disci
5							3	pline
	CSEXXX						5	Elect
	Х	Discipline Elective - V	3	0	0	3		ive
								DISCI
6	~~~~~						3	Flect
	CSEXXX X	Discipline Elective - VI	3	0	0	3		ive
								Оре
7							3	n
,	XXXXXX						5	Elect
	Х	Open Elective – II	3	0	0	3		ive
Q							С	Scho
•	PPS/005	Antitude for Employability	0	0	2	1	Z	Core
	1134003		0	0	2	1		Scho
9		Data Structure and Web Development					2	ol
	CSE3217	with Python	0	0	2	1		Core

		TOTAL	20	0	6	2 3	26	
SEME STER- 7								
S. NO.	COURSE	COURSE NAME	CREDI T STRU CTUR E					BASK ET
	CODE		т	т	р	C		
1	XXXXXX X	Open Elective – III (Management Basket)	3	0	P 0	3	3	Ope n Elect ive
2	CSEXXX X	Discipline Elective –VII	3	0	0	3	3	Disci pline Elect ive
3	CSEXXX X	Discipline Elective – VIII	3	0	0	3	3	Disci pline Elect ive
4	CSEXXX X	Discipline Elective – IX	3	0	0	3	3	Disci pline Elect ive
5	CSEXXX X	Discipline Elective – X	3	0	0	3	3	Disci pline Elect ive
6	PIP2001	Capstone Project	_	-	-	4	0	Scho ol Core
7	PPS3018	Preparedness for Interview	0	0	2	1	2	Scho ol Core
		TOTAL	15	0	2	2 0	17	
SEME STER- 8								
S. NO.	COURSE	COURSE NAME	CREDI T STRU CTUR E					BASK ET
	CODE		L	Т	Р	С	CONTAC T HOURS	

1							0	Scho ol
	PIP4002	Internship	-	-	-	8	0	Core
		TOTAL	0	0	0	8		

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.

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

Course Code: MAT1001	Course Title: Calculus and Linear Algebra Type of Course: School Core Lab Integrated	L-T- P- C	2	1	2	4		
Version No.	3.0					J		
Course Pre- requisites	Basic Concepts of Limits, Different	iation, Int	egratio	on				
Anti-requisites	NIL							
Course Description	The course focuses on the concepts of calculus and linear algebra with reference to specific engineering problems. The course is of both conceptual and analytical type in nature. The lab sessions associated with the course are concerned with acquiring an ability to use the MATLAB software.							
Course Objective	The objective of the course is Skill I Problem Solving Techniques.	Developn	nent o	fstude	ent by	using		
Course Out Comes	 On successful completion of the coto; 1) Comprehend the knowledge of applications. 2) Understand the concept of applications. 3) Apply the principles of integral ca 4) Adopt the various analytical equations. 5) Demonstrate the use of MATLAB mathematical problems. 	urse the s oplication partial lculus to methods software	studer s of m deriva evalua s to to dea	its sha natrix p natives nate inte solve nal with	erincipl and egrals. differe a varie	ble .es. their ential ety of		

Course Content:			
Module 1	Linear		10
	Algebra		Classes

Review: Types of matrices, elementary transformations, rank of a matrix, normal form, Solution of systems of linear equations: (Homogenous and non-homogenous system) AX = O and AX = B using rank method.

Linear Algebra:

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

Engineering Applications of Linear Algebra.



Review: Differential calculus with single variable.

Partial Derivatives:

Homogeneous functions and Euler's theorem, Total derivative, Change of variables, Jacobians, Partial differentiation of implicit functions, Taylor's series for functions of two variables, Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.

Engineering Applications of partial derivatives.

	Advanced		10
Module 3	Integral		
	calculus		Classes

Review: Integral calculus for single integrals.

Advanced Integral calculus:

Beta and Gamma functions-interrelation-evaluation of integrals using gamma and beta functions; error function-properties. Multiple Integrals- Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves, evaluation of triple integrals-change of variables between Cartesian and cylindrical and spherical polar co-ordinates.

Engineering applications of partial derivatives.

Module 4	Ordinary Differential Equations	rdinary Ifferential Assignment Programming quations		12 Classes	
Review: First order and first-degree Ordinary Differential Equations, Method o				Method of	
separation of variables, Homogeneous and Non- Homogeneous Equations reducible to					
Homogeneous fo	rm.				

Linear Differential Equations, Bernoulli's Differential Equation, Exact and Non- Exact Differential Equations, Higher order Differential Equation with constant coefficients and with right hand side of the form e^{ax} , sinax, cosax, $e^{ax}f(x)$, $x^nf(x)$ etc., Linear equations with variable coefficients such as Cauchy Equation and Lagrange's Equation, D-operators and Inverse D- operators, Method of Variation of Parameters.

Engineering applications of differential equations.

List of Laboratory Tasks:

Introductory Task: Introduction to usage of the software and simple programming tasks. [3 Sessions]

Experiment N0 1: Solution of Simple differentiation with single variable and use of chain Rule.

Experiment No. 2: Solution based on application of Tailors' Series using software Experiment No. 3: Application of Maxima and Minima condition using software.

Experiment No. 4 Computation of different functions for a specific problem Experiment No. 5 Computation of Area under a curve.

Experiment No. 6 Solution of a set of simultaneous equations in matrix method

Experiment No. 7 Computation of Eigen Values and Eigen Vectors.

Experiment No. 8 Solution of Partial Differential equation

Experiment No. 9 solution using Cauchy Equation and Lagrange's Equation

Targeted Application & Tools that can be used:

The contents of this course has direct applications in most of the core engineering courses for problem formulations, Problem Solution and system Design. Tools Used: MatLab, Zylink.

Assignment:

- 1. List at least 3 sets of Matrix Applications concerning the respective branch of Engineering and obtain the solution using MATLAB.
- 2. Select any one simple differential equation pertaining to the respective branch of engineering, identify the dependent and independent variable Obtain the solution and compare the solution sets by varying the values of the dependent variable.

Text Book

- 1. Sankara Rao, Introduction to Partial differential equations, Prentice Hall of India, edition, 2011
- 2. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.

References:

- 1. Victor Henner, Tatyana Belozerova, Mickhail Khenner, Ordinary and Partial Differential Equations, CRC Press, Edition, 2013.
- 2. Walter Ledermann, Multiple integrals, Springer, 1st edition

- 3. Lay, Linear Algebra ansd its applications, 3rd Ed., 2002, Pearson Education India.
- 4. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition
- 5. MatLab usage manual

E-resources/ Web links:

1. https://nptel.ac.in/courses/109104124

2. https://nptel.ac.in/courses/111106051

- 3. https://nptel.ac.in/courses/111102137
- 4. https://www.cuemath.com/learn/mathematics/algebra-vs-calculus/
- 5. https://stanford.edu/~shervine/teaching/cs-229/refresher-algebra-calculus

6. https://math.hmc.edu/calculus/hmc-mathematics-calculus-online-tutorials/linearalgebra/

7. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html

8. https://www.scu.edu.au/study-at-scu/units/math1005/2022/

Topics relevant to the development of Foundation Skills: All solution methods

Topics relevant to development of Employability skills: Use of Matlab software.

Course Code: PHY1002	Course Title: Optoelectronics and Device Physics Type of Course: 1] School Core & Laboratory integrated	L-T-P-C	2-0-2-3
Version No.	1.0		
Course Pre- requisites	NIL		
Anti- requisites	NIL		
Course Descriptio n	The purpose of this course is to enable the stu- fundamentals, working and applications of optoe develop the basic abilities to appreciate the a microscopy and quantum computers. The course de experimental and analytical skills. The associate opportunity to validate the concepts taught and enh concepts for technological applications. The labora following skills: An attitude of enquiry, confidence problems, ability to interpret events and result physical phenomena, select suitable equipment, i locate faults in systems.	idents to under electronic devi- applications of velops the critic d laboratory p ances the abilit itory tasks aim and ability to is, observe an nstrument and	erstand the ces and to advanced cal thinking, provides an y to use the to develop tackle new d measure i materials,

Course	Out	t On successful completion of the course the students shall be able to:				
Comes		CO1: Describe the concepts of semiconductors, magnetic materials and superconductors.				
		CO2: Apply the concept of materials in the working of optoelectronic and magnetic devices.				
		CO3: Discuss quantum comp	the quant outers.	um concepts used in advand	ced microscopy and	
		CO4: Explain technological fi	the applica elds.	ations of lasers and optica	l fibers in various	
		CO5: Interpret	the results o s and advance	f various experiments to verify ced devices. [Lab oriented].	the concepts used in	
Course Object	ive	The objective of "Optoelectroni Experiential Le	of the course cs and devi earning tech	e is to familiarize the learners ce physics "and attain Skill D niques	with the concepts of evelopment through	
Course Conter	: nt:					
Module 1		Fundamental s of Materials.	Assignme nt	Plotting of magnetization (M) v/s Magnetic field (H) for diamagnetic, paramagnetic and ferromagnetic materials using excel/ origin software.	No. of Classes: 07	
	Topic Ferm	s: Concept of e i level, Hall effec	energy band t, Magnetic	s, charge carriers, carrier conc materials, Superconductors:	entration, concept of	
Modul	e 2	Advanced Devices and applications	Assignme nt	Data collection on efficiency of solar cells.	No. of Classes: 8	
	Topic Solar	s: p-n junctions, cells, I-V charac	Zener diode teristics, and	e, transistor characteristics, Op d LEDs	toelectronic devices:,	
Module 3		Quantum concepts and Applications	Term paper	Seminar on quantum computers.	No. of classes: 8	
	Topic hypo elect equa	Topics: Planck's quantum theory, applications of Quantum theory: de-Broglie hypothesis, matter waves, properties. de-Broglie wavelength associated with an electron. Heisenberg's uncertainty principle. Schrodinger time independent wave equation. Particle in a box				
Modul	e 4	Lasers and Optical fibers	Term paper	Case study on medical applications of Lasers.	No. of classes :07	

Topics: Interactions of radiations with matter, Characteristics of laser, conditions and requisites of laser, Modern day applications of laser: LIDAR, LASIK, Cutting, Welding and Drilling.
Principle of optical fibers, Numerical aperture and acceptance angle (Qualitative), Attenuation, Applications: Point to point communication with block diagram, application of optical fibers in endoscopy.
List of Laboratory Tasks:
Experiment No. 1: Experimental errors and uncertainty using excel
Level 1: Calculation of accuracy and precision of a given data
Level 2: propagation of errors in addition, subtraction, multiplication and division.
Experiment NO 2: To determine the wavelength of semiconductor diode Laser and to estimate the particle size of lycopodium powder using diffraction.
Level 1: Determination of Wavelength of Laser
Experiment No. 3: To determine the proportionality of Hall Voltage, magnetic flux density and the polarity of Charge carrier.
Level 1: To determine the proportionality of Hall Voltage and magnetic flux density Level 2: To determine the polarity of Charge carrier.
Experiment No. 4: To study the I-V characteristics of a given zener diode in forward and reverse bias conditions.
Level 1: To study I –V characteristics of the given Zener diode in reverse bias and to determine break down voltage.
Level 2: To study I –V characteristics of the given Zener diode in forward bias and to determine knee voltage and forward resistance.
Experiment No. 5: To study input and output characteristics of a given Transistor.
Level 1: To determine the input resistance of a given transistor. Level 2: To determine current transfer characteristics and transistor parameters of a given transistor
Experiment No. 6: Determination of Fermi energy and Fermi temperature of a given metal and bimetallic wire.
Level 1: Determination of Fermi energy and Fermi temperature of given metal wire.
Level 2: Determination of Fermi energy and Fermi temperature of given bimetallic wire.
Experiment No. 7: To study the current vs voltage characteristics of CdS photo- resistor at constant irradiance and To measure the photo-current as a function of the irradiance at constant voltage.
Level 1 To study the current vs voltage characteristics of CdS photo-resistor at constant irradiance.

Level 2: To measure the photo-current as a function of the irradiance at constant					
voltage.					
Experiment No. 8: To study the I-V characteristics and I-R characteristics of a solar					
cell as a function of the irradiance.					
Level 1: To study the I-V characteristics					
Level 2: I-R characteristics of a solar cell as a function of the irradiance.					
Experiment No. 9: Calculate the numerical aperture and study the losses that occur					
in optical fiber cable					
Level 1: Calculate the numerical aperture.					
Level 2: study the losses that occur in optical fiber cable.					
Experiment No. 10: To determine the magnetic susceptibility of a given diamagnetic					
and paramagnetic substances using Quincke's method.					
Level 1: To determine the magnetic susceptibility of a given diamagnetic substance.					
Level 2: To determine the magnetic susceptibility of a given paramagnetic					
substance.					
Experiment No. 11: Plotting I-V characteristics in forward and reverse bias for LEDs					
and Determination of knee voltage.					
Level 1: Plotting I-V characteristics in forward and reverse bias for LEDs					
Level 2: Determination of knee voltage.					
Experiment No. 12: Determination of Stefan's constant and verification of Stefan-					
Boltzmann Law.					
Level 1: Determination of Stefan's constant					
Level 2: Verification of Stefan-Boltzmann Law.					
Targeted Application & Tools that can be used:					
1. Areas of application are optoelectronics industry, Solar panel technologies,					
quantum computing software, electronic devices using transistors and					
diodes, memory devices, endoscopy, SQUIDS in MRI, Advanced material					
characterizations using SEM and STM.					
2. Origin, excel and Mat lab soft wares for programming and data analysis.					
Project work/Assignment: Mention the Type of Project /Assignment proposed for					
this course					
Assessment Type					
Midterm exam					
 Assignment (review of digital/ e-resource from PU link given in 					
references section - mandatory to submit screen shot accessing digital					
resource.)					
• Ouiz					
End Term Evam					
 Self-Learning Prepare a comprehensive report on non-conventional energy resources in 					
I. Frepare a comprehensive report on non-conventional energy resources in Karnataka and their procland conc					
Karnataka and their pros and cons.					

	2. Write a report on importance of quantum entanglement in supercomputers.
	Text Book
	1. Engineering Physics by Avadhanalu, Revised edition, S. Chand
	Publications,2018.
	References: 1. Elementary Solid state Physics: Principles and Applications by M.A.
	Omar. 1 st Edition. Pearson Publications. 2002.
	2 Principles of Quantum Mechanics by B Shankar 2 nd edition
	springer Publications 2011
	3 Ontoelectronics: An Introduction by John Wilson and John Hawkes
	3 rd edition Pearson Publications 2017
	4 Engineering Physics by Gaur and Gunta Dhannat Rai Publications
	2012.
	5. Introduction to Quantum Mechanics, David L. Griffiths, Cambridge
	University Press, 2019
l	E-Resourses:
	1. <u>https://search.ebsconost.com/login.aspx?direct=true&db=niebk&AN=55304</u>
	<u>5&Site=enost-iive</u>
	2. <u>https://search.ebsconost.com/login.aspx?direct=true&db=niebk&AN=83306</u>
	<u>8000000000000000000000000000000000000</u>
	3. <u>Intps://search.ebsconost.com/login.aspx?direct=true&db=mebk&AN=32398</u>
	<u>ooosite-enost-iive</u> 4 https://coarch.abscabast.com/login.acpy2diract-true%db-plabk%AN=15200
	4. <u>Intersections and the second seco</u>
	5 https://search.ebscobost.com/login.aspy?direct=true&db=plebk&AN=48603
	28 site = ahost-live
	Topics relevant to "SKILL DEVELOPMENT": Fundamentals of materials, Lasers and
	optical fibers.
	for Skill Development through Participative Learning Techniques. This is attained
	through the Assignment/ Presentation as mentioned in the assessment component
	in course handout.

Course Code: ENG1002	Course Title: Technical English Type of Course:1] School Core 2] Laboratory integrated	L-T-P-C	1-0-2-2
Version No.	1.0 V. 3		
Course Pre- requisites	Intermediate Level English		

Course Anti-requisites	NIL					
Course Description	Technical English course is designed to equip students with the language					
	skills necessary for effective communication in technical and scientific					
	contexts. The course for	ocuses on the spec	cialized vocabular	ry, writing styles,		
	and communication te	chniques used in	various technical	fields, including		
	engineering and inform	nation technology.				
		· · · ·				
Course Objectives	The objective of this co	ourse is to develop	the learners' EM	PLOYABILITY		
	SKILLS by using EXF	'ERIENTIAL LE	EARNING and PA	ARTICIPATIVE		
	LEARNING TECHN	IQUES.				
Course	On successful comple	tion of the cours	e, the students sh	all be able to:		
Outcomes	1. Develop profic	iency in using tecl	hnical vocabulary	and		
	terminology.		1. 1.11 .			
	2. Apply language fields.	e skills for better s	speaking skills in t	echnical		
	3. Write technica	al descriptions				
	4. Demonstrate v	vriting skills in v ch as reports ma	writing technical			
	documents su	en us reports, me	induits, and articl	05.		
Course Content:						
Madula 1	Fundamentals of	Worksheets&	Veeebuler	0 Classes		
Module 1	Communication	Quiz	y building	9 Classes		
Introduction to Techni	cal English					
Differences between T	echnical English and Gen	eral English				
Technical Writing Bas	ics					
Technical Vocabulary						
Module 2	Technical Presentation	Presentatio	Speaking Skills	s 12 Classes		
	Tresentation	115		Classes		
Introduction						
Planning the Presentat	ion					
Creating the Presentation						
Giving the Presentatio	n					
Module 3	Technical Description	Assignmen t	Group Presentation	12 Classes		
Product Description		·				
Process Description						

User Manuals				
Transcoding: Diagran	ns, charts and images			
Module 4	Technical Writing	Assignmen t	Writing Skills	12 Class es
Email Writing				
Persuasive and Descriptive	e Language			
Professional Email Etiquet	te			
Writing clear and concise t	echnical emails			
Communicating technical	information effectively			
Technical Report Writing	2			
Types of technical reports (L	ab reports, research reports, etc.)		
Components of technical rep	orts			
Writing an abstract and exec	utive summary			
Structure and content organized	zation			
Transcoding: diagrams, char	ts and images			
List of Laboratory T 1. Module-1 Level 1: Worksheets Level 2: Worksheets 2. Module 2 Level 1: Preparing Pr Level 2: Giving Prese 3. Module-3 Level 1: Product Des Level 2: Process Des 4. Module 4 Level 1: Email Writin Level 2: Report Writin Module 4 Level 1: Email Writin Level 2: Report Writin Module 4 Level 2: Report Writin Module 4 Level 3 Module 4 Level 4 Level 4 Level 4 Level 4 Level 5 Module 5 Modul	resentation entation (Individual) cription & User Manual cription & Transcoding ng ng ns & Tools that can be us	ed:		
 Bring out the ess technical commu Prepare a techni relevance in a techni The following individe 	ence of technical commu inication, with examples cal presentation on the ir chnical field, with real-lif	nication with re nportance of Te e examples.	eference to the convention chnical Communication a be given to the students.	s of and its
 Presentation Describing a pro Individual Report 	duct/process rts	_ `	-	
Text Books 1. Kumar, Sanjay; Engineers. Oxfo	Pushpalatha. <i>English La</i> rd University Press. 201	nguage and Co 8.	mmunication Skills for	

2.	Brieger, Nick and Alison Paul. Technical English Vocabulary and Grammar.
htt	ps://nmetau.edu.ua/file/technical_english_vocabulary_and_grammar.pdf
Re	ference Book:

Chauhan, Gajendra Singh, and Kashmiramka, Smita, *Technical Communication*. Cengage Publication. 2018.

- 2. Sunder Jain. Technical Report Writing. Centrum Press, 2013.
- John Bowden. "Writing a Report: How to Prepare, Write & Present Really Effective Reports?". 9th Edition 2011

Comfort, Jeremy et. al. 1984. Business Reports in English. Cambridge University Press.

4. Sharma, R.C. and K. Mohan. 2011. Business Correspondence and Report Writing, Fourth Edition. Tata McGraw Hill.

Web Resources:

1:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&u nique id=JSTOR1 3307.

2;https://puniversity.informaticsglobal.com:2282/ehost/detail/detail?vid=5&sid=3a77d69b-abe5-

4681-b39d-

32dfdcb8f4a5%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=154223466&db=iih

3: Last, Suzan, et. al. *Technical Writing Essentials.* University of Victoria, British Columbia, 2019 (E- Book)

4 Wambui, Tabita Wangare, et al. *Communication Skills- Volume 1*, LAP LAMBRET, USA, 2012 (E Book)

Topics Relevant to the Development of Employability Skills: Speaking Skills, Writing Skills, Critical Thinking and Critical Analysis, and Group Communication.

Course	Code:	Course Title: Problem Solving Using C		1	0	4	3
CSE1004			L-T-P-C				
		Type of Course: School Core Lab Integrated.					
Version No.		1.0					
Course	Pre-	NIL					
requisites							
Anti-requisit	es	NIL					
_							

Course Description	The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs and applications in C. ACAlso by learning the basic programming constructs they can easily switch over to any other language in future.					
Course Object	The objective of the course Problem Solving Using C an Methodologies.	is to familian nd attain Em	rize the learners ployability thro	with the concepts of ough Problem Solving		
Course Outcomes	On successful completion of Write algorithms and to draw Demonstrate knowledge and constructs	this course th flowcharts for develop sir	e students shall or solving probl nple application	be able to: ems ns in C programming		
	Develop and implement appli Decompose a problem into fu Solve applications in C using Design applications using Sec	cations using inctions and o structures an quential and l	g arrays and strin develop modula nd Union Random Access	ngs r reusable code File Processing.		
Course Content:						
Module 1	Introduction to C Language	Quiz	Problem Solving	9 Hrs.		
Topics: Introduction to Programming – Algorithms – Pseudo Code - Flow Chart – Compilation – Execution – Preprocessor Directives (#define, #include, #undef) - Overview of C – Constants, Variables and Data types – Operators and Expressions – Managing Input and Output Operations – Decision Making and						
Module 2	Introduction to Arrays and Strings	l Quiz	Problem Solving	9 Hrs.		
Topics: Arrays: Introductio Programs – Sorting Arrays – Initializat Introduction – Dec	Topics: Arrays: Introduction – One Dimensional Array – Initialization of One Dimensional Arrays – Example Programs – Sorting (Bubble Sort, Selection Sort) – Searching (Linear Search) - Two Dimensional Arrays – Initialization of Two Dimensional Arrays. Example Programs – Matrix operations. Strings: Introduction – Declaring and Initializing String					
Variables – Reading	g Strings from Terminal – Writi Functions and Pointers	ng String to S	Screen – String	9 Hrs		
	T unctions and T oniters	Quiz	Solving	71113.		
Topics: Functions: Introduction – Need for User-defined functions – Elements of User-Defined Functions: declaration, definition and function call–Categories of Functions – Recursion. Pointers: Introduction – Declaring Pointer Variables – Initialization of Variables – Pointer Operators – Pointer Arithmetic – Arrays and Pointers – Parameter						
Module 4	Structures and Union	Quiz	Problem	9 Hrs.		
Tenier			Solving			
Structures: Introduc	ction – Defining a Structure – 1	Declaring Str	ucture Variable	– Accessing Structure		
Members – Array Declaring Union –	of Structures – Arrays within Difference Between	Structures –	Union: Introdu	action – Defining and		
Module 5	File handling (Case Study	Problem So	lving 9 Hrs.		
Topics:	1 -		-	-		

Files: Defining and Opening a File – Closing a File – Input / Output Operations on File – Random Access Files

List of Practical Tasks Lab Sheet 1 (Module I) Programs using IO Statements, Conditional Statements and Looping Statements Lab Sheet 2 (Module II) Programs using Arrays and Strings Lab Sheet 3 (Module III) Programs using Functions and Pointers Lab Sheet 4 (Module IV) Programs using Structures and Unions Lab Sheet 5 (Module V) Programs using Files

Text Book(s):

1. E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316- 513-0.

Reference Book(s):

Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.

ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.

Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2015

Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th Edition, 2014.

Stephen G. Kochan, "Programming in C", Addison-Wesley Professional, 4th Edition, 2014.

Web Links and Video Lectures:

1. https://nptel.ac.in/courses/106/105/106105171/

2. https://archive.nptel.ac.in/courses/106/104/106104128/

Topics:

Overview of natural resources: Definition of resource; Classification of natural resources- biotic and abiotic, renewable and non-renewable. **Water resources**: Types of water resources- fresh water and marine resources;

Soil and mineral resources: Important minerals; Mineral exploitation Soil as a resource and its degradation.

Energy resources: Sources of energy and their classification, renewable and non-renewable sources of energy; Advantages and disadvantages.

Self- learning topics: Availability and use of water resources; Environmental impact of over-exploitation, issues and challenges.; Environmental problems due to extraction of minerals and use; Sustainable Development Goals (SDGs)- targets, indicators, and challenges for SDGs.

Modul	Environmental Issues: Local,	Case	02 Classes
e 3	Regional and Global	study	

Topics:

Environmental Pollution: Types of Pollution-air, noise, water, soil, municipal solid waste, hazardous waste; Trans- boundary air pollution; Acid rain; Smog. Land use and Land cover change: land degradation, deforestation, desertification, urbanization. Global change: Ozone layer depletion; Climate change Self -learning topics: Environmental issues and scales

Module 4	Conservation of Biodiversity and Ecosystems	Assignment	02 Classes
Taniaa			

Topics:

Biodiversity-Introduction, types, Species interactions, Extinct, endemic,

endangered and rare species, Threats to biodiversity: Natural and anthropogenic activities.

Self-learning topics: Mega-biodiversity, Hot-spots, Major conservation policies. Biodiversity loss: past and current trends, impact.

Module 5	Environmental Pollution and Health	Case study	03 Classes
<u> </u>			

Topics:

Pollution, Definition, point and nonpoint sources of pollution, **Air pollution**sources, major air pollutants, health impacts of air pollution.

Water pollution – Pollution sources, adverse health impacts on human and aquatic life and mitigation, Water quality parameters and standards.

Soil pollution and solid waste- Soil pollutants and their sources, solid and hazardous waste, Impact on human health.

Self-learning topics: Noise pollution, Thermal and radioactive pollution.

Module 6	Impacts, Adaptation and Mitigation	Assignment/cas e	02 Classes
	Climate Change:	• • • • •	

Topics:

Understanding climate change: Natural variations in climate; Projections of global climate change with special reference to temperature, rainfall and extreme events; Importance of 1.5 °C and 2.0 °C limits to global warming; Impacts

Vulnerability and adaptation to climate change: Observed impacts of climate change on ocean and land systems; Sea level rise, changes in marine and coastal ecosystems; Impacts on forests and natural ecosystems; Indigenous knowledge for adaptation to climate change.

Self-learning topics: Mitigation of climate change: Synergies between adaptation and mitigation measures; National and international policy instruments for mitigation.

	Module 7	Environmental Management	C	ase study	Data analysis	02
						Classe
						S
-	Tonics					

iopics:

Environmental management system: ISO 14001; Environmental risk assessment Pollution control and management; Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability.

Self-learning topics: Environmental audit and impact assessment; Eco labeling /Eco mark scheme

	Module 8	Environmental Treaties and Legislation	Case study	Data analysis	01 Classe s
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Topics:

Major International Environmental Agreements: Convention on Biological Diversity (CBD), Major Indian Environmental Legislations: Environmental Protection Act, Forest Conservation Act, Public awareness.

Self-learning topics: Paris Agreement, Conference of the Parties (COP), India's status as a party to major conventions: Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act.

List of laboratory tasks : Any eight experiments will be conducted

- 1. Determination of total alkalinity of a water sample (knowledge)
- 2. Estimation of water hardness by EDTA method and its removal (by zeolite/ ion exchange method) (Comprehensive)
- 3. Estimation of copper from industrial effluents by colorimetric method (Comprehensive)
- 4. Estimation of iron from industrial effluents by titrimetric method/potentiometric method (Comprehensive)
- 5. Estimation of nickel from industrial effluents by titrimetric method (Comprehensive)
- 6. Estimation of chloride in drinking water by titrimetric method (Comprehensive)
- 7. Estimation of fluoride in ground water by colorimetric method (Comprehensive)
- 8. Determination of calcium in aqueous solution (Comprehensive)
- 9. Determination of Total Dissolved Salts, conductivity and pH of a water samples (Knowledge)
- 10. Determination of Chemical oxygen demand in the industrial effluent. (Comprehensive)
- 11. Biological oxygen demand of waste water sample (Comprehensive)
- 12. Determination of dissolved oxygen of an industrial effluent (Comprehensive)
- 13. Quality monitoring analysis of a soil sample (knowledge)
- 14. Flame photometric estimation of Sodium and potassium (Application)
- 15. Gas Chromatographic analysis of volatile organic compounds (Application)

Targeted Application & Tools that can be used:

Application areas are Energy, Environment and sustainability

Tools: Statistical analysis of environmental pollutants using excel, origin etc. Project work/Assignment: Assessment Type

- Midterm exam
- Assignment (review of digital/ e-resource from PU link given in references section mandatory to submit screenshot accessing the digital resource.)
- Lab evaluation/Assignment
- End Term Exam
- Self-learning

Assignment 1: Write a Statement of Environment report of your town/city/state/country

Assignment 2: Individual students will carry out the analyses of polluted solid, liquid, and gaseous samples and propose suitable mitigation measures. A detailed and in-depth report needs to be submitted for each case. This may include preparation of reagents, sample preparation (extraction), chemical analysis carried out, instruments and tools used, data collected and processed, inferences made and conclusions arrived at. Necessary support is given in the form of lab manual and reference links to e-books.

Text Book

- 1. G. Tyler Miller and Scott Spoolman (2020), Living in the Environment, 20th Edition, Cengage Learning, USA
- 2. Krishnamurthy, K.V. (2003) Text book of Biodiversity, Science Publishers, Plymouth, UK.
- 3. Jackson, A.R. & Jackson, J.M. (2000), Environmental Science: The natural environment and human impact, Pearson Education.

Reference Books

- 1. Fisher, Michael H. (2018) An Environmental History of India- From Earliest Times to the Twenty-First Century, Cambridge University Press.
- 2. William P. Cunningham and Mary Ann Cunningham (2017), Principles of Environmental Science: Inquiry & Applications, 8th Edition, McGraw-Hill Education, USA.
- 3. Sinha N., (2020) Wild and Wilful. Harper Collins, India.
- 4. www.ipcc.org; https://www.ipcc.ch/report/sixth-assessment-report-cycle/
- 5. Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press.
- 6. Richard A. Marcantonio, Marc Lame (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press.

E-resources:

- 1. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATA LOGUE_BASED&unique_id=DO AB_1_06082022_18126
- 2. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATA LOGUE_BASED&unique_id=DO AB_1_06082022_8761
- 3. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATA LOGUE_BASED&unique_id=DO AJ_1_02082022_3333
- 4. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATA LOGUE_BASED&unique_id=DO AB_1_06082022_3063
- 5. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATA

LOGUE_BASED&unique_id=DO AB_1_06082022_20719

- 6. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATA LOGUE_BASED&unique_id=DO AB_1_06082022_16824
- 7. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATA LOGUE_BASED&unique_id=DO AB_1_06082022_3954
- 8. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATA LOGUE_BASED&unique_id=DO AB_1_06082022_491
- https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATA LOGUE_BASED&unique_id=CU STOM_PACKAGE_16012023_WORLD_BUSINESS_COUNCIL_SUSTAINABLE_ 488
- 10.https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATA LOGUE_BASED&unique_id=CU STOM_PACKAGE_16012023_WORLD_BUSINESS_COUNCIL_SUSTAINABLE_ 583
- 11.https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECAT ALOGUE_BASED&unique_id=SP_RINGER_INDEST_1_171
- 12.https://presiuniv.knimbus.com/user#/searchresult?searchId=3R%20principl e&_t=1687427221129
- 13.https://presiuniv.knimbus.com/user#/searchresult?searchId=eco%20labelli ng&_t=1687427279979
- 14.https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECAT ALOGUE_BASED&unique_id=TE
 - XTBOOK_LIBRARY01_06082022_395&xIndex=4
- 15.https://www.ugc.gov.in/oldpdf/modelcurriculum/env.pdf

Topics relevant to Skill Development:

Industrial revolution and its impact on the environment, Environmental impact of over-exploitation of water resources, pollution and ill effects, lab experiments for Skills development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.

All topics in theory component are relevant to Environment and Sustainability.

Course Code: PPS 1001	Course Title: Introduction to Soft Skills		
		L- T-P- C	0-0-2-1
	Type of Course: Practical Only		
	Course		
Version No.	1.0		
Course Pre-	Students are expected to understa	nd Basic Engl	ish.
requisites	Students should have desire and el and learn.	nthusiasm to	involve, participate

Anti-	NIL					
requisites						
Course	This course is designed to	enab	ole students understand so	ft skills		
Description	concepts and improve conf	fidence	e, communication and profe	essional		
	skills to give the students	a co	mpetitive advantage and in	ncrease		
	chances of success in the p	profess	sional world. The course will	benefit		
	learners in presenting thems	selves	effectively through various a	ctivities		
	and learning methodologies	and learning methodologies.				
Course	The objective of the course	e is to	familiarize the learners w	ith the		
Objective	concepts of "Soft Skills" and attain SKILL DEVELOPMENT through					
	PARTICIPATIVE LEARNING	3 tech	niques.			
Course Out	On successful completion	ofthis	s course the students shall	he		
Comes	able to:	or this				
001100						
	CO1: Recognize significanc	e of so	ft skills			
	CO2: Illustrate effective co	mmun	ication while introducing one	eself		
	and others					
	CO3: List techniques of forr	ning h	ealthy habits			
	CO4: Apply SMART techniqu		chieve goals and increase			
	productivity	16 10 a	chieve goals and increase			
	productivity					
Course						
Content:						
	INTRODUCTION TO SOFT			04		
Module 1	SKILLS		Classroom activity	Hours		
Topics: Setting	Expectations, Ice Breaker, Si	gnifica	nce of soft skills, Formal gro	ooming,		
punctuality		•		0		
	I		1			
Module 2	EFFECTIVE		Individual Assessment	10		
Module 2	COMMUNICATION		individual Assessment	Hours		
Topics: Differe	nt styles of communication,	Differe	ence between hearing and lis	stening,		
Effective comm	nunication for success, Ema	il etiq	uette, Self-introduction fran	nework,		
Video introduct	ion, email- writing, Resume B	Building	g- Digital, Video, Traditional.			
	_					
Madula 2			Worksheets &	4		
Module 3	HABIT FORMATION		Assignment	Hours		
Topics: Profes	sional and personal ethics fo	or suco	cess. Identity based habits. I	Domino		
effect, Habit Lo	op, Unlearning, standing up fo	or wha	t is right			
	Cool cotting & Time			8		
Module 4	Managamant		Goal sheet	Hours		
	management					
A session where	e students will be introduced t	to Time	e management, setting SMAF	RT		
Goals, Introduc	tion to OKR Techniques, Time	e Mana	igement Matrix, steps to man	aging		

time through outbound group activity, making a schedule, Daily Plan and calendars (To Do List), Monitoring/charting daily activity

Targeted Application & Tools that can be used: LMS

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

- 1) Individual Assessment
- 2) LMS MCQ

The topics related to Skill Development: Communication and professional grooming, Goal setting and presentation for skill development through participative learning techniques. This is attained through assessment component mentioned in course handout.

Course	Course Title: Problem Solv	ing Using C)		1	0	4	3
Code:				L- T-P-C				
CSE1004	Type of Course:			0				
	School Core Lab							
	Integrated.							
Version No.	1.0							
Course Pre- requisites	NIL							
Anti-requisites	NIL							
Course Description	The course is designed to Students will be able to de programs and applicatio programming constructs to to any other language in fu	provide co evelop logi ns in C. hey can eas iture.	mplete knov cs which wi AC Also by sily switch o	vledge o ll help th y learnir ver	f C em Ig	lan to the	gua cre ba	ge. ate Isic
Course Object	The objective of the course concepts of Problem Solvi Problem Solving Methodol	e is to famil ng Using C ogies.	iarize the lea and attain E	arners wi Employat	ith † pilit	the y th	irou	gh
Course Outcomes	 On successful completion 1. Write algorithms an 2. Demonstrate know programming construct 3. Develop and impler 4. Decompose a probreusable code 5. Solve applications i 6. Design applications Processing. 	of this cou d to draw f ledge and c ts ment applic lem into fu in C using s s using Seq	Irse the stuc lowcharts fo develop simp cations usin nctions and structures ar uential and	lents sha or solving ple applic g arrays a develop nd Union Random	and Ac	e a oblion str dul	ble ems s in ings ar	to: S C s
Course Content:								
Module 1	Introduction to C Language	Quiz	Problem Solving	9 Hrs.	•			

Topics:						
Introduction to Programming – Algorithms – Pseudo Code - Flow Chart – Compilation –						
Execution – Preprocessor Directives (#define, #include, #undef) - Overview of C -						
Constants, Variables and Data types – Operators and Expressions – Managing Input and						
Output Operations – Decision Making and Branching - Decision Making and Looping.						
Module 2 Introduction to Arrays and Quiz Problem 9 Hrs. Strings Solving						
Topics:						
Arrays: Introduction – One Dimensional Array – Initialization of One Dimensional Arrays						
– Example Programs – Sorting (Bubble Sort, Selection Sort) – Searching (Linear Search) -						
Two Dimensional Arrays – Initialization of Two Dimensional Arrays. Example Programs –						
Matrix operations. Strings: Introduction – Declaring and Initializing String Variables – Reading Strings from Terminal – Writing String to Screen – String Handling Functions.						
Module 3Functions and PointersQuizProblem9 Hrs.Solving						
Topics:						
Functions: Introduction – Need for User-defined functions – Elements of User-Defined						
Functions: declaration, definition and function call–Categories of Functions –						
Recursion. Pointers: Introduction – Declaring Pointer Variables – Initialization of						
Variables – Pointer Operators – Pointer Arithmetic – Arrays and Pointers – Parameter						
Passing: Pass by Value, Pass by Reference.						
Module 4 Structures and Union Quiz Problem 9 Hrs. Solving						
Topics:						
Structures: Introduction – Defining a Structure – Declaring Structure Variable –						
Accessing Structure Members – Array of Structures – Arrays within Structures – Union:						
Introduction – Defining and Declaring Union – Difference Between Union and Structure.						
Module 5 File handling Case Study Problem Solving 9 Hrs.						
Topics: Files: Defining and Opening a File – Closing a File – Input / Output Operations on File – Random Access Files						
List of						
Practical						
Tasks Lab						
Sheet 1						
(Module I)						
Lab Sheet 2 (Module II)						
Programs using Arrays and Strings						
Lab Sheet 3 (Module III)						
Frograms using runctions and Pointers						
Lab Sheet 4 (Module IV)						
Programe liging Structurge and Ligione						
Programs using Structures and Unions						
Programs using Structures and Unions Lab Sheet 5 (Module V) Programs using Files						
Programs using Structures and Unions Lab Sheet 5 (Module V) Programs using Files Text Book(s):						
Programs using Structures and Unions Lab Sheet 5 (Module V) Programs using Files Text Book(s): 1. E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill						

Reference	
Book(s):	
1.	Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
2.	ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.
3.	Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second
Editio	on, Pearson Education, 2015
4.	Schildt Herbert, "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 Lectures:
1. https	://nptel.ac.in/courses/106/105/106105171/
2. https	://archive.nptel.ac.in/courses/106/104/106104128/

Course Code: MAT1003	Course Title: Applied StatisticsType of Course: School Core	LTP C	1	0	2	2
Version No.	3.0			J		
Course Pre- requisites	None					
Anti-requisites	None					
Course Description	The goal of this course is to p probability and statistics by me descriptive statistics, probabilit keeping in mind the future course and probabilistic components. Th descriptive statistics, probability variables and probability distribution	The goal of this course is to provide a firm understanding of probability and statistics by means of a thorough treatment of descriptive statistics, probability and probability distributions keeping in mind the future courses having statistical, quantitative and probabilistic components. The course covers topics such as descriptive statistics, probability, rules for probability, random variables and probability distributions, standard discrete and continuous probability distributions.				
Course	The objective of the course is to f	amiliariz	ze the	learn	ers wit	th the
Objective	concepts of "Applied Stat	istics"	and	at	tain	<u>Skill</u>
	Development Through Problem S	<u>Solving</u> t	echni	ques.		
Expected Outcome:	At the end of this course, students	s will be ir	n a po	sition t	0	
	1. apply the techniques of des	scriptive	statist	ics effe	ectively	ý
	2. interpret the ideas of probability and conditional probability					

	 demonstrate the knowledge of probability distributions Compute statistical parameters, correlation and regression, probability and sampling distributions using R software. 				
Module 1	Descriptive Statistics	Assignment	Coding needed	10 classes	
Introduction to Statistics, Data and statistical thinking, review of basic statistical parameters, Covariance, Correlation, Types of Measures of Correlation - Karl Pearson's Correlation Coefficient, Spearman Rank Correlation, linear regression, Multi linear regression.					
Module 2	Probability			6 classes	
Introduction to Pro Conditional Probal	bability, Probability pility, Total Probabil	of an event, Adc ity and Baye's th	lition Principl eorem with e	e, Multiplication law, examples	
Module 3	Random Variables and Probability Distributions		Coding needed	14 classes	
Introduction to Rar Variables, Probabi Function, Various Poisson, Normal a	ndom variables, Disc lity Distributions, P Probability distribut nd Exponential dist	crete Random V Probability Mass tions, Binomial, ributions	ariables and Function an Negative Bir	Continuous Random d Probability Density nominal (Self Study),	
Module 4	Sampling Theory		Coding needed	15 classes	
Introduction to Sampling Theory, Population, Statistic, Parameter, Sampling Distribution, Standard Error. Testing of Hypothesis, Types of Errors, Critical Region, level of Significance. Difference between Parametric and Non-parametric Tests, Large Sample Tests: Z-Test for Single Mean and Difference of Means (Self Study) , Small Sample Tests: Student's t-Test for Single Mean and Difference of Means , F-Test, Chi-Square Test.					
Targeted Application & Tools that can be used:					
The objective of the course is to familiarize students with the theoretical concepts of probability and statistics and to equip them with basic statistical tools to tackle engineering and real-life problems.					
Tools used: R Software / MS-Excel					
 Text Book 1. Ronald E Walpole, Raymond H Myers, Sharon L Myers, and Keying E Ye, Probability and Statistics for Engineers and Scientists, Pearson Education, 2016. 					
References					

- 1. James T. McClave, P. George Benson and Terry Sincich, Statistics for Business and Economics, 2018.
- 2. David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Essentials of Modern Business Statistics with Microsoft Excel, 2020.
- 3. David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Essentials of Statistics for Business and Economics, 2019.
- 4. Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, John Wiley and Sons, 2018.
- 5. Richard A. Johnson, Miller and Freund's Probability and Statistics for Engineers, 2018.
- 6. Kishor S Trivedi, Probability and Statistics with reliability, Queuing and Computer Science Applications, John Wiley & Sons, 2008.

Topics relevant to SKILL DEVELOPMENT: The goal of this course is to provide a firm understanding of probability and statistics by means of a thorough treatment of descriptive statistics, probability and probability distributions keeping in mind the future courses having statistical, quantitative and probabilistic components. The course covers topics such as descriptive statistics, probability, rules for probability, random variables and probability distributions, standard discrete and continuous probability distributions for **Skill Development through Problem Solving methodologies.** This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Digital Design						
ECE2007	Type of Course: Theory & Integrated	L-T-P-C	2	0	2	3	
	Laboratory						
Version No.	2.0						
Course Pre-	[1] Elements of Electronics/Electrical Engineering, 2] Basic concepts of						
requisites	number representation, Boolean Algebra						
Anti-	NIL						
requisites							
Course	The purpose of this course is to enable the students to appreciate the						
Description	fundamentals of digital logic circuits and Boolean algebra focusing on both combinational and sequential logic circuits. The course emphasizes on minimization techniques for making canonical and low-cost digital circuit implementations. This course deals with analysis and design of digital electronic circuits. The course also creates a foundation for future courses which includes Computer Architecture, Microprocessors, Microcontrollers, and Embedded Systems etc. The course enhances the Design, Implementation and Programming abilities through laboratory tasks. The associated laboratory provides an opportunity to verify the theoretical knowledge.						

Course Objective	The objective of the course is to familiarize the learners with the concepts of Digital Design and attain the SKILL DEVELOPMENT through EXPERIENTIAL LEARNING.				
Course Outcomes	 On successful completion of this course the students shall be able to: Describe the concepts of number systems, Boolean algebra and logic gates. Apply minimization techniques to simplify Boolean expressions. Demonstrate the Combinational circuits for a given logic Demonstrate the Sequential and programmable logic circuits Implement various combinational and sequential logic circuits using gates. 				
Course					
Module 1	Fundamentals of Number systems- Boolean algebra and digital logic	Application Assignment	Data Analysis task	06 classes	
Topics: Review of Numb and simplificatio Universal Gates (er systems and logic gates, Number ns, two, three, four variable K-Ma NAND & NOR) Implementations.	base conversion ps- Don't care Introduction to	ns, Overview of Boole conditions- Both SO HDL.	an functions P and POS-	
Module 2	Boolean function simplification	Application Assignment	Data Analysis task	08 Classes	
Topics: Introduction to Combinational circuits, Analysis, Design procedure, Binary Adder and Subtractor, Magnitude comparator, Parity generator and checker, Multiplexers-Demultiplexers, Decoders, Encoders and Priority Encoders HDL Models of combinational circuits					
Module 3	Combinational Logic circuits:	Application Assignment	Programming Task & Data Analysis task	08 Classes	
Topics: Introduction to sequential circuits, Storage elements: latches and flip flops, Characteristic tables and equations, excitation table, Analysis of clocked sequential circuits, Mealy & Moore Models of finite					
List of Laboratory Tasks: Experiment N0 1: Verify the Logic Gates truth table Level 1: By using Digital Logic Trainer kit Level 2: By using Analog devices like RPS, Volt meter, Resistors and ICs Experiment No. 2: Verify the Boolean Function and Rules					
Level 1: By using Digital Logic Trainer kit Level 2: By using Analog devices like RPS, Volt meter, Resistors and ICs					
Experiment No. 3: Design and Implementations of HA/FA Level 1: By using basic logic gates and Trainer Kit Level 2: By using Universal logic gates and Trainer Kit					
Experiment No. 4: Design and Implementations of HS/FS Level 1: By using basic logic gates and Trainer Kit Level 2: By using Universal logic gates and Trainer Kit					
Experiment No. 5: Design and Implementations of combinational logic circuit for specifications					

Level 1: Specifications given in the form of Truth table Level 2: Specification should be extracted from the given scenario

Experiment No. 6: Study of Flip flops

Experiment No. 7: Design and Implementations of sequential logic circuit for specifications

Level 1: Specifications given in the form of Truth table Level 2: Specification should be extracted from the given scenario

Experiment No.8: HDL coding for basic combinational logic circuits Level 1: Gate level Modeling Level 2: Behavioral Modeling

Experiment No.9: HDL coding for basic sequential logic circuit Level 1: Gate level Modeling Level 2: Behavioral Modeling

Targeted Application & Tools that can be used:

Digital electronics is the foundation of all modern electronic devices such as cellular phones, MP3 players, laptop computers, digital cameras, high definition televisions, Home Automation, Communication in systems in industries

Professionally Used Software: HDL/VHDL/Verilog HDL/ OOPS

Text Book(s):

- 1. Mano, M. Morris and Ciletti Michael D., "Digital Design", Pearson Education, 6th edition
- 2. Thomas L. Floyd "DIGITAL LOGIC DESIGN", Pearson Education, fourth edition.

Reference(s):

Reference Book(s):

R1. Jain, R. P., "Modern Digital Electronics", McGraw Hill Education (India), 4th Edition

R2. Roth, Charles H., Jr and Kinney Larry L., "Fundamentals of logic Design", Cengage Learning, 7th Edition

Online Resources (e-books, notes, ppts, video lectures etc.): <u>Book Free Download</u> (studymaterialz.in)

- 1. eBook1: Mano, M. Morris and Ciletti Michael D., "Digital Design", Pearson Education.
- 2. {[PDF] Digital Design By M. Morris Mano, Michael D Ciletti Book Free Download
- }
- **3. eBook2:**Floyd "DIGITAL LOGIC DESIGN" fourth edition- ePub, eBook- [PDF] DIGITAL LOGIC DESIGN FOURTH EDITION FLOYD | abri.engenderhealth.org.
- 4. NPTEL Course- <u>NPTEL :: Electrical Engineering NOC: Digital Electronic Circuits</u>
- 5. Digital Logic Design PPT <u>Slide 1 (iare.ac.in)</u>
- 6. Lab Tutorial: <u>Multisim Tutorial for Digital Circuits Bing video</u>

CircuitVerse - Digital Circuit Simulator online

Learn Logisim Beginners Tutorial | Easy Explanation! - Bing video

Digital Design 5: LOGISIM Tutorial & Demo

7. https://presiuniv.knimbus.com/user#/home E-content:

- 1. Z. Xin-Li and W. Hong-Ying, "The Application of Digital Electronics in Networking Communication," 2016 Eighth International Conference on Measuring Technology and Mechatronics Automation (ICMTMA), 2016, pp. 684-687, doi: 10.1109/ICMTMA.2016.168.
- An encoding technique for design and optimization of combinational logic circuit DipayanBhadra;Tanvir Ahmed Tarique;Sultan Uddin Ahmed;Md. Shahjahan;KazuyukiMurase2010 13th International Conference on Computer and Information Technology (ICCIT)
- A. Matrosova and V. Provkin, "Applying Incompletely Specified Boolean Functions for Patch Circuit Generation," 2021 IEEE East-West Design & Test Symposium (EWDTS), 2021, pp. 1-4, doi: 10.1109/EWDTS52692.2021.9581029.
- A. Matrosova, V. Provkin and E. Nikolaeva, "Masking Internal Node Faults and Trojan Circuits in Logical Circuits," 2019 IEEE East-West Design & Test Symposium (EWDTS), 2019, pp. 1-4, doi: 10.1109/EWDTS.2019.8884434.

Topics relevant to "SKILL DEVELOPMENT": Adders, Multiplexers, Decoders / Encoders; Flip-Flops, Counters and Registers for **Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.

Course Code: CIV1008	Course Title: Basic Engineering Sciences Type of Course: Theory Only	L-T-P- C	2	0	0	2
Version No.	1.0					
Course Pre- requisites	NIL					
Anti-requisites	NIL					
Course Description	This basic course on engineering science is designed to introduce students to the fields of civil, mechanical and petroleum engineering. Student will be exposed to various fields in civil engineering and different manufacturing techniques in addition to machinery for power production and consumption. Additionally, students will be getting an overview of various sectors of oil & gas industries. This course acquaints students to basics of Industry 4.0 and Construction 4.0. The course aims to enable students to appreciate the multidisciplinary nature of engineering design and operations in the current era with mechanization and digitization transforming every aspect of					
Course Objective	The objective of the course is sk Participative Learning techniques	kill devel S.	lopmer	nt of stud	ent by	using

Course Outcomes	On successful completion of this course the students shall be able to:			
	1] Recognize the significance of various disciplines in Civil Engineering			
	2] Discuss the recent evolutions in Civil Engineering			
	3] Explain various energies, energy generating machineries and energy consumption machineries			
	4] Describe the fundamental concept and terminology associated with the Petroleum Industry			
	5] Distinguish techniques	n between con	ventional and moderr	n manufacturing
Course Content:				
Module 1	Introduction to various fields in Civil Engineering	Assignment	Case studies on different Civil Engineering Projects	6 Sessions
Topics: Introduction t	o Civil Engineer	ing: Definition, s	scope and branches of (Civil Engineering,
Kole of civil Lingineer	Current			
Module 2	Trends and Evolution in Civil	Assignment	Article Review	6 Sessions
	Engineering			
Iopics: Mechanizatio	n in Constructio	on, Application of C	of Digital Technologies in Construction Overview	n Planning, of Smart Cities
Module 3	Power Production and Consumptio n Machinery	Assignment & Quiz	Data Collection	6 Sessions
Topics: Energy and its types, Engines and their applications, Pumps-Compressors and their applications.				
Module 4	Overview of Petroleum Engineering	Assignment & Quiz	Article Review	6 Sessions
Overview of the Petroleum Industry, Importance of Petroleum Engineering, lifecycle of Petroleum products, Classifications of E&P activities: Key difference between Offshore and Onshore, Onshore facilities, offshore platforms, Digitization of petroleum engineering				
Module 5	Industry 4.0	Assignment & Quiz	Data Collection	6 Sessions
Topics: Conventional manufacturing process: Metal forming, metal removal and metal joining				
process. Modorn Manufacturi	ng prococci 2D	Drinting / Additi	vo Manufacturing	
Targeted Application	& Tools that ca	n be used:	ve manulacturing.	

Application Areas include design and implementation of Smart City projects, Infrastructure maintenance, Power production, IC engines, Electric vehicles, onshore and offshore exploration and production activities

Project work/Assignment:

Assignment 1: Collect data and prepare report on various Mega Projects in Civil Engineering Assignment 2: Review Articles on current evolutions in Civil Engineering.

Assignment 3: Collect data related to renewable energy generation (Wind, Solar)

Assignment 4: Prepare an energy consumption chart for a compressor or pumps.

Assignment 5: Prepare a report on role of 3D printing across various industries.

Assignment 6: Prepare an assignment on geopolitical influence on oil and gas industries. Text Book:

- T1. Elements of Civil and Mechanical Engineering, L.S. Jayagopal & R Rudramoorthy, Vikas Publishers
- T2. Elements of Mechanical Engineering, by VK Manglik
- T3. Fundamentals of Oil & Gas Industry for Beginners by Samir Dalvi, Notion Press; 1st edition

References

- 1. K.P. Roy, S.K. Hajra Choudhury, Nirjhar Roy, "Elements of Mechanical Engineering", Media Promoters and Publishers Pvt Ltd, Mumbai.
- 2. Nontechnical Guide to Petroleum Geology, Exploration, Drilling & Production by Norman J. Hyne, PennWell Books; 3rd Revised edition

Web-resources:

1. Basic Civil Engineering

https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2706932&site=ehostlive

2. Post-parametric Automation in Design and Construction

https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1155197&site=ehostlive

3. Smart Cities : Introducing Digital Innovation to Cities

https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1993146&site=ehostlive

4. Innovation Energy: Trends and Perspectives or Challenges of Energy Innovation

https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2323766&site=ehostlive

- 5. Mechanical Engineering <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BAS</u> <u>ED&unique_id=EBSCO106_REDO_1705</u>
- 6. Additive Manufacturing: Opportunities, Challenges, Implications <u>https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1134464&site=e</u> <u>host-live</u>
- 7. Society of Petroleum Engineers (SPE)

https://www.spe.org/en/
8. PetroWiki: A comprehensive online resource created by the Society of Petroleum
Engineers that provides information on various aspects of petroleum engineering.
https://petrowiki.spe.org/PetroWiki
9. Rigzone: A resource for news and information about the oil and gas industry, including
job postings and industry trends.
https://www.rigzone.com/
Topics relevant to the development of SKILLS:
Engines-Turbines and their applications.
Mechanization in Construction.
Digitization in Petroleum Industries

Course Code:	Course Title: Engineering Graphics Type of Course: School Core & Theory	L-T-P-	2-0-0-2				
MEC100	Only	С					
6							
Version No.	1.2						
Course Pre- requisites	NIL						
Anti- requisites	NIL						
Course Description	The course is designed with the objective of giving an overview of engineering graphics. It is introductory in nature and acquaints the students with the techniques used to create engineering drawings. The course emphasizes on projection of points, lines, planes and solids and isometric projections.						
Course Objective	The objective of the course is to familiarize the of " Engineering Graphics " and attain SKIL . Problem solving methodologies.	ne learners L DEVEL	with the concepts OPMENT through				
1	<u> </u>	•					
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	On successful completion of this course the students shall be able to:						
	(1) Demonstrate competency of Engineering Graphics as per BIS conventions						
	and standards.	r ,	6 - T				
	(2) Comprehend	the theory of projec	tion for drawing projections of	of Points,			
~	Lines and Planes	s under different cond	ditions.	,			
Course	(3) Prepare mul	tiview orthographic	projections of Solids by visu	alizing			
mes	them indifferen	t positions.					
	(4) Prepare picto	orial drawings using t	he principles of isometric pro	jections to			
	visualizeobjects	in three dimensions.					
	Course Conte	ent:	1				
Module 1	Introduction	Assignment	Standard technical	02			
	to Drawing		drawing	Sessions			
Topics:							
Introduction, dra	awing instrumen	ts and their uses, rele	vant BIS conventions and sta	ndards,			
[02 Hours: Com	prehension Leve	41	of drawing sheet size and sca	ale.			
		, 1]					
Module 2	Orthographic projections of	Assignment	Projection methods	10			
	Points.		Analysis	Sessions			
	Straight Lines						
	and Plane						
	Surfaces						
Topics:				1			
Introduction, D	efinitions – Ele	ments of projection	and methods of projection,	Planes of			
projection, refer	rence line and co	onventions adopted.	First angle and third angle p	projections.			
Projection of Po	oints inall 4 quad	rants.					
Projections of S	Straight Lines (lo	ocated in first quadra	nt/first angle projection only): True and			
apparent length	is, true and ap	parent Inclinations	to reference planes. (No	application			
triangle square	rectangle pents	surfaces (First angle	e projection): Regular plane ircle – in different positions	inclined to			
both the planes	using change of	position method only					
· · · · ·			[10 Hours			
Application Lo	evel]						
Module 3	c	Assignment	Multi-view drawing	10			
	Projections		Analysis	Sessions			
	of		-				
	Solids						

Topics:

Introduction, Projection of right regular prisms, pyramids, cone, hexahedron and tetrahedron indifferent positions (Problems resting on HP only and First angle projection).

[10 Hours: Application Level]

Module 4	Isometric Projections of Solids (Using isometric scale only)	Assignment	Spatial Visualization	8 Sessions
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Topics:

Introduction, Isometric scale, Isometric projections of right regular prisms, cylinders, pyramids, cones and their frustums, spheres and hemispheres, hexahedron (cube), and combination of 2 solids, conversion of orthographic view to isometric projection of simple objects.

[8 Hours: Application Level]

Text Book:

1.N. D. Bhatt, "Engineering Drawing: Plane and Solid Geometry," Charotar Publishing House Pvt. Ltd.

References:

1. K.R. Gopalakrishna, "Engineering Graphics", Subhash Publishers, Bangalore.

2. D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, "Engineering Graphics with AutoCAD," Prentice Hall.

3. D. A. Jolhe, "Engineering Drawing with Introduction to AutoCAD," Tata McGraw Hill.

Web resources:

https://nptel.ac.in/courses/112103019

Topics relevant to "SKILL DEVELOPMENT": Projection in first and third angle for **SKILL DEVELOPMENT** through **Problem Solving methodologies**. This is attained through the assessment component mentioned in the course handout.

ENG2001	Advanced English	L- T- P-				
		С	1	0	2	2
Version No.	1.3					
Course Pre-	ENG1002 Technical English					
requisites						
Anti-requisites	NIL					
Course	The course emphasizes on technical commur	nication at	advar	ncec	l lev	el by
Description	exploring critical reading, technical presenta	tion and r	eview	wri	ting	. The
	purpose of the course is to enable learners to review literature in any form					
	or any technical article and deliver technic	cal preser	tation	is. E	Exte	nsive
	activities in practical sessions equip to express	s themselv	es in v	ario	ous f	orms

	of technical com	nmunications. Technical	presentations a	nd the module on		
	career setting f	ocus on learners' area	a of interests a	nd enhance their		
	English language	e writing skills to comm	unicate effective	ly.		
Course Out	On successful co	mpletion of the course	the students sha	all be able to:		
Come	1. Develop a cr	itical and informed resp	oonse reflectively	y, analytically,		
	discursively,	and creatively to their	reading.			
	2. Communicat	te effectively, creatively	, accurately and	appropriately in		
	their writing					
	3. Deliver tech	nical presentations				
	4. Design resur	4. Design resume and create professional portfolio to find a suitable				
	career	career				
Course Content:	Theory					
	Critical					
Module 1	Reasoning and Writing	Writing Essays	Critical Readir	ng 4 Classes		
Topics:				I		
A Catalog	of Reading Strate	gies				
 The Myth 	of Multitasking					
A Guide to	o Writing Essays S	peculating about Cause	s or Effects			
Is Google	Making Us Stupid	(Self Study)				
Module 2	Technical Presentation	Presentation	Oral Skills	3 Classes		
Topics:	·					
 Planning t 	he presentation					
 Creating t 	he presentation					
 Giving the 	e presentation	I				
Module 3	Writing Reviews	Prezi	Review Writin	g 4 Classes		
Topics:						
Review W	riting					
Short film	reviews					
 Advanced 	English Grammar	(Self Study)				
Module 4	Career	Online Writing Lab	Writing Skills	4 Classes		
Topics:	_					
Preparing	a Resume					
Writing Et		n Leπer folio				
• Creating a	Processional Port	10110				
Module 1	Critical Reasoni	ng and Writing		8 Classes		
Module 1	Critical Reasoni	ng and Writing		8 Classes		
Module 1 1. Reading a	Critical Reasoning	ng and Writing		8 Classes		

2. Writing Na	arrative Essays	
Level 1 – I	Draft 1	
Level 2 – I	Draft 2	
Module 2	Technical Presentation	10 Classes
3. Fishbowl		
In Fishbov	vl, students form concentric circles with a small group ins	ide and a larger
group out	side. Students in the inner circle engage in an in-depth di	scussion, while
students i	n the outer circle listen and critique content, logic, and g	roup interaction.
Level 1 – v	within group	
Level 2 – A	Among 2 group	
4. Technical	Group Presentation	
Module 3	Writing Reviews	4 Classes
5. Practice V	Vorksheets	
Level 1 – I	Eliminating the Passive Voice	
Level 2 – S	Simple, compound and complex sentences	
6. Writing Sł	nort Film Reviews	
Module 4	Starting your Career	6 Classes
7. Collaborat	tive Project	
Job search	n and writing report	
Writing Re	esume	
Module 1-4	Academic Journal	2 Classes
8. Academic	Journal Writing	I
Level 1- N	lid Term	
Level 2 – I	End Term	
Targeted Applica	tion & Tools that can be used: Writing reports, Review w	riting, Group
Discussion, Dyau	imment:	
	Journal – Assignment	
In Academ	nic Journal (CII) students compile task and activities com	nleted in each
module a	nd submit to the instructor at the middle and end of the s	semester.
References		
1. Hering Design	g, Heik. How to Write Technical Reports: Understanding	g Structure, Good
2. Johnso	on, Richard. (2010) <i>Technical Communication Today</i> . Pear	son, 2015

- 3. Rice B. Adelrod, Charles R. Cooper and Ellen C. Carillo. (2020) *Reading Critically Writing Well: A Reader and Guide*. Beford/St. Martin's Macmillan Learning, New York.
- 4. The Princeton Review. (2010) *MCAT Verbal Reasoning & Writing.* The Princeton Review, Inc.
- 5. <u>https://www.hitbullseye.com/Strong-and-Weak-Arguments.php Accessed on 10</u> Dec 2021
- 6. <u>https://www.inc.com/guides/how-to-improve-your-presentation-skills.html</u> Accessed on 10 Dec 2021

Topics Relevant to "employability": Critical Reasoning, Presentation, Review Writing and Starting Career

Topics Relevant to "Human Values and Professional Ethics": Critical reasoning

Course Code: ECE2010	Course Title: Innovative Projects using Arduino	L- T-P- C	-	-	-	1
Version No.	1.0	•				
Course Pre- requisites	NIL					
Anti-requisites	NIL					
Course Description	This course is designed to provide an in-depth understanding of Arduino microcontrollers and their application in various real time projects involving sensors. Throughout the course, students will learn the fundamentals of Arduino programming and gain hands-on experience with a wide range of sensors. Students will explore how to connect and					no

interface sensors with Arduino boards, read sensor data, and use it to					
	control various o	output devices This co	ourse is suitable for beginr	ners who	
	are interested in	exploring the world	of electronics and develop	ing	
	practical applica	practical applications using Arduino and sensors.			
Course	The objective of	the course is Empl	oyability Skills of studer	nt by using	
Objective	PARTICIPATIVE	LEARNING techniq	ues.		
Course	On successful co	ompletion of the cou	rse the students shall be a	able to	
Outcomes	e Arduino prototype board	1			
	2) Demonstra	ate the hardware inte	rfacing of the peripherals	to Arduino	
	system.				
	3) Understan	d the types of sensor	s and its functions		
	4) Demonstra	ate the functioning	of live projects carried	out using	
	Arduino sys	stem.			
Course Content:					
Module 1	Basic concepts of Arduino	Hands-on	Interfacing Task and Analysis	4 Sessions	
Topics: 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.					
Module 2	Sensory Devices	Hands-on	Interfacing Task and Analysis	4 Sessions	
Arduino Sensors: Humidity Sensor, Temperature Sensor, Water Detector / Sensor, PIR Sensor, Ultrasonic Sensor, Connecting Switches and actuators, sensor interface with Arduino. Introduction to 3D Printer: 3D Printer technology and its working Principles, Applications. Introduction to online Simulators: Working with Tinkercad Simulator.					
Topics: Types of	Topics: Types of Arduino boards, sensors, 3D Printer				
Targeted Applic	ation & Tools tha	t can be used:			
Application Area	a:				
Home Automat Automation, Int Education and Le Arduino and sen	ion, Environmen ernet of Things earning. These are sors can be applie	ital Monitoring, Ag (IoT), Robotics, Wo just a few examples ed. The flexibility and	riculture and Farming, earable Devices, Security of the many application a l affordability of Arduino,	Industrial ⁷ Systems, reas where combined	

with the wide range of sensors available, allow for endless possibilities in creating innovative projects.

Professionally Used Software: students can use open SOURCE Softwares Arduino IDE and Tincker CAD

Project work/Assignment:

1. Projects: At the end of the course students will be completing the project work on solving many real time issues.

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 Library Link</u>.

3. Presentation: There will be a presentation from interdisciplinary students group, where the students will be given a project on they have to demonstrate the working and discuss the applications for the same

Textbook(s):

Monk Simon "Programming Arduino: Getting Started with Sketches", Mc Graw Hill Publications Second Edition

References

Reference Book(s)

1. Neerparaj Rai "Arduino Projects for Engineers" BPB publishers, first edition, 2016.

2. Ryan Turner "Arduino Programming " Nelly B.L. International Consulting Ltd. first

edition,2019.

Online Resources (e-books, notes, ppts, video lectures etc.):

- 1. Arduino trending Projects < <u>https://www.https://projecthub.arduino.cc/</u>>
- 2. Introduction to Arduino < https://onlinecourses.swayam2.ac.in/aic20_sp04/preview>
- 3. Case studies on Wearable technology< <u>https://www.hticiitm.org/wearables></u>

E-content:

- 1. Cattle Health Monitoring System Using Arduino and IOT (April 2021 | IJIRT | Volume 7 Issue 11 | ISSN: 2349-6002)
- M H Hemanth Kumar, Ravi Pratap Singh, Nishu Sharma, Pragya Singh" IOT BASED SMART SECURITY SYSTEM USING ARDUINO" 2021 JETIR August 2021, Volume 8, Issue 8.
 - **3.** R. Maheswar, P. Jayarajan, S. Vimalraj, G. Sivagnanam, V. Sivasankaran and I. S. Amiri, "Energy Efficient Real Time Environmental Monitoring System Using Buffer Management Protocol," 2018, pp. 1-5, doi: 10.1109/ICCCNT.2018.8494144. https://ieeexplore.ieee.org/document/8494144.
 - **4.** Yaser S Shaheen, Hussam., " Arduino Mega Based Smart Traffic Control System ," December 2021 Asian Journal of Advanced Research and Reports 15(12): 43-52, 2021(15(12): 43-52, 2021):15(12): 43-52, 2021.

Topics relevant to development of "SKILL": System design for achieving Sustainable Development Goals.

Course Code: CSE2001	Course Title: Data Structures and Algorithms Type of Course: Integrated	L- T-P- C	3-0-2-4		
Version No.	1.0	•			
Course Pre- requisites	Problem Solving Using Java				
Anti-requisites	NIL				
Course Description	This course introduces the fundamental c emphasize the importance of choosing a technique for program development. This co which emphasizes on understanding the imp structures using Java programming languag fundamental concepts of data structure implementing them, the student can be an et software applications.	concepts of d an appropriate ourse has theo lementation and ge. With a go es and prace ffective design	ata structures and to e data structure and ry and lab component nd applications of data ood knowledge in the ctical experience in her, developer for new		
Course Objective	Structures and Algorithms and attain Skill Development through Experiential Learning techniques.				
Course Out C omes	On successful completion of the course the stu CO1: Implement program for given prob structures. [Application] CO2: Apply an appropriate linear data [Application] CO3: Apply an appropriate non-linear da [Application] CO4: Explain the performance analysis algorithms.	dents shall be olems using to structure fo ta structure fo of given se	able to: fundamentals of data r a given scenarios. For a given scenarios. earching and sorting		

Course Content:				
Module 1	Introduction to Data Structure and Linear Data Structure – Stacks and Queues	Assignment	Program activity	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 Module 2 Structure- Linked List	Assignment	Program activity	17 Sessions
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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	Session
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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 - Sequential and Binary Search, Sorting – Selection and Insertion sort.

Performance Analysis - Time and space analysis of algorithms – Average, best and worst case analysis.

List of Laboratory Tasks:

Lab sheet -1

Level 1: Prompt the user, read input and print messages. Programs using class, methods and objects Level 2: Programming Exercises on fundamental Data structure - Arrays based on Scenario.

Lab sheet -2

Level 1: Programming Exercises on Stack and its operations

Level 2: Programming Exercises on Stack and its operations with condition

Lab sheet -3

Level 1: Programming on Stack application infix to postfix Conversion

Level 2: -

Lab sheet -4

Level 1: Programming Exercises on Queues and its operations with conditions

Level 2: -

Lab sheet -5

Level 1: Programming Exercises on Linked list and its operations.

Level 2: Programming Exercises on Linked list and its operations with various positions

Lab sheet	-6
Level 1:	-
Level 2:	Programming scenario based application using Linked List
Lab sheet	-7
Level 1:	Programming Exercises on factorial of a number
Level 2:	Programming the tower of Hanoi using recursion
Lab sheet	-8
Level 1:	
Level 2:	Programming the tower of Hanoi using recursion
Lab sheet	-9
Level 1:	Programming Exercise on Doubly linked list and its operations
Level 2:	-
Lab sheet	-10
Level 1:	Program to Construct Binary Search Tree and Graph
Level 2:	Program to traverse the Binary Search Tree in three ways(in-order, pre-order and
post-order) and implement BFS and DFS
Lab sheet	-11
Level 1:	Program to Implement the Linear Search & Binary Search
Level 2:	Program to Estimate the Time complexity of Linear Search
Lab sheet	-12
Level 1:	Program to Implement and Estimate the Time complexity of Insertion Sort
Level 2:	Program to Implement and Estimate the Time complexity of Insertion Sort
Lab sheet	-13
Level 1:	Program to Implement and Estimate the Time complexity of Selection Sort
Level 2:	Program to Implement and Estimate the Time complexity of Selection Sort
Targeted A	oplication & Tools that can be used
Use of Pow	erPoint software for lecture slides and use of Ubuntu for lab programs to execute. Tool is
Codetantra	tool.
	Duciest work (Assistant out)
1	Project work/Assignment:

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": Linked 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: CSE3155	Course Title: Data Communications and Computer Networks Type of Course: Program Core Theory– Laboratory integrated	L-T-P- C 3-0-2-4	3	0	2	4
Version No.	1.0	I	L		1	I
Course Pre- requisites	Digital Design					
Anti-requisites	NIL					
Course Description	The objective of this course is to provide knowl and computer networks, its organization and i practical experience in the installation, monito LAN systems.	edge in data ts impleme ring, and ta	a co enta roul	mn tion bles	nunio n, an shoo	cations id gain ting of

	The associated laboratory is designed to implement and simulate various networks using Cisco packet tracer, NS2. All the lab exercises will focus on the fundamentals of creating multiple networks, topologies and analyzing the network traffics.					
Course Objective	The objective of the Communications an Problem Solving Met	course is to familiariz d Computer Netwo hodologies.	ze the learners with orks and attain En	the concepts of Data ployability through		
Course Out Comes	On successful completion of the course, the students shall be able to: 1] I llustrate the Basic Concepts Of Data Communication and Computer Networks. 2] Analyze the functionalities of the Data Link Layer. 3] Apply the Knowledge of IP Addressing and Routing Mechanisms in Computer Networks. 4] Demonstrate the working principles of the Transport layer and Application Layer.					
Course Content:						
Module 1	Introduction and Physical Layer- CO1	Assignment	Problem Solving	07 Classes		
Introduction to Topologies, Tran Physical Layer Multiplexing and	Computer Network smission Media –Ro -Analog and Digita l Spread Spectrum.	es and Data comm eference Models -C l Signals – Digital	nunications, Netwo OSI Model – TCP/I and Analog Signa	ork Components – P Suite. ls – Transmission -		
Module 2	Reference Mode and Data Link Layer – CO2	ls Assignment	Problem Solving	7 Classes		
Data Link Layer - Error Detection and Correction – Parity, LRC, CRC, Hamming Code, Flow Control and Error Control, Stop and Wait, ARQ, Sliding Window, Multiple Access Protocols, CSMA/CD,CSMA/CA, IEEE 802.3, IEEE 802.11 Ethernet.						
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 Lay -CO3	er 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 Tasks: Lab sheet -1, M-1, 3 [2 Hours] Experiment No 1: Level 1: Study of basic network commands and network configuration commands. 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 [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 [2 Hours] Experiment No. 1: Configure the telnet protocol in the router using the Cisco packet tracer. Lab sheet – 8, M-4[2 Hours] 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. http://www.nptelvideos.com/course.php?id=393

3.<u>https://www.youtube.com/watch?v=3DZLItfbqtQ</u>

4.<u>https://www.youtube.com/watch?v=_fldQ4yfsfM</u>

5. https://www.digimat.in/keyword/106.html

https://puniversity.informaticsglobal.com/login

Course Code: CSE2009	Course Title: Computer Organization and Architecture	L-T- P- C	3-0-0-3		
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 learne Computer Organization and Architecture and attain Sk Participative Learning techniques.	ers with t ill Develo	he concepts of pment through		

Course	On successful com	On successful completion of the course the students shall be able to:					
Outcomes	 Describe the basic components of a computer, their interconnections, and instruction set architecture [Comprehension] Apply appropriate techniques to carry out selected arithmetic operations Explain the organization of memory and processor sub-system 						
Course Content:							
Module 1	Basic Structure computers	of Assignment	Data Analysis task	12 Classes			

Topics:

Computer Types, Functional Units, Basic Operational concepts, Bus Structures, Computer systems RISC & CISC, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. Arithmetic Operations on Signed numbers. Instructions and Instruction Sequencing, Instruction formats, Memory Instructions.

	Instruction	Set				
Module 2	Architecture	and	Assignment	Analysis,	Data Collection	12 Classes
	Memory Unit					

Topics:

Instruction Set Architecture: Addressing Modes, Stacks and Subroutines.

Memory System: Memory Location and Addresses, Memory Operations, Semiconductor RAM Memories, Internal Organization of Memory chips, Cache memory mapping Techniques.

	Arithmet	tic			
Module 3	and	Input/output	Case Study	Data analysis task	10 Classes
	Design				

Topics:

Arithmetic: Carry lookahead Adder, Signed-Operand Multiplication, Integer Division, and Floating point operations.

Input/output Design: Accessing I/O Devices, I/O communication, Interrupt Hardware, Direct Memory Access, Buses, Interface Circuits

Module 4	BPU and Pipelining	Assignment	Analysis, Data Collection	11 Classes

Topics:

Basic Processing Unit: Fundamental Concepts, Single Bus organization, Control sequence, Execution of a Complete Instruction, Multiple Bus Organization.

Pipelining: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Hazards. 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

Text Book

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", Fifth Edition, McGraw-Hill Higher Education, 2016 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. <u>https://nptel.ac.in/courses/106106092</u>

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 Code: MAT2004	Course Title: Discrete Mathematical Structures Type of Course: Program Core	L-T- P- C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Nil					
Anti- requisites	Nil					
Course Description	The course provides insights into the fundamental aspects of mathematical logic and predicate calculus. The course delves deeply into the concepts of algebraic structures, lattices and Boolean algebras which are widely used in computer science and engineering. It also highlights the principles of counting techniques and their applications.					
Course Objective	The objective of the course is Skill Develo Problem Solving Techniques.	pment of	f stuc	lent t	y us	ing

Course	On successful completion	on of the course the	students shall be able	e to:			
Outcomes	CO1: Explain logical sentences through predicates, quantifiers and logical						
	connectives.	connectives.					
	relations.		st theory and different	types of			
	CO3: Elucidate the conc	epts of lattices and	Boolean algebra.				
	CO4: Deploy the countin	ng techniques to tac	kle combinatorial prol	blems.			
Course Content:							
	Mathematical Logic			12			
Module	Calculus			classes			
Propositional Lo Introduction to function, Inferen	ogic, Propositional Logic Proofs, Conversion to cl ice theory of the Predicate	c Equivalences, No lausal form, Predic e Calculus.	ormal forms, Inferen cate calculus, The S	ce rules, statement			
Module 2	Algebraic Structures			10 classes			
relation by mate	rix, closure of different t	ype of relations, e	quivalence relations,	primitive			
Module 3	Algebra			classes			
Partial ordering, algebraic systen Boolean lattice &	Posset, Lattices & Alge ns by lattices, Distributive & Boolean algebra, cance	braic structures, S e lattices, complem llation laws and unio	ub lattice, Basic prop nent of an element in que complement theo	perties of a lattice, rem.			
Module 4	Principles of Counting Techniques			12 classes			
Chinese Rema Generalized Pe	Chinese Remainder Theorem, pigeonhole principle, generalized pigeonhole principle, Generalized Permutations and Combinations, Recurrence Relations.						
Targeted Applic	ation & Tools that can be	used:					
Discrete mathematics provides the mathematical foundations for many computer science courses including data structures, algorithms, database theory, automata theory, formal languages, compiler theory, computer security, and operating systems.							
Project work/As course	signment: Mention the T	Type of Project /Ass	ignment proposed fo	or this			
Assignment 1: Logic Equivalences and Predicate calculus. Assignment 2: Equivalence Relations and Lattices Assignment 3: Recurrence Relations							

Text Books

- 1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", McGraw-Hill's 7th Edition, 2011.
- 2. Kolman, Bernard; Busby, Robert C; Ross, Sharon Cutler," Discrete mathematical structures", Pearson India, 6th Edition, 2015.
- Liu, C L Mohapatra, D P.," Elements of Discrete Mathematics a Computer 3.
- oriented approach", New Delhi McGraw Hill Education, 4th Edition, 2015. Mott, Joe L; Kandel, Abraham; Baker, Theodore P, "Discrete Mathematics for Computer Scientists and Mathematicians", Pearson India, 2nd Edition, 2015. 4.
- Epp, Susanna S, "Discrete Mathematics with applications", New Delhi Cengage 5. Learing, 4th Edition, 2016.

References:

- 1. Tremblay, J.P. and Manohar.R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.
- 2. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007.
- Discrete Mathematics, Richard Johnsonbaugh, 8th Edition, Prentice Hall, 2017. 3.

Course Code:	Course Title: Fundamentals of Data Analytics		2	0	2	3
CSE3190	Type of Course: Theory-embedded Lab	L-T- P- C				
Version No.	3.0					
Course Pre- requisites	NIL					
Anti-requisites	NIL					

•							
Course	Fundamentals of	f Data Analytics is	designed for inspectin	ng, cleansing,			
Description	transforming, and	ransforming, and modeling data with the goal of discovering useful information,					
	and supports in d	ecision-making. The co	urse begins by covering D	ata extraction,			
	pre-processing, and transformation. It delivers the basic statistics and taught in an						
	intuitive way to a	nalysis the data. This co	ourse will help the studen	ts to apply the			
	knowledge on dat	a analysis to a wide ran	ge of applications.				
Course Objective	The objective of	the course is to familia	arize the learners with th	ne concepts of			
	Fundamentals of	Data Analytics and	attain SKILL DEVELOPN	/IENT through			
	PROBLEM SOLVIN	G Methodologies.		_			
Course Out Comes	On successful com	pletion of the course th	ne students shall be able t	:0:			
	1) Explain di	fferent types of data a	nd variables.				
	2) Interpret	data using appropriate	statistical methods.				
	3) Demonstr	rate the collection. proc	essing and analysis of dat	a for any given			
	applicatio	on and Illustrate various	s charts using visualizatio	n methods.			
	4) Apply the	Data Analysis techniqu	ues by R Programming				
	, , ,	, ,	, , ,				
Course Content:							
	Introduction to		Data Collection, data				
Module 1	Data Analysis	Assignment	analysis, Programming	8 Sessions			
- • • • • •				<u>с .: т</u> і			
Iopics: Introducing	Data, overview of	data analysis: Data in ti	ne Real World, Data vs. In	formation, The			
Many "Vs" of Data	, Structured Data	and Unstructured Data	, Types of Data, Data An	alysis Defined,			
Types of Variables,	Central Tendency of	of Data, Scales of Data, S	Sources of Data. Data pre	paration.			
R Studio: Base R-R	Studio IDE-Introdu	iction to R Projects and	R Markdown Basic R. R a	as a Calculator-			
Scripts and Comme	nts-R Variables Da	ta I/O: Working Director	ries-Importing Data Export	ing Data-More			
ways to save-Data I	$/\Omega$ in Base R						
	o in base it.						
	Data Analysis and	Casa studias		Q Cassiana			
iviodule z	Visualization	Case studies	Programming	8 Sessions			
Topics: Data Sum	marization: One	Quantitative and Cat	egorical Variable. Data	Classes: One			
Dimensional Data C	Classes-Data Frame	es and Matrices-Lists. Da	ata Cleaning: Dealing with	Missing Data-			
Strings and Recodi	ng Variables. Mar	nipulating Data in R: R	eshaping Data-Merging	Datasets. Data			
Visualizations: Plott	ing with ggplot2- F	Plotting with Base R					
Module 3	Statistical Analysis	Case studies	R programming	7 Sessions			
Tonics: Proportion	tests-Chi squarec	test-Fisher exact test	-Correlation-T_test-Wilco	xon Rank sum			
tests-Wilcoxon sign	ed rank test- one-v	way ANOVA test- Kruska	l Wallis test	Kon Kank Sam			
		1					
Module 4	Predictive	Case studies	Programming	8 Sessions			
	Analysis		• 8. •				
Topics: Linear lea	l ast-squares — impl	ementation – the good	l dness of fit – testing a l	inear model –			
weighted recomplin	or Regression usin	g Stats models - multin	le regression – nonlinear	relationshins			
logistic regression	- actimating nara	motors - accuracy Tim	ne regression – nonimedi ne series analysis – movi	ing averages			
missing values	- countral paid	incleis - accuracy. Ill	tion to survival analysis	ing averages -			
inissing values – Sel	nai correlation – al		alon to survival dridlysis				

List of Laboratory Tasks:

Experiment No. 1: Introduction to R and RStudio

Level 1: Getting Started with R and RStudio

- Installing R and RStudio.
- Basic R syntax and commands.

Level 2: Working with RStudio

- Understanding the RStudio interface.
- Creating and managing R scripts.

Experiment No. 2: Basic Data Handling in R

Level 1: Data Types and Structures in R

- Vectors, matrices, and data frames.
- Lists and factors.

Level 2: Data Import and Export

- Reading data from CSV, Excel, and text files.
- Exporting data to different formats.

Level 3: Exploring Datasets

• Using functions like head(), summary(), and str().

Experiment No. 3: Basic Data structure in R

Level 1: a. Demonstrate a program to join columns and rows in a data frame using cbind() and rbind() in R.

b.Implement different data structures in R (Vectors, Lists, Data Frames)

Level 2: R AS CALCULATOR APPLICATION a. Using with and without R objects on console

a. Using mathematical functions on console

b. Write an R script, to create R objects for the calculator application

Experiment No. 4: Data Cleaning and Preprocessing

Level 1: Handling Missing Data in R

- Identifying missing values.
- Imputing missing values using mean, median, or other methods.

Level 2: Data Transformation in R

- Standardizing and normalizing data.
- Log-transformations and scaling.

Experiment No. 5: Exploratory Data Analysis (EDA) with R

Level 1: Descriptive Statistics

- Calculating mean, median, and standard deviation.
- Visualizing data using histograms, box plots, and scatter plots.

Experiment No. 6: Data Visualization with ggplot2

Level 1: Demonstrate various graphs that can be made and altered using the ggplot2 package.

Level 2: Create 500 random temperature readings for six cities over a season and then plot the generated data using ggplot2 packages in R

Experiment No. 7: Perform Tests of Hypotheses hypothesis test (parametric)

Level 1: How to perform tests of hypotheses about the mean when the variance is known. How to compute the p-value. Explore the connection between the critical region, the test statistic, and the p-value.

Level 2: A teacher claims that people who work for only five hours per week will score significantly lower than people who work for ten hours per week on a quantitative abilities test. He brings twenty people and randomly assigned them to one or two groups. In one group he has participants who work for ten hours and in another group, he has participants who work for five hours. He conducts the test for all participants. Scores on the test range from one to ten with higher scores representing better performance. Test if there is any significant difference between those who work for five hours per week versus those who work for ten hours per week based on the test performance.

Experiment No 8: Hypothesis – Non-Parametric Test

Level 1: A car manufacturing company like to find the sales of three types of cars produced by them in three regions and is given. Test if there is an association between the regions and types of cars purchased.

Experiment No 9: Correlation and Covariance

Level 1: Using the iris data set in R

- a. Find the correlation matrix.
- b. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.
- c. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.

Level 2: Ramesh is doing a statistics paper in his post-graduation course. He met his friend Amal who is a textile engineer. Ramesh, who is doing his internship at ABC Researchers, is interested in a question. He poses this question to Amal and tries to find if he can answer. The question is as follows: The data regarding sales of soft- drinks and sales of cotton clothes in a place during the last 12 months are given. Find if there is any association between sales of soft drinks and sales of cotton clothes. Also explain the reason if there is any relationship.

Experiment No 11: Regression Model

Level 1: Import data from web storage (http://www.ats.ucla.edu/stat/data/binary.csv). Name the dataset and now do Logistic Regression to find out the relation between variables that are affecting the admission of a student in an institute based on his or her GRE score, GPA obtained, and rank of the student. Also check the model is fit or not. Require (foreign), require (MASS).

Level 2: Demonstrate multiple regressions, if data have a continuous Independent variable. Apply on the above dataset

Experiment No. 12: Time Series Analysis in R

Level 1: Demonstrate Time series analysis using Time Series Data Library at http://robjhyndman.com/TSDL/. Targeted Application & Tools that can be used:

Application Area are Decision making in business, health care, financial sector, Medical diagnosis etc.

Text Books

- 2. Glenn J. Myatt and Wayne P. Johnson, "Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining Paperback", Import, 22 July 2014.
- 3. Introduction to statistics and Data analytics, Christian H, Michael S, Springer, 2016
- 4. Introduction to R- Robert Parker, John Mushcelli and Andrew Jaffe, Johns Hopkins University, 2020 (E-resource)
- 5. Introduction to Time Series and Forecasting (Springer Texts in Statistics), Peter Brockwell, Richard A. Davis, Springer, 2016.

References

- 1. 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.
- 2. The R Software-Fundamentals of Programming and Statistical Analysis -Pierre Lafaye de Micheaux, Remy Drouilhet, Benoit Liquet, Springer 2013.

Online resources:

http://www.modernstatisticswithr.com/solutions.html#solutionsch3

https://johnmuschelli.com/intro_to_r/

https://users.phhp.ufl.edu/rlp176/Courses/PHC6089/R_notes/

Topics relevant to development of "FOUNDATION SKILLS":

- 1. Statistical Concepts for data, visualization techniques.
- 2. Data collection for project based assignments.
- 3. Inferential Statistics (T test, Z test)
- 4. Probability Calculation

for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Innovation Project-Raspberry Pi		0	4	2
ECE2001	Using Python	L- T-P-		This includes	
		С		few lecture	
	Type of Course: School Core & Practical Only.			sessions	
Version No.	1.0				
Course Pre- requisites	NIL				
Anti-requisites	NIL				
Course	The Raspberry Pi is an amazing single board comp	uter (SBC) cap	able of running l	inus
Description	and a whole host of applications. Python is language that is used in schools, web developme	a beginn nt, scienti	er-fri ific re	endly programi search, and in n	ming nany
	Bythen to blink lights, respond to button push	os road	ling	own programs	with the
	Raspberry Pi and many more. The course also offers in-depth knowledge designing, developing, coding and implementing projects using Raspberry Pi.				

	I			
Course Outcomes	On successful cor	npletion of this c	ourse the students shall be abl	e to:
	1. Write a p	rogram in Python.		
	2. Explain th	ne main features o	of the Raspberry Pi board	
	3. Demonst	rate the hardware	e interfacing of the peripherals	s to Raspberry Pi
	system.			
	4. Demonst	rate the function	ning of live various projects o	arried out using
	Raspberry Pi s	ystem.		
Course Content:				
	Basics of Python.			
Module 1	functions	Quiz	Problem Solving	4 Lab Sessions
Topics:				
Introduction, Struc	ture of Python Pi	ogram, Data Typ	es and Variables, Input and O	utput, Operators,
Importing libraries,	Functions, Develo	ppment Tool.		
Concepts will be ta	aught by solving p	roblems through	programs.	
	Python	Quia	Droblom Colving	4 Lab Cassiana
iviodule 2	Programming	Quiz	Problem Solving	4 Lab Sessions
Control statements	, Lists and Diction	aries, Problem sol	ving using Python.	
Concepts will be ta	ught by solving p	roblems through	programs.	1
	Overview of	Project	System Design Task and	4 Lab
Module 3	Raspberry Pi	Development	Analysis	Sessions
Topics:				
An exploration of G	PIO pins. LED and	switch control. In	stallation of libraries. PuTTY SS	H. Raspberry Pi
to interface with m	ore complicated s	ensors and actuat	ors like Pi Camera, servo motor	ADS51115
through PIP librarie	es. Arduino with Ra	aspberry-pi		
	Interaction with	Project	Modeling and Simulation	
Module 4	API Services	Development	task	3 Lab Sessions
Topics:				
Raspberry Pi intera	ict with online API	services through	the use of public APIs and SDF	s using Firebase,
Gspread API.		0	·	0 ,
Node-RED – a prog	ramming tool for v	wiring together ha	ardware devices, MQTT.	
Android/Case study	y.			
Targeted Application	on & Tools that ca	n be used:		
Making it a reality	(Raspberry Pi Proje	ects) :		
Projects will include	e but not limited t	o :		
 Intelligent home 	e locking system.			
Intelligent wate	r level manageme	nt system.		
Home automati	on using RFID.			
Real time clock-	based home autor	nation.		
Intelligent Autor	matic Irrigation Sy	stem		
Professionally Use	ed Software: Raspl	perry Pi.		
Project work/Pyth	on Lab Test:			
Project wo Python tes	rk t.			
Text Book(s):				
1) Ashok Namdey	Kamthane, Amit	Ashok Kamthane	. "Problem Solvina and Pytho	Programming"
Mc Graw Hill Educa	ation, 2018.		,	, , , , , , , , , , , , , , , , , , ,
Reference(s):				
1. https://git	hub.com/thibmae	k/awesome-rasp	berry-pi	

2. <u>MagPi ma</u>	gazine
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lopics relevant to	development of "Foundation Skills": Basic Concepts of Python-Programming, and
Raspberry Pi.	
Topics related to d	evelopment of "Employability Skills": Problem solving, Creative Thinking, Team work,
Prototype Develor	oment.
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:	Course Title: Software En	gineering		L-T- P-	2002	
CSE2014	Type of Course: School Co	ore [Theory O	nly]	С	5-0-0-5	
Version No.	1.0					
Course Pre-	NIL					
requisites						
Anti-requisites	NIL					
Course	The objective of this cours	e is to provide	e the funda	amentals co	ncepts of Software	
Description	Engineering process and p	principles.				
	The course covers software requirement engineering processes, system analysis,					
	design, implementation and testing aspects of software system development.					
	The course covers software quality, configuration management and maintenance.					
Course	The objective of the cour	The objective of the course is to familiarize the learners with the concepts of				
Objectives	Software Engineering ar	nd attain Skill	Developn	nent throug	gh Participative	
	Learning techniques.					
Course Out	On successful completion	of this course	the studer	nts shall be	able to:	
Comes	1] Describe the Soft	ware Engine	eering pi	rinciples,	ethics and process	
	models(Knowledge)					
	2] Identify the requirements, analysis and appropriate design models for a given					
	application(Comprehension	on)				
	3] Understand the Agile P	rinciples(Knov	vledge)			
	4] Apply an appropriate pl	anning, sched	uling, evalu	uation and r	maintenance principles	
	involved in software(Appli	cation)				
	Introduction to Software					
Module 1	Engineering and Process	Quiz			09 Hours	
	Models					
	(Knowledge level)					

Introduction: Need for Software Engineering, Professional Software Development, Software Engineering Ethics, Software Engineering Practice-Essence of Practice, General Principles Software Development Life Cycle

Models: Waterfall Model – Classical Waterfall Model, Iterative Waterfall Model, Evolutionary model-Spiral, Prototype.

	Software Requirements,		Development of SRS	
Module 2	Analysis and Design	Assignment	documents for a given	11 Hours
	(Comprehension level)		scenario	

Requirements Engineering: Eliciting requirements, Functional and non-Functional requirements, Software Requirements Specification (SRS), Requirement Analysis and validation. Requirements modelling-Introduction to Use Cases, Activity diagram and Swim Iane diagram. CASE support in Software Life Cycle, Characteristics of CASE Tools, Architecture of a CASE Environment.

Design: Design concepts, Architectural design, Component based design, User interface design.

	Agile Principles &		
Module 3	Devops	Quiz	09 Hours
	(Knowledge level)		

Agile: Scrum Roles and activities, Sprint Agile software development methods - Scaling, User Stories, Agile estimation techniques, Product backlogs, Stake holder roles, Dynamic System Development Method.

Devops: Introduction, definition, history, tools.

Software Testing and Module 4 Maintenance (Application Level)	Assignment	Apply the testing concepts using Programing	12 Hours
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Software Testing-verification and validation, Test Strategies - White Box Testing, Black box Testing. Automation Tools for Testing.

Software Quality Assurance-Elements of software quality assurance, SQA Tasks, Goals and Metrics, Software configuration management- SCM process, SCM Tools (GitHub).

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: CSE1005	Course Title: Progra	amming in Python		1	0	4	3
	Type of Course: Sch Lal	nool Core b Integrated	C	-			
Version No	1.0						
Course Pre-requisites	Basic knowledge of	Computers and Mat	hematics				
Anti-requisites	NIL	NIL					
Course Description	The purpose of this	course is to enable t	he studen:	its to de	evel	op pytho	n
	scripts using its bas	ic programming feat	ures and a	lso to f	amil	iarize the	į
	Python IDLE and ot	her software's. This c	ourse dev	elops a	naly	tical skill	s to
	enhance the progra	mming abilities.					
	The associated labo	pratory provides an o	pportunity	y to vali	idate	e the con	cepts
	taught and enhance	es the ability to build	real time	applica	tion	S.	
Course Object	The objective of the	e course is to familiar	ize the lea	arners v	vith	the conc	epts
	of Programming in	Python and attain	n Employa	ability t	hrou	ugh Probl	em
	Solving Methodolo	gies.					
Course Outcomes	On successful comp	pletion of this course	e the stude	ents sh	all b	e able to	:
	1. Summarize the basic Concepts of python.						
	2. Demonstrate proficiency in using data structures.						
	3. Illustrate user-de	fined functions and e	exception	handlin	ıg.		
	4. Identify the vario	ous python libraries.					
Course Content:							
Module 1	Basics of Python programming	Assignment	Programr	ning		14 Cla	asses
Topics: Data types, opera	ators and Expression	ns, Input and Outpu	it Stateme	ents. Co	ontr	ol Struct	ures –
Selective and Repetitive s	tructures						
	Indexed and						
Module 2	Associative Data	Simple applications	Programn	ning		20 Cla	asses
	Structures						
Topics: Strings, Lists, Sets,	Tuples, Dictionaries						
	Functions,	Casa study					
Module 3	Exception handling	Case study	Programn	ning		10 Cla	sses
	and libraries						
Topics: User defined func	tions, exception han	dling, Introduction to	o python b	uilt-in l	ibra	ries	
Targeted Application & T	ools that can be use	d:					
Targeted Application : We	eb application develo	opment, Al, Operatir	ng systems	S			
Application Areas	5:						
Web Developmen	nt						
Game Developme	ent						
Scientific and Nur	neric Applications						
 Artificial Intelliger 	nce and Machine Lea	rning					

- Software Development
- Enterprise-level/Business Applications
- Education programs and training courses
- Language Development
- Operating Systems
- Web Scrapping Applications
- Image Processing and Graphic Design Applications

Professionally Used Software: Python IDLE, Spyder, Jupyter Notebook, Google Colab

Project work/Assignment:

Project Assignment: Developing python scripts using built in methods and functions

Text Books:

- Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education, Forth edition (20 March 2018).
- Alex Campbell, "Python for Beginners: Comprehensive Guide to the Basics of Programming, Machine Learning, Data Science and Analysis with Python", August 29, 2021.
- Charles Dierbach, "Introduction to Computer Science Using Python", Wiley India Edition, 2015.
 References:
 - 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 (Programming Languages for Beginners)", August 25, 2021.
 - 4. Python Tutor Visualize Python, Java, C, C++, JavaScript, TypeScript, and Ruby code execution
 - 5. <u>https://practice.geeksforgeeks.org/courses/Python-Foundation</u>

Topics relevant to development of "FOUNDATIONS SKILLS"- Solve the real time problems by analyzing and visualizing the data.

Topics relevant to "HUMAN VALUES & PROFESSIONAL ETHICS" - Data collection and its arrangement

Course Code: MAT2003	Course Title: NUMERICAL METHODS FOR ENGINEERS Type of Course: School Core	L-T- P-C	1	0	2	2
Version No.	1.0					
Course Pre- requisites	MAT1002 – Transform Techniques, Partial E Their Applications	Differentia	l Equ	uatio	ns ar	nd
Anti- requisites	Nil					

Course Description	The course focuses on formulating and solving problems concerning real- world engineering applications numerically as well as statistically. This course provides an introduction to basic numerical methods to deal with algebraic and transcendental equations, system of equations, interpolation, differentiation and integration. This course also deals with numerical solution of ordinary differential equations by means of Taylor's series method, modified Euler's method and Runge-Kutta methods.				
Course	The objective of the course is to familiarize the learners with the				
Objective	concents of "NUMEDICAL METHODS FOR ENGINEERS" and attain Skill				
	concepts of Nomenical methods for Engineers and attain <u>skill</u>				
	<u>Development</u> Through <u>Problem Solving.</u>				
Course	On successful completion of the course the students shall be able to:				
Outcomes					
outcomos	1] Solve algebraic and transcendental equations numerically.				
	21 Adopt numerical techniques to differentiate and integrate functions.				
	31 Apply numerical methods to solve ordinary differential equations				
Course					
Content:					
	Numerical solution				
Module 1	of Algebraic and 15				
	Transcendental Classes				
	Equations				

Algebraic and Transcendental Equations, Regula - Falsi method, Bisection method (Self study), Secant method, Newton-Raphson method, and NR method for non-linear Equations, Fixed-point iteration method.

System of Linear Equations: Introduction, LU decomposition method, Gauss-Jacobi method, Gauss-Seidel iteration method, Largest Eigen value and corresponding Eigen vector by Power method & Jacobi Method.

		1	
	Numerical		
Module 2	Interpolation,		15
	differentiation and		Classes
	Integration		

Numerical Interpolation: Newton's forward and backward interpolation method, Newton's divided difference method, Lagrange's method, numerical differentiation. Numerical integration: Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule, Weddle's Rule.

Area between the two curves.

Madula 2	Numerical solution	15
Module 3	of ODEs and PDEs	Classes

Solution of ordinary differential equations: Initial Value problems: Taylor's series method, Picard's method, Euler's Method, Modified Euler's method, Runge-Kutta method, Milne's predictor-corrector formula. Adams -Bashforth method, Boundary value problems - Finite difference methods for ODE. Numerical solution for LCR & damped forced oscillatory equations.

Solution of partial differential equations: Schmidt Explicit Formula for Heat Equation, Crank-Nicolson method. Numerical solution to Wave, Laplace & Heat Equation.

Targeted Application & Tools that can be used:

The objective of the course is to familiarize students with a variety of numerical techniques and the theoretical concepts of probability and statistics so as to equip them with the necessary numerical approaches and basic statistical tools to tackle engineering and real-life problems.

Assignment:

- 1. Gauss-Jacobi iteration method.
- 2. Numerical differentiation.
- 3. Gaussian quadrature rule for numerical integration.
- 4. Taylor series method for ODEs.
- 5. Implicit and explicit schemes for PDEs.

Text Books

- T1: M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computations, 6th Edition, New age Publishing House, 2015.
- T2: Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley& Sons

(India), 2014.

References:

- R1: B.S. Grewal, Numerical methods in engineering and science, 10th Edition, Khanna publishers, 2016.
- R2: B.S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers.

R3: Steven C Chapra and Raymond P Canale, "Numerical Methods for Engineers," 7th Ed., McGraw-Hill Edition, 2015.

R4: C. Ray Wylie and Louis C Barrett, "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill, 2012.

Topics relevant to SKILL DEVELOPMENT: This course focuses on formulating and solving problems concerning real-world engineering applications numerically as well as statistically. This course provides an introduction to basic numerical methods to deal with algebraic and transcendental equations, system of equations, interpolation, differentiation and integration with numerical solution of ordinary differential equations by means of Taylor's series method, modified Euler's method and Runge-Kutta methods for **Skill Development through Problem Solving methodologies.** This is attained through assessment component mentioned in course handout.

Course Code: CSE2007	Cours Algori	e Title: Design and Analysis of thms		3	0	0	3
	Type o only	of Course: Program Core & Theory	L- T- P- C				
Version No.		2.1					

Cour requi	se Pre- sites		CSE20	01, Data Structure and	d Algo	rithms		
Anti-			NIL					
requi	sites							
Cour	se		This intermediate course enables students to design and analyze				nalyze	
Desc	ription		efficient algorithms to solve problems. This course covers typical				ypical	
			design	methods such	as d	livide-and-conquer, dy	namic	
			program	nming and greedy me	thod t	o solve problems. The stu	idents	
			shall de	evelop strong analytic	al ski	lls as part of this course.		
Cour	se		This co	urse is designed to impro	ove the	e learners' EMPLOYABILI	FY SKILLS	
Obje	ctives		by using	g PROBLEM SOLVING	G Met	hodologies.		
0			0		6 4 10 0		ll ha ahla	
Outc	omes		to:	On successful completion of the course the students shall be able to:				
			1] Iden	tify the efficiency of a	a give	n algorithm. [Comprehe	nsion]	
			2] Employ divide and conquer approach to solve a problem. [Application]					
			3] Illus prot	strate dynamic prog plem. [Application]	gramr	ning approach to solv	e a given	
			41 Solve a problem using the greedy method. [Application]					
			51 Discuss the techniques to solve a real-world problem based on its					
			complexity classes. [Comprehension]					
Cour	se							
Cont	ent:							
Modu	ıle 1	Introd to Alg	luction orithms	Assignment		Problem Solving	06 Sessions	
	Topics:							
	Algorithn	n Desig	n and eff	ficiency, measuring of	runni	ng time of algorithms. Ins	sertion sort	
	and merg	ge sort,	Asympto	otic Growth and Notati	ons. F	RecurrencesMasters me	thod.	
	Assignm	ent: Co	omparati	vely evaluate bubble s I	ort, in	sertion sort and mergeso	rt.	
		Review	W Of					
Modu	ıle 2	and S	orting	Assignment		Programming/ Problem Solving	12	
		techn	iques	U		1 TODICITI OOUTING	Sessions	
	T		•					
	Iopics:	nd Con		omplos Strasson's Mr	triv m	ultiplication		
	Sorting:	Ouick	sort. He	amples. Strassen's Ma apsort. Lower bour	nd of	comparison-based sor	ting non-	
	comparis	son-bas	sed sortir	ng: Radix sort.				
	Search:	Review	of Linea	r Search and Binary Se	arch,	Hashing and hash tables.		
	Assignm	ent: De	esign and	I develop an algorithm	using	Divide and Conquer tech	inique for a	
	given sce	enario.						

Module 3		Greedy Algorithms	Assignment	Programming/ Problem Solving	09 Sessions			
	Topics: Introduc	tion, Fractional H	Knapsack Problem, Mi	nimal Spanning Tree: Prir	n's Algorithm and			
	Kruskal's	s Algorithm, Sing	le-source Shortest Pa	h: Dijkstra's Algorithm. H	luffman Codes.			
	Assignm	nent: Design and	Develop a solution to	a given scenario using gr	eedy method.			
Module 4 Dynamic Program		Dynamic Programming	Assignment	Programming/ Problem Solving	09 Sessions			
	Topics:							
	Introduc Ford alg Multiplic	tion with exampl orithm, Floyd-W ation.	les, Principles of Mem arshall's Algorithms. (oization, 0-1 Knapsack P Optimal Binary Search Tr	roblem, Bellman- ees, Chain Matrix			
	Assignm argue the	ent: For a given s e best approach	scenario, attempt the to solve the problem	three design paradigms l	earned so far and			
Modu	ıle 5	Complexity Classes and Heuristics	Assignment	Programming/ Problem Solving	09 Hours			
	Topics:				I			
	plexity classes: P, NP, and NP-Complete Problems. Backtracking: n-Queens. Branch and bound: Travelling Salesman Problem. Assignment: Apply backtracking algorithmic designing technique for solving queen's problems for 4, 8 and 16 inputs.							
	Targeted	Application &	Fools that can be use	d:				
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/Assignme	nt:					
1.	 Problem Solving: Design of Algorithms and implementation of programs. Programming: Implementation of given scenario using Java. 							
	Text Boo	ok:						
	T1. TI <i>ʻlı</i>	nomas H.Cormentroduction to Al	en, Charles E.Leisers gorithms', MIT Press, 2	on, Ronald L. Rivest ar 2022.	nd Clifford Stein,			
	T2. J.	Kleinberg and E.	Tardos, 'Algorithm De	sign', Addison-Wesley, 20	005.			
	Referen	ces						
	R1. A Ec	nany Levitin, <i>'In</i> ducation, 2003.	troduction to the Des	ign and Analysis of Algo	orithms', Pearson			
	R2. Tim Roughgarden, ' <i>Algorithms Illuminated</i> ' (books 1 through 3), Soundlikeyourself Publishing, 2017,18,19 respectively.							

Course Code: CSE3156	Course Title: Database M Type of Course: 1) Schoo 2) Labora	Management Systems ol Core atory Integrated		L-T-P-C	3	0	2	4
Version No.	1.0							
Course Pre- requisites	NIL							
Anti-requisites	NIL							
Course Description	This course introduces the core principles and techniques required in the 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 anddatabase 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 transactions of database							
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 OutComes	 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:								
Module 1	Introduction to Database Modelling and Relational Algebra (Understanding)	Assignment	Problem S	olving		8 C	lasse	×s
Topics: Introduction to Database: Schema, Instance, 3-shema architecture, physical and logical 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 ioins) and division operator. Examples on Relational Algebra Operations								
Module 2	Fundamentals of SQL andQuery Optimization (Applying)	Assignment	Program	mming	8	S Cla	asses	

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
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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), JoinDependencies (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	
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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, NativeXML 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 thefollowing 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 MySOL 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 initalic. 1. Problem Solving: Constructing ER-Diagrams for a given real time requirements, Normalizing the databases, querying the databases using relational algebra. 2. Programming: Implementation of any given scenario using MySOL. **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 designusing 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: Ope	rating Systems			3	0	0	3
CSE3351	Type of Course: P	rogram Core and Theo	ory Only	L-T- P- C				
Version No.	1.0							1
Course Pre- requisites	CSE2009- Comput Students should h hardware, and Co recommended.	ter Organization, Probl have basic knowledge c mputer Organization.	em solvin on comput Prior prog	g using C ters, compute ramming exp	er so erie	oftw ence	are & e in C is	
Anti-requisites	NIL							
Course Description	This course introd structure and its d internal algorithm and recovery and solving, systems p	uces the concepts of op lesign and implementans such as process sche d memory manageme programming ability an	perating synthesis of the second seco	ystem operati vers the class nchronizatior ourse also e idies.	ions ical n, de nha	ope ope eadl nce	erating erating s ocks de s the p	system systems tection roblem
Course Object	The objective of Operating Syste Methodologies.	the course is to fam ms and attain I	niliarize tl E mployab	he learners v ility throug	with h	n th Pro l	e conco blem	epts of Solving
Course Out Comes	On successful con 1] Describe the fu [Knowledge] 2] Demonstrate va 3] Apply various t 4] Demonstrate da 5] Illustrate vario	npletion of the course indamental concepts o arious CPU scheduling tools to handle synchro eadlock detection and r us memory manageme	the stude f operatin algorithm onization ecovery n	nts shall be a og Systems an os[Applicat problems.[A p nethods [App ques.[Applic	ble t d ca ion oplica	to: ase s] cation ntion	studies. on] n]	
Course Content:				<u>4[</u>		<u>,</u>]		
Module 1	Introduction to Operating System	Assignment	Programı	ming			9	Hours
Topics: Introduction to O types, Operating S	S, Operating-Syst	em Operations, Opera System Program and it	ating Syste s types, Li	em Services, nkers and Loa	, Sy adei	ster rs, C	n Calls Overviev	and its w of OS
Module 2	Process Management	Assignment/Case Study	Programi	ming/Simulat	ion		11	Hours
Topics: Process Concept, server systems (so Threading Issues, SJF, SRTF, RR and I	Operations on Pr ockets, RPC, Pipes), Process Scheduling Priority.	ocesses, Inter Process , Introduction to thread g– Basic concepts, Sche	s Commur ds - Multit eduling Cr	nication, Com hreading Mo iteria, Schedu	nmu dels Iling	nica 5, Th 5 Alg	ation in read Lil gorithm	client- braries, s: FCFS,

Module 3	Process Synchronization and Deadlocks	Assignment	Programming	11 Hours		
Tonics:						
The Critical-Section	on Problem- Pete	rson's Solution Synch	pronization hardware Semanh	ores Classic		
Problems of Sync	hronization with 9	Semanhore Solution- P	roducer-Consumer Problem R	eader-Writer		
nroblems Dining	Philosopher's Prob	lem Introduction to D	eadlocks Necessary conditions	for deadlock		
Resource allocation	on Granh Methods	s for handling deadlock	" Deadlock Prevention and Imn	lementation		
Deadlock Avoidan	ice and Implement	ation Deadlock detect	ion & Becovery from Deadlock	iementation,		
Deddioek/Worddin	Memory					
Module 4	Management	Assignment	Programming/Simulation	10 Hours		
Topics:	Management					
Introduction to M	amary Managama	nt Pasis bardwara Pas	a and Limit Pagistors Momony	Aanagomont		
	amic loading and	linking Swapping	Contiguous and Non Contigue			
Allocation Sogma	annic Ioduing and	tructure of the Dage Te	bla Virtual Mamory and Dam	and Daging		
Allocation, Segme	ntation, Paging - S	lructure of the Page Ta	ible – Virtual Memory and Dem	anu Paging – bing		
Page Faults and Pa		Algorithms, Copy-on-wr	feed (access mothods, directory	ning (atmusture a)		
File systems involve	ie system manager	nent: File System Inter	face (access methods, directory	/ structures),		
File system impler	nentation.					
largeted Applicat	non:					
Application area	is traffic managem	ent system, banking sy	/stem, health care and many m	ore systems		
where in there ar	e resources and er	ntities that use and ma	nage the resources.			
Software Tools:						
1. Oracle Vir	tual Box/VMWare	Virtualization software	e [Virtual Machine Managers]. U	sed to		
install and wo	rk on multiple gue	st Operating Systems o	n top of a host OS.			
2. Intel Proc	essor identification	utility: This software	is used to explain about multi-c	ore		
processors. It	helps to identify th	ne specifications of you	r Intel processor, like no of core	s, Chipset		
information, t	echnologies suppo	orted by the processor	etc.			
Project work/Ass	ignment					
1. Demonst	rate process conce	pts in LINUX OS.				
2. Simulatio	n of CPU schedulir	ng algorithms.				
3. Develop p	program to demon	strate use of Semapho	ores in threads.			
4. Develop	program to demon	strate use of deadlock	avoidance algorithms.			
5. Develop	program to demon	strate use of page repl	acement algorithms.			
6. Simulatio	n of memory alloc	ation strategies [first f	it, best fit and worst fit].			
Text Book	•	· -				
1. Silberscha	atz A. Galvin P B and	d Gagne G . "Silberscha	tz's Operating System Concepts	". Paperback.		
Global Edition	Wiley 2019			,,		
References						
1 Silberscha	atz A. Galvin P.B.an	d Gagne G "Operating	System Concepts" 10th edition	Wiley 2018		
2 William St	tallings "Opprating	a Gagne G, Operating	n By Boarson Banorback 1 Mar	whey, 2010.		
2. william stallings, Operating systems , winth Edition, By Pearson Paperback , I March 2018.						
3. Sundaram RIVID, Shriram K V, Abhishek S N, B Chella Prabha, " Cracking the Operating System						
skills, Dream	Ama si Duasa ay A		"On a matting a Constant of These			
4. Kemzi H. Arpaci-Dusseau Andrea C. Arpaci-dusseau , "Operating Systems: Three Easy Pieces						
Amazon digit	Amazon digital Services", September 2018.					
E-resources/Web	links					
5. <u>https://w</u>	ww.os-book.com/(<u>)59/</u>				
6. <u>https://pa</u>	ages.cs.wisc.edu/~ı	remzi/OSTEP/				
7. h	ttps://codex.cs.yale	e.edu/avi/os-book/OS1	.0/index.html			

Course Code: CSE 3078	Co Ne ⁻ Typ The	urse Title: Cryp twork Security oe of Course: Pro eory only	tography and ogram Core &	1	L- T-P- C	3	0	0	3
Version No.		1							
Course Pre- requisites		"Data Communi	cations and Co	ompute	r Network	cs".			
Anti- requisites		NIL							
	The	e Course covers	the principle	s and	practice	of cry	otography	and n	etwork
	sec	curity, focusing in	particular on	the se	ecurity as	pects	of the web	and Int	ternet.
	Тор	bics : The crypto	graphic tools	such	as share	d key	encryptio	n, pub	lic key
Course Description	end	cryption, key exc	change, and	digital	signatur	e are	explored.	The us	se and
•	util	ization of the int	ernet protoco	ls and	applicati	ons su	ich as SSI	./ TLS,	IPSEC,
	Ker	beros, PGP, and	S/ MIME, SET	are re	viewed. S	ystem	security is	sues s	uch as
	viru	ises, intrusion ar	nd firewalls are	e also	explored.				
Course	The	e objective of th	ne course is	SKILL	DEVELC	PMEN	T of stud	ent by	using
Objective	PARTICIPATIVE LEARNING techniques.								
	CO1: Identifies the basic concept of Cryptography (Knowledge)CO2: Express the different types of Cryptographic Algorithms.								
Course	(Co	omprehension)							
Outcomes	со	3: Recognize t	the Public k	ey C	ryptograp	hic Te	chniques	for v	various
	арр	olications. (Com	prehension)						
	со	4: Apply the ne	etwork securit	ty con	icepts du	ring th	neir imple	mentat	tion of
	net	work security ap	plication deve	elopm	ents. (Ap	olicati	on)		
Course Content:									
Module 1		roduction to	Assignmen	Iden	tify the Co	ncept	s	08 Ses	sions
Topics:		0. abit	<u> </u> -	1			I		
Introduction to Attacks: active Confidentiality, Polyalphabetic, Structure	Cry att Data Play	otography, Mode acks, passive a a Integrity, Nonre r-fair and Hill Cip	el of Network attacks, servio pudiation, Sul her, Introduct	Secur ces: A bstitut ion to	ity, OSI S Authentica tion Ciphe Block Cip	ecurity ation, ers : Ca her an	/ architec Access (aesar, Mor d Stream (ture, Sontrol, ontrol, o alpha Cipher,	ecurity , Data abetic, Festal
	Priv	vate Key		Anal	veis of roc	ujirem	ent of	13 Ses	sions
Module 2	Cry Nui	ptography and mber Theory	Assignmen t	com	plexity in tography	լառելո			

Topics:

Symmetric Encryption Algorithms : Data Encryption Standard, Introduction to Galois Field, Advanced Encryption Standard, Modular Arithmetic, Prime numbers, Fermat's little theorem, brief about primality testing and factorization, Discrete Logarithmic Problem, Euclidean and Extended Euclidean Algorithm, Euler Totient Function, Chinese Remainder Theorem

	Public Key		Decognize the importance	10 Sessions
	Cryptography and	Assignmen	of various security	
Module 3	its Applications	t	concepts to achieve	
			sumclent solutions	

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, Discussion on real time practices of Cryptography.

Module 4 Network Security	Assignmen t	Implement the advanced network security algorithms in recent applications.	07 Sessions
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Topics:

Network Security fundamentals, Network Security applications: Authentication: Kerberos, PKI, Network Security applications: e-mail security: PGP, MIME, Network Security applications: IP Security: IP Sec architecture, Network Security applications: Web 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.

Assignment:

Assignment 1: Solve the problems of basic encryption techniques.

Assignment 2: Solve and analyze the problems on symmetric and asymmetric encryption.

Textbooks:

1. William Stallings, "Cryptography and Network Security - Principles and Practices", Prentice

Hall, 8th Edition, 2019.

2. Wade Trappe and Lawrence C Washington, "Introduction to Cryptography with Coding

Theory", Pearson, 2020.

Reference Books:

1.Behrouz A Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", McGraw Hill, third edition, 2010.

2. R.Rajaram, "Network Security and Cryptography" SciTech Publication.3rd Edition, 2014.

AtulKahate, "Cryptography and Network Security", Tata McGraw-Hill, 2nd Edition, 2019.
 BruceSchneier, "Applied Cryptography", John Wiley and Sons Inc. Second Edition, 2015.

Web references:

1.<u>https://onlinecourses.nptel.ac.in/noc22_cs90/preview</u>

2.e-pgpathshala UGC lecture series : E-Series and Self learning Materials.

https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==

3. http://182.72.188.195/cgi-bin/koha/opac-

detail.pl?biblionumber=10133&query_desc=kw%2Cwrdl%3A%20Cryptography%20and%20Network%2

OSecurity

4.<u>http://182.72.188.195/cgi-bin/koha/opac-</u> detail.pl?biblionumber=5875&query_desc=kw%2Cwrdl%3A%20Cryptography%20and%20Network%20 Security.

Topics relevant to "Skill Development": Symmetric and Asymmetric Encryption Algorithms and its problems.

Course Code:	Course Title: Mastering Object- Oriented	1 - T-	0-0-2-1				
0852016	Concepts in Python	P-C					
C3E3210	Type of Course: Lab						
Version No.	1						
Course Pre- requisites	CSE1005 – Programming in Python						
Anti- requisites	NIL						
Course Description	This course covers mastering object-oriented concepts in Python, including classes, inheritance, polymorphism, and encapsulation. Students will learn to design and implement robust, reusable code using real-world examples. Ideal for those with basic Python knowledge, it enhances problem-solving skills and software development proficiency.						
Course	The objective of the course is to familiarize the	learner	s with the concepts				
Objective	of Mastering Object Oriented Concepts in Pythe Development through Experiential Learning.	on and a	attain Skill				
	CO1: Explain features of Oops along with creation objects to represent real world Objects. [Underst	of Pyth and]	on classes and				
Course Out Comes	CO2: Demonstrate inheritance, polymorphism, ar build maintainable and extendable software syste	nd abstra ms. [Ap]	action in Python to ply]				
	CO3: Demonstrate exception handling in Python t handling mechanisms and debugging tool and Ass techniques in Python. [Apply]	o build r sess var	obust error- ious file handling				
Course Content:							

Module 1	Introduction to OOPS, Classes and Objects	MCQ	Assignment	10 Sessions					
Topics:									
Introduction to Language, Featu and Polymorphi	Introduction to OOPs: Problems in Procedure Oriented Approach, Specialty of Python Language, Features of OOPS - Classes and Objects, Encapsulation, Abstraction, Inheritance and Polymorphism.								
Classes and Ok Variables, Name Methods, Passir	ojects: Creating a Class, espaces, Types of Methoo ng Members of One Class	The Self Varia ds - Instance N s to Another C	ble, Constructor, Destructors 1ethods, Class Methods, Stat lass, Inner Classes.	, Types of ic					
Module 2	Inheritance and Polymorphism	MCQ	Assignment	10 Sessions					
Constructors in Method, Types o Order(MRO), Po Overloading, Me Abstract Classe	Constructors in Inheritance, Overriding Super Class Constructors and Methods, The Super() Method, Types of Inheritance – Single Inheritance, Multiple Inheritance, Method Resolution Order(MRO), Polymorphism, Duck Typing Philosophy of Python, Operator Overloading, Method Overloading, Method Overriding.								
Abstract Classe	s vs. Interfaces.								
Module 3	Exceptions and Files in Python	МСQ	Assignment	10 Sessions					
Exceptions: Err Exceptions, Exc User-Defined Ex Files in Python: Files Containing with Statement,	 Exceptions: Errors in a Python Program – Compile-Time Errors, Runtime Errors, Logical Errors. Exceptions, Exception Handling, Types of Exceptions, The Except Block, The assert Statement, User-Defined Exceptions, Logging the Exceptions. Files in Python: Files, Types of Files in Python, Opening a File, Closing a File, Working with Text Files Containing Strings, Knowing whether a File Exists or Not, Working with Binary Files, The with Statement, Pickle in Python, The seek() and tell() Methods. 								
Targeted Applic	ation & Tools that can b	e used:							
Python, PyChar	m								
Project work/A	ssignment:								
Assignment:									
Module 1 Assignment: Design and implement a Python application that simulates a banking system using classes and methods for customers and accounts.									
Module 2 Assignment: Develop a Python application that simulates Library management system that demonstrates inheritance, polymorphism and abstraction concepts.									
Module 3 Assigr while processin and File handlin	nment: Develop a Python g user input for a movie ti g concepts.	program that cket booking :	handles different types of exc system showcasing exception	ceptions I handling					

Text Book

1. Dr. R Nageshwara Rao, "Core Python Programming", Dreamtech Press, 3rd Edition, 2021.

References

- 1. Alex Martelli, Anna Ravenscroft & Steve Holden, "Python in a Nutshell The Definitive Reference", O'Reilly Media, 3rd edition, 2017.
- 2. Luciano Ramalho, "Fluent Python Clear, Concise, and Effective Programming", O'Reilly Media, 2nd edition, 2022.
- 3. Mark Lutz, "Learning Python: Powerful Object-Oriented Programming", O'Reilly Media, 5th edition, 2013.
- 4. David Beazley, Brian K. Jones, "Python Cookbook: Recipes for Mastering Python 3", O'Reilly Media, 3rd edition, 2013.

Weblinks:

- 1. www.learnpython.org
- 2. https://realpython.com/python3-object-oriented
- 3. <u>https://www.tutorialspoint.com/python/python_oops_concepts.htm</u>

Topics relevant to "SKILL DEVELOPMENT":

Building Real-World Applications Using OOPS Concepts, Error Handling and Debugging Techniques, Concurrency in Python, Advanced File Handling Techniques, Creating and Managing Python Packages and Modules, Designing and Implementing Python Interfaces

This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Cyber Foren	sics	L-T- P-	2	0	0	2
C3E2U37	Type of Course: Program	core	C				
Version No.	1.0						
Course Pre-	Cryptography and Netwo	rk Security	,				
Anti	NUL						
ANU- requisites	NIL						
Course	The nurnose of this course i	is to introdu	ce to the	stuc	lents	Cyber For	ensic concents
Description	The course is both conceptu source software's. The course analyze computer forensic the tools and tactics associa assignments with various o	al and analy rse develops evidence, a ated with Cyl open-source	vtical an critica nalyze ber Fore softwar	d is u l thin and v ensic re.	inder king valida s. The	stood wit like corre ite Forens course ir	h various open- ctly collect and sics Data, study wolves quizzes,
Course Objective	The objective of the cours Cyber Forensics and attain techniques.	se is to fam n <u>Skill Deve</u>	iliarize lopme	the l nt thr	earne ough	ers with t Experie	he concepts of ntial Learning
Outcomes	 (1) understand various (knowledge) (2) understand various f (3) Recognize the import for analysis to achieve address various applications (Comt (4) Apply techniques for the second secon	s digital in ile formats (tance of dig equate persp prehension forensic inve	vestigat knowle ital fore pectives estigatio	dge) ensic of d	dupli igital pplica	inologies ication an forensic i ation)	and methods d various tools investigation in
Course Content:							
Module 1	DIGITAL INVESTIGATION	Quiz			MCQ on Inves proc	/Based stigation ess	No. of Sessions: 09
Digital Evidence - Technology and Motive and Tech	e and Computer Crime - Hist d Law - The Investigative Pr nology -Digital Evidence in	cory and Terr ocess -Inves the Courtroo	minolog tigative om.	gy of Reco	Comp onstru	outer Crim action - M	ie Investigation odus Operandi,
Module 2	UNDERSTANDING INFORMATION	Quiz			MCQ on fi	/Based le format	No. of Sessions: 09
Methods of stor	ing data: number systems, c	haracter co	des, rec	ord s	truct	ures, file f	ormats and file
signatures - Wo Disk Formats - I understanding t	rd processing and graphic f Recognition of file formats he dimensions of other later	file formats and internal	- Struct buffers	cure a 5 - Ex	and A stract	nalysis of ion of for	f Optical Media ensic artifacts–
Module 3	COMPUTER BASICS FOR DIGITAL INVESTIGATORS	Assignment			Writ	ing task	No. of Sessions: 09

Computer Forensic Fundamentals - Applying Forensic Science to computers - Computer Forensic Services - Benefits of Professional Forensic Methodology -Steps taken by computer forensic specialists.

Information warfare: Arsenal – Surveillance Tools – Hackers and Theft of Components Contemporary Computer Crime-Identity Theft and Identity Fraud – Organized Crime & Terrorism. Computer forensic cases: Developing Forensic Capabilities – Searching and Seizing Computer Related Evidence – Processing Evidence and Report Preparation – Future Issues. Assignment: Computer Crime

Computer ForensicModule 4Evidence and DataRecovery	Assignment		Writing task	No. of Sessions: 09
--	------------	--	--------------	------------------------

Data Recovery Defined, Data Backup and Recovery, The Role of Backup in Data Recovery, The Data-Recovery Solution, Hiding and Recovering Hidden Data.

Data Collection and Data seizure: why collect evidence? - Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody. Reconstructing the Attack.

Assignment: Data Recovery

Targeted Application & Tools that can be used:

- 1. FTK Forensic Toolkit
- 2. Encase
- 3. Kali Linux- Vinetto, galatta
- 4. Autopsy Disk Forensics

Project work/Assignment:

Each batch of students (self-selected batch mates) will identify projects based on the content and implement with the most suitable 2 or 3 antecedents.

Textbook(s):

John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", Cengage 1. 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: https://onlinecourses.swayam2.ac.in/cec21 ge10/preview 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: CSE2037_P	Course Title: Cyber Forensics Lab Type of Course: Program Core	L- T-P- C	0-0-2-1
Version No.	1.0		
Course Pre- requisites	Cryptography and Network Security		
Anti-requisites	NIL		
Course Description	The purpose of this course is to introduce concepts. The course is both conceptual and various open-source software's. The cours correctly collect and analyze computer foren Forensics Data, study the tools and tactics ass course involves quizzes, assignments with var	to the stud analytical an e develops sic evidence, ociated with ious open-so	lents Cyber Forensic ad is understood with critical thinking like analyze and validate Cyber Forensics. The ource software.
Course	The objective of the course is to familiarize	the learners	with the concepts of
Objective	Cyber Forensics and attain Skill Deve Learning techniques.	lopment th	rough <u>Experiential</u>
Course Outcomes	 On successful completion of this course the (1) understand various digital investigat (knowledge) (2) understand various file formats (knowledge) (3) Recognize the importance of digital fore for analysis to achieve adequate perspectives various applications (Comprehension) (4) Apply techniques for forensic investigation 	e students s tion termino edge) ensic duplica of digital for on (Applicat	hall be able to: ologies and methods tion and various tools rensic investigation in ion)
Course Content:			

List of Laboratory Tasks:

- 1. Case Studies of Opensource Forensic Tools
- 2. FTK Forensic Tool kit for taking mirror image

Disk Forensics-

- 3. Identify digital evidences
- 4. Acquire the evidence
- 5. Authenticate the evidence
- 6. Preserve the evidence
- 7. Analyze the evidence
- 8. Report the findings

Network Forensics:

- 9. Intrusion detection
- 10. Logging
- 11. Correlating intrusion detection and logging

Device Forensics

- 12. Mobile phone
- 13. Digital Music
- 14. Printer Forensics
- **15. Scanner Forensics**
- 16. Credit Card Forensics
- 17. Telecommunications Forensics
- 18. Forensic Analysis of a Virtual Machine
- 19. Forensic analysis of Cloud storage and data remnants
- 20. RAM Dumping Tool

Targeted Application & Tools that can be used:

- 2. FTK Forensic Toolkit
- 3. Encase
- 4. Kali Linux- Vinetto, galatta

5. Autopsy – Disk Forensics

Project work/Assignment:

Each batch of students (self-selected batch mates) will identify projects based on the content and implement with the most suitable 2 or 3 antecedents.

Textbook(s):

2. John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", Cengage Learning, 2nd Edition, 2019

References

 Ravi Kumar & B Jain,2006," Cyber Forensics - Concepts and Approaches", icfai university press
 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.

				<u> </u>		<u> </u>		
Course Code:	Course Title: Ethical Hack	ing	LT.P.C		0	2	2	
CSE3342	Type of Course: Core Subje	ect	2-1-1-0	2	v	~	-	
Version No.	1.3							
Course Pre-	Basic networking tools know	Basic networking tools knowledge and Cryptography & Network Security						
requisites								
Anti-	NIL							
requisites								
Course	This course introduces stu	dents to a wide	range of topics	relat	ed t	o et	hical	
Description	hacking. It also provides	an in-depth und	erstanding of I	now t	o e	ffect	ively	
	protect computer networl	ks. These topics	cover some	of th	e to	ools	and	
	penetration testing metho	dologies used by	/ ethical hacke	ers ar	nd p	orovi	de a	
	thorough discussion of what	at and who an eth	ical hacker is a	nd ho	i wc	npo	rtant	
	they are in protecting corpo	orate and governm	ient data from c	yber-	atta	cks		
	The objective of the course	e is to familiarize	the learners wi	th the	e coi	ncen	ots of	
Course	Ethical Hacking and attain	to improve the l	earners' Emplo	vahil	ity	Skill	ls hv	
Objective	using Experiential Learnin	a techniques	earners Empre	Juen	109		is of	
		g teeninques.						
Course Out	On successful completion	of this course the	students shall	be ab	le to	:		
Comes	1] Extrapolate the impor	tance of ethical	hacking.					
	2] Determine the various	s techniques for	performing re	conn	aiss	sanc	e	
	3] Categorize various typ	es of system sca	anners and the	eir fur	nctio	ons.		
	4] Identify the function o	f sniff on a netw	ork.					
Course								
Content:								
			Programmir	nd			12	
Module 1	Introduction to Hacking	Assignment	activity	ig		н		
			activity				ours	
Topics:								
Introduction to I	Hacking-Important Terminolo	ogies - Asset - Vulı	nerability - Pene	etratio	on Te	st -		
Vulnerability As	sessments versus Penetratio	n Test - Penetratic	on Testing Metho	odolo	gies	-		
Categories of Pe	enetration Test.							
Assignment: Di	fferent phase methodologies	on penetration te	esting					
Module 2	Linux Basics	Assignment	Programmir activity	ıg		н	10 ours	
Topics:	•	- L						
Major Linux Ope	erating Systems - File Structu	re inside of Linux	- BackTrack - Cl	nangi	ng tł	ne		
Default Screen Resolution - Some Unforgettable Basics.								
Assignment: Pe	Assignment: Penetration testing distribution							

Module 3	Information Gathering Techniques	Assignment	Programming 11 activity Hours				
Topics:		·					
Sources of Infor	mation Gathering - Copying	Websites Local	ly - NeoTrace - Xcode Exploit				
Scanner - Intera	cting with DNS Servers - DNS	S Cache Snoop	ing - DNS Lookup with Fierce -				
SNMP - SMTP.							
Assignment:Do	main internet groper						
	Target Enumeration and						
Module 4	Port Scanning Techniques	Assignment	Programming 13 activity Hours				
Topics:	1	1					
Target Enumerat	tion and Port Scanning Techr	niques - Host Di	scovery - Scanning for Open Ports				
and Services - T	ypes of Port Scanning - Vulne	erability Assess	ment.				
Assignment: De	emonstrations for port scann	iing					
Text Book							
1.Rafay Baloch.	2014: "Ethical Hacking and I	Penetration Tes	ting Guide" Apple Academic Press				
Inc.							
References							
1.Gary Hall, Rr	in Watson, 2016: "Hacking:	Computer Ha	acking, Security Testing, Penetration				
Testing, and Bas	sic Security".	·					
2.James Corley	, Kent Backman, Michael S	Simpson, 2010): "Hands-On Ethical Hacking and				
Network Defens	e", 2nd Edition, Cengage Lea	arning.					
E-Resources:							
(1) Ethical Hacking in 12 Hours - Full Course - Learn to Hack! - YouTube							
Topics relevant to "EMPLOYABILITY SKILLS": CEH Certification							
	•						
Ethical hacking	Ethical hacking techniques for Employability skills through Experiential Learning						
techniques. This is attained through the assessment component mentioned in course							

Course Code: CSE3342 P	Course Title: Ethical Hacking Lab	L-T- P- C	0	0	4	2		
Version No.	1.3		•					
Course Pre- requisites	Basic networking tools knowledge and Cryptography & Network Security							
Anti- requisites	NIL	NIL						
Course Description	This course introduces students to a wide ran hacking. It also provides an in-depth unders protect computer networks. These topics of penetration testing methodologies used by a thorough discussion of what and who an ethic they are in protecting corporate and governmen	course introduces students to a wide range of topics related to ethical ing. It also provides an in-depth understanding of how to effectively act computer networks. These topics cover some of the tools and tration testing methodologies used by ethical hackers and provide a bugh discussion of what and who an ethical hacker is and how important are in protecting corporate and government data from cyber-attacks						
Course Objective	The objective of the course is to familiarize the learners with the concepts of thical Hacking and attain to improve the learners' Employability Skills by using Experiential Learning techniques.							
Course Out Comes	 On successful completion of this course the students shall be able to: 5] Extrapolate the importance of ethical hacking. 6] Determine the various techniques for performing reconnaissance 7] Categorize various types of system scanners and their functions. 8] Identify the function of spiff on a network 					ce		
Course Content:								
List of Laborato Experiments: 1. Comma 2. Wiresha 3. Netscan 4. OWZAP 5. Neotract 6. NMAP 7. AngryIPS 8. Maltigo 9. Readnot 10. HTTRAC 11. Yougetsi 12. CAPSA F 13. Samspa 14. Shodan	nd Prompt rk itool e Scanner tify K ignal Portable Network Analyzer de							

- 16. Brupsuit
- 17. Zenmap
- 18. OSINT
- 19. John the ripper

Targeted Application & Tools that can be used: Application Software and open source tools like SQL Injection and NIDS, HIDS.

Text Book

1.Rafay Baloch, 2014: "Ethical Hacking and Penetration Testing Guide" Apple Academic Press Inc.

References

1.Gary Hall, Rrin Watson, 2016: "Hacking: Computer Hacking, Security Testing, Penetration Testing, and Basic Security".

2.James Corley, Kent Backman, Michael Simpson, 2010: "Hands-On Ethical Hacking and Network Defense", 2nd Edition, Cengage Learning.

E-Resources:

(1) Ethical Hacking in 12 Hours - Full Course - Learn to Hack! - YouTube

Topics relevant to "EMPLOYABILITY SKILLS": CEH Certification

Ethical hacking techniques for **Employability skills** through **Experiential Learning techniques**. This is attained through the assessment component mentioned in course handout.

Course Code:	Course Title: Theory of Computation		2	0	0	2				
CSE2018	Type of Course: Theory Only	L- 1-P- C	3	0	0	5				
Version No.	2.0									
Course Pre-	The students should have the Knowledge on	he students should have the Knowledge on Set Theory								
requisites										
Anti-requisites	Nil	Nil								
Course	The course deals with introduction of form	al languages	and	the co	rrespo	ondence				
Description	between language classes and the automata	between language classes and the automata that recognize them.								
	Topics include: Formal definitions of gramm	nars and aco	ceptor	s, Dete	rmini	stic and				
	Nondeterministic systems, Grammar amb	oiguity, finit	e sta	te and	l pus	sh-down				
	automata; normal forms; Turing machines ar	nd its relatio	ns wit	h algor	ithms	•				
Course Objective	The objective of the course is to familiarize th	ne learners w	ith th	e conce	pts of	f Theory				
	of Computation as mentioned above an	d attain Sk	ill De	velopn	nent	through				
	Problem Solving Methodologies.									
Course Out Comes	On successful completion of the course the s	students sha	ll be a	ble to:						
	1. Describe various components of Aut	omata. (Kno	wledg	e)						
	2. Illustrate Finite Automata for the giv	en Language	e. (App	licatior	ר)					
	3. Distinguish between Regular gra	mmar and	Cont	ext fr	ee g	rammar.				
	(Comprehension)									
	4. Construct Push down Automata. (Ap	plication)								
	5. Construct Turing machine for a Lang	uage. (Appli	cation)						

Course Content:				
course content.			Duchlouse on Stuings and	
Module 1	Introduction to automata	Assignment	Problems on Strings and	06 Sessions
	theory	Ū.	Language operations	L
Topics:		•		
Introduction to Aut	omata Theory, Application	is of Automat	a Theory, Alphabets, String	gs, Languages &
operations on lang	uages, Representation of	automata, Lar	nguage recognizers <mark>,</mark> Finite	State Machines
(FSM):	[Deterministic		FSM,
Regular languages, I	Designing FSM, Nondetern	ninistic FSMs		
Module 2	Finite Automata	Assignment	Problems on DFA, NFA's	13 Sessions
Topics:				
Basic concepts of Fi	nite automata, DFA- defin	itions of DFA,	Deterministic Accepters T	ransition Graphs
and Languages and	d DFA's, Regular Langua	ges, NFA- De	finition of a Nondeterm	inistic Accepter,
Languages and NFA'	s Why Non-determinism?	Equivalence of	f Deterministic and Nondet	erministic Finite
Accepters, Reductio	n of the Number of States	in Finite Auto	mata.	
	Regular Expressions &		Problems on RE, CFG, PT,	
Module 3	Context Free Grammar	Assignment	PL and Ambiguity	12 Sessions
Topics:		1	<u> </u>	
Formal Definition of	f a Regular Expression. Lar	iguages Associ	iated with Regular Express	ions. Languages.
Regular Languages (RL) and Non-regular Langu	ages: Closure	properties of RLs. to show	some languages
are				some languages
not RIS Closure Pro	operties of Regular Conte	xt Free Gramm	nars-Examples of Context-	Free Languages
Leftmost and Righ	tmost Derivations Deriv	ation Trees	Relation Between Senten	itial Forms and
Derivation Trees An	nhiguity in Grammars and		mbiguous Grammars Rem	oving Ambiguity
Chomsky Normal Fo	ribiguity in Oralininais and orm. Gribiche Normal Form	Languages. Ai	indiguous Graniniais, Reini	Jving Ambiguity,
		I.	Drobloms on nuchdown	
Module 4	Push down Automata	Assignment	Automaton	08 Sessions
Touisse			Automaton	
Definition of a Push	down Automaton, Langua	ge Accepted by	y a Pushdown Automaton,	Acceptance by
Final State, Accepta	nce by Empty Stack, From	Empty Stack to	o Final State, From Final Sta	ate to Empty
Stack Equivalence o	f PDA's and CFG's: From Gr	ammars to Pu	shdown Automata.	
Module 5	Turing Machine	Assignment	Problems on Turning Machine	07 Sessions
Topics:				
Definition of a Turing	g Machine, Turing Machine	s as Language	Accepters, Example Langua	ages to construct
Turing machine, Turi	ing Machines as Transduce	rs, Halting Pro	gramming Techniques for 1	Furing Machines
Targeted Applicatio	n & Tools that can be used	d:	<u> </u>	
Targeted Application	וייי			
1. Text Process	sing			
2. Compilers	0			
3 Text Editors				
4 Robotics An	nlications			
5 Artificial Int	elligence			
Tools:	emgenee			
1 IELAD (Java	Formal Language and Auto	mata Package) Software simulation tool	It's interactive
1. JILAF (Java	ware written in lave to ev	oniala Fackage	s in automata theory	
	wale willien in Java to exp		in automata theory.	
2. Turing mach	ime Online simulators.			
	A		A. 1	
1. Peter Linz, "	An introduction to Formal l	Languages and	Automata", Jones and Barl	liett Publications
6 th Ed, 2018.				
References			•	
1. Aho, Ullmar	h 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:	Course Title: Web Technolo	gy		2-0-0-2				
CSE2067	Type of Course: Program co	re	L- T-P- C					
	Theory Only							
Version No.	2.0							
Course Pre-	NIL							
requisites								
Anti-requisites	NIL							
Course	This course highlights the	basic web design usi	ng Hypertext Ma	Irkup Language and				
Description	Cascading Style Sheets. Students will be trained in planning and designing effective							
	web pages by writing coc	le using current lea	ading trends in	the web domain,				
	enhancing web pages with	the use of page I	ayout technique	es, text formatting,				
	graphics, images, and multir	nedia. The focus is o	on popular key te	chnologies that will				
	help students to build Interr	net- and web-based a	applications that	interact with other				
	applications and with datab	ases.						
Course	The objective of the course	e is to familiarize th	e learners with	the concepts of Web				
Objective	Technology and attain Skill	Development throu	gh Experiential	Learn <mark>ing</mark> techniques.				
Course	On successful completion	of this course the	e students shall	be able to:				
Outcomes	CO1: Implement web-bas	ed application usir	ng client-side so	ripting languages.				
	(Application level)		0					
	CO2 : Apply various constr	ucts to enhance th	ne appearance	of a website.				
	(Application level)							
	CO3 : Illustrate java-script co	incents to demonstra	ation dynamic w	eb site (Application				
	level)			••••••••••••••••••••••••••••••••••••••				
	CO4: Apply server-side sc	rinting languages t	o develon a we	h nage linked to a				
	database (Application le	vel)						
Course Content								
	•		Quizzes on vario	115				
Module 1	Introduction to XHTMI	Quizzes and	features of XHTM					
Would'e I		Assignments	simple application					
Tonics:				715				
Basics: Web W	////// Web browsers Web	sarvars Internet						
VHTML · Origin	and Evolution of HTML a	nd VHTML · Pasic S	watay Standar	VUTMI Documont				
Structuro Paci	c Toxt Markun Imagos H	na Anniel, Basic S voortovt Linke Liete	s Tablas Form	s Framos Syntactic				
Differences bet	t lext Markup, Illages, Hy	pertext Links, List:	s, lables, rollin	s, Fidilles, Sylitactic				
Differences bei			Comprohensier	basad				
Modulo 2	Advanced CSS	Quizzes and		Vaseu 8 Socciona				
	Advanced CSS	assignments		0 305510115				

assignments;

	Application of CSS in	
	designing webpages	

Topics:

CSS: Introduction to CSS, Defining & Applying a style, Creating style sheets, types of style sheet, selectors, CSS font properties, border properties, Box model, opacity, CSS pseudo class and pseudoelements<mark>.</mark>

Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Responsive Design, CSS Frameworks XML: Basics, demonstration of applications using XML

Module 3	Fundamentals of JavaScript	Quizzes and assignments	Application of JavaScript for dynamic web page designing	7 Sessions
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Topics:

JavaScript: Introduction to JavaScript, Basic JavaScript Instructions, Functions, Methods & Objects, Decisions and Loops, Document Object Model, Event handling, handling window popups, JavaScript validation.

Module 4	PHP – Application Level	Quizzes and assignments	Application of PHP in web designing	7 Sessions

Topics:

PHP: Introduction to server-side Development with PHP, Arrays, \$GET and \$ POST, \$_Files Array, Reading/Writing Files, PHP Classes and Objects, Working with Databases, SQL, Database APIs, Managing a MySQL Database. Accessing MySQL in PHP.

Targeted Application & Tools that can be used:

Xampp web server to be used to demonstrate PHP.

Project work/Assignment:

Assignments are given after completion of each module which the student need to submit within the stipulated deadline.

Textbook(s):

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

2] CSS Notes for Professionals, ebook available at https://books.goalkicker.com/CSSBook/ (Retrieved on Jan. 20, 2022)

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

References

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

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

Topics related to development of "FOUNDATION":

- 1. Web, WWW, Web browsers, Web servers, Internet.
- 2. CSS, PHP.
- 3. Designing for healthcare.

for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

E-References

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

Course Code:	Course Title: Web							
CSE2067_P	Technologies Lab	L-T-	0	0	2	1		
	Type of Course: Program	P- C						
	core lab course							
Version No.	1.0							
Course	Database Management Systems-CSE3156							
Pre-								
requisites								
Anti-requisites	NIL							
Course	This course highlights the comprehensive i	introdu	ction	to sci	ripting			
Description	languages that are used for creating web-b	based a	pplica	tions	i.			
	The associated laboratory provides an opp	The associated laboratory provides an opportunity to implement the						
	concepts and enhance critical thinking and	concepts and enhance critical thinking and analytical skills.						
Course	The objective of the course is to familiarize	The objective of the course is to familiarize the learners with the						
Objective	concepts of Web Technology and attain Ski	<mark>ill Deve</mark>	lopm	<mark>ent</mark> tl	hrough			
	Experiential Learning techniques.							
Course	On successful completion of this course the	e stude	nts sł	nall b	e able t	to:		
Outcomes	CO1: Implement web-based application using	ng clien	nt-side	scrip	oting			
	languages.							
	(Apply)							
	CO2 : Apply various constructs to enhance the	he appe	earan	ce of	a webs	ite.		
	(Apply)							
	CO3: Apply server-side scripting languages	to deve	lop a	web	page lir	iked		
	to a database.							
	(Apply)							
Course Content:								
List of Laborator	y Tasks:							

Experiment No. 1: Demonstration of XHTML features

Level 1: Demonstration of various XHTML Tags (Level 1)

Level 2: Design and develop static web pages for an online Book store (Level 2).

Experiment No. 2: Application of CSS in web designing

Level 1: Design a document using XHTML and CSS to create a catalog of items for online electronic shopping.

Level 2: Create and save XML document for students' information and display the same using cascaded style sheet.

Experiment No. 3: Application of PHP in web designing.

Level 1: Write a PHP program to read the personal information of a person such as first name, last name, age, permanent address, and pin code entered by the user into a table created in MySQL. Read the same information from the database and display it on the front end.

Level 2: Using PHP develop a web page that accepts book information such as ISBN number, title, authors, edition, and publisher and store information submitted through the web page in MySQL database.

Experiment No. 4: Building a website.

Build a website for organizing an International Conference. The conference website must be able to collect the author's details and upload a file.

Targeted Application & Tools that can be used:

Xampp web server to be used to demonstrate

PHP.

Project work/Assignment:

Assignments are given after completion of each module which the student need to submit within the stipulated deadline.

Textbook(s):

- 1. Robert. W. Sebesta, "*Programming the World Wide Web*", Pearson Education, 9th Edition, 2016.
- 2]Paul Deitel, Harvey Deitel, Abbey Deital,"Internet & World Wide Web How to Program", Fifth Edition, Pearson Education, 2021.

3]CSS Notes for Professionals, ebook available at https://books.goalkicker.com/CSSBook/ (Retrieved on Jan. 20, 2022)

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

Reference Book(s):

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.

Additional web-based resources

- W1. W3schools.com
- W2. Developer.mozilla.org/en-US/docs/Learn

W3. docs.microsoft.com

W4. informit.com/articles/ The Relationship Between Web 2.0 and Social Networking <u>https://presiuniv.knimbus.com/user#/home</u>

Topics related to development of "FOUNDATION":

1. Web, WWW, Web browsers, Web servers, Internet.

2. CSS, PHP.

3. Designing the website for healthcare.

The objective of the course is to familiarize the learners with the concepts of Web Technology and attain Skill Development through Experiential Learning techniques.

Course Code								
Course Coue.	Course Title: Cyber	threats for IOT and	Cloud					
C3L2040	course mile. Cyber		Ciouu		3	0	0	2
	Type of Course 11 P	rogram Core		L- 1-F- C	5	0	0	5
	2] T	heory Only						
Version No].							
Course Pre-	Cyber Security Info	rmation Security ar	d Networks					
requisites	cyber Security, into	inition security a						
Anti-roquisitos								
Anti-requisites								
Course	Objective of the cou	irse is to understan	d the most impo	ortant cybe	er threa	its for	IOT	and
Description	Cloud. Cyber attacke	ers discover new po	ssibilities in the	areas of Ir	nternet	of Th	ings	and
	cloud services. It m	ainly focuses on m	nultiple security	challenge	s facin	g the	loT	and
	cloud computing es	pecially concerns s	urrounding priv	acy and cy	/ber se	curity	' thr	eats
	of the users and the	how can the cybe	r risks relating t	o them be	mitiga	ted.		
Course	The objective of the	e course is to famil	iarize the learne	ers with th	e conc	epts o	of Cy	yber
Objectives	threats for IOT and (Cloud and attain Ski	ll Development	through P	articipa	ative l	.ear	ning
	techniques.							
Course Out	On successful comp	letion of the course	e the students sl	hall be abl	e to:			
Comes	Understan	d the different typ	es of cyber thr	eats for IO	T and o	cloud		
	Develop a d	leeper understandi	ng and familiarit	y with var	ious ty	pes of	fcyb	per-
	attacks, cybercr	imes, vulnerabilitie	s and remedies	thereto.				
	Plan, imple	ment, and monitor	cyber security i	mechanish	ns to ei	nsure	the	
	protection of in	formation technolo	gy assets.					
Course Content:								
Module 1	Introduction to IOT	Assignment	Programmi	ng lask		12 S	essi	ons
	and Cloud							
1	computing							
Topics								
What is loT, Ger	nesis of IoT, IoT and	Digitization, IoT	mpact, IoT Cha	allenges, I	OT Arc	hitect	ure	and
protocols, Variou	s platforms for IoT,	Real-Time example	s of IoT, Overvie	ew of IoT	compo	nents	and	lloT
communication	Technologies. Intro	duction to Cloud (Computing, The	e Vision o	t Clou	d Con	nput	ting,
Defining a Cloud,	, Cloud Computing R	Reference Model, C	haracteristics ar	nd Benefit	s, Chall	enges	S Ah	ead,
Distributed Syste	ms, Virtualization, S	ervice-Oriented Co	mputing, Utility	-Oriented	Compu	iting,	Buil	ding
	g Environments, App	blication Developm	ent, Infrastruct	ure and Sy	/stem	Develo	opm	ient,
	orms and Technologie	es.						
Accignment								
Assignment:								
	Cubor Throp	te Accignment	Drogramming	Tack	0 0	occio	20	
	Cyber Threa	Assignment	Programming	IdSK	03	essio	115	
Topics:						•.		
What are Cyber S	ecurity Inreats? Co	ommon Sources of (yber Threats,	Types of C	yber se	curity	′ 	
Inreats-Malware	attacks, Social Engir	neering attacks, Sup	piy chain attack	s, Man-in-	the mi	adle A	Attac	ск,
Inreat Detection	loois, Cyber Defens	e for individuals.						
Assignment:								

			•		
Module 3	Cyber Thi Internet Things	reats in of	Assignment	Programming/Data analysis task	10 Sessions
Topics:					
IoT threats and threats-Botnets, Advanced persis Best practices to Threats.	vulnerabilities- IoT Denial of service, tent threats, Ranso reduce risks and p	⁻ attack Man-in omware orevent	surface, Atta I-the-Middle, e, Remote rec threats. Secu	ck surface areas of the Identity and data the ording, How does the irity guidelines for IoT	e IoT, Types of IoT security ft, Social engineering, e IoT influence security?, T. Managing IoT Security
Assignment:					
Module 4	Cyber Threats in Cloud computing	Assignr	nent	Programming/Data analysis task	9 Sessions
Topics:					
Cybersecurity II Service, Insider Insecure API's, C Assignment: Text Books T1. Sunit Belap Forensics And Le T2. David Hane Fundamentals: I Edition, Pearsor T3. Rajkumar B Hill Education	Threats to Cloud Col Threats, Reduced I Compliance and reg gal Perspectives" s, Gonzalo Salgueir Networking Techno Education (Cisco F uyya, Christian Vec	ole, "Cy ole, "Cy Wiley I o, Patri ologies, Press In cchiola,	yber Security ndia Pvt Ltd,2 ck Grossetete Protocols, an dian Reprint) and Thamara	t Security, Cloud misc ty, Unauthorized use ating cyber risks in clo 2013 e, Robert Barton, Jero d Use Cases for the Ir . (ISBN: 978- 9386873 ai Selvi Mastering Clou	r Crimes, Computer me Henry,"IoT nternet of Things", 1 st 8743) ud. Computing McGraw
References					
R1. Brooks, C John Wiley & R2. Ollie Wh of Things Dev R3. Securing (Syngress/Els Weblinks: https://www.co https://presiuni	Charles J., Christopl Sons,2018 itehouse, "Security ices and Beyond", g The Cloud: Cloud evier) - 978-1-5974 ursera.org/learn/cl perva.com/learn/a v.knimbus.com/u	ner Gro y of Thi NCC Gr Compu i9-592- i9-592- ioud-se pplicat	w, Philip Crain ngs: An Imple oup, 2014 uting Security 9 <u>curity-basics</u> ion-security/o ome	g, and Donald Short. (ementers' Guide to Cy Techniques and Tacti cyber-security-threats	Cybersecurity essentials. /ber-Security for Internet cs by Vic (J.R.) Winkler
Topics relevan	it to "SKILL DE	VELC	JPMENT":		

Cyber threats in IoT and Cloud Computing for skill development through Participative Learning techniques. This is attained through the assessment component mentioned in the course handout.

Course Code: CSE3145	Course Title: Intrusion Prevention System	n Detection and	L- T-P-	3	0	0	3
	Type of Course:1] Pro 2] The	gram Core eory Only	C				
Version No.	1.0					I.	
Course Pre- requisites	Fundamental knowle	dge in Operating Sy	stems, I	nformatio	on Secu	rity and Ne	tworks
Anti-requisites	NIL						
Course Description	Objective of the cou Intrusion Detection to an enterprise. Apply Detection in order to Intrusion Detection S distinguish attack typ	rse is to Understa ools and techniques knowledge of th avoid common pit Systems and Analy es from false alarm	nd whe in orde e fund falls in ze intru s.	en, where er to impro amentals the creati usion det	e, how, ove the and h on and ection	and why t security po istory of lu l evaluation alerts and	o apply sture of ntrusion of new logs to
Course Objectives	The objective of the c of Intrusion Detectio through Participative	course is to familiari on and Prevention S Learning technique	ize the l System a es.	earners w and attain	ith the Skill D	concepts evelopmen	t
Course Out Comes	 On successful comple Understand Define intru: Explain the fudemonstrate the Use various particular security tools to complete the 	etion of the course to about the intrude sion detection and undamental conception skill to capture and protocol analyzers and detect network atta	he stud ers. d preve ts of Ne analyze nd Netv cks and	ents shall ntion po twork Pro e network vork Intru troublesł	be abl licies btocol A packet sion De noot ne	e to: analysis and s. etection Sys twork prob	tems as lems.
Course Content:							
Module 1	Introduction to Intrusion Detection and Prevention System	Assignment	P	rogrammi	ing Tasl	< 10 S	essions
Topics							

Understanding 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.

Topics:

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, noncredential analysis. Architecture models of IDs and IPs.

Assignment: Applying Intrusion detection in security applications.

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.

Mardula 4		Due evenue in a /D ata	0.6
wodule 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.

	1		1	1	1		1
Course Code: CSE3097	Course Title: We Type of Course:	eb Security Theory course	L-T-P- C	2	0	0	2
Version No.	1.0		1	1	1		1
Course Pre- requisites	Data Communication and Computer Networks (CSE3011)						
Anti-requisites	NIL						
Course Description	The purpose of this course is to introduce you to the field of web security by understanding web functionality and various security validations. The web is our gateway to many critical services and is quickly evolving as a platform to connect all our devices. Web vulnerabilities are growing on a year-to-year basis and designing secure web applications is challenging. The course covers fundamental concepts of web security principles, web vulnerability and exploitation, various attacks on web applications, and a few basic topics on web encryption					f web security lidations. The v evolving as a e growing on a s challenging. ity principles, applications,	
Course Objective	The objective of the course is to familiarize the learners with the concepts of Web Security and attain Skill Development through Experiential Learning techniques.						
Course Outcomes	 On successful completion of this course the students shall be able to: Define the fundamentals of Web applications and validation. (Remember) Recognize the significance of password and authentication in web applications. (Understand) Explain the importance of session management in web. (Understand) Apply web attack techniques to find vulnerabilities in web applications. (Apply) 						
Course Content:							
Module 1	Introduction to Web Security	Quiz	Knov	wledge	9		08 Sessions

Topics:

Web Functionality, Encoding Schemes, Mapping the Application - Enumerating the Content and Functionality, Analyzing the Application Bypassing, Client-Side Controls: Transmitting Data Via the Client, Capturing User Data, Handling Client-Side Data Securely - Input Validation, Blacklist Validation, Whitelist Validation. The Defense in-Depth Approach - Attack Surface Reduction, Rules of Thumb, Classifying and Prioritizing Threats.

Module 2	Web Application Authentication	Assignments	Comprehension	08 Sessions
				· · · · · · · · · · · · · · · · · · ·

Topics:

Authentication Fundamentals- Two Factor and Three Factor Authentication - Password Based, Built-in, HTTP, Single Sign-on Custom Authentication- Secured Password Based Authentication: Attacks against Password, Importance of Password Complexity, Design Flaws in Authentication Mechanisms - Implementation, Flaws in Authentication Mechanisms - Securing Authentication.

Module 3	Session Management &Web Security Principles	Quiz	Comprehension		08 Sessions
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Topics:

Need for Session Management, Weaknesses in Session Token Generation, Weaknesses in Session Token Handling, Securing Session Management; Access Control: Access Control Overview, 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.

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

Textbook(s):

T1. Dafydd Stuttard, Marcus Pinto, "The Web Application Hacker's Handbook", Willey Publishing Inc. ,2008

References: R1. B. Sullivan, V. Liu, and M. Howard, <i>"Web Application Security"</i> , A B Guide. New York: McGraw-Hill
R1. B. Sullivan, V. Liu, and M. Howard, <i>"Web Application Security"</i> , A B Guide. New
Vork: McGrow-Hill
Education 2011
P2 Web Application Security: Evaluitation and Countermoseure for Medern Web
K2. Web Application Security. Exploitation and Countermeasure for Modern web
Applications,
byAndrew Hoffman.
E-book Links
T1: https://www.oreilly.com/library/view/web-application-security/9780071776165/
12: <u>https://www.orelliy.com/library/view/web-application-security/9/81492053101/</u>
Web links
I. NPTEL course : Introduction to Information Security I, IIT Madras
https://nptel.ac.in/courses/106106129
2. Coursera Link : https://www.coursera.org/learn/security-and-authentication
Topics related to development of "Skills":
Web technology fundamentals, web security measures and webyulnerability/attacks.
Topics related to development of "Experimental Learning":

Course Code: CSE3097_P	Course Title: Web Security Lab Type of Course: Lab Course	L- T-P- C	0	0	2	1
Version No.	1.0					
Course Pre- requisites	Data Communication and	Data Communication and Computer Networks				
Anti-requisites	NIL					

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Course Description Course Objective	The purpose of this course is to introduce you to the field of web security by understanding web functionality and various security validations. The web is our gateway to many critical services and is quickly evolving as a platform to connect all our devices. Web vulnerabilities are growing on a year-to-year basis and designing secure web applications is challenging. The course covers fundamental concepts of web security principles, web vulnerability and exploitation, various attacks on web applications, and a few basic topics on web encryption.The objective of the course is to familiarize the learners with the concepts of Web Security and attain Skill Development through
Course Outcomes	 On successful completion of this course the students shall be able to: 5. Define the fundamentals of Web applications and validation. (Remember) 6. Recognize the significance of password and exthention in the second state of th
	 authentication in web applications. (Understand) 7. Explain the importance of session management in web. (Understand) 8. Apply web attack techniques to find vulnerabilities in web applications. (Apply)
Course Content: List of Labo 1. Practical know scripting Practical know scripting: U	oratory Tasks: nowledge of known vulnerabilities in CGI, LAMP stacks, REST APIs cross-site wledge of known vulnerabilities in CGI, LAMP stacks, REST APIs cross-site Use the Nessus tool to scan the network for vulnerabilities.
i. ii. iv. v. vi. vii. vii.	Basic Network scanning Advanced scanning in general search Ntstat port scanning: Vulnerability Mapping Policies: Plugins: General Scanning Port Scanning

Level 1: Identification of vulnerabilities

Level 2: Apply the concept

2. HTTP and setting up stacks, the various types of databases Access Controls, Vulnerabilities

HTTP and setting up stacks

- i. Create a simple web application that can store information sent to it. For example, you could create a web application that will store to a text file anything provided in a URL parameter
- ii. Write or modify an existing application that legitimately needs access to a sensitive resource ,but uses it at a time when it does not actually need it

Various types of databases Access Controls

- i. Role-Based Access Control (RBAC)
- iii. Mandatory Access Control (MAC)

Vulnerability: Study and work with KF Sensor

STEP1: Download KF Sensor tool Evaluation Setup File from KF Sensor Website.

STEP-2: Install with License Agreement and appropriate directory path.

STEP-3: Reboot the Computer now. The KF Sensor automatically starts during

Windows boot.

STEP-4: Click Next to setup wizard.

STEP-5: Select all port classes to include and Click Next.

STEP-6: "Send the email and Send from email", enter the ID and Click Next.

STEP-7: Select the options such as Denial of Service[DOS], Port Activity,

Proxy Emulsion, Network Port Analyzer, Click Next.

STEP-8: Select Install as System service and Click Next.

Level 1: Identification of vulnerabilities Level 2: Apply the concept

3. Study of web authoring tools (any 2-3 tools)

- i. Study and work with Net Stumbler tool
- ii. Study and work with Snort
- iii. Study and work with Nmap

Level 1: Install the tools required

Level 2: Apply the concept

4. Testing web applications Study and work with Word press tool

i.	Create an Online Community website and test the website
ii.	Showcase Your Work Online and test its worth
iii.	Create a Local Business Website and test the website.
Lev	rel 1: Define the test cases
Lev	rel 2. Apply the concept to test the web application
5. SQL	Injection and prevention
FIOIIIU	le given data set,
i.	. Put limits on all result sets
ii.	. Cleanse and Validate Freeform User Input
iii.	. Remove Freeform User Input When Possible
iv	. Validate Data Prior to Processing
V	. Ensure Errors are Not User-Facing
vi	. Use Stored Procedures to Abstract Business Logic and Control parameters
vii	. Use LIKE Operators Carefully
viii.	. Limit Use of xp_cmdshell and Other Extended Stored Procedures
İX.	. Perform Penetration Tests
Χ.	. Code Review
XI	. Minimizing the Impact of SQL Injection
XII	. Principle of Least Privilege & Login Security
	. Secure Linked Servers and Data Sources
LOVUL	
Level 2	2: Apply the concept
6. Cros	ss site request forgery attack lab
With th	ne usage of Virtual Machines
i.	Configure the Virtual Machines:
ii	Observing HTTP Request in Victim VM
iii.	CSBE Attack using GET Request
iv.	CSRF Attack using POST Request
٧.	Implementing a countermeasure
Level 1	I: Identify and acquire the data
Level 2	2: Apply the concept
7. Web) tracking
Irackin	g the Web based scenario by
Envi	ronment Configuration
 clear 	r history and cookies
• oper	n a new private window in Firefox
500	
Task 1:	Understand the basic working of the web tracking

Task 2: Importance of cookie in Web tracking
Task 3: Tracked user interests and data
Task 4: How ads are displayed in a website
Task 5: Tracking in a Private browser window
Task 6: Real world tracking
Task 7: Countermeasures
Level 1: Identify and acquire the data logs
Level 2: Apply the concept
Targeted Application & Tools that can be used:
(1) Word press tool can be used for building websites with possible
 (2) Tools such as Nmap and Nessus can be used for web attack demonstration. (3) KF Sensor advanced 'honeypot' intrusion and insider threat detection system for Windows networks
(4) Snort can be used for network intrusion detection system and intrusion prevention system
 Net Stumbler tool for Windows that facilitates detection of Wireless LANs using the 802.11b, 802.11a and 802.11g WLAN standards.
Textbook(s):
T1. Dafydd Stuttard, Marcus Pinto, "The Web Application Hacker's Handbook", Willey Publishing Inc. ,2008

Course	Course Title: Cloud Computing	L-T-P-	2	0	0	2
Code:	Type of Course: Theory	С				
CSE3343						
Version	1.0					
No.						
Course	Data Communication and Computer Net	works (CSE2	011)			
Pre-						
requisi						
tes						
Anti-	Nil					
requisites						
Course	Cloud Computing provides a hands-on com	prehensive stu	dy of Cl	oud con	cepts and ca	apabilities
Descriptio	across the various Cloud service models in	cluding Infras	tructure	as a Ser	vice (IaaS)	, Platform
n	as a Service (PaaS), and Software (PaaS), and Software as a Service (PaaS), and Software (PaaS), and Software as a Service (PaaS), and Software (PaaS), and Softwar	rvice (SaaS).	It dives	into all	of the det	ails that a
	student needs to know in order to plan for de	eveloping appl	ications	on the c	loud and wl	nat to look
	for when using applications or services host	ted on a cloud				

Course Objectives	The objective of the course is to familiarize the learners with the concepts of CLOUD COMPUTING and is designed to improve the learners' SKILL DEVELOPMENT through PARTICIPATIVE LEARNING TECHNIQUES.				
Cours e Out Comes	 On successful completion of the course the students shall be able to: 1. Describe the fundamental components and layers of Cloud Computing Architecture. [Remember] 2. Identify appropriate Virtualization techniques to virtualize infrastructures [Understand] 				
	3. Summariz	e various Cloud mechanis	ms to optimize the QoS par	ameters [Understand]	
	4. Apply clo	ud platforms to develop va	rious applications [Apply]		
Course Content:					
Module 1	Introduction to Cloud services	Assignment	Theory	L: 10	
Evolution of c PaaS, SaaS, T	loud computing, Com ypes of Clouds, Cloud	puting Platforms and Techr Computing Environments	lologies, Cloud Computing . [Understanding]	Architecture, IaaS,	
Module 2	Virtualization Techniques	Assignment	Theory	L: 10	
Basics of Vir Implementation	tualization - Types o on Levels of Virtualiz	f Virtualizations, Taxono ation. [Understanding]	my of Virtualization Tech	iniques,	
Module 3	Cloud QoS and Management	Assignment	Theory	L: 10	
Cloud Infrastr Usage Monito Listener, Load [Understandin	ucture Mechanisms-] or, Ready-Made Env d Balancer, SLA Mor [g]	Logical Network Perimete vironment, SLAs, Special nitor, Pay-Per-Use Monito	r, Virtual Server, Cloud St ized Cloud Mechanisms- r, Audit Monitor, Cloud S	orage Device, Cloud Automated Scaling ecurity Mechanisms.	
Module 4	Cloud Application development in Cloud	Assignment	Theory	L: 10	
Programming environments	Models for Cloud Co for	omputing – MapReduce, C	GL Mapreduce, Cloud Ha	skell, Development	
service develo	pment (Demonstration	n using AWS Cloud/Saturn	Cloud); Dockers and Cont	ainers. [Apply]	
Applications: Cloud Platform, Use of cloud technology in different applications like healthcare, agriculture etc. Tools:					
2. AWS,	Saturn Cloud etc.				
course	rk/Assignment: N	fention the Type of P	roject /Assignment p	roposed for this	
 Stude mach Desig Devel 	nts can design ine using cloud co n and Implement opment of a Mult	and implement dyn omputing environmer ation of a Scalable Cl i-Cloud Managemen	amic resource alloc nt. loud-Based Data Stor t Platform	ation for virtual age System	

Text Book

1. Rajkumar	Buyya, Christian Vecchiola, and Thamarai Selvi, "Mastering Cloud
Computing",	McGraw Hill Education, 2013 edition.

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

References

1. Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, "Cloud Computing
Concepts, Technology & Architecture", PHI publisher 2013 edition.

- 2. K. Chandrasekaran, "Essentials of CLOUD COMPUTING", CRC Press, 2015 edition.
- 3. David E.Y. Sarna, "Implementing and Developing Cloud Applications", CRC Press, 2018 edition.
- 4. Manvi, Sunilkumar, and Gopal K. Shyam. "Cloud Computing: Concepts and Technologies". CRC Press, 2021.

Web Based Resources and E-books: W1. IEEE Transactions on Cloud Computinghttps://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6245519 W2. International Journal of Cloud Computing- https://www.inderscience.com/jhome.php?jcode=ijcc W3. CloudSim Resources https://javadoc.io/doc/org.cloudsimplus/cloudsimplus/latest/org/cloudbus/cloudsim/resources/class-use/Resource.html W4. Journal of Network and Computer Networkinghttps://www.journals.elsevier.com/journal-of-network-and-computer- applications Topics relevant to "Skill Development": AWS, Azure, APIs, Aneka Cloud Platform, Virtualization, Cloud Platforms in Industry, EC2, Installation of VM Workstation, Cloud Infrastructure and Challenges for Skill Development through Participative Learning techniques. This is attained through assessment component

mentioned in course handout.

Course	Course Title: Cloud Computing	L- T-P-	0	0	2	1
Code:	Lab	С				
CSE3343_						
Р						
Version	1.0					
No.						
Cours	Data Communication and Computer Net	works (CSE20)11)			
e Pre-						
requisi						
tes						
Anti-	Nil					
requisites						

Cours Descr n	se riptio	Cloud Computing 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.
Cours Objec	se ctives	The objective of the course is to familiarize the learners with the concepts of CLOUD COMPUTING and is designed to improve the learners' SKILL DEVELOPMENT through PARTICIPATIVE LEARNING TECHNIQUES.
Cours Conte	se ent:	
Targ Appli Cloud Tools	eted Aj ications Platform	 pplication & Tools that can be used : S: I, Use of cloud technology in different applications like healthcare, agriculture etc.
1. 2. Proje	Google AWS,	App Engine Saturn Cloud etc. k/Assignment: Mention the Type of Project /Assignment proposed for this
cours	se Studor	k/Assignment. Mention the Type of Troject/Assignment proposed for this
•	machin Design Develo	ne using cloud computing environment. and Implementation of a Scalable Cloud-Based Data Storage System opment of a Multi-Cloud Management Platform
List o	of Labo	pratory Tasks:
Expe	criment Create	s: a simple cloud software application and provide it as a service using any Cloud Service
	Provide	er to demonstrate Software as a Service (SaaS).
2.	Create Virtuali	a Virtual Machine with 1 vCPU, 2GB RAM and 15GB storage disk using a Type 2 zation Software
3.	Create	a Virtual Hard Disk and allocate the storage using VM ware Workstation
4.	Create VM	a Snapshot and Cloning of a VIVI and lest it by loading the Previous Version/Cloned
5.	Demon Cloud S and Lau	strate Infrastructure as a Service (IaaS) by Creating a Virtual Machine using a Public Service Provider (Azure/GCP/AWS), configure with minimum CPU, RAM, and Storage unch the VM image.
6.	Create Provide	a Simple Web Application using Java or Python and host it in any Public Cloud Service er (Azure/GCP/AWS) to demonstrate Platform as a Service (PaaS)
7.	Create	a Storage service using any Public Cloud Service Provider (Azure/GCP/AWS) and check
8.	Create	a SQL storage service and perform a basic query using any Public Cloud Service
9.	Perform	n the basic configuration setup for Installing Hadoop 2.x like Creating the HDUSER and
10. 11.	Install I Launch	anost Hadoop 2.x and configure the Name Node and Data Node. the Hadoop 2.x and perform MapReduce Program for a Word Count problem

Text Book

3. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, 2013 edition.

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

References

Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, "Cloud Computing Concepts, Technology & Architecture", PHI publisher 2013 edition.

K. Chandrasekaran, "Essentials of CLOUD COMPUTING", CRC Press, 2015 edition.

David E.Y. Sarna, "Implementing and Developing Cloud Applications", CRC Press, 2018 edition.

Manvi, Sunilkumar, and Gopal K. Shyam. "Cloud Computing: Concepts and Technologies". CRC Press, 2021.

Web Based Resources and E-books: W1. IEEE Transactions on Cloud Computinghttps://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6245519 W2. International Journal of Cloud Computing- https://www.inderscience.com/jhome.php?jcode=ijcc W3. CloudSim Resources https://javadoc.io/doc/org.cloudsimplus/cloudsimplus/latest/org/cloudbus/cloudsim/resources/class-use/Resource.html W4. Journal of Network and Computer Networkinghttps://www.journals.elsevier.com/journal-of-network-and-computer- applications Topics relevant to "Skill Development": AWS, Azure, APIs, Aneka Cloud Platform, Virtualization, Cloud Platforms in Industry, EC2, Installation of VM Workstation, Cloud Infrastructure and Challenges for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE3102	Course Title: Malware Analysis	L- T-P- C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Should Have the knowledge of Cryptography and Network Security					
Anti-requisites	NIL					

Module 2 Topics: X86 Architecture- I Instructions, The Sta Scanning, Fingerprim Structure of a Virtual Assignment: Static a Module 3 Topics: Live malware analysi network activities. An Monitoring with Proc Assignment: Demon	Static Analysis Main Memory, Instr ack, Conditionals, Bra t for Malware, Portab Machine, ReverseEn nalysis on malware (I Dynamic Analysis is, dead malware anal nti-dynamic analysis t cess Monitor, Packet S istration of wireshark	uctions, Opcodes anching, Rep Inst de Executable File gineering- x86 Arc PeStudio & ProcM ysis, analyzing tra echniques anti-vm niffing with Wires	Assignment and Endianne ructions, C Ma Format, The P chitecture on) Assignment ces of malware- , runtime-evasion shark	Programming activity ess, Operands, Register in Method and Offsets. PE File Headers and Sec Programming activity - system-calls, api-calls, on techniques, , Malware	11 Hours cs, Simple Antivirus tions, The 11 Hours registries, e Sandbox,		
Module 2 Topics: X86 Architecture- I Instructions, The Sta Scanning, Fingerprint Structure of a Virtual Assignment: Static a Module 3	Static Analysis Main Memory, Instr ack, Conditionals, Br t for Malware, Portab Machine, ReverseEn malysis on malware (I Dynamic Analysis	uctions, Opcodes anching, Rep Inst ole Executable File gineering- x86 Arc PeStudio & ProcM	Assignment and Endianne ructions, C Ma Format, The P chitecture on) Assignment	Programming activity ess, Operands, Register in Method and Offsets. PE File Headers and Sec Programming activity	11 Hours rs, Simple Antivirus ctions, The 11 Hours		
Module 2 Topics: X86 Architecture- M Instructions, The Sta Scanning, Fingerprint Structure of a Virtual Assignment: Static a	Static Analysis Main Memory, Instr ack, Conditionals, Br t for Malware, Portab Machine, ReverseEn nalysis on malware (1	uctions, Opcodes anching, Rep Inst ole Executable File gineering- x86 Arc PeStudio & ProcM	Assignment and Endianne ructions, C Ma e Format, The P chitecture on)	Programming activity ess, Operands, Register in Method and Offsets. PE File Headers and Sec	11 Hours rs, Simple Antivirus ctions, The		
Module 2	Static Analysis		Assignment	Programming activity	11 Hours		
Assignment. Difei st							
Module 1 Topics: Introduction to malw worms, rootkits, Tro dynamic malware and Assignment: Brief st	MALWARE ANALYSIS vare, OS security conc ojans, bots, spyware, alysis. udy on types of spywa	epts, malware thro adware, logic bo are	Assignment eats, evolution of mbs, malware	Programming activity of malware, malware typ analysis, static malware	12 Hours		
Course Content:	Introduction to						
	4. Apply tea antianalysis techn	chniques and conc iques in future ma	epts to unpack, e lware samples.	extract, decrypt, or bypas	ss new		
	3. Analyze malware	 3. Analyze scientific and logical limitations on society's ability to combat malware 					
	combated through 2. Apply the	detection and class ne methodologies a	sification. nd tools to perfo	orm static and dynamic			
Course OutComes	On successful cor 1. Understa	On successful completion of this course the students shall be able to: 1. Understanding the nature of malware, its capabilities, and how it is					
Course Objective	The objective of MalwareAnalysis techniques.	the course is to fa and attain Emplo	amiliarize the le yability through	earners with the concept a Participative Learnin	ts of g		
	software using a debugger, and oth	elligence, respond ourse builds a stro variety of system a er tools useful for	I to information ong foundation and network mo turning malware	cal to an organization's n security incidents, a for reverse-engineering nitoring utilities, a disas e inside-out.	nd fortify malicious sembler, a		
Course Description	The purpose of th Understanding th derive threat int defenses. This co	e course is to explo e capabilities of 1	ore malware ana	lysis tools and technique	es in depth.		
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

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. https://www.geeksforgeeks.org/introduction-to-malware-analysis/

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

W3: https://sm-nitk.vlabs.ac.in/

References

- I. 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: CSEXXXX	Course Title: Internet of Things	L- T-P- C	1	0	4	3
	Type of Course: Integrated					
Version No.	2.0					
Course Pre- requisites	 Students should know basic python programming. Students have basic knowledge basic electronic contemperature, motion, pressure, and actuators etc. Students should have basic idea about Cloud and its should have basic idea about cloud about cloud and its should have basic idea about cloud about clo	omponen uses.	ts su	ch as	sens	ors –
Anti-requisites	NIL					

Course	The Internet of Things	(IoT) is an emerging	naradigm comhining h	eterogeneous
Description	devices at an unprecede	ented scale, thereby er	habling individuals and or	ganizations to
	gain greater value from	networked connection	ns among people, proces	ses. data. and
	things. The Internet of T	hings (IoT) is a course	of objects interacting with	n people, with
	information systems, a	nd with other object	ts. The course will focus	s on creative
	thinking. IoT concepts &	IoT technologies.		
Course	The objective of the cou	urse is to familiarize the	e learners with the concer	ots of Internet
Obiective	of Things and attain	SKILL DEVELOPMEN	T through EXPERIENTIA	L LEARNING
	techniques			_
Course Out	On successful completio	on of the course the stu	udents shall be able to:	
Comes	1. Identify the app	olication areas of IoT		
	2. Understand buil	ding blocks of Internet	t of Things and characteris	stics
	3. Describe IoT Pro	otocols	-	
	4. Demonstrate us	e of IoT devices for sin	nple application	
Course Content:				
Modulo 1	INTRODUCTION TO	Assignment	Simulation/Data	18 Sossions
	INTERNET OF THINGS	Assignment	Analysis	10 363310113
Introduction, Def	finition & Characteristics	s of IOT, Physical Desi	gn of IoT- Things in IoT,	IoT Protocols,
Logical design of	IoT- IoT functional block	ks, IoT Communication	n Models, IoT Communica	tion APIs, IoT
Enabling Technol	ogies- Wireless sensor no	etworks, Cloud compu	ting, Big data Analytics	
	IOT COMMUNICATION		Numerical from E-	
Module 2	MODEL AND	Assignment	Resources	18 Sessions
	PROTOCOLS			
Connectivity Prot	tocols: 6LoWPAN, IEEE 8	302.15.4, Zigbee, Wire	less HART, Z-Wave, ISA 1	00,NFC, RFID.
Communication/	Transport Protocols: Blu	etooth. Data Protocols	s: Message Queue Teleme	etry Transport
(MQTT), Constrai	ned Application Protocol	(CoAP), Advanced Me	essage Queuing Protocol (A	AMQP), XMPP
– Extensible Mes	saging and Presence Pro	tocol		
		Term	Simulation/Data	10.0
Module 3		paper/Assignment	Analysis	19 Sessions
	PROTOCOLS	ataath Data Drataaal		
(MOTT) Constrai	nad Application Protocols: Blue		S: Message Queue Teleme	
Extensible Mes	neu Application Protocol	tocol BEID: Introductic	SSage Queuing Protocol (A	AIVIQP), XIVIPP
REID system	saging and resence rio		on, Finciple of Krib, Com	porients of an
List of Laboratory	/ Tasks			
1 Installation of a	rduino IDF & Arduino nr	ogram to implement s	crolling LFD to glow even	/odd LED
2 Arduino progra	m to demonstrate usage	of nush button to con	trol the LED, to glow even	
3 Arduino progra	m to demonstrates traffi	c control system		
4 Arduino progra	m to demonstrates usage	e of servo motor with	potentio meter.	
5.Arduino progra	am to Control an LED us	sing Bluetooth.		
		0		
6.Arduino progra	am to implement RFID r	eader for security acc	cess.	
7. Arduino Progra	am to detect obstacle u	ising IR sensor.		
8.Arduino Progra	am to detect motion usi	ng PIR sensor.		
9.Installation of R	aspberry pi software			
10. Working basic	c commands on Raspber	ry pi & to demonstrate	e remote logging in raspbe	erry pi
11.Raspberry pi p	program to implement bl	inking LED		
12. Raspberry pi	program to implement c	amera module for vide	20	
13. Raspberry pi	program to obtain the te	mperature using DHT	sensors	
14.Using a Raspb	erry Pi with distance sen	sor (ultrasonic sensor	HCSR04)	
15. Raspberry pi	program to implement G	arage 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: CSE 3132	Course Title: Network Management3 -0-0-3SystemsL- T-P- CType of Course: Theory Only Course
Version No.	1.0
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 course is to familiarize the learners with the concepts of Network Management Systems and attain Skill Development through Participative Learning techniques.
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 management systems and open network management systems. 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 Collection/Interpretation	on 12 Sessions
Topics: OVERVIEW : Analo Case Histories of Network Manager Network Managen	gy of Telephone Ne Networking and Ma nent: Goals, Orgar nent System Platfori	twork Manageme anagement, Chall nization, and Fun m, Current Status	nt, Communications pro enges of Information T ictions, Network and S and future of Network I	otocols and Standards, echnology Managers, System Management, Management.
Module 2	Simple Network Management Protocol	Case studies / Case let	Case studies / Case	let 12 Sessions
Topics:	I	1		I
SNMPV1 NETWORK MANAGEMENT MANAGED NETWORK: Organization and Information Models				
MANAGED NETWO	ORK: Case Histories	and Examples, The	e History of SNMP Mana	agement, The SNMP
Model, The Organization Model, System Overview, The Information Model.				
SNMPV1 NETWORK MANAGEMENT: Communication and Functional Models The SNMP				
Communication M	odel, Functional mo	odel. SNMP MANA	GEMENT: SNMPv2 Maj	or Changes in
SNMPv2, SNMPv2 System architecture, SNMPv2 Structure of Management Information, The				
SNMPv2 Managem	SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility with SNMPv1.			
Module 3	Remote Monitoring	Quiz	Case studies / Case	let 14 Sessions
Topics:				
Monitoring, A Cas NETWORK: Why Architecture, TMN Issues.	e Study of Internet TMN? , Operation Management Serv	rg? ,RMON SM t Traffic Using RN s Systems, TMN rice Architecture,	AND MIB, RIVIONT, RI 10N TELECOMMUNICAT Conceptual Model, T An Integrated View of T	TION2, ATM Remote TIONS MANAGEMENT MN Standards, TMN TMN, Implementation
Module 4	NETWORK MANAGEMENT TOOLS AND SYS	Quiz <mark>.</mark> TEMS	Case studies / Case let	14 Sessions
Network Manage	ment Tools, Netwo	ork Statistics Me	easurement Systems, H	History of Enterprise
Management, Net Management, Ente	work Management erprise Managemen	systems, Comme t Solutions.	rcial Network managen	nent Systems, System
Module 5	WEB-BASED MANAGEMENT	Quiz	Case studies / Case let	14 Sessions
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: Simu	lation of NMS using	any of the tools r	nentioned above	
Text Book				
Pearson Education	manian, "Network l , 2010.	ivianagement Prin	cipies and Practice", 2nd	ι Ediπon,

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. https://documentation.solarwinds.com/

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

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

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: CSE 2058	Course Title: Firewall and Internet security Type of Course: IntegratedL- T-P- C2-0-2-3
Version No.	1
Course Pre-	Computer Networks
requisites	
Anti-requisites	
Course Description	This course provides an in-depth study of various network attacks techniques and 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 the course is to familiarize the learners with the concepts of Firewall
Objective	and Internet security and attain Skill Development through Problem Solving
	Methodologies.
Course Out Comes	 On successful completion of the course the students shall be able to: 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	Introduction to Firewall	Assignment	Data Collection/Interpretation	12 Sessions	
Introduction of Firewall location masks Packet fil	Firewall in compute on and Configura	r network,Catego ation,Firewall Po Ils Resources	ories of firewall,How firewall work olicies,Firewall Biasing,Network	s,Types of firewall, Architecture,Net	
Module 2	Computer security	Case studies / Case let	Case studies / Case let	12 Sessions	
Topics: Atta Principles of Se Sockets Layer, T	Topics: Attacks on Computers and Computer Security: Need for Security, Security Approaches, Principles of Security Types of Attacks. Transport Level Security: Web Security Considerations, Secure Sockets Layer, Transport Layer Security, HTTPS, Secure Shell (SSH) Module 3 Network Security Ouiz Case studies / Case let 10 Sessions				
Module 3	Network Security	Quiz	Case studies / Case let	10 Sessions	
Network At Standard (D Algorithm ,D Hash Algorit	ttacks ,Security DES),Advanced Er Diffie-Hellman Key Chm (SHA) , Digita Cyber laws and Compliance	Methods ,Sym cryption Stand -Exchange Prot Signatures.	metric-Key Cryptography :Da lard (AES) , Public-Key Crypt cocol , Authentication :Hash Fur	ta Encryption ography :RSA nction , Secure	
	Standards	2012 <mark>-</mark>	Case studies / Case let	II Sessions	
defamation,Crir	ne against individua	al,Government,P	roperty.		
 List of Laboratory Tasks: Perform encryption, decryption using the following substitution techniques (i) Ceaser cipher, (ii) playfair cipher iii) Hill Cipher iv) Vigenere cipher Perform encryption and decryption using following transposition techniques i) Rail fence ii) row & Column Transformation Apply DES algorithm for practical applications. Apply AES algorithm for practical applications. Implement RSA Algorithm using HTML and JavaScript Implement the Diffie-Hellman Key Exchange algorithm for a given problem. Calculate the message digest of a text using the SHA-1 algorithm. Implement the SIGNATURE SCHEME – Digital Signature Standard. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w. Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool Defeating Malware					
Targeted Applic	Targeted Application & Tools that can be used				
Fext Book F1 : 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. <u>https://networklessons.com/cisco/asa-firewall</u>
- 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	Course Title: Search Engine Optimization		3-0-0-3
Code: CSE3123	Type of Course: Program Core & Theory Only	L-T-P- C	
Version No.	1.0		
Course Pre- requisites	NIL		
Anti-requisites	NIL		
Course Description	Objective of this course is to make students learn the and develop ability to optimize the searching based the business can be improved. The search engine of improving a website to upsurge its visibility when p or services. The more visible a website has on search it is that brand captures business. The students sho of WWW to pursue the Course. After successful com students would acquire knowledge to compreh Optimization algorithms, SEO tools and Reporting m sites.	ne basic l on the optimiza eople so h engin ould hav npletion nend th ethods	s of Search Engine key words so that ation is the skill of earch for products es, the more likely e prior knowledge of the Course, the ne Search Engine to analyze the web
Course Objective	The objective of the course is to familiarize the lear Search Engine Optimization and attain Skill Develop	rners w ment th	ith the concepts of rough Participative
	Learning techniques.		

Course Out Comes	 On successful completion of 1. Outline the basic con 2. Discuss the content of (Comprehension) 3. Illustrate Technical S 4. Analyse the Report of Analysis) 	the course the stuncepts of SEO (Interest of SEO (Interest of SEO) (Application of SEO) to measu	udents shall be able to: Knowledge) n-page & Off-Page SEO n) nre the performance (
Course Content:			Γ
Module 1	Introduction to SEO		10 Sessions
Topics: Search Engine – wor technique-Search Competition analysi	ks- SEO vs SEM- need – history- Engine Algorithm- Google Algo s- Page ranking technology	works- Googlebot prithm- Key word	(Google Crawler)- Types of SEO search- Types of key words-
Module 2	On-Page and Off-Page SEO	Assignment	12 Sessions
Introduction to On- Tag, Title Tag, Image search and Analysis Introduction to Off- Building back links- grey hat and Black h	Page SEO, Basics of website desig e Tag and H Tag Optimization- Li Page optimization- Local marketi Type of links – Natural Link, ma nat SEO- Social Media optimizatio	gning/developme ink building- Option ing of website as p anually built link & on technique.	nt, HTML Basics for SEO, Meta mizing SEO content- Key word per the location- Page ranking- & Self-created link- White hat,
Module 3	Technical SEO		10 Sessions
Basics of Technical S protocol, Overcomi Redirects, Best Prac	SEO- Crawling and Indexing- HTN ng Error codes, Technical Analy tices, Analysis of Crawl Errors	AL Sitemap vs. XM sis connected wit	IL Sitemap, The robots.txt File th Redirection, Broken Links -
Module 4	SEO Reporting	Assignment	08 Sessions
Website position a Google analytics- G	nalysis in various search engine cals and conversion- Tracking an	e- Analyzing perfo d report- Reports	ormance of the website using submission- Securing Ranks.
Targeted Application Applications: Online Professionally used	n & Tools that can be used: Business models such as e-Com software – Google Analytics	merce, Digital Ma	irketing, Health Care
Text Book T1 - "Search engine 2015. T2 -"Google AdWo influencer on socia	e optimization all-in-one for dum rds: A beginner's guide to Google I media", Wally Bax , Notion Pre	mies", Clay, B ,3rc e. Use Analytics, S ss Media Pvt Ltd.,	l ed., John Wiley & Sons, Inc., EO, and AdWords. Become an 2022.
References R1 – "Introduction Apress. (2017). R2 - "Step By Step 2018. R3 - "Search Engine	to search engine optimization: A Guide to SEO", Upendra Rana, O e Optimization (SEO).Grow the A	Nguide for absolut cean Books Pvt Lt udience", Clark, H	<i>te beginners"</i> , Kelsey, T, d.R-Tech Offset Printers, lack Book Works, 2022.
Weblinks: W1: <u>https://punive</u>	ersity.informaticsglobal.com/logi	<u>n</u>	

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

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: Information Retrieval			-			
CSE2051	Turne of Courses Theory Only Course		L-T- P- C	3	0	0	3
	Type of Course: Theory Only Course	•					
version No.							
Course Pre-	Basic Knowledge in Data Structures	and algor	ithms and pr	obabili	ty and	d statis	πcs,
requisites	background in machine learning						
Anti-	NIL						
requisites				·			<u> </u>
Course	The course studies the theory, design	gn and im	plementation	n of Te	xt- ba	sed in	formation
Description	systems. The Information Retrieva	I core co	ncepts of th	e coui	rse in	clude	statistical
	characteristics of text, representation of information needs and documents. Topics						
	Include Several important retrieval models (Basic IR Models, Boolean Model, IF-IDF						
	(Term Frequency/Inverse Document Frequency) Weighting, Vector Model, Probabilistic						
	Model, Latent Semantic Indexing Model, Neural Network Model). Retrieval Evaluation,						
	Crawling Recommender Systems: Pacies of Content based Recommender Systems						
	Content-based Filtering Collabora	tive Filte	ering Matrix	facto	rizatio	n mc	dels and
	neighborhood models			iucto	1120110		acis ana
Course	The objective of the course is to fam	niliarize th	e learners wi	th the	conce	nts In	formation
Objective	Retrieval and attain Skill Dev	velopmer	nt through	Part	icipa	tive	Learning
,	techniques.	ere price		1 011 0	p u		200010010
Course Out	On successful completion of the cou	urse the st	udents shall	be able	e to:		
Comes	CO1: Define basic concepts of inform	mation Re	trieval. [Knov	vledge]		
	CO2: Evaluate the effectiveness and	efficiency	of different	inform	ation	retriev	/al
	methods. [Application]						
	CO3: Explain different indexing met	hodology	requirement	s and t	he co	ncept	of web
	retrieval and crawling. [Comprehen	ision]					
	CO4: Classify different recommende	er system a	and its aspec	t. [Con	npreh	ension]
Course							
Content:	ļ						
Module 1	Introduction to Information	Assignme	nt Da	ta			7
	Retrieval	10018111101	col	llectior	۱		Sessions
Information	Retrieval – Early Developments – The	IR Proble	m – The User	s Task	– Info	rmatic	on versus
Data Retriev	al – The IR System – The Software A	rchitectu	re of the IR S	System	– The	e Retri	eval and
Ranking Proc	cesses						

Module 2	Modeling and Retrieval	Assignment	Problem	10
	Evaluation		solving	Sessions
Basic IR Mo Weighting – Network Mo Collection – L	dels – Boolean Model – TF-IDF Vector Model – Probabilistic Moo del – Retrieval Evaluation – Retrie Jser-based Evaluation – Relevance F	(Term Frequency/Ir del – Latent Seman eval Metrics – Prec eedback and Query	iverse Document tic Indexing Moo ision and Recall Expansion – Expli	t Frequency) del – Neural – Reference cit Relevance
Feedback.				
Module 3	Indexing & Web- Retrieval	Term paper/Assignment	Data analysis	8 Sessions
Indexing and The Web – Se	Searching – Inverted Indexes – Se earch Engine Architectures – Cluster	quential Searching - based Architecture	 Multi-dimensio Search Engine R 	nal Indexing. anking – Link
based Rankir a Web Crawle	ng – Simple Ranking Functions, Evalu er.	uations — Search En	gine Ranking – Ap	pplications of
	Recommender	Term	Problem	8
Module 4	System	paper/Assignment	solving	Sessions
Basics of Cor Drawbacks of Targeted Appl Information R	ntent-based Recommender System Content-based Filtering – Collaborat ication & Tools that can be used: etrieval System, Collaborative Filte	ns – High Level Ar tive Filtering – Matri ring System, Feedba	chitecture – Ad x factorization mo nck System, Evalu	vantages and odels. ation
Metrics	·····	0 - 7	- , ,	
Assignment:				
Group assign	ment, Quiz			
Text Book T1 Ricardo Ba and Techno <u>https://people</u> T2 Ricci, F, Rok	eza-Yates and Berthier Ribeiro-Netc logy behind Search", Third e.ischool.berkeley.edu/~hearst/irboo cach, L. Shapira, B.Kantor, —"Recom	o, —" Modern Inforr Edition, ACM ok/ mender Systems Ha	nation Retrieval: Press Books, ndbook", Fourth I	The Concepts 2018. Link: Edition, 2018.
References R1 Stefan Bu <i>Implementing</i> R2 Jian-Yun Ni R3 Stefan M. F R4 B. Liu, Spri Edition, 2013. R5 C. Manning	ettcher, Charles L. A. Clarke and and Evaluating Search Engines", The e Morgan & Claypool –" Cross-Lange Rüger Morgan & Claypool – "Multim inger, - "Web Data Mining: Explorin g, P. Raghavan, and H. Schütze, —"	d Gordon V. Corma e MIT Press, 2017. uage Information Re edia Information Re ng Hyperlinks, Conte 'Introduction to Info	ack, —"Informat etrieval", Publishe trieval", Publisher ents, and Usage f prmation Retrieva	tion Retrieval: r series 2011. r series 2014. Data", Second
University Pre Web Based R	ss, 2015. Link: <u>https://nlp.stanford.e</u> esources and E-books:	edu/IR-book/		
https://punive	ersity.informaticsglobal.com/logi	<u>n</u>		
Topics based Filte attained tl	erelevant to the development of SK ering for Skill Development throug nrough assessment component mer	ILLS: Recommenda th Participative Lear ntioned in course ha	ntion Techniques, ning techniques. ndout.	Content- This is

Course Code:	Course Title: Big	Data Analytics					
CSE3002			L- T-P- C	2	0	2	3
	Type of Course: L	aboratory Integrated					
Version No.	2.0						-
Course Pre-requisites	DDL, DML of SQL writing a file, cont	Queries and Creation of Clas trol statements in java progr	ss & object, amming.	inter	ace, r	eadin	g &
Anti-requisites	NIL						
Course Description	This course is d	esigned to provide the fu	ndamental	know	ledge	to e	quip
	students being ab	le to handle real world big d	lata problen	ns inc	luding	g the t	hree
	key resources of	f Big Data: people, organ	izations, ar	nd se	nsor.	With	the
	advancement of l	T storage, processing, comp	utation and	sensi	ng tec	hnolo	gies,
	big data has beco	ig data has become a novel norm of life.					
Course Objective	The objective of t	the course is to familiarize t	he learners	with	the c	oncep	ts of
	Big Data Ana	alytics and attain SK	ILL DEVE	LOPN	IENT	thro	ough
	EXPERIENTIAL LE	ARNING techniques					
Course Out Comes	On successful con	npletion of the course the st	udents shal	l be a	ble to	:	
	1: Describe the fu	ndamental concepts of big o	lata analytic	cs (Kn	owlec	lge)	
	2: Apply Map-Rec	Aap-Reduce programming on the given datasets to extract required					
	Insignts. (Applicat	nication).					
	5. Employ applop	lytics for a given problem (A	nnlication	ive, r	Dase	10	
	4. Use Snark and	nosal tool to analyse the give	en dataset f	orag	iven r	nnhle	m
	(Application)	nosqi toor to unuiyse the giv		orug	iven p		
Course Content:	(
	Introduction to						
Module 1	Big data	Assignment	Case study o	on Re	^{al} 10	Sessi	ons
	Analytics	0	time applica	tions			
Introduction to Big Dat	a: Basics of Distr	ibuted File System, Four V	s, Drivers fo	or Big	, data	, Big	data
applications, Structured	, unstructured, sei	mi-structured and quasi stru	ctured data	. Big (lata C	haller	nges-
Traditional versus big da	ta approach.						
The Hadoop: History c	of Hadoop-Hadoo	p use cases, The Design o	of HDFS, Bl	ocks	and	replica	ation
management, Rack aw	areness, HDFS ar	chitecture, HDFS Federatio	n, Name n	ode	and d	lata n	ode,
Anatomy of File write, A	natomy of File read	d. Role of Data Scientist - Rol	e of Data Ar	nalyst	– Dat	a Anal	ytics
in Product developmer	nt - Business Inte	lligence vs Data analytics	- Real time	e Bus	iness	Analy	/tical
ProcessCase studies rela	ited to big data ap	plications					
	Hadoop		Installation	of			
Module 2	MapReduce	Assignment	multimode	cluste	r 10	Sessi	ons
Man Raduce . Overview	Framework	istributed processing for bi	a data Int	roduc	tion 1	ha ha	4000
framework and ManBoy	w and need of D	The second s	g uala- mi			itoctuu	100p
hadoon – Working with	badoon daamon	s-Installation of hadoon sin	ale node cli	ustor	and r	nulti r	
clusters - Working with I	sters - Working with MapReduce programming.					iouc	
	Hive and Hhase						
Module 3	Analytical tools	Term paper/Assignment	Hive joins		10	Sessi	ons
Hive : Apache Hive with Hive Installation, Hive Data Types, Hive Table partitioning, Hive DDL commands,							
Hive DML commands, a	nd Hive sort by vs.	order by, Hive Joining tables	s, Hive buck	eting			
Hbase : Introduction to I	HBase and its work	ing architecture- Commands	s for creatio	n and	listing	g of ta	bles-
disabled and is disabled	of table - enable	and is enabled of table- des	cribing and	dropp	oing o	f table	e-Put
and Get command - dele	ete and delete all o	command-commands for sca	an, count, tr	uncat	e of t	ables.	
Module 4	Data Analytics with Spark	Term paper/Assignment	Spark RDD		10	Sessi	ons

Spark: Spark: Apache Spark's Philosophy, History of Spark, Running Spark, A Gentle Introduction to Spark, Spark's Basic Architecture, Spark Applications, DataFrames, Partitions, Transformations, Lazy Evaluation, 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=1223 875&site=ehost-live&ebv=EB&ppid=pp_xiii

2.https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2706929&sit e=ehost-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: Edge Computing		3-0-0-3
Code:		L-T-P-C	
CSE2034			

	Type of Cou Course Dis	rse: Theory Only				
Version No.	1.0			I	1	
Course Pre- requisites	Distributed S	Systems and Algorithms				
Anti-	Nil					
requisites						
Course	In this course	e, we will study significa	ant tools and ap	plications t	hat comp	rise today's
Description	cloud compute applications. industry, cloud information of edge compute (MEC)). The software serve computing. S	ting platform, with a s The course covers vari oud computing basics on the different types of te services (such as CI e course also educates t vices, standard bodies an Students will also create	special focus o ous topics such and edge con edge compute DN Edge, IOT he students on ad open source a research pro	n using the n as the evo nputing. The deploymen Edge, and the differen communitie ject of their	e cloud f lution of he cours its, differe Multi-ant vendor es availat choosing	or big data computing e provides ent types of ccess Edge platforms, ole for edge g.
Course Objective	The objective Computing a	e of the course is to fam nd attain Employability th	niliarize the lear prough Problem	ners with the second seco	he concer hodologie	ots of Edge es.
Course Out Comes	On successfu CO1 Unders CO2 Descril CO3 Summ CO4 Descri	Il completion of the cou tand the principles, arch be IoT Architecture and arize edge to Cloud Pro ibe Edge computing wit	rse the student itectures of edg Core IoT Mod tocols (Compre h RaspberryPi	s shall be al ge computin ules (Comp chension) (Comprehe	ole to: ng (Kno orehensio ension)	owledge) m)
Course Content:			-			
Module 1	IoT and Edge Computing Definition and Use Cases	Term paper/Assignment/Cas e Study	Programming/ Collection/any associated acti	Simulation other such vity	/Data	9 Sessions
Topics: Introduction definition, E Edge vs Fog	to Edge Co dge computir Computing,	mputing Scenario's and ng use cases, Edge comp Communication Models	d Use cases - puting hardward s - Edge, Fog a	Edge com e architectu nd M2M.	puting p res, Edge	urpose and platforms,
Module 2	IoT Architecture and Core IoT Modules	Term paper/Assignment/Cas e Study	Programming/ Collection/any associated acti	Simulation other such vity	/Data	9 Sessions
Topics: A co a network an Understandin – Telemedici	onnected ecos d Metcalfe's ng Implemen ine palliative	system,IoT versus mach and Beckstrom's laws, I tations with examples-I care, Requirements, Im	ine-to-machine oT and edge ar Example use ca plementation, I	e versus, SC chitecture, se and depl Use case ret	CADA, T Role of a loyment, trospectiv	he value of n architect, Case study /e.

Module 3	RaspberryPi	Term paper/Assignment/Cas e Study	Programming/Simulation /Dat a Collection/any other such associated activity	10 Sessions
Topics: Intro	oduction to 1	RaspberryPi, About the	RaspberryPi Board: Hardware	Layout and
Pinouts, Op	perating Sys	tems on RaspberryPi	, Configuring RaspberryPi, I	Programming
RaspberryPi,	Connecting	Raspberry Pi via SSH,	Remote access tools, Interfacing	DHT Sensor
with Pi, Pi as	s Webserver,	Pi Camera, Image & Vio	deo Processing using Pi.	
	Edge to	Term	Programming/Simulation/Data	7 6

Module 4	Cloud	paper/Assignment/Cas	Collection/any other such	7 Sessions
	Protocols	e Study	associated activity	

Topics: Implementation of Microcomputer RaspberryPi and device Interfacing, Edge to Cloud Protocols- Protocols,MQTT, MQTT publish-subscribe, MQTT architecture details, MQTT state transitions,MQTT packet structure, MQTT data types, MQTT communication formats, MQTT 3.1.1 working example.

Edg con Module 5 wit Ras	ge nputing h spberryPi	Term paper/Assignment/Cas e Study	Programming/Simulation /Data Collection/any other such associated activity	7	Sessions
Ras	spberryPi	e 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: CSE3021	Course Title: BLOCK PUBLIC SECTOR	KCHAIN FOR	L-T-P-C	3-0-0-3
	Type of Course: Theory			
Version No.	1.0			
Course Pre- requisites	Foundations of Blockchair	n Technology		
Anti-requisites	NIL			
Course Description	Blockchain Technology is being increasingly employed in the public sector, specifically where trustworthiness and security are of importance. This course discusses about the blockchain technology and its potential applications, emerging technologies and their role in the implementation of blockchain technologies in the digital government and the public sector particularly in Smart City, Electronic Health Care monitoring and Digital Certificates. It also analyses effects, impacts, and outcomes from the implementation of blockchain technologies in the public sector in the application of blockchain technologies in the public sector in the			
Course Objective	The objective of the course of Blockchain For Put Participative Learning techn	e is to familiarize t olic Sector and niques	the learners with attain Employa	the concepts bility through
Course Out Comes	 On successful completion of the course the students shall be able to: 1] Understand the Standards and Protocols of Blockchain and data management in the public sector [COMPREHENSION] 2] Apply Artificial intelligence and machine learning approaches for implementation of Smart cities using blockchain architecture [APPLICATION] 3] Discuss about Electronic Healthcare Records Monitoring using Blockchain Technology [COMPREHENSION] 4] Describe the Blockchain Technology use cases in Indian and Foreign Countries [KNOWLEDGE] 			
Course Content:				
Module 1	Blockchain in Government and the Public Sector	Quiz	Data Collection	9 Sessions
Blockchain in Govern of Blockchain - data 1 Understanding and ad Governance.	nent and the Public Sector unanagement in the public s dressing risks and challeng	use cases – Benef sector - Building ses. Blockchain A	fits – Standards a networked pub Applications to 1	and Protocols lic services - Public Sector
Case Study – Keyless	Signature Infrastructure (K	SI)		
Module 2	Blockchain in Smart City Applications	Assignment	Data Collection	9 Sessions

The Application of Blockchain Technology to Smart City Infrastructure - Artificial intelligence and machine learning approaches for smart transportation in smart cities using blockchain architecture - Blockchain architecture for intelligent water management system in smart cities -Blockchain-based energy-efficient smart green city in IoT environments - Citizen e-governance using blockchain - Cloud/edge computing for smart cities.

Module 3	Blockchain in Healthcare	Case Study	Data Collection	9 Sessions

Blockchain in Healthcare Applications – Use cases - Blockchain and Data Security – Blockchain Medical Records - Healthcare Blockchain Use Case: Supply Chain Transparency – Electronic Health Records, A novel Blockchain-based Access Control Manager to Electronic Health Records.

Case Study – Avaneer Health, MEDICALCHAIN, BurstIQ, Guardtime

Module 4	Implementation of Blockchain in Indian System and Foreign Countries	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=h iU7EAAAQBAJ&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. https://www.oecd.org/gov/innovative-government/oecd-guide-to-blockchain-
- technology-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. https://www.ibm.com/in-en/blockchain/industries/government

6. https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/using-

blockchain-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-for-health-care.html</u>

15. https://www.niti.gov.in/sites/default/files/2020-01/Blockchain_The_India_

Strategy_Part_I.pdf

16. https://www.bigchaindb.com/usecases/government/benben/

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: CSE2025	Course Title: Business Continuity and Risk Analysis Type of Course: Theory	L- T-P- C	3-0-0-3
Version No.	1.0		
Course Pre-	NIL		
requisites			
Anti-requisites	NIL		

Course Description	Through the study of incident response and contingency pla incident response plans, disaster recovery plans, and business this course aims to help students comprehend the pri- management.	nning, including continuity plans, inciples of risk			
Course	The objective of the course is to familiarize the learners w	ith the concepts			
Objective	of Business Continuity and Risk Analysis and attain Emp	loyability through			
-	Participative Learning techniques.				
	On successful completion of the course the students shall	be able to:			
1. Describe concepts of risk management [Knowledge]					
	2. Define and be able to discuss incident response option	15			
Course Out	[Comprehension]				
Comes	3. Design an incident response plan for sustained organizational				
Comes	operations [Comprehension]				
4. Discuss and recommend contingency strategies, including data ba					
	and recovery and alternate site selection for business resumption planning.				
	[Knowledge]				
Course					
Content:					
Module 1 Sourc	ees of disaster and types of disasters	10 Sessions			
Disaster Recover	ry Operational cycle of disaster recovery, disaster recovery co	ost, incidents that			
requires disaster	r recovery plans, evaluating disaster recovery - method	s, team, phases,			
objectives, chec	klist. Best practices for disaster recovery - Business contin	nuity - Business			
continuity vs. dis	saster recovery	·			
		10			
viodule 2 Bush	ness continuity management:	10 Sessions			
Introduction - H	Elements of business continuity management. Business co	ntinuity plan –			
Business contin	uity planning and strategies - BCP standards and guideling	es - BCP Project			
Organization -	Crisis communication plan - Emergency response plan	- Contingency			
planning					
Module 3 Mana	ging, assessing and evaluating risks:	09 Sessions			
Importance of 1	risk management - Risk management methodology - Atta	ck methods and			
Countermeasures - Cost benefits analysis of risk management - Risk assessment					

monitoring – Verification tools and techniques.Module 4 Risk control policies and Counter measures09 Sessions

Introduction - Counter measures - Risk control policy development factors-Development of information assurance principles and practices - Laws and procedures in information assurance policy implementation, Security test and evaluation, Automated security tools, Cost benefit analysis, Developing a risk assessment methodology, Security requirements, Information categorization, Risk management methodologies to develop life cycle management policies and procedures, Education, training and awareness. Policy development Information security policy, change control policies, system acquisition policies and procedures, Risk analysis policies and General risk control policies.

responsibilities - Responsibilities of security professional - Information system auditing and

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: CSE3095	Course Title: Cloud SecurityType of Course:Theory	L-T-P-C	3 -0-0-3
Version No.	1.0	1	
Course Pre- requisites	Cloud Computing and Services (CSE32	2)	
Anti-requisites	NIL		
Course Description	This course provides ground-up covera landscape, architectural principles, and to architecture and explores the guiding secu	ge on the echniques. It rity for Infra	high-level concepts of cloud describes the Cloud security structure and Softwares.
Course	The objective of the course is to familiariz	e the learnei	rs with the concepts
Objective	of Cloud Security and attain Employab techniques.	ility through	Participative Learning
Course	On successful completion of this course th	e students sl	all be able to:
Outcomes	1. Describe fundamentals of clou	d computing	g [Knowledge].
	2. Explain cloud computing	security ar	chitecture and associated
	challenges [Comprehension].		
	3. Discuss cloud computing software	e security ess	entials [Comprehension].

	4. Apply infrastructure security and data security in cloud computing enviroment. [Application].				
Course Content:					
Module 1:	Fundamentals of Cloud Computing	Quiz	Knowledge based Quiz	10 Sessions	
Topics: Cloud Cor and Technologies, Software as a Ser (IaaS), Cloud Dep	mputing at a Glance, Building Cloud Computing Architectur vice (SaaS), Cloud Platform a loyment Models, Expected Ber	Cloud Computing Envir e: Cloud Delivery Mod as a Service (PaaS), Cl nefits.	ronments, Computin els, The SPI Framev oud Infrastructure a	g Platforms vork, Cloud s a Service	
Module 2:	Cloud Security Challenges and Cloud Security Architecture	Quiz	Comprehension based Quiz	10 Sessions	
Topics: Security Security Manage Autonomic Securi	Policy Implementation, Comp ment. Architectural Consider ty.	outer Security Incident rations, Identity Mana	Response Team, Vingement and Acces	rtualization ss Control,	
Module 3	Cloud Computing Software Security Essentials	Assignment	Batch-wise Assignments	9 Sessions	
Topics: Cloud In Requirements, Clo and Business Cont	formation Security Objective oud Security Policy Implementa tinuity Planning/Disaster Reco	es, Cloud Security Ser ation, Secure Cloud Soft very.	vices, Secure Clou ware Testing, Cloud	d Software Computing	
Module 4:	Infrastructure Security and Data Security	Assignment and Presentation	Batch-wise Assignment and Presentations	9 Sessions	
Topics: Infrastru Data Security : A	cture Security: The Network Aspects of Data Security, Data Securit	Level, The Host Level, ' Security Mitigation, Pro	The Application Levovider Data and its S	el. ecurity.	
Targeted Applica	tion & Tools that can be used	: Use of CloudSim sir	nulator.		
Survey on Cloud Text Book 1. Rajkuma: <i>Computing</i> '', 1 2. Roland L <i>Cloud Computi</i>	Service Providers r Buyya, Christian Vecchiola McGraw Hill Education, July Krutz and Russell Dean Vines, ing", Wiley Publishing, Inc. 2	a, and Thamarai Selvi, y 2017. " <i>Cloud Security - A Co</i> 2010.	, "Mastering Cloud omprehensive Guide	d to Secure	
References 1. Sushil Jaju <i>"Secure Cloud</i> 2. John Ritti <i>Security"</i> , CRG 3. Tim Math Enterprise Pe	odia, Krishna Kant, Pierangela <i>l Computing</i> ", Springer, ISBN nghouse and James Ransome, C Press, 2010. ner, Subra Kumaraswamy an erspective on Risks and Com	a Samarati, Anoop Sing 978-1-4614-9278-8 (ef " <i>Cloud Computing, Im</i> d Shahed Latif", "Clo apliance", Oreily Publ	hal, Vipin Swarup, Book). Book). <i>plementation, Mana</i> , ud Security and Pr ication, 2009.	Cliff Wang, g <i>ement and</i> ivacy – An	
WEB RESOURC	CES:				
https://presiuniv	.knimbus.com/user#/home				
Topics relevant t implementation, In Participative Lea course handout.	o "EMPLOYABILITY SKII nfrastructure security and Data arning techniques. This is att	LLS": Cloud computin security for developing ained through assessn	ng architecture, Sect g Employability Ski nent component mo	urity policy lls through entioned in	

Course Code:	Course Title: Cyber Digital Ty	win		3-0-0-3		
CSE3096	Type of Course: Theory Only	Course	L- I-P- C			
Version No.	1.0					
Course Pre-	CSE2013					
requisites						
Anti-requisites	NIL					
Course Description	This course is designed to imp modeling, optimizing, and to get familiar with the Cyb considerations, Data-Mode Management and Applicati	prove the learn risk manager per digital tw lling Enviror ons.	ners 'Skill D nent approa in-working nment, Digi	Development' by using ach. The course objective is principal, Development ital Twin Optimization, Rist		
Course	The objective of the course is	s to familiarize	e the learne	rs with the concepts of Cyb		
Objective	Digital Twin and attain Emplo	byability throu	ign Participa	ative Learning techniques.		
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 Distance of the course the students shall be able to: 					
Course Content:						
Module 1	Introduction	Assignment	Theory	No. of Classes:0		
Introduction- C principal Techn technology driv	Cyber Digital twin-definition of the second	on-uses and l shadow-bui	benefits-ne lding block	eed for digital twin-workir ts of digital twin-digital tw		
Module 2	Data Modelling Environment	Assignment	Theo	No. of Classes:1		
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	The	ory No. of Classes:1		
Cyber range vs	Cyber range vs digital twin-human behavior modeling in digital twin-optimization using digital					
twin-digital twi simulation and cloud technolog	in and cyber security-Techni digital twin-Machine learn	ques. Techno ing and digit	ologies-Indu al twin-vir	ustrial IOT and Digital Twin tual reality and digital twin		

Module 4	Risk Applica	Management ations	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 simulation- based systems and digital twins: Build, validate, and deploy digital twins. Digital twin models							
		Pr	oject	work/Assignment:			
Project Assignn	nent:						
Text Book 1. Clint B Hacking E: Solutions", 2. Eric D. Implement Mitnick,"	odunger xposed I ,1st Edit Knapp ing Secu The Art o	1, Bryan Singe Industrial Cont ion, ISBN: 978 and Raj Samar urity Controls i of Invisibility"	r, Aar rol S <u>3</u> 3-125 ni," A nto tl .2017	ron Shbeeb, Kyle V ystems: ICS and SC 9589713. pplied Cyber Secur he Modern Power I 7.	Vilhoit, and S CADA Secur rity and the S nfrastructure	Stephen Hilt," ity Secrets & Smart Grid: e ",1st Edition. Kevin	
References				-			
1. Michae Part of the	el E. Aue Lecture	erKalyan Ram Notes in Netw	B. Di orks	igital," Cyber-phys and Systems book	ical System a series".	and Digital Twins -	
2. Nassim Cloud", El	ı Khaed, sevier, 2	Bibin Pattel an 020.	nd Af	ffan Siddiqui," Dev	elopment an	d Deployment on the	
Weblinks:							
3. <u>https:///ogin.aspx%</u> live%26eb	punivers <u>63fdirec</u> v%3dEF	sity.informatics t%3dtrue%26d 3%26ppid%3d	globa b%3 pp_x	al.com/login?qurl= dnlebk%26AN%3c iii	https://searcl 11223875%2	h.ebscohost.com%2fl 26site%3dehost-	
4. https://	www.ud	emy.com/cour	se/dig	gital-twin-a-compre	ehensive-ove	erview/	
Topics releva blocks of digita vs digital tw Employability assessment co	nt to " al twin, in-huma Skills mponer	EMPLOYABI Digital Twin ir in behavior n through Parti it mentioned i	LIT n Mar node cipat n cou	Y SKILLS":Digit nufacturing-Digital ling in digital tw ive Learning tech urse handout.	al thread-dig Twin in Aut vin-optimiza niques. Thi	gital shadow-building omotive, Cyber range tion for developing s is attained through	

Course Code: CSE3094	Course Title:	Cyber Secu	urity					
	Type of Cour	se:1] Discip	oline	L- T-P- C		3 -0-	0-3	
	Elective	_						
		2] Theo	ry Only					
Version No.	1.1		-					
Course Pre-	Fundamenta	Fundamental knowledge in Information Security and Networks						
requisites								
Anti-	NIL							
requisites	This is a d	د میل ما م نا می		acarad	towardo a			
Description	This is a		r program	i geared	towards ge	enerating ar	id enhancing	
Description	awareness	about cybe	er security	/ challeng	es and the	concept of C	yper security	
	and Cyber	Ethics amo	ong the st	akenolde	rs to neip t	nem becom	e responsible	
	Cyber Citiz	ens and p	barticipate	sately a	na securely	/ in the rap	olaly evolving	
	Information	-age socie	ty. . in duider	Natural	. C			
	fine import	tant topics	s include:	Network	security i	nodel, attac	cks, maiware,	
	Trewall, II a	act and Cyr	ber forensi	CS		+ + + +	ta af Caban	
Course		e of the cou	rse is to far	nillarize th brough Po l	e learners wi	th the concep	ts of Cyber	
Objectives	Security and		loyability t	niougii Pa i		arning technic	lues.	
Course Out	On successfu	I completio	on of the co	urse the st	udents shall	be able to:		
Comes	1) Describe	the basic o	concept of	Cyber See	curity [Knov	vledge]		
	2)Classify di	ifferent typ	oes of atta	cks for a s	cenario [Co i	mprehensior	n]	
	3) Prepare a	n mitigation	n policy fo	r security	threat [Con	prehension]	_	
	4) Demonst	rate Cyber	Security t	ools [App	lication]			
Course		-	-		_			
Content:								
					1			
Module 1	Introductio	Quiz	Knowledge	2			10 Sessions	
	n to Cyber							
	Security							
Topics		_						
History of Inter	net, Cyber Cri	me, Informa	ation Securi	ity, Compu	ter Ethics and	Security Polic	cies, Guidelines	
to choose web	browsers, Se	curing web	browser, A	Antivirus, E	imail security	, Guidelines f	or setting up a	
Secure passwo	ord , Cyber Sec	curity Threa	at Landscap	e, Emergir	ng Cyber Sec	urity Threats,	Cyber Security	
lechniques								
Madula 2	[a a u	it. in	Accianmon	t Com			10 Sessions	
iviodule 2	Secur	nty in Jorke	Assignmen	t Com	prenension		10 Sessions	
	Netw	OIKS						
Topics:								
Security in Net	works – Conce	epts, threat	s in Networ	^r k, website	vulnerabilitie	es, man in the	middle attack,	
denial of Servi	ce attack, distr	ibuted den	ial of servic	e attack, F	irewalls – inti	roduction and	design, types	
of firewalls, pe	rsonal firewal	ls, Program	Security – I	non malicio	ous program	errors, malicio	ous program	
Tiaws, virus and	d other malicio	ous code, p	revention o	t virus infe	ction.			
Assignment: P	rogram Securi	ty – non ma		gram error	<u>s</u> .		10.0	
Module 3	Sma	artphone	Assignmer	nt Com	prehension		12 Sessions	
	Seci	urity						

Topics:

Introduction to mobile phones, Smartphone Security, Android Security, IOS Security, Cyber Security Exercise, Cyber Security Incident Handling, Cyber Security Assurance, Guidelines for social media security, Tips and best practices for safer Social Networking ,Basic Security for Windows, User Account Password

Assignment: Social Media Security

		,			
Module 4	Ethical	Issues	inAssignment	Programming/Data	9 Sessions
	Cyber So	ecurity		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-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: Information Security and	L-T- P-	3-0-0-3
CSE2060	Management Type of Course: Theory Only Course	C	
Version No.	1		
Course Pre-	Data Communication and Computer Networks, Inf	ormation	n Security, Database
requisites	Management Systems and Concepts of cryptograph	ny.	
Anti-requisites			

Course Description	The course explores information security through some introductory material and helps gain an appreciation of the scope and context of information security. It includes a brief introduction 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 able to determine and analyze potential career opportunities in this profession.							
Course Objective	The objective of the contribution of the contr	ourse is to fai Management a	niliarize the learners with the and attain Employability throug	e concepts of h Participative				
Course Out Comes	 On 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 Collection/Interpretation	10 Sessions				
Topics: Informat Vulnerabilities a Computer Securi	tion Security Overview, and Exposure (CVE), Se ty Concerns, Information	Threat and A ecurity Attack n Security Mea	Attack Vectors, Types of Atta s, Fundamentals of Informa asures.	cks, Common tion Security,				
Module 2	Fundamentals of Information Security and Data Leakage	Case studies / Case let	Case studies / Case let	13 Sessions				
Topics: Key Ele Characteristics, I Reducing the Ris	ements of Networks, Information States. Wh k of Data Loss, Key Perfo	Logical Elem at is Data Lea ormance Indica	hents of Networks, Critical kage and Statistics, Data Lea tors (KPI), Database Security.	Information kage Threats,				
Module 3	Information Security Policies and Management	Case studies / Case let	Case studies / Case 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 Application & Tools that can be used: An ISMS is a systematic approach to managing sensitive company information so that it remains secure. It includes people, processes and IT systems by applying a risk management process.								
It can help smal The ISO 27000 f	i, medium and large bu family of standards help	sinesses in an os organizatio	y sector keep information as ns keep information assets s	sets secure. ecure.				

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-standards/iso27001.html</u>

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 Code: CSE3102	Course Title: Malware Analysis Type of Course: Discipline Elective in Cyber Security Basket	L-T P- C	3-0-0-3
Version No.	1.0		
Course Pre- requisites	Should Have the knowledge of Cryptography and Net	work Secu	ırity
Anti-requisites	NIL		
Course Description	The purpose of the course is to explore malware analy in depth. Understanding the capabilities of malw organization's ability to derive threat intelligence, r security incidents, and fortify defenses. This co foundation for reverse-engineering malicious softw system and network monitoring utilities, a disassen other tools useful for turning malware inside-out.	sis tools a ware is o respond t ourse bui vare using mbler, a o	nd techniques critical to an o information lds a strong g a variety of lebugger, and

Course Objective	The objective of Malware Analys techniques.	the course is to sis and attain I	familiarize th E mployability	e learners with the o through Participativ	concepts of e Learning
Course OutComes Course Content:	On successful co 1. Understa combated throu 2. Apply th analysis on unkr 3. Analyze combat malware 4. Apply te bypass new anti	ompletion of this anding the natur gh detection and the methodologie nown executable scientific and lo e chniques and co analysis technic	course the st re of malware d classification es and tools to es. gical limitatio oncepts to unp ques in future	udents shall be able , its capabilities, and n. perform static and o ns on society's abilit pack, extract, decrypt malware samples.	to: how it is dynamic y to c, or
Module 1	Introduction to MALWARE ANALYSIS		Assignment	Programming activity	12 Hours

Topics:

Introduction to malware, OS security concepts, malware threats, evolution of malware, malware typesviruses, worms, rootkits, Trojans, bots, spyware, adware, logic bombs, malware analysis, static malware analysis, dynamic malware analysis.

Assignment: Brief study on types of spyware

Module 2Static AnalysisAssignmentProgramming activity11 Ho
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Topics:

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)

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

Malware Functionalit and Detectio Techniques	Assignme	ent 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

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. https://www.geeksforgeeks.org/introduction-to-malware-analysis/

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

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: CSE3009	Course Title: Optimization Techniques for Machine LearningL- T-P-Type of Course: Discipline Elective in Artificial Intelligence and Machine Learning Basket Theory3-0-0-3						
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-offs of numerical accuracy and theoretical and empirical complexity. For the students with some optimization background this course will introduce a variety of applications arising in machine learning and statistics as well as novel optimization methods targeting these applications						
Course	The objective of the course is to familiarize the learners with the concepts						
Objective	of Optimization Techniques for Machine Learning and attain Employability through Problem Solving Methodologies.						
Course	On successful completion of this course the students shall be able to:						
Outcomes	 Describe fundamentals of Machine learning [Knowledge]. Explain Machine learning models [Comprehension]. Discuss Convex optimization models [Comprehension]. Apply Methods for convex optimization [Application]. 						
Course							
Content:							

Module 1:	Fundamentals of Machine learning	Quiz	Knowledge based Quiz	8 Sessions
Topics: Machine	e learning paradigm, empirical	risk minimization, strue	ctural risk minimizati	ion, learning
Module 2:	Machine learning models	Quiz	Comprehension based Quiz	10 Sessions
Topics: logistic low rank matrix f	regression, support vector mag	chines, sparse regression tiple kernel learning.	on, low dimensional	embedding,
Module 3	Convex optimization models	Assignment	Batch-wise Assignments	9 Sessions
Topics: linear	optimization, convex quadra	atic optimization, see	cond order cone o	ptimization,
semidefinite opti	mization, convex composite of	ptimization		
Module 4:	Methods for convex optimization	Assignment and Presentation	Batch-wise Assignment and Presentations	11 Sessions
Topics: gradient gradient methods	descent, Newton method, inter s, coordinate descent, cutting p	ior point methods, acti- lances, stochastic grad	ve set, prox methods, ient.	, accelerated
Project work/As	alloll & Tools that tall of us		01	
Survey on Meth	nods for convex optimization			
Text Book T1. Charu C. A 2020. T2. Sra Suvr Learning", The	Aggarwal, " <i>Linear Algebra ar</i> it, Nowozin Sebastian, and MIT Press,2012.	<i>nd Optimization for Ma</i> Wright Stephen J, " <i>C</i>	achine Learning", Sp Optimization for Mc	ringer, achine
References	I an "First order and Stocka	atio Optimization Mot	hada fan Maahina I a	
Springer Ch	I Lan, First-order and Stochu	sile Oplimization Meir	ioas for machine Lec	irning,
	lam, 2020.			
Web References W1 https://	/sm_nitk vlahs ac in/			
W2 https://	/mntel ac in/courses/			
Topics related to	o development of "EMPLOYA	ABILITY SKILL": C	Convex optimization	models and

Methods for convex optimization, for development of Employability Skills through Participative Learning Techniques. This is attained through assessment components mentioned in course handout.

Course Code:	Course Title: Privacy and Security in IoT		3 -0	0	3
CSE3063	Type of Course: Program Core & Theory	L- T- P-			
	only	С			
Vorsion No	1.0				
version no.	1.0				
Course Pre-	[1] The primary prerequisite is a working knowledge of basic algebraic number				
requisites	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 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 fair knowledge of mathematics and computing. The course develops the critical thinking and analytical skills. The course also enhances the programming abilities through assignments.			
Course 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 Outcomes	 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. 			
Course Content:				
Module 1	Introduction to Elliptic Curves	Quiz	Comprehension based Quizzes and assignments;	15 Classes
Elliptic Curve Cry in Cryptography, Definition of Ellipt (EC),The Abelian (yptosystems (ECC Discrete Logarithr tic curves,General f Group, Operations	C): Introduction to EC ns in Finite Fields, E form of a EC, Weierstr on ECC- Point addition	CC, Method of Diophantus, E Elliptic Curve on a finite se rass Equation, Points on the on, Point doubling.	Elliptic curves t of Integers, Elliptic Curve
Module 2	Elliptic Curve Cryptosystems	Quizzes and assignments	Comprehension based Quizzes and assignments;	15 Classes
Topics: E lliptic Curve Cr Is Elliptic Curve Cr ECC, Example – Ell ECC Diffie-Hellma Signature Algorith	Topics: E lliptic Curve Cryptosystems (ECC): Public-Key Cryptosystems, Public-Key Cryptography, What Is Elliptic Curve Cryptography (ECC)?,Using Elliptic Curves In Cryptography, Generic Procedures of ECC, Example – Elliptic Curve Cryptosystem Analog to El Gamal, Diffie-Hellman (DH) Key Exchange, ECC Diffie-Hellman, Example – Elliptic Curve Diffie-Hellman Exchange, Elliptic Curve Digital Signature Algorithm (ECDSA) Why use ECC?, Security of ECC, Applications of ECC, Benefits of ECC.			
Module 3	IOT Protocols	projects with presentation	Project implementations in software, batch wise presentations	10 Classes
Topics: IoT Communication model and Protocols : Communication/Transport Protocols: Bluetooth. Data Protocols: Message Queue Telemetry 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 stu Google, and impl Project Assignme	adents (self-selec ement with the n ent:	ted batch mates) with the set of	NIST /SECP curves	searching on

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 Security in Online Social Media Type of Course: Program Core & Theory Only	L-T-P- C	3	0	0	3
Version No.	1.0	1			I	
Course Pre- requisites	Basic of Network security and crypto	ography.				
Anti-requisites	NIL					
Course Description	Objective of this course is to make students learn the basics of privacy an 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 both conceptual and analytical in nature that would help the student to predice the effects of any activity on Social Media. The students should have price 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.		cy and rtance urse is predict prior of the om the			
Course Objective	The objective of the course is to fami of Privacy and Security in Online So through Participative Learning techn	liarize th cial Med iques.	ie learners l ia and atta	with the co ain Employ a	oncepts ability	

Course Out Comes	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. [Application]			
Course Content:	11			
Module 1	ANALYSIS OF PRIVACY IN SOCIAL NETWORKS	Assignment	Knowledge	8 Sessions
Topics: Three-Layered Frame Social Web Users-Pri Identifiable Facets-P Assignment: Find rea	ework-Characteristics Used t vacy Issues Related to Servio rivate Facets. al world problems and sugge	o Analyze Social ce Providers-Sect est solutions.	Web Privacy-Privacy urity and Privacy for E	Issues Related to Digital Facets-

	ENCRYPTION FOR PEER-		Comprehension		
Module 2	TO-PEER SOCIAL	Assignment		8 Sessions	
	NETWORKS				
Topics:					
Essential Crit	eria for the P2P Encryption S	systems-Existing P2P OSN	I Architectures-Evaluat	ions of	
Existing Encry	yption Schemes Based on Οι	ır Criteria-Broadcast Encr	yption-Predicate Encry	yption.	
Assignment	: - Survey of Unethical Behav	ior and Influencing facto	rs.		
Module 3	STEALING REALITY AND K- ANONYMITY	Quiz	Comprehension	11 Sessions	
Topics:					
Stealing Real	ity- Social Attack Model- Soc	ial Learnability- k-Anonyr	nity- k-Degree Anonym	nity- k-	
Neighborhoo	d				
Anonymity- k	- Automorphism- k-Isomorp	hism-L-diversity- Attack N	Nodel and Privacy Gua	rantee-	
Insights from	an ℓ-Diversified Graph.				
	PRIVACY IN SOCIAL		Application		
	NETWORKS- LINKS	Assignment/Case		11 Sections	
would 4	RECONSTRUCTION	study		II Sessions	
	ATTACK				
Privacy in So	Privacy in Social Networks- Link Prediction- Feature Extraction- Communities Datasets- Electronic				
Currencies- A	nonymity- The Bit coin Syste	em- The Transaction Netv	vork- The User Networ	k- Anonymity	
Analysis- Inte	grating Off-Network Informa	ation. Use Case and the T	hreat Model- Use Case	e for Private	
Record Linka	ge- Use Case for Privacy-Pres	erving Record Linkage-			
Assignment: - The Bit coin Faucet- Voluntary Disclosures- TCP/IP Layer Information- Context Discovery-					
Flow and Ten	nporal 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%20Onl ine%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 Code:	Course Title: Software Project Management	трс	3-0 -0-3
CSE 2028	Type of Course: Theory Only Course	L-1- P- C	
Version No.	1		
Course Pre- requisites	Basics of Programming		
Anti-requisites			
Course Description	Effective software project management is cru- development or maintenance project. The role manager is numerous and varied. However, classified in to the project planning and monit planning involves making cost, effort, and c various types of plans such as schedule, management, quality management. Staffing pl activities encompass keeping track of progres techniques such as PERT, GANTT, and also building etc.	cial to the es and respo at the bro oring and o luration es configurat an etc. The ss and rem effective r	success of any software onsibilities of the project oad level, these can be control activities. Project timation and preparing tion management, risk e monitoring and control oving bottlenecks using isk management, team
Course Objective	The objective of the course is to familiarize	e the lear	ners with the concepts
	of Software Project Management and attain E	mployabili	ty through Participative
	Learning techniques.		

	On successful completion Understand the di 	of the course the fferent project co	e students shall be a ontexts and appropriate	ble to: riate management
	strategy.		and abb. ch.	
Course Out Comes	 Practice the role of professional ethics in successful software development. 			
	 Identify the key ph Determine an app 	lases of project m propriate project	ianagement. : management appi	roach through an
	evaluation of the busir	ness context and s	scope of the project.	
Course Content:				
Module 1	Conventional & Modern Software Management	Assignment	Case studies	9 Sessions
Topics:				
Waterfall Model, Cor	nventional Software Manag	ement Performa	nce; Evolution of Sof	tware Economics -
Software economics	, Pragmatic software cost	estimation, Redu	cing software produ	ct size, Improving
software processes.	Principles of Conventional	Software Engine	eering, Principles of	Modern Software
Management, Transi	tioning to an interactive Pro	ocess.		
Module 2	Software Management Process Framework	Case studies / Case let	Case studies	9 Sessions
Topics:				
Life cycle phases, The	e artifact sets, Managemen	t artifacts, Engine	eering artifacts, Prag	matic artifacts;
ModelBased Softwar	e Architectures - A manage	ement perspective	e and A technical per	rspective.
Module 3	Project Organization and Planning	Quiz	Case studies	10 Sessions
Topics:				
Work breakdown st	ructures, Planning guideli	nes, The cost a	nd schedule estima	ting process, The
iteration planning p	rocess, Pragmatic planning	, Line-of-Busines	s organizations, Proj	ect organizations,
Evolution of organiza	tions; Process automation	- Automation buil	ding blocks, The proj	ect environment.
Module 4	Project Control and Process Instrumentation	Quiz	Case studies	10 Sessions
Topics:				
PROJECT CONTROL	AND PROCESS INSTRUM	IENTATION :The	Seven-Core metri	ics, Management
indicators, Quality in	dicators, Life-Cycle expecta	itions, Pragmatic	software metrics, M	etrics automation,
Modern project prof	iles, Next generation softw	are economics, N	lodern process trans	itions.
Targeted Application	i & Tools that can be used:			
	Project w	ork/Assignment:		
Assignment:				
Text Book				
T1. Walker Royce Pearson Education. 2	, "Software Project Manage 021	ement : A unified	Framework", 1st Edi	tion,

References	
R1. Bob Hughes an	d Mike Cotterell, "Software Project Management", 3rd Edition, Tata McGraw Hill
Edition, 2005.	
R2. Joel Henry, "So	ftware Project Management", 1st Edition, Pearson Education, 2006.
E book link T1:	
https://www.edute	chlearners.com/download/Software%20Project%20Management.pdf
Web resources: bt	ths://onlinecourses.nntel.ac.in/noc19_cs70/nreview
brarv	tips://onimecourses.nptende.n/noers_es/o/preview
resources: https://	presiuniv.knimbus.com/user#/searchresult?searchId=eBook&curPage=0&layout=g
rid&sortFieldId=doc	title_str&topresult=false&content=*software%20project%20management*⊂
category name=Co	mputer%20Science%20and%20IT
Topics relevant to de	evelopment of "EMPLOYABILITY SKILLS": Life cycle Phases, Seven Core Metrics, for
development of Em	ployability Skills through the Participative Learning Techniques. This is attained
through the assessm	ent components mentioned in the course handout.
Catalogue prepared	Mr. Sunil Sahoo
by	
Recommended by	(BOS NO: SOCSE1st. BOS held on 22 / 12 / 2022)
the Board of	
Studies on	
Date of Approval by	(Academic Council Meeting No.20.3 , Dated 15 /02 /23)
the Academic	
Council	

Course Code:	Course Title: Network Programming	L-T-P-C	0 -0-4-2	
Version No.	2.0			
Course Pre-requisites	language			
Anti-requisites	NIL	JIL		
Course Description	Network Programming intends to explore the opportunities for developing, maintaining and supporting distributed and network applications. The Course covers the basics of computer networks to designing and implementing networks.			
Course Objective	The objective of the course is to familiarize Network Programming and attain EXPERIENTIAL LEARNING techniques	e the learne SKILL DE	ers with the concepts of VELOPMENT through	
Course Outcomes	On successful completion of this laboratory based course the students wi be able to: 1. Outline the basic network troubleshooting commands in windows/Linux.			

	 Configure various networks using cisco packet tracer tool. Demonstrate the working of client-server TCP/IP socket programming. Demonstrate the usage of Wireshark tool in networking. Simulate networking scenarios using NS2 simulator. 					
Course Content:						
List of Laboratory Tasks						
Task 1: Troubleshoot us	ing network DOS command					
Task 2: Demonstration of	of Cisco Packet Tracer Tool					
2.1: Introductio	n to Cisco Packet Tracer					
2.2: User interfa	ace and simulation view					
2.3: Configure u	ser name and password for the three modes in router					
2.4: Configure the DHC	CP Server using 2 wireless router					
2.5: Configure the TEL	NET Service for 2 different network					
2.6: Demonstrate the s	2.6: Demonstrate the static routing with multiple networks using serial port and interface					
2.7: Demonstrate the RIP routing with multiple networks using serial port and interface						
2.8: Configure the Static and dynamic NAT for private network						
Task 3: Demonstrate the working of client-server TCP/IP socket programming						
Task 4: Demonstrate the Wireshark tool Usage						
Task 5: Demonstration	of Network Simulator Version 2					
Targeted Application & Simulate networking sco Demonstrate the usage of Practice the simulation-	Tools that can be used: enarios using Cisco Packet Tracer. of Wireshark tool in networking. based network performance evaluation techniques using NS2.					
Textbooks:	1					
1. Behrouz A. Forouza Hill, 2017.	an, Data Communications and Networking 5E, 5th Edition, Tata McGraw-					
References						
R1. "Network Simulati	on Lab Manual" Presidency University.					
E-Resource						
<u>18 Most Popular Net</u>	twork Simulation Software Tools in 2022 (networkstraining.com)					
Virtual Labs (vlab.co	<u>o.in)</u>					
NPTEL course- Con	uputer Networks and Internet Protocol - Course (notel.ac.in)					
By Prof. Soumy https://puniversity	/a Kanti Ghosh, Prof. Sandip Chakraborty IIT Kharagpur .informaticsglobal.com/login Or <u>http://182.72.188.193/</u>					
Topics relevant to "SKIL	L DEVELOPMENT": Troubleshoot using network DOS command,					
Demonstration of Cisc	co Packet Tracer Tool for Skill Development through Experiential					
Learning techniques.	This is attained through assessment component mentioned in course					
Course Code:	Course Title: Problem	m Solving using	JAVA	L- T-P- C	2-3	
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CSE1001	Type of Course: Integ	grated				
Version No.	2.0	1 1 1				
Course Pre-	Basic Programming	g knowledge.				
requisites						
Anti-requisites	NIL	.1				
Course Description	course has theory a implementation and helps the student t concepts and also understand the need	ces the core co nd lab compor l application o to build real t for effective p l for object ori	ncepts of objection ent which en f object-orien ime secure a roblem solvi ented program	nphasizes on nted program applications ng. The stuc nming to bui	understanding the ming paradigm. It by applying these lents interpret and ild applications.	
Course Objective	The objective of the Problem-Solving us EXPERIENTIAL LEAR	e course is to sing JAVA ar NING technique	familiarize the nd attain S s	e learners wi SKILL DEVEL	ith the concepts of .OPMENT through	
Course Out Comes	 On successful completion of the course the students shall be able to: C.O. 1: Describe the basic programming concepts. [Knowledge] C.O. 2: Apply the concept of classes, objects and methods to solve problems. [Application] C.O. 3: Apply the concept of arrays and strings. [Application] C.O. 4: Implement inheritance and polymorphism building secure applications. [Application] C.O. 5: Apply the concepts of interface and error handling mechanism. 					
Course Content:						
Module 1	Basic Concepts of Programming and Java	Assignment	Data Collectio	n/Interpretat	ion 12 Sessions	
Topics: Introducti	on to Principles of	Programming:	Process of F	Problem Solv	ving, Java program	
structure, Downlo	oad Eclipse IDE to r	un Java progra	ms, Sample p	orogram, Data	a types, Identifiers,	
Variables, Const	ants in java, Opera	ators, Assignm	ents and Ex	pression, Ba	asic Input/ Output	
functions, Contro	ol Statements: Brand	hing and Loop	oing.			
Module 2	Classes, objects, methods and Constructors	Case studies / Case let	Case stud	lies / Case let	12 Sessions	
Topics: Classes,	Objects and Metho	ds: Introductio	on to object (Oriented Prin	nciples, defining a	
class, adding dat	a members and me	thods to the c	lass, access s	pecifiers, ins	stantiating objects,	
reference variable	e, accessing class m	embers and m	ethods.			
Static Polymorph	ism: Method overlo	ading, constru	ctors, constru	ctor overload	ding, this keyword,	
static keyword, N	lested classes, Acce	ssing members	in nested cla	asses.		
Module 3	Arrays, String and String buffer	Quiz	Case stud	lies / Case let	14 Sessions	
Topics: Arrays: D	efining an Array, In	nitializing & A	ccessing Arr	ay, Multi –I	Dimensional Array,	
Array of objects.	String: Creation &	Operation. Str	ing builder cl	<u>ass, metho</u> ds	s in String Buffer <mark>.</mark>	
Module 4	Inheritance and Polymorphism	Quiz	Case stud let	ies / Case 14	4 Sessions	

Topics: Inheritance: Defining a subclass, Types of Inheritance, super keyword. Dynamic Polymorphism: Method overriding. Final keyword: with data members, with member functions and with class. Abstract keyword: with data members, with member functions and with class, Exception handling.

Module 5	Input & Output Operation in Java	Quiz	Case studies / Case let	14 Sessions				

Input/output Operation in Java(java.io Package), Streams and the new I/O Capabilities, Understanding Streams, working with File Object, File I/O Basics, Reading and Writing to Files, Buffer and Buffer Management, Read/Write Operations with File Channel, Serializing Objects, Observer and Observable Interfaces.

List of Laboratory Tasks:

- P1 Problem Solving using Basic Concepts.
- P2 Problem Solving using Basic Concepts and Command Line Arguments.
- P3 Programming assignment with class, objects, methods and Constructors.
- 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", PearsonR2: 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> 1.pdf

E book link R2: <u>Java(tm) Design Patterns: A Tutorial([PDF] [7qmsenjl97t0] (vdoc.pub)</u>

Web **resources**

bs://youtube.com/playlist?list=PLuOW_9III9agS67Uits0UnJyrYiXhDS6q 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.

for **Skill Development** through **Experiential Learning** techniques. This is attained through assessment component mentioned in course handout.

Course Code:	Course Title: Digit	al and Mobile						
CSE3099	Forensics			L- T-P- C	2	0	2	3
	Type of Course: In	tegrated						
Version No.	1.0							
Course Pre-	Data Communicatio	ons and Compu	ter Networl	ks (CSE31	155)			
requisites								
Anti-	Nil							
requisites								
Course Description	Inis course demonstrates the use of Mobile phones and digital devices across the globe has increased dramatically. These devices are more susceptible to information security attacks and thus they also possess huge evidences which shall be used during crime scene investigation. This makes the Course on mobile and digital forensics an inevitable one for the security professionals. This Course on mobile and digital forensics will provide a better understanding on different forms of evidences in many digital devices, collection and interpretation 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.							
Course Objective	The objective of the course is to familiarize the learners with the concepts of Database Management Systems and attain EMPLOYABILITY SKILLS through PARTICIPATIVE Learning techniques							
Course Outcomes	On successful completion of this course the students shall be able to: CO 1: Outline the basic concepts of Cybercrime and digital Forensics. (Remember) CO 2: Employ various digital Forensic tools to perform Forensic investigation (Apply) CO 3: Interpret security challenges and Forensic examination process of wireless devices. (Understand) CO 4: Produce digital evidence through the usage of mobile device Forensic tools							
Course Content:								
Module 1	Cybercrime and Digital Forensic Principles	Assignment	Cybercrim	e Bloon leve selecte Remen	n's l ed: iber	ions - L[07] + P[06]
Cyberc cyberc on Cyb Overvi Potent	rime: Definition, N rime, Investigating (er Crimes. ew of Digital Foren ial of Digital Devices	ature and Sco Cybercrime, Di Isics: Phases o 5, closed and o	pe of Cybe gital Evider f Digital For pen system	rcrime, T nce, Prevo rensics, D s.	ypes of cyber ention of cyber Digital devices	crime, C ercrime, in societ	Categorie Case stu ty, Evide	es of idies ntial

Module	e 2	Digital Forensics examination process	Case Studies	Digital Evidence	Bloom's level selected: Apply	16 Sessio	ons - L[08] + P[08]	
	Langua challer Digital locatio	age of Computer nging aspects of dig forensics examinat ns, A seven-elemer	crime invest ital evidence, j tion principles it security mod	igation, prep presenting dig : Previewing, del.	baring a D gital evidend Imaging, Co	igital Fore ce, Device u ontinuity an	nsics Investigation, usage. Id hashing, Evidence	
Module	e 3	Wireless technologies and Wireless threats	Certification	GSM, Paraben's Cell Seizure	Bloom's level selected: Understand	15 Sessi	ons - L[07] +P[08]	
	Overvi War-Cł Cell Ph	ew of Modern Wire nalking, War Flying, one Forensics, Fore	eless Technolo Voice SMS, GS ensic Rules for	ogy: Wireless 5M and Identif Cellular Phon	Crime Preve fication, Cell es.	ntion Techi Phone Had	niques, War-Driving, cking and Phreaking,	
Module	e 4	Mobile phone Forensics	Presentation	Forensic Tool	S	Bloom's level selected: Understand	16 Sessions - L[08]]+P[08]	
	Import Mobile SIM Ca Mobile	ance and Motivat Phones, Evidence, ard, SMS Spam, Mo Devices.	ion behind N Forensic Proc bbile Phone Fc	1obile Forens edures of mo prensics Tools	sics, Mobile bile phones and Metho	e Phone Fc , The SIM C ods, Social	orensics: Crime and Card, Files Present in Media Forensics on	
	Targeto • •	ed Application & To Wireless Security Digital Forensics Android Forensics	ools that can b	e used:				
	Textbo T1: Green	ooks: egory Kipper, "Wire , September 19, 20	less Crime and 19.	d Forensic Inve	estigation",	Auerbach P	Publications, 1st	
	 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 re https:/ Topics	eferences: /presiuniv.knimbus relevant to "Emplo	.com/user#/h	<u>ome</u>				
	1. 2. 3. 4. for dev throug	Prevention of cyb preparing a Digita Mobile Phone For Mobile Phone For reloping Employabil h assessment comp	ercrime l Forensics Inv ensics: Crime ensics Tools ity Skills throu ponent mentio	restigation and Mobile P ugh Participati ned in course	hones. ve Learning handout.	technique	s. This is attained	

					1			
Course Code:	Course Title:	Mobile Applicati	on for IoT	L-T-P-C	3-0-0-3			
CSE3066	Type of Cours	e: Program Core	& Theory					
	Only							
Version No.	1.0							
Course Pre-requisites	NIL							
Anti-requisites	NIL							
Course Description	Mobile Applic which helps in The purpose understand th Design Const course is both help the stude while carrying	Vobile Application is the essential part for IoT infrastructure, which helps in understanding the architectural overview of IOT. The purpose of this course is to expose the students to understand the IoT Reference Architecture and Real World Design Constraints along with various IOT protocols. This course is both conceptual and analytical in nature that would help the student to predict the effects of forces and its motion while carrying out creative design functions.						
Course Objective	The objective of Mobile and 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	I completion of th	ne course th	e student	s shall be able to:			
		 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	Progra	imming Ta	ask 9 Sessions			
Topics:								
IoT-An Architectura capabilities, An IoT Fundamentals- Devices processes in IoT, Everyth Assignment: Case stud	I Overview Buildir architecture outlin and gateways, Loc ning as a Service(Xa	ng an architectune, standards co al and wide area aS), M2M and IoT esses in IoT.	re, Main c nsideration networking Analytics, I	lesign pr s. M2M g, Data m Knowledg	inciples and needed and IoT Technology anagement, Business e Management			
	, , ,			/=				
iviodule 2	Basic Design	Assignment	Data Colle	ction/Exc	ei 10 Sessions			
Topics: Introduction Basics of embedded systems design Embedded OS - Design constraints for mobile applications, both hardware and software related Architecting mobile applications user interfaces for mobile applications touch events and gestures Achieving quality constraints performance, usability, security, availability and modifiability.								
Assignment: Recent trends in mobile application development								

Module 3	IOT mobile apps	Assignment	Programming/Data analysis task	9 Sessions
Topics: IOT Mobile App Devel of IOT - UX / UI desig practice tips on desigr	opment Trends In 20 n for IoT Mobile app n for IoT mobile apps	20 - Role of Mob s - challenges of IoT App Design S	ile Apps in revolutionizing t UX/UI design for IoT appli olutions	he world cations -
Assignment: Challeng	es faced during mobi	le application dev	velopment	
Module 4	TECHNOLOGY I- ANDROID	Assignment	Programming/Data analysis task	10 Sessions
Introduction Establisl views Interacting with server side application applications.	hing the developme UI Persisting data usi ons Using Google N	nt environment ng SQLite Packagi 1aps, GPS and \	Android architecture Activing and deployment Interac Nifi Integration with socia	ties and tion with al media
Targeted Protocols 8 Bluetooth, ZigBee,	Tools that can be u LoRa, NBIoT, WiFi	sed: , and Thread		
T1: "From intelligen T2: Jeff M Wrox, 20:	ce", 1st edition, Acade IcWherter and Scott 12	e to the internet o emic press, 2014. Gowell, "Professio	onal Mobile Application De	e new age of velopment",
References R1: Bernd Scholz R2: Andrea Golds Weblinks:	3-642-19156-5 e-IS smith, "Android in pra	SBN 978-3- 642-1 actice," Cambridg	9157-2, Springer e University Press, 2005	
W1: <u>http</u> W2: <u>http</u> <u>trends-to</u> W3: <u>http</u> %2flogin	os://relevant.software os://medium.com/@i o-expect-in-2020-7fd s://puniversity.inforn	e/blog/mobile-iot ts.mattfitzgerald/ 7718155dc naticsglobal.com/ ue%26db%3dnle	<u>t-apps/</u> /top-14-iot-mobile-app-dev /login?qurl=https://search.e bk%26AN%3d1223875%26	elopment- ebscohost.com site%3dehost-
<u>%2520liv</u>	/e%26ebv%3dEB%26	ppid%3dpp_xiii		
Topics relevant to " Wifi integration an Participative Lear mentioned in the cou	SKILL DEVELO ad social media a ning Techniques. arse handout.	PMENT": malysis for de This is attaine	veloping Skill Develop ed through the assessme	ment throug ent componen

Course	Course Title: Wireless communication in		
Code:	IOT	LTRC	3 -0-0-3
CSE3055	Type of Course: Program Core& Theory	L-1-P-C	
	Only		

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						
Course Out Comes	On successful co	ompletion of the c	ourse the students shall be	able to:			
	 To understand the fundamentals of wireless networks Analyze the standards of IoT which employed for wireless networks Explain the use of various wireless technologies in IoT Design and develop various applications of IoT 						
Course Content:							
Module 1	Cellular standards	Assignment	Programming Task	9 Sessions			
Cellular carriers and Picocells, Handoff, 1st, 2nd, 3rd ar IP, WCDMA Assignment: Case study of	Frequencies, Chand 4th Generation	nnel allocation, (Cellular Systems (Iular systems.	Cell coverage, Cell Splittin GSM, CDMA, GPRS, EDGE,U	g, Microcells, MTS), Mobile			
Module 2	Radio Frequency (RF) Fundamentals	Assignment	Data Collection/Excel	10 Sessions			
Topics: Introduction to RF & Wir Communication Standard of RF Environment, Proto affecting network rang differences between phys Assignment: Determina	eless Communica ds, Understanding ocol Analysis of R e and speed, E sical layers- OFDN tion of RF and Mi	tions Systems, RF g RF & Microwave F Environment, U Environment, Line 1. crowave spectral A	and Microwave Spectral Ar Specifications. Spectrum A nits of RF measurements, F e-of-sight, Interference, De Analysis	nalysis, nalysis Factors efining			
Module 3	WLAN: Wi-Fi Organizations	Assignment	Programming/Data analysis	9 Sessions			
Topics:			เสรห				

Assignment: Protocols on WLAN connectivity Module 4 Wi-Fi Hardware Assignment Programming/Data & Software analysis Set							
			task				
Topics:							
Access Points, WLAN connect Aps, PoE Infra	Routers, WLAN Bridg astructure, Endpoint	es, WLAN Repeate , Client hardware a	ers, Direct-connect Aps, Disti and software, Wi-Fi Applicat	tions			
Targeted Protocols 8 Bluetooth, ZigBee,	Tools that can be u LoRa, NBIoT, WiF	sed: i, and Thread					
T1: Wireless Education Pt T2: Wireless Pte. Ltd.	Communications – F e. Ltd. Communications an	Principles and Prac d Networking; By:	ctice; by Theodore S Rappap Stallings, William; Pearson	oort, Pearson Education			
References R1:Bluetooth Rev Ltd., Delhi 4. R2:V R3: Andrea Golds Weblinks: W1: https://pian W2: https://behr	vealed; By: Miller, Br Wilson , "Sensor Tecl smith, "Wireless Con alytix.com/wireless- tech.com/blog/6-lea	ent A, Bisdikian, Cl hnology hand bool nmunications," Car communication-pr ading-types-of-iot-	hatschik; Addison Wesley Lo k," Elsevier publications 200 mbridge University Press, 20 rotocols-in-iot/ wireless-tech-and-their-bes	ongman Pte 15. 5. 005 : t-use-cases/			
Topics relevant to " GSM, CDMA for Techniques. This is handout.	SKILL DEVELO developing Ski s attained through	PMENT": Ill Developmen the assessment	t through Participativ component mentioned i	e Learning n the course			

Course Code:	Course Title:				
CSE 3053	Big Data Analytics for IoT				
		L- P- C	1	4	3
	Type of Course: Program Core				
	Theory with embedded lab				
Version No.	1.0				
Course Pre-					
requisites					
Anti-requisites	NIL				
Course	The course covers basic concepts for IOT Analytics,	collectio	on of d	lata f	or IOT,
Description	Integration of IOT with Cloud, Big Data Environm	nents. S	tuden	ts ca	n learn
	about applying geospatial analytics and applying ma	chine le	arning	g to t	he IOT
	data. The course also covers the organization of the	IOT dat	a, cos	t ben	efits of
	using IOT and review of IOT in various sectors.				

Course Objective	The objective of the course is to familiarize the learners with the concepts of Big Data Analytics for IoT and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING techniques.							
Course Outcomes	On successful completion of the course the students shall be able to: CO1: Demonstrate IOT Data Analytics and machine learning application in IOT (Apply)							
	CO2: <i>I</i>	202: Apply appropriate Hadoop Ecosystem tools to perform data analytics for a						
	given p	roblem (Apply) Examine concer) hts of cloud	based IO	T Big data and	I IOT (An	nlv)	
	CO4: I	llustrate techniq	ues and stra	itegies for	data collection	and Geos	patial Analytics	
	to IOT	Data (Apply)		U		1	5	
Course Content:								
Module 1	IOT A1	nalytics	Assignme	nt			5 sessions	
Introduction – IO	Γ Data, C	Challenges of IOT	analytics A	pplications	s – IOT analytic	s Lifecycle	and Techniques.	
IOT Cloud and Bi	g Data I	ntegration – Clou	id based IO	T platform	– Data Analyti	cs for IOT,	IOT devices in	
different domains.	IOT Ana	lytics for the Clou	ıd.					
Module 2		p Ecosystem					5 sessions	
Introduction Rig	1001S	Rig Data Analyti	as Hadoon	Foosystem	Hadoon Dist	ributed File	System (HDES)	
– MapReduce – YA	ARN Arc	hitecture – PIG A	Architecture	– Apache I	HIVE – Mahout	- Apache S	Spark – Apache	
HBase – Apache Zo	okeeper.			1		1	1 1	
Modulo 3	Overvi	ew of AWS	Assignmo	nt			5 cossions	
Wibuule 5	and Tl	ningworx	Assignme	III			5 565510115	
AWS overview - A environment.	WS key	services for IOT	analytics. Th	ningworx o	verview. Creatii	ng an AWS	Cloud Analytics	
Module 4		Geospatial An IOT Data	alytics to	Case Stu	dy	Data Co Analysis	ollection and	
Strategies and Tech storage for Geospat	nniques i zial.	in Data collection	: Designing	data proce	essing for analy	tics – Appl	ying big data to	
List of Practical T	asks [.]							
Experiment 1:[M	odule 1	1						
Level 1: In	stallatio	n of Raspbian O	S,working l	basic com	mands on rasp	berry pi		
Level 2: De	emonsti	ate to obtain th	e temperat	ure using	DHT22 sensor	S.		
Experiment 2: [N	/lodule :	1]						
Level 1: D	esign ai	nd Simulate the	e RADAR S'	YSTEM Us	sing Arduino a	ind display	on the serial	
monitor using	ultraso	nic sensor/PIR V	VITH & WIT	H OUT BU	ZZER/Servo m	otor		
Level 2: us	ing a ra	spberry pi to D	emonstrate	e to find t	he distance us	sing ultrase	onic sensor hc-	
sr04								
Experiment 3: [N	lodule 1	1						
Level 1 : usi	ng a ras	pberry pi Set th	e connectio	ons of hea	Ithcare sensor	S		
Level 2: usir	ng a rasp	berry pi to Den	nonstrate to	o find the	ECG, Temperat	ture, etc us	ing Healthcare	
sensors								
Experiment 4: [N	iodule 2		المعالمة المعام					
Level 1: Had			Installation		LU			
Lever 2: F		viulupie node clus	ster installati	on, windov	vs installation			
LAVEL 1. Baci	c hadoo	-I In commands ar	d Word co	unt analy	sis for given de	itaset		
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:**

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: <u>https://onlinecourses.nptel.ac.in/noc20_cs92/preview</u>

W2. Coursera: https://www.coursera.org/learn/big-data-introduction

W3. EDX: <u>https://www.edx.org/course/big-data-fundamentals</u>

W4. E-book Link : https://www.wiley.com /en-us/Internet+of+Things+and+ Data+ Analytics + Handbook -p-9781119173625

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

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	o Fog Computing e Elective	g L- T-P- C	3 -0-0-3					
Version No.	1.0			<u> </u>					
Course Pre- requisites	NIL								
Anti-requisites	NIL								
Course Description	The course will provide a solid base for understanding the challenges and problems underlying the design and development of fog computing systems and applications. Thus, this course will teach how to specify, design, program, analyze and implement such systems and applications. Fog computing is a decentralized computing infrastructure in which data, compute, storage and applications are located somewhere between the data source and the cloud. Like edge computing, fog computing brings the advantages and power of the cloud closer to where data is created and acted upon. Many people use the terms fog computing and edge computing interchangeably because both involve bringing intelligence and processing closer to where the data is created. This is often done to improve efficiency, though it might also be done for security and compliance reasons.								
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Introduction to Fog Computing and attain SKILL DEVELOPMENT through Problem Solving to shpigues								
Course Out Comes	 On successful completion of this course the students shall be able to: 1. Understand the basic principles and concepts of fog computing systems and their relation to other models such as Cloud Computing and Near-Far computing. 2. Understand the challenges of developing fog based applications and middleware, and the possible solutions. 3. Specifically, understand the issues mostly related to fog computing, namely: introduction to the fog programming model and related models, security, offloading, Software Defined Network, load balancing, communication, containers and orchestration, application areas. 4. Able to decide which is the best approach for a particular problem regarding the design and development of a fog computing system. 5. Able to design and implement an application using containers. 6. Able to measure and analyze the performance of a fog computing 								
Course Content:									
Module 1	INTRODUCTION TO FOG COMPUTING	Assignment ac	rogramming ctivity	11 Sessions					
Topics: Fog Computing, Cha Internet of Things-P Fog Computing and	aracteristics, Application Scen ros and Cons-Myths of Fog Con Edge Computing-IoT , FOG, Clo	aarios, Issues and mputing -Need an oudBenefits.	l challenges. d Reasons foi	Fog Computing, Fog Computing					
Module 2	ARCHITECTURE	Assignment Pr	rogramming ctivity	10 Sessions					
Topics:									

Communication and Network Model, Programming Models, Fog Architecture for smart cities, healthcare and vehicles. Fog Computing Communication Technologies: Introduction ,IEEE 802.11,4G,5G standards, WPAN, Short-Range Technologies, LPWAN and other medium and Long-Range

Technologies.

FOG PROTOCOLS Module 3 COMMUNICATIO TECHNOLOGIES	S AND N Assignment	Programming activity	10 Sessions
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Topics:

Fog Protocol-Fog Kit- Proximity Detection Protocols- DDS/RTPS computing protocols, Introduction ,IEEE 802.11,4G,5G standards, WPAN, Short-Range Technologies, LPWAN and other medium and Long-Range

Module 4 MANAGEMENT	Assignment	Programming	11
AND ORCHESTRATION		activity	Sessions

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 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.

Topics:

Fog computing requirements when applied to IoT: Scalability,Interoperability,Fog-IoT: architectural model, Challenges on IoT Stack Model via TCP/IP Architecture, DataManagement,filtering,EventManagement,DeviceManagement,cloudification,virualization, security and privacy issues. Integrating IoT,Fog, Cloud Infrastructures: Methodology, Integrated C2F2T Literature by Modeling Technique re by Use-Case Scenarios, Integrated C2F2T Literature by Metrics.

Targeted Application & Tools that can be used: Case Study: Wind Farm - Smart Traffic Light 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 Distributed Computing) by RajkumarBuyya and Satish Narayana Srirama.

3. Sensors, Cloud, and Fog: The Enabling Technologies for the Internet of Things Paperback by 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 Distributed Computing) by RajkumarBuyya and Satish Narayana Srirama. Fog and Edge Computing: Principles and Paradigms | Wiley Sensors, Cloud, and Fog: The Enabling Technologies for the Internet of Things Paperback by SudipMisra , Subhadeep Sarkar , Subarna Chatterjee.

<u>Sensors, Cloud, and Fog: The Enabling Technologies for the Internet of (routledge.com)</u>

References

1. FlavioBonomi, Rodolfo Milito, Jiang Zhu, SateeshAddepalli, —Fog Computing and Its Role in the Internet of Things∥, 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 Edge∥, 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.

Course Code:	Course Title:
CSE3046	DevOps Tools And Internals
	Type of Course:
	Theory & Integrated Laboratory
Version No.	1.2
Course Pre-	Fundamentals of Devops
requisites	
Anti-	NIL
requisites	
Course	This course is designed to offer profound perceptions and knowledge in
Description	various tools like Git, Ansible, Selenium and Jekins. With the proficient learning
	of DevOps course, a student will be able to work in all the above tools and
	become a trained practitioner in the integration and monitoring of software.
	DevOps Tool is an application that helps the software development
	process to industrialize. It mainly focuses on communication and collaboration
	between product management, software development, and operations
	professionals. The objective of this course is to discuss and implement the
	various tools usage and internals practically.

Course Objective	The objective of of DevOj Experiential Learn	the course is to ps Tools And Int ing techniques.	familiarize e rnals and	the learners with the attain Skill Developmen	concepts I t through
Course Out Comes	On successful co 1] Apply the fea workflow. 2] Practice the data used by Ans	mpletion of this co atures and common [Applicati filters and plugins sible Playbooks.	ourse the stud n Git on] to populate,	dents shall be able to: , manipulate, and mana [Ap	ge plication
] 3] Compute the IDE. 4] Interpret the]	e features of seleni [Applica installation and fea	um ation] atures of Jen	kins and build jobs. [Ap	plication
Course Contont:					
Module 1	Git		Quiz	Quiz on Git commands	5L +4P Classes
Topics: Introduction to Windows/Linu: repositories, Ri life cycle, Worl	Git, Features of x and Environme unning first Git co king locally with s	Git, Benefits, Wor nt set up, All Git ommand, Fundame staging, unstaging	kflow, Git v Commands- ntals of Repo and commit.	s GitHub, Installation Working with local an ository structure and fil	of Git on d remote le status
Module 2	Containerization Docker	Using	Quiz	Quiz on Ansible tool usage	5L +4P Classes
Topics: Docker Life Cycl Image and Conta Container Hub, I	e,Docker Installatio ainers, Create A Doc Docker File.	on, Docker Operatio cker Hub Account, D	ns,Docker Co ocker Images	incepts - Registry, Repos and Containers, Pushing	itory, Tag, Docker To
Module 3	Ansible		Assignment	Assignments on Selenium tool usage and test case	5L +4P Classes
Topics: Ansible Workflo Tower, Roles, ' YAML, Inventory	Dw, Architecture, Variables open link, , Debug, Apt, Linei	Installation in Lin , Tags, Galaxy, Comr nfile, Copy, Commaı	ux/Windows, nands Cheat S nd, File, Vault	ad-hoc Commands, F Sheets, Modules, Shell, T :, Windows, Yum, AWX, U	Jaybooks, Templates, Jnarchive,
Module 4	Jenkins	Assignment	Assignme Jenkins to jobs	ents on ool usage and Build Cla	+4P Isses
Topics: Introduction To Master Node C Creating A CI/CE	Continuous Integr Connection, Jenkins D Pipeline	ation, Jenkins Archi Integration With	tecture, Mar Devops Tools	naging Nodes On Jenkin 5, Understanding CI/CD	s, Jenkins Pipelines,

List of Laboratory Tasks: Git

 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 file1.txt file and the second commit with a file2.txt file.

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

7. 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

 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.
 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. https://www.simplilearn.com/tutorials/git-tutorial/git-tutorial-for-beginner
- 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:					
CSE2040	Course Title: Cyber threats for IOT and Cloud L- T-P- C 3 0 0 3				
	Type of Course:1] Program Core				
	2] Theory Only				
Version No.	1.0				
Course Pre- requisites	Cyber Security, Information Security and Networks				
Anti-requisites	NIL				
Course Description Course	Objective of the course is to understand the most important cyber threats for IOT and Cloud. Cyber attackers discover new possibilities in the areas of Internet of Things and cloud services. It mainly focuses on multiple security challenges facing the IoT and cloud computing especially concerns surrounding privacy and cyber security threats of the users and the how can the cyber risks relating to them be mitigated. The objective of the course is to familiarize the learners with the concepts of Cyber				
Objectives	threats for IOT and Cloud and attain Skill Development through Participative Learning techniques.				
Course Out	On successful completion of the course the students shall be able to:				
comes	 Develop a deeper understanding and familiarity with various types of cyber-attacks, cybercrimes, vulnerabilities and remedies thereto. Plan, implement, and monitor cyber security mechanisms to ensure the protection of information technology assets. 				

Course Content:				
Module 1	Introduction to IOT and Cloud computing	Assignment I	Programming Task	12 Sessions

Topics

What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, IoT Challenges, IOT Architecture and protocols, Various platforms for IoT, Real-Time examples of IoT, Overview of IoT components and IoT communication Technologies. Introduction to Cloud Computing, The Vision of Cloud Computing, Defining a Cloud, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Distributed Systems, Virtualization, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms and Technologies.

Assignment:

Module 2	Cyber Threat	s Assignment	Programming Task	8 Sessions

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 Threa	ats in Assignmer	nt Programming/Data	10 Sessions
	Internet	of	analysis task	
	Things			

Topics:

IoT threats and vulnerabilities- IoT attack surface, Attack surface areas of the IoT, Types of IoT security threats-Botnets, Denial of service, Man-in-the-Middle, Identity and data theft, Social engineering, Advanced persistent threats, Ransomware, Remote recording, How does the IoT influence security?, Best practices to reduce risks and prevent threats. Security guidelines for IoT. Managing IoT Security Threats. **Assignment:**

Cloud computing analysis task	5
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Topics:

Cybersecurity Threats to Cloud Computing-Identity First Security, Cloud misconfiguration, Denial of Service, Insider Threats, Reduced Infrastructure Visibility, Unauthorized use of Cloud workloads, Insecure API's, Compliance and regulation issues, Mitigating cyber risks in cloud computing

Assignment:

Text Books

T1. Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, 2013

T2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1 st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978- 9386873743)

T3. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi Mastering Cloud. Computing McGraw Hill Education

References

R1. Brooks, Charles J., Christopher Grow, Philip Craig, and Donald Short. Cybersecurity essentials. John Wiley & Sons, 2018

R2. Ollie Whitehouse, "Security of Things: An Implementers' Guide to Cyber-Security for Internet of Things Devices and Beyond", NCC Group, 2014

R3. Securing The Cloud: Cloud Computing Security Techniques and Tactics by Vic (J.R.) Winkler (Syngress/Elsevier) - 978-1-59749-592-9

Weblinks:

https://www.coursera.org/learn/cloud-security-basics

https://www.imperva.com/learn/application-security/cyber-security-threats/

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

Topics relevant to "SKILL DEVELOPMENT":

Cyber threats in IoT and Cloud Computing for **skill development** through **Participative Learning t**echniques. This is attained through the assessment component mentioned in the course handout.

Course Code: CSE3034	Course Title: BIG DATA SECURITY AND PRIVACY Type of Course: Elective in Big Data Basket Theory	L-T-P-C	3 -0-0-3		
Version No.	1.0				
Course Pre- requisites	CSE219 Big Data Analytics				
Anti-requisites	NIL				
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 DATA SECURITY AND PRIVACY and attain Skil Participative Learning techniques.	with the co I Develop	oncepts of BIG ment through		

C	0		41	-1-1 - 4 -	
course	On successful com	pletion of this course	the students shall be	able to:	
Outcomes	i.Define cryptographic principles and mechanisms to manage acce				
	controls in Big D	ata system.[Knowledg	ge]		
	ii.Explain security risks and challenges for Big Data system.[Knowledge]				
	iii.Recognize all sec	curity related issues in	big data systems. [Comp	rehension	
	iv Apply Kerbe	eros configuration	for Hadoon	ecosystem	
	components [An	plication	ioi iladoop	ccosystem	
0 0 1 1	components.[Ap	plication			
course content:					
	Big Data Privacy		Big data security-	08	
Module 1	Ethics And Security	Assignment/Quiz	organizational	classes	
	Luncs And Security		security	classes	
Topics:					
Privacy – Reidentific	cation of Anonymous	; People – Why Big Dat	a Privacy is self regulati	ng? – Ethics	
– Ownershin – Ethic	al Guidelines – Big D	ata Security – Organiz	ational Security		
Assignment Big dat	a security-organizati	ional security	actorial becarley.		
Assignment. Dig dat	Convritu		communication		
	Security,				
Module 2	Compliance,	Assignment	protocols for each of	08 classes	
	Auditing, And	8	the Hadoop ecosystem		
	Protection		components		
Topics:					
Steps to secure big	data – Classifving	Data – Protecting – H	Big Data Compliance –	Intellectual	
Property Challenge	- Research Question	s in Cloud Security – O	nen Problems		
Assignment: commu	nication protocols for	or each of the Hadoon	acosystem components		
Assignment. commu		of each of the flaubop	ecosystem components		
	Hadoop Security				
Module 3	Design. Hadoon	Case study	Kerberos configuration	08 classes	
	Fcosystem Security		for ecosystem tools		
Tonics	Leosystem beeutity				
Vorheren Defeult I	Indoor Model with a	ut an aurity Hadaan V	onhono Coorrity Incolor	e antation Q	
Kerberos – Delault F		ut security - Hadoop K	erberos security implen	nentation &	
Configuration. Confi	guring Kerberos for	Hadoop ecosystem col	mponents – Pig, Hive, Oc	ozie, Fiume,	
HBase, Sqoop.					
Assignment: Kerber	os configuration for l	Hadoop ecosystem too	ols		
Modulo 4	Data Security &	Casa study	Event monitoring in	09 classos	
Mouule 4	Event Logging	Case study	Hadoop cluster	00 classes	
Topics:	· · · · ·		·		
Integrating Hadoon	with Enterprise Secu	urity Systems - Securi	ng Sensitive Data in Had	oon – SIEM	
system - Setting up	audit logging in hade	on cluster		oop ollin	
Assignment: Event n	nonitoring in Undoor	n cluster			
Assignment. Event n	nonitoring in nauooj	p cluster			
Assignment:					
1 Book/Article revi	ow: At the end of eac	h module a book refer	ence or an article tonic y	will be given	
to an individual on a	group of students T	They need to refer the l	ibrowy recourses and w	vili De given	
	group of students. I		indiary resources and wi	ite a report	
on their understand	aing about the assig	ned article in approp	priate format. <u>Presidency</u>	v University	
<u>Library Link</u> .					
2. Presentation: Gro	up presentation, whe	ere the students will b	e given a topic. They will	l have to	
explain/demonstrat	e the working and di	iscuss the applications	for the same.		
	_				
Iext BOOK(S):	<i></i> –				
1. Sudeesh Nar	ayanan, "Securing H	adoop", Packt Publishi	ng, 2013.		
2. Ben Spivey, J	oey Echeverria, "Ha	doop Security Protecti	ng Your Big Data Proble	em", 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.

Course Code: CSE 3028	Course Title: Blockchain security and performances Type of Course: Program Core Theory and Laboratory Integrated	L-T-P-C	2 -0-2-3		
Version No.	1.0				
Course Pre-	Blockchain Technology and Applications				
requisites					
Anti-requisites	NIL				

Course Description	The purpose of this course is to introduce the students to security and privacy techniques in blockchain based systems. The course provides a comprehensive understanding of blockchain security, risks, methods, and best practices. The course develops critical thinking skills by augmenting the student's ability to tackle security related issues of blockchain The associated laboratory provides an opportunity to validate the concepts taught as well as enhances the ability to visualize the real-world problems in order to provide a solution using various tools and techniques.				
Course Out Comes	On successful complete CO1:Comprehend securit CO2: Apply cryptographi CO3: Implement secure t CO4: Apply security tech real world problems	ton of the course the ty and performance per ic techniques to enhance ransaction models. niques to blockchain s	students shall be able to spective of blockchain tectors se security in blockchain b ystems that provide solution	to: hnology. ased systems ons to some	
Course Outcome	The objective of the co CSE3028_BLOCKCHAIN through Experiential L	urse is to familiarize I SECURITY & PERFO earning techniques.	the learners with the co RMANCE and attain Em	oncepts of ployability	
Course Content:					
Module 1	Fundamentals Privacy And Secur Techniques Blockchain	of ity Assignment In	Programming	9 Sessions	
Categorization of blo vulnerabilities, Mining security techniques: Encryption, Secure Mul Contracts, Game-Based	ckchain threats and vi Pool vulnerabilities, Netw Mixing, Anonymous lti-Party Computation, No	ulnerabilities: Client vork vulnerabilities, Sr Signatures, Homo on-Interactive Zero-Kno	vulnerabilities, Consens nart Contract vulnerabiliti morphic Encryption, owledge (NIZK) Proof, T	Ause Mechanism ies; Privacy and Attribute-Based EE Based Smart	
Module 2	Cryptography	Assignment	Programming	12 sessions	
Cryptography, Public from a Random Nu Operations, Generati Ethereum's Cryptogra Client Address Protoc	Key Cryptography and imber, Public Keys, E ng a Public Key, El iphic Hash Function: Ke ol	l Cryptocurrency, Pr Elliptic Curve Cryp liptic Curve Librar eccak-256, Ethereum	ivate Keys, Generating tography, Elliptic Cur ies, Cryptographic Ha Address and Formats, I	a Private Key ve Arithmetic ish Functions, inter Exchange	
Module 3Transaction ModelAssignmentProgramming9 sessionsTopics: Blockchain Level Transaction Models : UTXO, Account-Based Online TransactionModel, CAP Properties in Blockchain, Security and Privacy Requirements of Online Transactions, BasicSecurity Properties: Consistency, Tamper-Resistance, Resistance to DDoS attacks, Resistance toDouble-Spending attacks, Resistance to the Consensus attacks, Pseudonymity; Additional Security andPrivacy Properties of Blockchain: Unlinkability, Confidentiality of Transactions and DataPrivacy, Consensus Algorithms, BFT based Consensus Algorithms, Sleepy Consensus, Proof ofElapsed Time, Proof of Authority, Proof of Reputation, Comparison of Consensus AlgorithmsList of Laboratory Tasks:Targeted Application & Tools that can be used:					
			and an an an and the state		
Project work/Assignn	nent: iviention the Type	e of Project /Assignm	ient proposed for this o	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&gb pv=1

W4 : Book

https://www.insiderintelligence.com/insights/blockchain-technology-applications-usecases/

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:CSE2019	CourseTitle: Foundations of Blockchain Technology TypeofCourse:ProgramCore& Theory only	L-T-P-C	3-0-0-3
Version No.	1.1		
Course Pre- requisites	Networks		
Anti-requisites	NIL		

CourseDescription	The purpose of the course is to provide the fundamental knowledge onBlockchaintechnologyand explore various aspects of Blockchain technology like types of Blockchain, Bitcoin and EthereumBlockchain platform.				
	With a good knowledg understand the mechan contracts	ge of block chain te nism of Bitcoin and a	chnology, the ble to write s	student can simple smart	
Course Objectives	The objective of the cou of Foundations of Blo through Participative Lea	rse is to familiarize the ckchain Technology a rning techniques.	e learners with and attain Skill	the concepts Development	
Course OutComes	Onsuccessfulcompletio	nofthiscoursethestude	ntsshallbeablet	:0:	
	 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	Knowledge based quiz on distributed ledger	10 Sessions	
Topics: The history of limitations of Block Blockchain: Distribut	of Blockchain: Blockchain chain, Tiers of Blockcha red ledgers, Public Blockc	n, Generic elements of ain technology, Featur hain, private Blockchai	a blockchain, es of Blockcha n, shared ledge	Benefits and ain. Types of er.	
Quiz:Knowledge bas	ed quiz on distributed lec	lger	DoW	09 Soccione	
Topics: Consensus: C Blockchain. Assignment: Write a	in assignment on PoW co	pes of consensus mech	anisms, Conse	nsus in	
Module 3	Introducing Bitcoin	Case study	Bitcoin network wallets	10 Sessions	
Topics: Bitcoin defini wallets, Bitcoin payme	tion, Digital keys and a ents.	ddresses, Transaction	s, mining, Bito	coin network	
Case Study: Conduct a	a study about hot bitcoin	wallets	h .	10.0 .	
Module 4	Smart contracts	Case study	how to execute smart contract	10 Sessions	
Topics:History, Defini Ethereum ecosystem	ition, Introduction to Ethe , Smart contracts.	ereum,Ethereum netwo	ork,Component	ts of	
Case Study: Create a s and show how to exec	simple smart contract for ute.	User identity managen	nent using Soli	dity language	

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: Mastering Blockchain - Google Books

References

R1.Andreas M. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly Media Inc, 2015.

R2.Blockchain by Melanie Swa, O'Reilly.

Weblinks:

1. Blockchain A-Z[™]: Learn How To Build Your First Blockchain | Udemy

2. <u>https://www.coursera.org/learn/wharton-cryptocurrency-blockchain-introduction-</u> digital-currency

- 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: CSE3152	Course Title: .NET Full Stack Development	L- T-P- C	2-0-2-3	
Version No.	1.0		·	
Course Pre- requisites	Nil			
Anti-requisites	CSE3151 Java Full Stack Development			
Course Description	This advanced level course enables students to perform full stack development using .NET, with emphasis on employability skills. The key technologies used for Full Stack development is based on either Java technology or .NET technology. In this course, the focus is on			

	using .NET an	d the related technolo	ogies/tools like C#, ASP.NET,	Entity	
	Framework Core, etc. On successful completion of this course, the				
	student shall be able to pursue a career in full-stack development. The				
	students shall	students shall develop strong problem-solving skills as part of this			
	course.				
Course Objectives	The objective of DotNET FULL Experiential Lea	of the course is to far STACK Development arning techniques.	niliarize the learners with the and attain Employability Ski	concepts of lls through	
Course Outcomes	On successful c	ompletion of the cour	se the students shall be able to:		
	1] Practice the	use of C# for developing	ng a small application [Applicati	on]	
	2] Show web a	pplications using Entity	y Framework. [Application]		
	3]Solve simple	web applications that	use SQL and ASP.NET [Applicati	on]	
	4] Apply conce	pts of ASP.NET to deve	lop a Full Stack application. [Ap	plication]	
Course Content:					
	C#				
Module 1	Programming for Full Stack Development	Project	Programming	10 Sessions	
Tonics:	Development				
arrays and collect statements, Mana Properties, Auto In methods, Sealed threading, Data va exceptions, Workir Assignment: Devel	ions, Working w ging program flo mplemented, Do Classes/Metho alidation and wo ng with Files, Un lop a small appli	with variables, operato ow and events, Workin elegates, Anonymous I ds, Partial Classes/M orking with data colle it Testing – Nunit frame cation for managing lik	rs, and expressions, Decision a g with classes and methods, OC Methods and Anonymous Types ethods, Asynchronous prograr ctions including LINQ, Handling ework prary using C#.	nd iteration P concepts, 5, Extension nming and errors and	
Module 2	Entity Framework Core 2 0	Project	Programming	06 Sessions	
Tonics:	010 2.0			·	
Entity Framework (the EDM; Working Operations; Perfor Assignment: Devel	Core 2.0 Code Fii With Stored Pro mance Optimiza lop an applicatic	rst Approach; Introduct ocedures; Advanced En otion; Data Access with on for managing HR pol	tion To Entity Framework and EDI tity Framework - DbContext [EF6 ADO.NET icies of a department.	∕I; Querying]; Advanced	
		Project	Brogramming	06	
would 5	ASP.INET		Fiogramming	Sessions	
Topics: ASP.NET Core, AS SQL using MS SQ Net MVC & Layou	SP.Net Core 3.1 L, Working Wit uts;	MVC, ASP.NET Core I h Data In Asp.Net, Raz	Middleware and Request pipeline zor View Engine, State Managen	e, Review of nent In Asp.	
Assignment: Deve	elop a web appli	cation to mark entry/ex	it of guests in a building.	00	
Module 4	ASP.NET	Project	Programming	Sessions	
Topics:					

Introduction To Models, Validations In Asp.Net MVC, Authentication and Authorization In Asp.Net MVC, Advanced Asp. Net MVC - Ajax Action Link In MVC, Advanced Asp.Net MVC - Ajax Forms In MVC, Microsoft Testing Framework – Unit Testing the .NET Application **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: Visual Studio

Project work/Assignment:

- 1. Problem Solving: Design of Algorithms and implementation of programs.
- 2. Programming: Implementation of given scenario using .NET.
- 3. Assignment: Case study on Web sites development

Text Book:

- T1. Fender, Young, "Front-end Fundamentals", Leanpub, 2015
- T2. Valerio De Sanctis, "ASP.NET Core 5 and Angular: Full-stack web development with .NET 5 and Angular 11", 4th Edition, Packt, 2021.

References

- R1. Benjamin Perkins, Jon D. Reid, "Beginning C# and .NET", Wiley, 2021 Reid, 2021.
- R2. Piotr Gankiewicz, "Full Stack .NET Web Development", Packt Publishing, 2017.
- R3. Tamir Dresher, Amir Zuker, Shay Friedman, "Hands-On Full-Stack Web Development with ASP.NET Core", Packt Publishing, 2018.
- R4. Dustin Metzgar, "Exploring .NET core with microservices, ASP.NET core, and Entity Framework Core", Manning, 2017.

Topics relevant to development of "Employability": C#, ASP.NET & SQL for developing Employability **Skill Development** through **Experiential Learning** techniques.. This is attained through assessment component mentioned in course handout.

Course Code: CSE2015	Course Title: Data Analysis and Visualization Type of Course:1] Program core 2] Lab Integrated Course	L-T- P- C	2 -0-4-4
Version No.	1.0		
Course Pre- requisites	Python Programming		
Anti-requisites	NIL		

Course Description	The purpose of the course is to instill a strong foundation of scientific process orientation that is the cornerstone of effective data handling, and creative design thinking appended with strong programming skills to create meaningful visualizations of data. The student should have prior knowledge of python programming and basic knowledge of data concepts. The associated laboratory provides an opportunity to strengthen student's skillset in the arena of Data Preprocessing and Visualization. With a good knowledge in the fundamental concepts of the various libraries for handling and visualizing data the student can gain a stronghold in Data Science enabling the student to be an effective analyst for prospective employers.				
Course Objective	The objective of the course is to familiarize the learners with the concepts of Data Analysis and Visualization and attain EMPLOYABILITY through Experiential Learning techniques.				
Course Out Comes	 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 				
Course Content:			1 1 9 8 9		
Module 1	Introduction to Data Visualization (Comprehension) Assignment Programming activity 10 Hours				
Topics: Data collection, Data Preparation Basic Models- Overview of data visualization - Data Abstraction - Task Abstraction - Analysis: Four Levels for Validation, Interacting with Databases, Data Cleaning and Preparation, Handling Missing Data, Data Transformation. Python Libraries : NumPy, pandas, matplotlib, GGplot,Introduction to pandas Data Structures					

Module 2	Data Visualization Techniques (Application)	Assignment	Programming activity	10 Hours
Topics				

Topics: 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 3Visual Analysis of data from various domain (Application)	Assignment	Programming activity	10 Hours
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Topics:

Time-oriented data visualization – Spatial data visualization, Text data visualization – Multivariate data visualization and case studies, Finance- marketing-insurance-healthcare etc.

Visualization of Streaming Data (Application)	Assignment	Programming activity	10 Hours
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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-dashpython-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>, Analytics and Visualization (DS) Courses | Chaminade University - PROD [Integrated] Catalog

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.

Course Code: CSE 3002	Course Title: Big Data Technologies Type of Course: Program Core Theory and Lab Integrated Course	L-T- P- C	2 -0-2-3	
Version No.	1.0			
Course Pre- requisites	CSE2012-Database Management System, CSE1001- Problem solving using Java.			
Anti-requisites	NIL			
Course Description	The purpose of the course is to provide the fundamentals of Big data technology, to emphasize the importance of choosing suitable tools for processing and analyzing big data to gain insights. The student should have knowledge and skill to select and use most appropriate big data tools to solve business problems. The associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills. With a good knowledge in the fundamentals of Big data technology, the student can gain practical experience in implementing them, enabling the student to be an effective relation provides for employed in the fundamentals.			
Course Objectives	The objective of the course is to familiarize Data Technologies and attain SKILL DEV LEARNING techniques.	the learners /ELOPMENT	with the concepts of Big through EXPERIENTIAL	

 Outcomes Apply Map-Reduce programming on the given datasets to ext required insights. (Application). Employ appropriate Hadoop Ecosystem tools such as scoop, Hba Hive, to perform data analytics for a given problem. (Application). Use Spark tool to analyze the given dataset for a given proble (Application). 	Course	On successful completion of the course the students shall be able to:
Course Content:	Outcomes	 Apply Map-Reduce programming on the given datasets to extract required insights. (Application). Employ appropriate Hadoop Ecosystem tools such as scoop, Hbase, Hive, to perform data analytics for a given problem. (Application). Use Spark tool to analyze the given dataset for a given problem. (Application).
	Course Content:	

Module 1	Introduction Hadoop	toProgramming Assignment	Data Collection Analysis	and 10 Classes
			• - • • • • - •	

Introduction to Big Data and its importance: Basics of Distributed File System, Four Vs, Drivers for Big data, Big data applications, Structured, unstructured, semi-structured and quasi structured data. Big data Challenges-Traditional versus big data approach, The Big Data Technology Landscape: No-SQL.

The Hadoop: History of Hadoop-Hadoop use cases, The Design of HDFS, Blocks and replication management, Rack awareness, HDFS architecture, HDFS Federation, Name node and data node, Anatomy of File write. Anatomy of File read, Hadoop Map Reduce paradigm, Map and reduce tasks, Job Tracker and task tracker, Map reduce execution pipeline, Key value pair, Shuffle and sort, Combiner and Partitioner, APIs used to Write/Read files into/from Hadoop, Need for Flume and Sqoop.

Anatomy of a YARN: Hadoop 2.0 Features, Name Node High Availability, YARN Architecture, Introduction to Schedulers, YARN scheduler policies, FIFO, Fair And Capacity scheduler.

Module 2	Hadoop Tools	EcosystemProg Assi	ramming gnment	Data Analy	Collection vsis	and	8 Classes

Introduction to SQOOP: SQOOP features, Sqoop Architecture, Sqoop Import All Tables, Sqoop Export All Tables, Sqoop Connectors, Sqoop Import from MySQL to HDFS, Sqoop vs flume.

Hive: Apache Hive with Hive Installation, Hive Data Types, Hive Table partitioning, Hive DDL commands, Hive DML commands, and Hive sort by vs. order by, Hive Joining tables, Hive bucketing.

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 command-commands for scan, count, truncate of tables.

Module 3	Spark	Programming Assignment	Data analysis	8 Classes
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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.

Scala: The Basics, Control Structures and functions, Working with arrays, Maps and Tuples. List of Laboratory Tasks:

1. Level 1: To install the Hadoop in pseudo cluster mode.

Level 1: HDFS Shell Commands – Files and Folders.

Level 2: HDFS Shell Commands – Management.

Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
 Level 1: Find the number of occurrence of each word appearing in the input file(s)

Level 2: Performing a Map Reduce Job for word search count (look for specific keywords in a file).

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.

Level 1: Find average, max and min temperature for each year in NCDC data set?

Level 2: Programming assignment to analyze the social media data for business analytics.

4. Level 1: Finding out Number of Products Sold in Each Country using map reduce with sample

dataset

Level 2: Find matrix multiplication using map reduce

5. Level 1: Installation of Hive, working on basic hive commands. (Create, Alter and Drop tables)

Level 2: Apply Hive commands to student database/employee database.

6. Level 1: Working on advance hive commands. (Static Partitioning & Dynamic partitioning) Level 2: Continue the previous experiment, select and apply suitable partitioning technique.

7. Level 1: Working on advance hive commands-2. (Bucketing)

Level 2: Continue the previous experiment, apply bucketing technique to bring out the difference between partitioning and bucketing.

- Level 1: Installing Ecosystem tools such as Scoop, Hbase.
 Level 2: Scoop Move Data into Hadoop.
- Level 1: Working on basic Hbase commands (General commands, DDL Commands)
 Level 2: Apply Hbase commands on Insurance database/employee dataset.
- Level 1: Working on advanced Hbase commands. (DML).
 Level 2: Continue the previous experiment to demonstrate CRUD operations.

11. Level 1: Install, Deploy & configure Apache Spark.

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

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 code indicates that the request has succeeded. Write a program to read the

records of

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 Application & Tools that can be used:
Business Analytical Applications
Social media Data Analysis
Predictive Analytics
Tools: Hadoop Framework tools like map reduce, Hive, Hbase, Scoop, Spark.
Text Book
Seema Acharya, Subhashini Chellappan. 2015. <i>Big Data and Analytics</i> . Wiley Publication.
Matei Zaharia, Bill Chambers. 2018. SPARK: The Definitive Guide. Oreilly.
References
Tom White. 2016. Hadoop: The Definitive Guide. O'Reilley.
Cay S. Horstmann. 2017. Scala for the Impatient. Wesley.
Topics relevant to development of "Skill Development": Real time application development using Hadoop Ecosystem tools through Experiential Learning as mentioned in the course handout.

Course Code:	Course Title: Service Oriented Architecture		3-0-0-3			
CSE3125	L	-Т-Р-С				
	Type of Course: Program Core					
Version No.	2.0					
Course Pre-	CSE207-Data Base Management System, CS	SE264	-Web			
requisites	Technology					
Anti-requisites	NIL					
Course	The study of the course is to enable the students	to unde	erstand the different			
Description	architectural styles and XML based web applicat	tions w	hich is required to			
	explore the basics of service-oriented Architecture(SOA) in two approaches					
	i.e. Web Services (WS) and Representational	State	Transfer (REST)			
	architecture.					

Course Objective	The objective of the c	ourse is to familiariz	e the learners with the cor	ncepts of						
	Service Oriented Architecture and attain Skill Development through									
	Participative Learning	g techniques.								
Course Out	On successful completion of this course the students shall be able to:									
comes	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 variou	us Web Service Standa	ards[Application]							
Course Content:										
Version No.	2.0	Γ	Γ							
Module 1	Introduction to XML	Assignment	Programming Task	08 Sessions						
Topics: XML do	cument structure ,Wel	l formed and valid d	ocuments ,Namespaces – 1	DTD – xml						
Schema – X-Files, Modelling Databas	Parsing XML – using ses in XML	DOM, SAX – XML	Transformation and XSL F	ormatting –						
	Service Oriented	Assignment	Architectural study	10						
iviodule 2	Architecture			Sessions						
Architecture patte Distributed archit	erns and styles ,Chara ectures – Benefits of S	cteristics of SOA, Co SOA ,Security and im	omparing SOA with Client- plementation ,Principles o	Server and of Service						
orientation ,Servio	ce Layers, Application	development proce	ss, SOA methodology for E	nterprise.						
Module 3	Web Services	Quiz	Data patterns	08 Sessions						
Topics: Service De	escriptions – WSDL – N	Messaging with SOAP	– Service Discovery – UD	DI –						
Message Exchange	e Patterns – Orchestratio	on – Choreography –	WS Transactions.							
Module 4	Building SOA based Applications	Quiz	Security aspects	11 Sessions						
Topics: Business H	Process Design, Busine	ss case for SOA, Stal	ke holder objectives, Servic	Topics: Business Process Design, Business case for SOA, Stake holder objectives, Service Oriented						
Analysis and Desi	Analysis and Design – Service Modeling – Design standards and guidelines – Composition – WS-									
BFEL – w S-Coordination – w S-Policy – w S-Security, 1001s available for implementing SOA, SOA Security, approach for enterprise wide SOA implementation. Trends in SOA Technologies in Relation										
	lination – WS-Policy – for enterprise wide SO	WS-Security, Tools a A implementation, Tree	vailable for implementing sends in SOA. Technologies	ion – WS- SOA, SOA in Relation						
to SOA, Advances	lination – WS-Policy – for enterprise wide SO in SOA, SOA Support	WS-Security , Tools a A implementation, Tro in J2EE.	and guidelines — Compose available for implementing S ends in SOA, Technologies	ion – WS- SOA, SOA in Relation						
to SOA, Advances Targeted Applicati	dination – WS-Policy – for enterprise wide SO in SOA, SOA Support on & Tools that can be	WS-Security , Tools a A implementation, Tro in J2EE. used:	available for implementing sends in SOA, Technologies	ion – WS- SOA, SOA in Relation						
to SOA, Advances Targeted Applicati Basic HTML and XI Textbook(s):	dination – WS-Policy – for enterprise wide SO in SOA, SOA Support on & Tools that can be ML	WS-Security , Tools a A implementation, Tre in J2EE. used:	and guidenness composition vailable for implementing sends in SOA, Technologies	ion – WS- SOA, SOA in Relation						
to SOA, Advances Targeted Applicati Basic HTML and X Textbook(s):	dination – WS-Policy – for enterprise wide SO in SOA, SOA Support on & Tools that can be ML	WS-Security , Tools a A implementation, Tro in J2EE. used:	and guidelines Composite available for implementing S ends in SOA, Technologies	ion – WS- SOA, SOA in Relation						
to SOA, Advances Targeted Applicati Basic HTML and XI Textbook(s): 1. Thomas Enducation 201	dination – WS-Policy – for enterprise wide SO in SOA, SOA Support on & Tools that can be ML cl, "Service Oriented An	WS-Security , Tools a A implementation, Tro in J2EE. used: rchitecture: Concepts,	Technology, and Design", I	Pearson						
to SOA, Advances Targeted Applicati Basic HTML and XI Textbook(s): 1. Thomas Enducation, 201 <u>http://182.</u>	dination – WS-Policy – for enterprise wide SO in SOA, SOA Support on & Tools that can be ML rl, "Service Oriented An 6. 72.188.195/cgi-bin/koh	WS-Security , Tools a A implementation, Tre in J2EE. used: chitecture: Concepts, a/opac-detail.pl?biblic	Technology, and Design", I	Pearson						
to SOA, Advances Targeted Applicati Basic HTML and XI Textbook(s): 1. Thomas Existence Education, 201 <u>http://182.</u> 2. Ron Schm <u>http://182.</u>	dination – WS-Policy – for enterprise wide SO in SOA, SOA Support on & Tools that can be ML rl, "Service Oriented An 16. 72.188.195/cgi-bin/koh elzer et al. "XML and W 72.188.195/cgi-bin/koh	WS-Security , Tools a A implementation, Tro in J2EE. used: cchitecture: Concepts, a/opac-detail.pl?biblic Web Services", Pearsor a/opac-detail.pl?biblic	<i>Technology, and Design</i> ", I <u>onumber=6532</u> n Education, 2013	Pearson						
to SOA, Advances Targeted Applicati Basic HTML and Xi Textbook(s): 1. Thomas Er Education, 201 <u>http://182.</u> 2. Ron Schm <u>http://182.</u> References	dination – WS-Policy – for enterprise wide SO in SOA, SOA Support on & Tools that can be ML rl, "Service Oriented Ar 16. 72.188.195/cgi-bin/koh elzer et al. "XML and V 72.188.195/cgi-bin/koh	WS-Security , Tools a A implementation, Tro in J2EE. used: cchitecture: Concepts, a/opac-detail.pl?biblic Web Services", Pearsor a/opac-detail.pl?biblic	<i>Technology, and Design</i> ", I <u>onumber=6532</u> n Education, 2013	Pearson						

- 1. Frank P.Coyle, "*XML, Web Services and the Data Revolution*", Pearson Education, 2002 http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=6647
- 2. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education, 2005

http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=6619

3. Sandeep Chatterjee and James Webber, "*Developing Enterprise Web Services: An Architect's Guide*", Prentice Hall, 2004.

http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=5906

4. James McGovern, Sameer Tyagi, Michael E.Stevens, Sunil Mathew, "*Java Web Services Architecture*", Morgan Kaufmann Publishers, 2003.

https://www.elsevier.com/books/java-web-services-architecture/mcgovern/978-1-55860-900-6

Web Resources:

- 1. https;//presiuniv.knimbus.com/user#/home
- 2. <u>https://www.coursera.org/learn/service-oriented-architecture</u>
- 3. <u>https://nptel.ac.in/courses/soa</u>

Topics relevant to "SKILL DEVELOPMENT": Based on an understanding of architectural styles, understanding web applications based on XML, review architectures for web applications, Service-Oriented Architecture (SOA) in two approaches: Web Services (WS*) and Representational State Transfer (REST) architecture for Skill Development through Participative Learning techniques. This is attained through the Presentation as mentioned in the assessment component.

Course Code:	Course Title:CSE3016 Neural Networks and		3-0-0-3			
CSE3016	Fuzzy Logic	LTDC				
	Type of Course: Discipline Elective in AI & ML	г				
	Basket Theory Course					
Version No.	1.0					
Course Pre-	NIL					
requisites						
Anti-requisites	NIL					
Course	This course aims to introduce the basic concepts	of Neura	l Networks and Fuzzy			
Description	Logic. Neural networks reflect the behavior o	f the hu	man brain, allowing			
	computer programs to recognize patterns and s	olve com	mon 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 imitate					
	rmediate possibilities					
	between digital values YES and NO. This course introduces fundamer					
	in Neural Networks and Fuzzy Logic Theory.					

Course	The objective of the course is to familiarize the learners with the concepts of						
Objective	Neural Networks and Fuzzy Logic and attain Skill Development through						
Common	Participative Learning techniques.						
Course	Un successful completion of this course the students shall be able to:						
outcomes	 Define the ideas behind most common learning algorithms in Neural 						
	Network [Knowledge]						
	3. Discuss the concepts of Fuzzy Sets and Relations. [Comprehension]						
	4. Demonstr	ate the Fuzzy logic cond	cepts and its applications.	Application			
]						
Course							
Content:			1				
Module 1	Introduction to Neural Network	Quiz	Single Layer Perceptron	9Classes			
Topics:			·				
Introduction to N	N: History, Artific	cial and biological neur	cal networks, Artificial inte	elligence and			
neural networks.							
Neurons and Ne	ural Networks: Bi	ological neurons, Mod	els of single neurons, Dif	ferent neural			
network models.	reantron. Laget	maan aquara algorith	m Looming autors Loo	ming notos			
Single Layer Pe	rceptron: Least	mean square algorith	im, Learning curves, Lea	arning rates,			
	Multilaver						
Module 2	Perceptron	Quiz	Multilayer Perceptron	10 Classes			
Topics:	·						
Multilayer Percep	otron: The XOR pro	blem, Back-propagatio	n algorithm, Heuristic for i	mproving the			
back-propagation	algorithm, Some	examples.					
Radial-Basis Fund	ction Networks: In	terpolation, Regulariza	tion, Learning strategies.				
Kononen Self-Or	ganising Maps: 3	Self-organizing map,	The SOM algorithm, Lea	rning vector			
quantization.	Fuzzy Sets						
Module 3	Operations and	Ouiz	Fuzzy Operations	10Classes			
	Relations		J J F				
Topics:							
Fuzzy Sets: Crisp	o Sets - an Overv	iew, Fuzzy Sets - Defi	nition and Examples, α -	Cuts and its			
Properties, Repre	sentations of Fuzz	y Sets, Extension Princ	iples of Fuzzy Sets.				
Fuzzy Operations	s: Uperations on tions of Operation	Fuzzy Sets - Fuzzy Col	nplements, Fuzzy Interse	ctions, Fuzzy			
Fuzzy Relations:	Binary Fuzzy r	olations Fuzzy Fauly	alence Relations Fuzzy (Compatibility			
ruzzy Relations: Binary ruzzy relations, ruzzy Equivalence Relations, ruzzy Compatibility							
	Fuzzy Logic an	d	Jovoloping Euzzy Logic				
Module 4	Fuzzy Log	ic Assignment	Controller	l0Classes			
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 Li	braries and Softwa	are (Eg.,Tensorflow, Sci	kit-Learn etc.)				
2. Matlab (Neural Network Toolbox, Fuzzy Logic Toolbox)							
Project work/Assignment:							
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/P200000003278/9780133002553 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-andapplications/oclc/505215200 **References:** Shivanandam, Deepa S, "Principles of Soft computing", N Wiley India, 3rd Edition, 1. 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 Kumar S., "Neural Networks - A Classroom Approach", Tata McGraw Hill, 2nd Edition 3. 2017.https://www.worldcat.org/title/neural-networks-a-classroom-approach/oclc/56955342 Fakhreddine O. Karray, and Clarence W. De Silva. "Soft computing and intelligent systems 4. *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. Catalogue Dr. S. Thiruselvan prepared by Recommended BOS NO: 12th BOS, held on 04/08/2021 by the Board of Studies on **Course Title:** Vulnerability Assessment and 3-0-0-3 **Course Code:** Penetration Testing L- T-P- C **CSE3098** Type of Course: Theory Only Course Version No. 1.0 CSE3078 **Course Pre**requisites NIL **Anti-requisites** This course explores the tools that can be used to perform information gathering. This course also covers how vulnerability can be carried out by means of tools or manual Course investigation, and analysis of common attacks in data, mobile applications and Description wireless networks Course Objective The objective of the course is to familiarize the learners with the concepts of Vulnerability Assessment and Penetration Testing and attain Employability through Problem Solving Methodologies.

Students will have to do group assignments for Modules 2 & 4. As a part of their assignments, they

	 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	Theory	9 Sessions	
Topics:		•			
Introduction - Tern	ninologies - Categories of P	enetration Testi	ng - Phases of Penetration Te	st -Penetration	
Testing Reports -	Information Gathering T	echniques - Ac	tive. Passive and Sources of	of Information	
Gathering – Appr	oaches. Host discovery	- Scanning for	open ports and services-	Types of Port.	
Vulnerability Scan	ner Function, pros and co	ns - Vulnerabilit	v Assessment with NMAP -	Testing, SCADA	
environment with	NMAP		,		
	Vulnerability Scanner in				
Module 2	SDN Networks and Web application	Quiz	Theory	10 Sessions	
Topics:					
Nessus Vulnerabili	ty Scanner - Safe check – S	Silent dependen	cies - Port Range Vulnerabilit	y Data	
Resources, SDN Da	ata plane, Control Plane, A	pplication Plane	. SDN security attack vectors	and SDN	
Harderning, Author	entication Bypass with Inse	ecure Cookie Ha	ndling - XSS Vulnerability - Fi	le inclusion	
vulnerability - Rem	note file Inclusion -Patching	g file Inclusions	- Testing a website for SSI Inj	ection.	
	Mobile Application				
Module 3	Security and wireless network Vulnerability analysis	Quiz	Theory	11 Sessions	
Topics:	,				
Types of Mobile A	pplication Key challenges	in Mobile Appl	ication and Mobile application	on penetration	
testing methodolo	bgy, Android and ios Vulne	erabilities - OW	ASP mobile security risk - Ex	ploiting WM -	
BlackBerry Vulner	rabilities - Vulnerability	Landscape for	Symbian - Exploit Preventi	on -Handheld	
Exploitation, WLA	N and its inherent insecu	, irities Bypassing	g WLAN Authentication unco	overing hidden	
SSIDs MAC Filters	s Bypassing open and sh	nard authentica	tion - Advanced WLAN At	tacks Wireless	
eavesdropping usi	ng MITM session hijacking	over wireless –	WLAN Penetration Test Met	hodology.	
Module 4	Exploits	Quiz	Theory	8 Sessions	
Tonics:			/		
Architecture and F	nvironment- Leveraging M	letasoloit on Pe	netration Tests Understandi	ng - Metasnloit	
Channels Metasn	loit Framework and Advar	ced Environme	nt configurations – Understand	nding the Soft	
Architecture Conf	figuration and Locking A	dvanced navloa	ds and add on modules Glo	hal datastore	
module datastore	saved environment Meter	rnreter			
Targeted Application & Tools that can be used:					
This course helps the students to understand the threats and vulnerabilities using NMAP.					
Project work/Assignment:					
Project Assignmer	nt:				
Text Book					

1. Rafay Baloch, Ethical Hacking and Penetration Testing Guide, CRC Press, 2015. ISBN : 78-1-4822-3161-8.

 Dr. Patrick Engebretson, The Basics of Hacking and Penetration Testing Ethical Hacking and Penetration Testing made easy, Syngress publications, Elsevier, 2013. ISBN :978-0-12-411644-3.
 Mayor, K.K.Mookey, Jacopo Cervini, Fairuzan Roslan, Kevin Beaver, Metasploit Toolkit for Penetration Testing, Exploit Development and Vulnerability Research, Syngress publications, Elsevier, 2007. ISBN : 978-1-59749-074-0

References

- 1. Mastering Modern Web Penetration Testing By Prakhar Prasad, October 2016 PacktPublishing.
- 2. SQL Injection Attacks and Defense 1st Edition, by Justin Clarke-Salt, Syngress Publication

Web resources: <u>https://onlinecourses.nptel.ac.in/noc19_cs68/preview</u> - **IIT Kharagpur,** Prof. Indranil Sen Gupta

Topics relevant to development of "EMPLOYABILITY SKILLS": Exploitation, Penetration testing techniques, for development of Employability skills through the Participative Learning Techniques. This is attained through the assessment components mentioned in course handout.

Course Code: CSE3098	Course Title: Vulnerability Assessment and Penetration Testing Type of Course: Theory Only Course	L- T-P- C	3-0-0-3
Version No.	1.0		
Course Pre- requisites	CSE3078		
Anti-requisites	NIL		
Course Description	This course explores the tools that can be u This course also covers how vulnerability ca manual investigation, and analysis of commo and wireless networks	sed to perform n be carried o on attacks in d	n information gathering. ut by means of tools or ata, mobile applications
Course Objective	The objective of the course is to familia of Vulnerability Assessment and Penetrat through Problem Solving Methodologies.	rize the learn ion Testing a	ers with the concepts nd attain Employability

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 techniqu	les.	automate the
Course Content:				
Module 1	Information Gathering, Host Discovery and Evading Techniques	Assignment	Theory	9 Sessions
Topics:				
Introduction - Terr	ninologies - Categories of P	Penetration Testi	ng - Phases of Penetration Te	st -Penetration
Testing Reports -	Information Gathering T	echniques - Ac	tive, Passive and Sources	of Information
Gathering – App	roaches, Host discovery	- Scanning for	open ports and services-	Types of Port,
Vulnerability Scan	ner Function, pros and co	ns - Vulnerabilit	y Assessment with NMAP -	lesting, SCADA
environment with				
Madula 2	Vulnerability Scanner in	Qui-	Theory	10 Cassiana
	SDN Networks and web	Quiz	Theory	10 Sessions
Tonics	application			
Nessus Vulnerahili	ity Scanner - Safe check – 9	Silent denenden	cies - Port Range Vulnerahili	ty Data
Resources, SDN Da	ata plane. Control Plane. A	polication Plane	SDN security attack vectors	and SDN
Harderning, Auth	entication Bypass with Ins	ecure Cookie Ha	indling - XSS Vulnerability - F	ile inclusion
vulnerability - Ren	note file Inclusion -Patchin	g file Inclusions	- Testing a website for SSI Ini	ection.
	Mobile Application		,	
Module 3	Security and wireless network Vulnerability analysis	Quiz	Theory	11 Sessions
Topics:		•		
Types of Mobile Application Key challenges in Mobile Application and Mobile application penetration testing methodology, Android and ios Vulnerabilities - OWASP mobile security risk - Exploiting WM - BlackBerry Vulnerabilities - Vulnerability Landscape for Symbian - Exploit Prevention -Handheld Exploitation, WLAN and its inherent insecurities Bypassing WLAN Authentication uncovering hidden SSIDs MAC Filters Bypassing open and shard authentication - Advanced WLAN Attacks Wireless				
				R Soccions
Topics	Exploits	Quiz	пеогу	o sessions
Architecture and Environment- Leveraging Metasploit on Penetration Tests, Understanding - Metasploit Channels, Metasploit Framework and Advanced Environment configurations – Understanding the Soft Architecture, Configuration and Locking, Advanced payloads and add on modules Global datastore, module datastore, saved environment Meterpreter.				
Targeted Applicat	ion & Tools that can be us	ed:		
This course helps	the students to understand	d the threats an	d vulnerabilities using NMAP	
Project work/Assignment:				

Project Assignment:

Text Book

2. Rafay Baloch, Ethical Hacking and Penetration Testing Guide, CRC Press, 2015. ISBN : 78-1-4822-3161-8.

3. Dr. Patrick Engebretson, The Basics of Hacking and Penetration Testing Ethical Hacking and Penetration Testing made easy, Syngress publications, Elsevier, 2013. ISBN :978-0-12-411644-3.

4. Mayor, K.K.Mookey, Jacopo Cervini, Fairuzan Roslan, Kevin Beaver, Metasploit Toolkit for Penetration Testing, Exploit Development and Vulnerability Research, Syngress publications, Elsevier, 2007. ISBN : 978-1-59749-074-0

References

2. Mastering Modern Web Penetration Testing By Prakhar Prasad, October 2016 PacktPublishing.

3. SQL Injection Attacks and Defense 1st Edition, by Justin Clarke-Salt, Syngress Publication Web resources: <u>https://onlinecourses.nptel.ac.in/noc19_cs68/preview</u> - **IIT Kharagpur,** Prof. Indranil Sen Gupta

Topics relevant to development of "EMPLOYABILITY SKILLS": Exploitation, Penetration testing techniques, for development of Employability skills through the Participative Learning Techniques. This is attained through the assessment components mentioned in course handout.

Course Code:	Course Title: Fundamentals of Data Analytics		2	0	2	3
CSE3190	Type of Course: Theory-embedded Lab	L-T- P- C				
Version No.	3.0	•				
Course Pre- requisites	NIL					
Anti-requisites	NIL					
Course Description	Fundamentals of Data Analytics is design transforming, and modeling data with the goal o and supports in decision-making. The course be pre-processing, and transformation. It delivers th	ed for f discover gins by co e basic sta	inspecting us vering atistics	cting eful g Dat	, c info a ex l tau	leansing, rmation, traction, ght in an

	intuitive way to ar knowledge on dat	nalysis the data. This co a analysis to a wide ran	ourse will help the studen ge of applications.	ts to apply the	
Course Objective	The objective of f Fundamentals of PROBLEM SOLVIN	the course is to familia Data Analytics and G Methodologies.	arize the learners with th attain SKILL DEVELOPN	ne concepts of /IENT through	
Course Out Comes	On successful com 5) Explain di 6) Interpret 7) Demonstr applicatio 8) Apply the	 Dn successful completion of the course the students shall be able to: 5) Explain different types of data and variables. 6) Interpret data using appropriate statistical methods. 7) Demonstrate the collection, processing and analysis of data for any given application and Illustrate various charts using visualization methods. 8) Apply the Data Analysis techniques by B Programming 			
Course Content:					
Module 1	Introduction to Data Analysis	Assignment	Data Collection, data analysis, Programming	8 Sessions	
R Studio: Base R-R Scripts and Comme ways to save-Data I,	, Structured Data Central Tendency o Studio IDE-Introdu nts-R Variables. Da /O in Base R.	and Unstructured Data of Data, Scales of Data, S action to R Projects and ta I/O: Working Director	R Markdown. Basic R: R ies-Importing Data Export	alysis Defined, paration. as a calculator- ting Data-More	
Module 2	Data Analysis and Visualization	Case studies	Programming	8 Sessions	
Topics: Data Summarization: One Quantitative and Categorical Variable. Data Classes: One Dimensional Data Classes-Data Frames and Matrices-Lists. Data Cleaning: Dealing with Missing Data-Strings and Recoding Variables. Manipulating Data in R: Reshaping Data-Merging Datasets. Data Visualizations: Plotting with ggplot2- Plotting with Base R					
Module 3	Statistical Analysis	Case studies	R programming	7 Sessions	
Topics : Proportion tests-Wilcoxon sign	tests-Chi squarec ed rank test- one-v	l test-Fisher exact test vay ANOVA test- Kruska	-Correlation-T test-Wilco I Wallis test	xon Rank sum	
Module 4	Predictive Analysis	Case studies	Programming	8 Sessions	
Topics : Linear lea weighted resamplir logistic regression missing values – ser	ast-squares – impl ng. Regression usin – estimating para rial correlation – au	ementation — the good g Stats models — multip meters — accuracy. Tim utocorrelation. Introduc	dness of fit – testing a l le regression – nonlinear ne series analysis – mov ction to survival analysis	inear model – relationships – ing averages –	

List of Laboratory Tasks:

Experiment No. 1: Introduction to R and RStudio

Level 1: Getting Started with R and RStudio

- Installing R and RStudio.
- Basic R syntax and commands.

Level 2: Working with RStudio

- Understanding the RStudio interface.
- Creating and managing R scripts.

Experiment No. 2: Basic Data Handling in R

Level 1: Data Types and Structures in R

- Vectors, matrices, and data frames.
- Lists and factors.
- Level 2: Data Import and Export
 - Reading data from CSV, Excel, and text files.
 - Exporting data to different formats.
- Level 3: Exploring Datasets
 - Using functions like head(), summary(), and str().

Experiment No. 3: Basic Data structure in R

Level 1: a. Demonstrate a program to join columns and rows in a data frame using cbind() and rbind() in R.

b.Implement different data structures in R (Vectors, Lists, Data Frames)

Level 2: R AS CALCULATOR APPLICATION a. Using with and without R objects on console

- c. Using mathematical functions on console
- d. Write an R script, to create R objects for the calculator application

Experiment No. 4: Data Cleaning and Preprocessing

Level 1: Handling Missing Data in R

- Identifying missing values.
- Imputing missing values using mean, median, or other methods.

Level 2: Data Transformation in R

- Standardizing and normalizing data.
- Log-transformations and scaling.

Experiment No. 5: Exploratory Data Analysis (EDA) with R

Level 1: Descriptive Statistics

- Calculating mean, median, and standard deviation.
- Visualizing data using histograms, box plots, and scatter plots.

Experiment No. 6: Data Visualization with ggplot2

Level 1: Demonstrate various graphs that can be made and altered using the ggplot2 package.

Level 2: Create 500 random temperature readings for six cities over a season and then plot the generated data using ggplot2 packages in R

Experiment No. 7: Perform Tests of Hypotheses hypothesis test (parametric)

Level 1: How to perform tests of hypotheses about the mean when the variance is known. How to compute the p-value. Explore the connection between the critical region, the test statistic, and the p-value.

Level 2: A teacher claims that people who work for only five hours per week will score significantly lower than people who work for ten hours per week on a quantitative abilities test. He brings twenty people and randomly assigned them to one or two groups. In one group he has participants who work for ten hours and in another group, he has participants who work for five hours. He conducts the test for all participants. Scores on the test range from one to ten with higher scores representing better performance. Test if there is any significant difference between those who work for five hours per week versus those who work for ten hours per week based on the test performance.

Experiment No 8: Hypothesis – Non-Parametric Test

Level 1: A car manufacturing company like to find the sales of three types of cars produced by them in three regions and is given. Test if there is an association between the regions and types of cars purchased.

Experiment No 9: Correlation and Covariance

Level 1: Using the iris data set in R

- d. Find the correlation matrix.
- e. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.
- f. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.

Level 2: Ramesh is doing a statistics paper in his post-graduation course. He met his friend Amal who is a textile engineer. Ramesh, who is doing his internship at ABC Researchers, is interested in a question. He poses this question to Amal and tries to find if he can answer. The question is as follows: The data regarding sales of soft- drinks and sales of cotton clothes in a place during the last 12 months are given. Find if there is any association between sales of soft drinks and sales of cotton clothes. Also explain the reason if there is any relationship.

Experiment No 11: Regression Model

Level 1: Import data from web storage (http://www.ats.ucla.edu/stat/data/binary.csv). Name the dataset and now do Logistic Regression to find out the relation between variables that are affecting the admission of a student in an institute based on his or her GRE score, GPA obtained, and rank of the student. Also check the model is fit or not. Require (foreign), require (MASS).

Level 2: Demonstrate multiple regressions, if data have a continuous Independent variable. Apply on the above dataset

Experiment No. 12: Time Series Analysis in R

Level 1: Demonstrate Timeseries analysis using Time Series Data Library at http://robjhyndman.com/TSDL/.

Targeted Application & Tools that can be used:

Application Area are Decision making in business, health care, financial sector, Medical diagnosis etc.

Text Books

- 6. Glenn J. Myatt and Wayne P. Johnson, "Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining Paperback", Import, 22 July 2014.
- 7. Introduction to statistics and Data analytics, Christian H, Michael S, Springer, 2016
- 8. Introduction to R- Robert Parker, John Mushcelli and Andrew Jaffe, Johns Hopkins University, 2020 (E-resource)
- 9. Introduction to Time Series and Forecasting (Springer Texts in Statistics), Peter Brockwell, Richard A. Davis, Springer, 2016.

References

- 3. 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.
- 4. The R Software-Fundamentals of Programming and Statistical Analysis -Pierre Lafaye de Micheaux, Remy Drouilhet, Benoit Liquet, Springer 2013.

Online resources:

http://www.modernstatisticswithr.com/solutions.html#solutionsch3

https://johnmuschelli.com/intro_to_r/

https://users.phhp.ufl.edu/rlp176/Courses/PHC6089/R_notes/

Topics relevant to development of "FOUNDATION SKILLS":

- 2. Statistical Concepts for data, visualization techniques.
- 3. Data collection for project based assignments.
- 4. Inferential Statistics (T test, Z test)
- 5. Probability Calculation

for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Course Code: CSE3095	Course Title: Cloud Security Type of Course: Discipline Elective in Cloud Computing Basket TheoryL-T- P-
Version No.	1.0
Course Pre- requisites	[1] Cloud Computing and Services (CSE322)
Anti-requisites	NIL
Course Description	This course provides ground-up coverage on the high-level concepts of cloud landscape, architectural principles, and techniques. It describes the Cloud security architecture and explores the guiding security for Infrastructure and Softwares.
Course Objective	This course is designed to improve the learners' <u>EMPLOYABILITY SKILLS</u> by using <u>EXPERIENTIAL LEARNING</u> techniques.
Course	On successful completion of this course the students shall be able to:
Outcomes	1. Describe fundamentals of cloud computing [Knowledge].
	2. Explain cloud computing security architecture and associated
	challenges [Comprehension].
	3. Discuss cloud computing software security essentials [Comprehension].

	4. Apply infrastructure s enviroment. [Application].	security and data securit	ty in cloud computin	g
Course Content:				
Module 1:	Fundamentals of Cloud	Quiz	Knowledge based	10 Sessions
Topics: Cloud Con and Technologies, Software as a Ser (JaaS) Cloud Dep	nputing at a Glance, Building Cloud Computing Architectur vice (SaaS), Cloud Platform a	Cloud Computing Envi e: Cloud Delivery Mod as a Service (PaaS), Cl	ronments, Computin els, The SPI Framev oud Infrastructure a	g Platforms vork, Cloud as a Service
Module 2:	Cloud Security Challenges and Cloud Security Architecture	Quiz	Comprehension based Quiz	10 Sessions
Topics: Security Security Manager Autonomic Securit	Policy Implementation, Comp ment. Architectural Consider ty.	puter Security Incident rations, Identity Mana	Response Team, Viagement and Acces	irtualization ss Control,
Module 3	Cloud Computing Software Security Essentials	Assignment	Batch-wise Assignments	9 Sessions
Topics: Cloud In Requirements, Clo and Business Cont	formation Security Objective ud Security Policy Implementa inuity Planning/Disaster Reco	es, Cloud Security Ser ation, Secure Cloud Soft very.	vices, Secure Clou ware Testing, Cloud	d Software Computing
Module 4:	Infrastructure Security and Data Security	Assignment and Presentation	Batch-wise Assignment and Presentations	9 Sessions
Topics: Infrastrue Data Security : A	cture Security: The Network	Level, The Host Level, Security Mitigation, Pro	The Application Levovider Data and its S	vel. ecurity.
Project work/Ass Survey on Cloud	ignment: Service Providers			
Text Book 1. Rajkuman Computing", N 2. 2. Roland L N Cloud Computi References 1. Sushil Jaja "Secure Cloud 2. John Rittin Security", CRO 3. Tim Math	r Buyya, Christian Vecchiola McGraw Hill Education, Jul Krutz and Russell Dean Vines, <i>ng</i> ", Wiley Publishing, Inc. 2 odia, Krishna Kant, Pierangela <i>Computing</i> ", Springer, ISBN nghouse and James Ransome, C Press, 2010. her, Subra Kumaraswamy an	a, and Thamarai Selvi y 2021. <i>"Cloud Security - A Co</i> 2019. a Samarati, Anoop Sing 978-1-4614-9278-8 (el <i>"Cloud Computing, Im</i> d Shahed Latif", "Clo	, " <i>Mastering Cloud</i> omprehensive Guide thal, Vipin Swarup, Book). plementation, Mana oud Security and Pr	d to Secure Cliff Wang, gement and ivacy – An
Enterprise Pe Topics related to o implementation. Topics related to d	rspective on Risks and Com development of "FOUNDATI evelopment of "EMPLOYABI	npliance", Oreily Publ ON": Cloud computin LITY": Infrastructure	ication, 2009. ng architecture, Sec	urity policy curity.
			,	J

Course Code:	Course Title: Front	end Full Stack				
CSF3150	Development					
	Development			L- T-P- C	2-0-2-3	
Version No.	1.0					
Course Pre-	Nil					
requisites						
Anti-requisites	NIL					
Course Description	This intermediate	course enables	students	to perfor	m front-end full	
	stack developmen	t, with emphasis	s on empl	oyability s	Kills. The course	
	covers key techno	logies and arch	itectures	that enable	es the student to	
	design and imple	ment iront-end	. On succ	cessiul col	npletion of this	
	development. The	atudanta ahall d	e to pur	sue a care	er in iun-stack	
	development. The	students shall d	evelop su	ong proble	m-solving skins	
Course Objectives	This source is designed	rse.	ha laamaa		VADILITY SVILL	C hr
Course Objectives	using PROBLEM S	OI VING Metho	ne learner	S' EMPLO	IABILITI SKILL	.S by
	using I KODLEWI S		uologies.			
					h h l	
Course Outcomes	On successful comp	letion of the cou	rse the stu	idents shall	be able to:	
	1) Describe the fun	damentals of De	vOps and	Front-end i	ull stack developm	nent.
	[Comprehension] mont of a rospor		[Application		
	2] mustrate develop	f Angular is to de	velop 2 w	Application	II] d [Application]	
	Al Apply concepts o	f Angular is to de	velop a w	eb front-en	d [Application]	
Course Content:						
course content.						
	Fundamentals of					
Module 1	DevOns and Web	Project	Programn	ning	04 Sessi	ions
	Development	i i oject	1105101111		04 0000	0115
Topics:	Development				I	
Introduction to Agile	Methodology: Scrum	Fundamentals:	Scrum Role	es. Artifacts	and Rituals: DevC)ps –
Architecture, Lifecycle	e, Workflow & Princi	ples; DevOps Too	ls Overviev	w – Jenkins	, Docker, Kubernet	ces.
Review of GIT source	, control. HTML5 – Syr	, tax, Attributes, E	vents, We	b Forms 2.0	, Web Storage, Car	nvas,
Web Sockets; CSS3 – (, Colors, Gradients, Tex	kt, Transform				
Assignment: Develop	a website for manage	ing HR policies o	f a depart	ment.		
Module 2	Responsive web	Draiget	Drogram	aina	02 5-5-	0.000
	design	Project	Programm	ning	03 58551	ons
Topics:						
BootStrap for Respon	isive Web Design; Ja	vaScript – Core s	syntax, HT	ML DOM, o	objects, classes, As	sync;
Ajax and jQuery Intro	duction					
Assignment: Design a	and develop a websi	te that can active	ely keep tr	rack of entr	y-exit information	of a
housing society.	1					
Module 3	Fundamentals of	Project	Programn	ning	NR Sassi	one
	Angular.js		- i ogi unin	סייייי		5115
Topics:				_		
Setting up Developme	ent & Build Environ	nent: Node.js and	d NPM; In	troduction	to TypeScript; Wor	rking
with OOP concepts w	71th TypeScript; Ang	ular Fundamenta	ls; Angula	r CLI; Intro	oduction to TypeSc	cript;
Debugging Angular a	applications; Compo	nents & Databii	naing in I	Jepth; Ang	ular Directives; U	JSING

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).

Assignment: Develop a software tool to do inventory management in a warehouse.

	React.js	Project	Programming	15 Sessions
Module 4	Fundamentals of	Project	Programming	15 Sessions

Topics:

Overview of React.js.; Reactive Programming; React Components; Render Method; Virtual DOM and Bandwidth Salvation; Two Distinct Ways of Initializing a React Class; States & Life Cycles; Component Mounting; Node.js & NPM; JSX Walkthrough; React Testing.

Assignment: Develop a web-based application to book movies/events (like bookmyshow).

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. Greg Sidelnikov, "React.js Book_ Learning React JavaScript Library", 1 edition, Scratch-River Tigris LLC 2016

R5. Web Reference:

https://www.youtube.com/watch?v=JGNTYXkVCVY&list=PLd3UqWTnYXOkTSBCBNyyhxo_jxlY_u TWA&index=2

Course Code: CSE3151	Course Title: Java Full Stack Development	L- T-P- C	2-0-2-3
Version No.	1.0		
Course Pre- requisites	Nil		
Anti-requisites	CSE3152 .NET Full Stack Development		

Course	This advance	d laval agura anab	las students to perform full	ato alz					
Course	This advance	a level course enab	ies students to perform full						
Description	development	using Java, with emph	asis on employability skills.	he key					
	technologies	used for Full Stack d	evelopment is based on eithe	r Java					
	technology or	· .NET technology. In	n this course, the focus is on	using					
	Java, and the	related technologies/t	ools like Java EE, Java Persis	stence,					
	Hibernate, Ma	aven, Spring Core, et	c. On successful completion	of this					
	course, the s	tudent shall be able	e to pursue a career in full	-stack					
	development.	The students shall de	evelop strong problem-solving	skills					
	as part of this	course.							
Course	This course is	designed to improve th	ne learners' EMPLOYABILITY	SKILLS by					
Objectives	using PROBLE	EM SOLVING Methodo	logies.						
Course Outcomes	On successful o	completion of the cours	se the students shall be able to:						
	1] Practice the	use of Java for full stac	k development [Application]						
	2] Show web a	pplications using Java I	EE. [Application]						
 3] Solve simple applications using Java Persistence and Hibernate [Application] 4] Apply concepts of Spring to develop a Full Stack application. [Application] 5] Employ automation tools like Maven, Selenium for Full Stack development. 									
						[Application	ו]		
					Course Content:				
Module 1	Introduction	Project	Programming	03 Sessions					
Topics:									
Review of Java; Ac	dvanced concept	s of Java; Java generics	; Java IO; New Features of Java.	Unit Testing					
tools.									
Module 2	Java EE Web Applications	Project	Programming	05 Sessions					
Topics:	·	·							
Introduction to E	clipse & Tomca	t; JSP Fundamentals;	Reading HTML form Data with	n JSP; State					
Management with	n JSP; JSP Stand	ard Tag Library - Core	& Function Tags; Servlet API Fur	ndamentals;					
ServletContext, Se	ession, Cookies;	Request Redirection Te	chniques; Building MVC App wit	h Servlets &					
JSP; Complete Apr	o - Integrating JD	BC with MVC App							
Assignment: Deve	lop an application	on for managing HR pol	icies of a department.						
	Java								
	Persistence	Project		06					
Module 3	using JPA and	- ,	Programming	Sessions					
	Hibernate								
Topics:				1					
Fundamentals of	Java Persistenc	e with Hibernate: JPA	for Object/Relational Mapping	. Querving.					
Caching, Perform	ance and Conci	rrency: First & Second	Level Caching, Batch Fetching	,, Ontimistic					
Locking & Version	ning: Entity Rela	tionshins Inheritance	Manning & Polymornhic Querie	s: Ouerving					
database using IP	OI and Criteria 4	ΔΡΙ (ΙΡΔ)							
Assignment: Desig	an and develop	a website that can activ	vely keep track of entry-exit info	mation of a					
housing society	gir and develop								
Module 4	Spring Core	Proiect	Programming	10					
				Sessions					
Topics:									
Spring Core Sprin	ng MVC Spring	Boot REST API · Und	erstanding Spring Framework [,] L	Ising Spring					

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				

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: CSE3152	Course Title: .NET Full Stack Development L-T- P- C 2-0-2-3					
Version No.	1.0					
Course Pre- requisites	Nil					
Anti-requisites	CSE3151 Java Full Stack Development					
Course Description	This advanced level course enables students to perform full stack development using .NET, with emphasis on employability skills. The key technologies used for Full Stack development is based on either Java technology or .NET technology. In this course, the focus is on using .NET and the related technologies/tools like C#, ASP.NET, Entity Framework Core, etc. 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	This course is using PROBLE	designed to improve the SOLVING Methodo	he learners' EMPLOYABILITY logies.	SKILLS by
Course Outcomes	On successful c 1] Practice the 2] Show web ar 3]Solve simple 4] Apply concer	ompletion of the cours use of C# for developin oplications using Entity web applications that ots of ASP.NET to devel	e the students shall be able to: g a small application [Applicatio Framework. [Application] use SQL and ASP.NET [Applicatio op a Full Stack application. [App	n] n] lication]
Course Content:				
Module 1	C# Programming for Full Stack Development	Project	Programming	10 Sessions
arrays and collecti statements, Manag Properties, Auto Ir methods, Sealed threading, Data va exceptions, Workin Assignment: Develo	ons, Working w ging program flo mplemented, Do Classes/Metho Ilidation and wo g with Files, Uni op a small applic	vith variables, operato ow and events, Workin elegates, Anonymous ds, Partial Classes/M orking with data colle t Testing – Nunit frame cation for managing libr	rs, and expressions, Decision a g with classes and methods, OC Methods and Anonymous Types ethods, Asynchronous prograr ctions including LINQ, Handling work rary using C#.	nd iteration P concepts, S, Extension nming and errors and
Module 2	Entity Framework Core 2.0	Project	Programming	06 Sessions
Topics: Entity Framework (the EDM; Working Operations; Perforr Assignment: Develo	Core 2.0 Code Fi With Stored Pro mance Optimization op an application	rst Approach; Introduct ocedures; Advanced En tion; Data Access with A n for managing HR poli	ion To Entity Framework and EDI tity Framework - DbContext [EF6 ADO.NET cies of a department.	И; Querying]; Advanced
Module 3	ASP.NET	Project	Programming	06 Sessions
Topics: ASP.NET Core, AS SQL using MS SQI MVC & Layouts; Assignment: Deve	SP.Net Core 3.1 , Working With	MVC, ASP.NET Core I Data In Asp.Net, Razor	Middleware and Request pipeline View Engine, State Management	, Review of In Asp. Net
Module 4	ASP.NET	Project	Programming	08 Sessions
Topics: Introduction To M MVC, Advanced A MVC, Microsoft Te Assignment: Deve Targeted Applicatio	odels, Validation sp. Net MVC - A esting Framewor lop a software to on & Tools that o	ns In Asp.Net MVC, A Ajax Action Link In MV k – Unit Testing the .N ool to do inventory man can be used:	Authentication and Authorization /C, Advanced Asp.Net MVC - Aj ET Application agement in a warehouse.	In Asp.Net ax Forms In
Application Area is used by all applicat	to Design and A tion developers	Analyzing the efficiency	of Algorithms. This fundamenta	al course is

Professionally Used Software: Visual Studio

Project work/Assignment:

- 1. Problem Solving: Design of Algorithms and implementation of programs.
- 2. Programming: Implementation of given scenario using .NET.

Text Book:

- T1. Fender, Young, "Front-end Fundamentals", Leanpub, 2015
- T2. Valerio De Sanctis, "ASP.NET Core 5 and Angular: Full-stack web development with .NET 5 and Angular 11", 4th Edition, Packt, 2021.

References

- R1. Benjamin Perkins, Jon D. Reid, "Beginning C# and .NET", Wiley, 2021 Reid, 2021.
- R2. Piotr Gankiewicz, "Full Stack .NET Web Development", Packt Publishing, 2017.
- R3. Tamir Dresher, Amir Zuker, Shay Friedman, "Hands-On Full-Stack Web Development with ASP.NET Core", Packt Publishing, 2018.
- R4. Dustin Metzgar, "Exploring .NET core with microservices, ASP.NET core, and Entity Framework Core", Manning, 2017.

Course Code: CSE3016	Course Title:CSE3016 Neural Networks and Fuzzy Logic Type of Course: Discipline Elective in AI & ML Basket
Version No.	1.0
Course Pre- requisites	NIL
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 fundamental concepts in Neural Networks and Fuzzy Logic Theory.
Course Objective	The objective of the course is to familiarize the learners with the concepts of Neural Networks and Fuzzy Logic and attain Skill Development through Participative Learning techniques.

Course	On successful	completion of this co	ourse the students s	hall be able			
Outcomes	to:	•					
	2. Define the co	2. Define the concept of Neural Networks. [Knowledge]					
	3. Define the id	eas behind most comn	non learning algorithm	s in Neural			
	Network.[Kn	Network.[Knowledge]					
	5 Demonstrate	Demonstrate the Europy logic concepts and its applications [
	Application 1			۰L			
Course							
Content:							
	Introduction		Single Lavor				
Module 1	to Neural	Quiz	Percentron	9Classes			
	Network						
Topics:		icial and hislogical no	und notworks Artificia	Lintolligon co			
and neural netwo	NN: HISLOFY, AFLII		arai networks, Artificia	Intelligence			
Neurons and Ne	ural Networks	Biological neurons M	odels of single neuro	ns Different			
neural network n	nodels.		oucle of single field	is, binerene			
Single Layer Per	ceptron: Least n	nean square algorithm	, Learning curves, Lea	arning rates,			
Perceptron.	-		-	_			
Module 2	Multilayer Perceptron	Quiz	Multilayer Perceptron	10 Classes			
Topics:				0120000			
Multilayer Perce	ptron: The XO	R problem, Back-pro	pagation algorithm, I	-leuristic for			
improving the ba	ick-propagation a	algorithm, Some exam	ples.				
Radial-Basis Fun	ction Networks: 1	Interpolation, Regulariz	zation, Learning strate	gies.			
Kohonen Self-Or	ganising Maps: S	Self-organizing map, T	he SOM algorithm, Lea	rning vector			
quantization.	Europe Cata						
	Fuzzy Sets,						
Module 3	and	Quiz	Fuzzy Operations	10Classes			
	Relations						
Topics:							
Fuzzy Sets: Cris	o Sets - an Over	view, Fuzzy Sets - Def	inition and Examples,	a - Cuts and			
its Properties, Re	presentations of	Fuzzy Sets, Extension	Principles of Fuzzy Se	ts.			
Fuzzy Operations	s: Operations on	Fuzzy Sets - Fuzzy (Complements, Fuzzy I	ntersections,			
Fuzzy Unions, Co	mbinations of O	perations, Aggregation	Operations.	Composibility			
Pelations	binary Fuzzy re	iacions, Fuzzy Equivale	ence Relations, Fuzzy (compatibility			
	Fuzzy Log	ic					
	and Fuzz	y Assignment	Developing Fuzzy				
Module 4	Logic	L	ogic Controller	UCIasses			
	Controller			-			
Fuzzy Logic: Cla	assical Logic, Mi	ultivalued Logic, Fuzz	y Propositions, Fuzzy	Quantifiers,			
Linguistic Hedges	s, Inference from	Conditional Fuzzy Pro	positions, Conditional a	and Qualified			
FUZZY Controller	Quantineu Propo	Fuzzification Module	FUZZV Rulo Baso Fuz	zv Inference			
Engine. Defuzzification Module. An Example.							
Targeted Applie	cation & Tools (that can be used:					
2. Python Librar	2. Python Libraries and Software (Eg., Tensorflow, Scikit-Learn etc.)						
3. Matlab (Neural Network Toolbox, Fuzzy Logic Toolbox)							
Project work/A	ssignment:						
Students will ha	ave to do group	assignments for Mo	dules 2 & 4. As a p	part of their			
assignments, the	ey will have to im	plement the solution t	o particular problems.				

Textbook(s):
 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/P200000003278/9780133002553
 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:
 Shivanandam, Deepa S, "Principles of Soft computing", N Wiley India, 3rd Edition, 2018.https://www.wileyindia.com/principles-of-soft-computing-3ed.html
3. Timothy J. Ross, " <i>Fuzzy Logic with Engineering Applications</i> ", Third Edition, Wiley, 2011.
https://onlinelibrary.wiley.com/doi/book/10.1002/9781119994374
 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
 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 Machine Learning				
CSE3087	Type of Course: 1] Program Core 2] Laboratory integrated	L-T- P- C	2 - 0	2	3
Version No.	1.0				
Course Pre- requisites	CSE3001 Artificial Intelligence and Mach	ine Le	arning	I	
Anti-requisites	NIL				
Course Description	Machine Learning algorithms are the key to develop intelligent systems 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 the students in developing intelligent systems for real life				
Course Objectives	This course is designed to improve the learned by using <u>EXPERIENTIAL LEARNING</u> technique laboratory exercises, assessments and the learning process.	ers ` <u>EM</u> s. The group p	PLOYA superv projects	BILITY vised ha s facilit	<u>SKILLS</u> ' ands-on ate this

Course Out Comes	On successful completion of the course the students shall be able to: 1] Apply advanced supervised machine learning methods for predictive 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	Programming using Keras/Sklearn	No. of Classes L – 7 P – 12			
Topics: An over features, Features simple linear rep Softmax Regress Theorem, estimat Bayes for supervi margin and kerne	erview of Machine Engineering -Da gression, loss func ion with cross entr ing conditional prob sed learning; Bayes el tricks.	Learning(ML); ML ta Imputation Met tions; Polynomial opy as cost function abilities for categori sian Belief networks	workflow; types of N hods; Regression – Regression; Logistic on ; Bayesian Learn ical and continuous fea s; Support Vector Ma	1L; Types of introduction; Regression; ing – Bayes itures, Naïve chines – soft			
Module 2	Ensemble Learning	Assignment	Programming using Keras/Sklearn	No. of Classes L-3 P-4			
Topics: Ensemb of features -rand Forest; Boosting Stacking.	le Learning – using lom patches and ra g – AdaBoost, G	g subset of instance indom subspaces n Gradient Boosting,	es – Bagging, Pasting, nethod; Voting Classi Extremely Random	using subset fier, Random nized Trees,			
Module 3	Perceptron Learning	Assignment /Quiz	Programming using Keras/Sklearn	No. of Classes L-7 P -2			
Topics: Percept Threshold Units, sigmoid, tanh, re Backpropagation	ron Learning – fro logical computatio lu and softmax, con algorithm using Gra	m biological to arti ns with Perceptron nmon loss functions dient Descent.	ificial neurons, Percep s, common activatior s, multi-layer Percept	trons, Linear functions – rons and the			
Module 4	Unsupervised Learning	Assignment	Programming using Keras/Sklearn	No. of Classes L-6 P -6			
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**

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 :

- 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>
- 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.

- 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
- 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.

- 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-</u> <u>computational-thinking-and-data-science-fall-2016/resources/lecture-11-introduction-</u> <u>to-machine-learning/</u>
- 4. https://onlinecourses.nptel.ac.in/noc21 cs85/preview

Course Code: CSE 3014	Course Title: FUNDAMENTALS OF NATURAL LANGUAGE PROCESSING Type of Course: Theory Only Course	L-T- P- C	3-0	0	3
Version No.	1.0				
Course Pre- requisites	[1] CSE 3001 – Artificial Intelligence and M	achine Lea	arning		
Anti- requisites	NIL				
Course Description	The purpose of this course is to introduce st language processing (NLP). NLP is the sci from unstructured text. It is basically ho understand human languages and extract to regular theory, the course also involves: 1. Programming Assignments 2. Regular Quiz Tests (once a week and on	udents to t ence of e> w we can meaning fi ce after ev	te scie tractin teach rom te rom te	ence of ng info n mach xt. In a odule)	natural rmation nines to addition

Course Objective	The objective of the cou of Fundamentals of Development through	urse is to fam Natural lan Participat i	niliarize the learners with guage Processing and i ve Learning techniques.	the concepts attain Skill			
Course Out Comes	 On successful completion of the course the students shall be able to: Understand the fundamental concepts of Natural Language Processing. [Knowledge] Read corpora and train models for different NLP tasks. [Application] Use word embeddings for solving an NLP Application. [Application] Understand sequence to sequence modeling as used in machine translation. [Application] 						
Course Content:							
Module 1	Introduction	Quizzes		7 Sessions			
Topics: Introduction. His Edit distance. In translation.	Topics: Introduction. History. Text Analytics. Various tasks in NLP. Sentence boundary Detection. Edit distance. Introduction to word embeddings, PoS tagging, chunking, parsing, machine translation						
Module 2	Word and Text Representations	Quizzes	Assignments	8 Sessions			
Topics: Logistic Regress Neural Networks learning architec	Topics: Logistic Regression and Naïve Bayes classification. Vector semantics and embeddings. Neural Networks and Neural Language Models. Text representations and classification. Deep learning architectures for sequence processing (CNN and LSTM).						
Module 3	PoS Tagging, NER Tagging and Parsing	Quizzes	Assignments	12 Sessions			
Topics: Part-of-Speech T data and Hidden tagging and PoS	agging – using NLTK ar Markov Model. Named tagging. Constituency F	nd spacy. Bui Entity Recog Parsing.	lding a PoS Tagger using nition. Relationship betwe	existing en NER			
Module 4	NLP Applications	Quizzes		9 Sessions			
Topics: Lexical Resource Creation. Sentiment Analysis. Machine Translation. Word Sense Disambiguation and WordNet. Question Answering. Targeted Application & Tools that can be used: 1. Python Libraries (Eg. NLTK, Spacy, etc.)							
3. Google Cola	b						
Assignment: Students will hav assignments, the Text Book T1Daniel Juraf edition draft, 202	Project v ve to do group assignme ey will have to implement sky, and James Martin.	ork/Assign ents for Modunt the solutio Speech and	Iles 2 & 3. As a part of th n to particular problems. Language Processing" (31	eir rd			
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-</u> dv6htOOZVBgAvLd1WscI0RgC/view

Web resources:<u>https://web.stanford.edu/~jurafsky/slp3/</u>

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

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.

Course Code: CSE 3010	Course Title: Deep Learning TechniquesType of Course: Program CoreTheory3-0						
Version No.	2.0						
Course Pre- requisites	Data Mining and Machine Learning fundamentals Basic working knowledge of Statistics and Probability Familiarity with programming languages and hands on coding						
Anti- requisites	NIL						
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						
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 course the students shall be able to: Apply basic concepts of Deep Learning to develop feed forward models(Knowledge)						

	Apply Supervised and Unsupervised Deep Learning techniques to build effective models for prediction or classification tasks(Comprehension) Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains of Machine Learning and Machine vision. (Comprehension) Analyze performance of implemented Deep Neural models(Application)					
Course Content:						
Module 1	Introduction to Deep Learning	Assignment	Programming	10 Sessions		
Topics: Fundamentals of Neural Network, Gradient Descent Network: Step by	deep learning and neural ne , Perceptron, MLP Structu t, Back-propagation, Training y Step.	etworks, Deep N Ires, Activation Neural Network	Neural Network, F Functions, Loss ks, Building your I	Feedforward Functions, Deep Neural		
Module 2	Improving Deep Neural Networks	Assignment	Programming	8 Sessions		
Topics: Initialization, Ov Batch Normaliza	verfitting and Underfitting, Re ation, Artificial Neural network	egularization and	d Optimization, D	Propout,		
Module 3	Deep Supervised Learning Models	Assignment	Programming	10 Sessions		
Topics: Convolutional r GRU, Deep Moo	neural network, Deep learning deltain termination deltain termination.	ng in Sequenti	ial Data, RNN &	LSTM,		
Module 4	Deep Unsupervised Learning	Assignment	Programming	10 Sessions		
Basics of Deep Boltzmann Ma Network,Genera Targeted Applic Professionally	unsupervised learning, Auto achine, Kohonen Networks ative Adversarial Networks, Pr cation & Tools that can be used software : Anaconda, S	encoders, Boltz s, Deep Beli obabilistic Neura used: Google (Spider.	man Machine, Re ief Network, I al Network. collab	estricted Hopfield		
T1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2017						
References R 1. Duda, F 2nd Editio R2. Theodor Press, 2015 R3. Russell, Series in A R4. Bishop,	R.O., Hart, P.E., and Stork, D. n. 2013 idis, S. and Koutroumbas, K S. and Norvig, N. Artificial In Artificial Intelligence, 2013 C. M. Neural Networks for P	G. Pattern Class K. Pattern Reco telligence: A Mc attern Recogniti	sification. Wiley-Ir gnition. Edition 4 odern Approach. F ion, Oxford Unive	nderscience, 4, Academic Prentice Hall ersity Press,		
Weblinks: W1: pu.infor Topics relevant	matics.global, https://sm-n : to "SKILL DEVELOPMENT"	itk.vlabs.ac.in	/ Analysis using De	ep learning.		

Development through Participative Learning techniques. This is attained through the **Presentation** as mentioned in the assessment component.

Course Code: CSE465	Course Title: Reinforcement Learning	L-T- P-							
	Type of Course: Theory Only	С	3-0	0	3				
Version No.	1.0				1				
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-	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								
Course	The objective of the course is to familiarize	the learne	ers wit	h the c	oncepts				
Objective	of Reinforcement Learning and attain Problem Solving Methodologies	Skill Dev	velopi	nent	through				
Course Out Comes	On successful completion of the course the Knowledge of basic and advanced reinforce Identification of suitable learning tasks to techniques can be applied. Appreciation of some of the current limitat techniques.	students ement lea which the ions of re	shall b rning se lea inforce	oe able techniq rning ement l	to: ues. earning				

	Formulation of decision problems, set up and run computational experiments, evaluation of results from experiments.				
Course Content:					
Module 1	Introduction	Assignment	Programming	No. of Classes:10	
Topics: Course logistics a connections with Probability Brush up of Proba PDFs, CDFs, Expe	and overview. Origin and l other related fields and ability concepts - Axioms of ectation. Concepts of joint a tributions. Correlation and	history of Reinfor with different b f probability, conc and multiple rand independence.	cement Learning ranches of mach epts of random va om variables, joir	research. Its nine learning. Primer ariables, PMF, nt, conditional	
Module 2	Markov Decision Process	Assignment	Programming	No. of Classes:10	
(MRP). Introduct existence of solut (MDP), state and functions and pol	ion to and proof of Bell ion to Bellman equations i action value functions, Be icies, Bellman optimality e	man equations f in MRP. Introduct Ilman expectation equations.	ion to Markov dec equations, optim	with proof of cision process nality of value	
Module 3	Dynamic Programing	Assignment	Programming	NO. OT Classes:10	
principle of optim fixed point theor optimality opera algorithms, DP ex Monte Carlo Me Overview of Mont Carlo, Monte Carl	nality, iterative policy evaluem, proof of contraction tors, proof of converger stensions ethods for Model Free P te Carlo methods for mode to control, On policy and o	uation, policy iter mapping propert nce of policy ev rediction and Co el free RL, First vis ff policy learning,	ration, value itera y of Bellman exp valuation and va ontrol sit and every visit Importance sam	ation, Banach pectation and alue iteration t Monte pling.	
Module 4	TD Methods and Policy Gradients	Assignment	Programming	No. of Classes:10	
Topics: Incremental Mon TD(λ), k-step est methods - SARSA Getting started algorithm, bias a gradient estimate Targeted Applic While Convolution becoming more in and Natural Lang computational ne Besides, there se industries. Despit the space of corp Tools: Torch, Go Project work/A This part is writt	te Carlo Methods for Mod imators, unified view of D A, Q-Learning and their val with policy gradient met and variance in Reinforc es, baselines, advantage fu ation & Tools that can b on Neural Network (CNN mportant for businesses do juage Processing (NLP), Re euroscience to model decise eems to be very little res te the criticisms about RL' orate research given its hu ogle Colaboratory, Spider, ssignment: en for general readers. At	el Free Prediction)P, MC and TD ev- riants. hods, Log-deriva- ement Learning, <u>inction, actor-crit</u> be used: 1) and Recurrent ue to their applica- einforcement Lea- sion making proc- ources detailing 's weaknesses, RL uge potentials in a , Jupiter Notebool	n, Overview TD(0 valuation method ative trick, Naive Reducing variau ic methods. Neural Networ ations in Compute rning (RL) as a f ess seems to be how RL is applie should never be assisting decision	 D), TD(1) and s, TD Control e REINFORCE nce in policy k (RNN) are er Vision (CV) ramework for undervalued. d in different e neglected in making. 	
readers with som	en for general readers. An le knowledge about RL.		it will be of grea	ater value for	

Designing algorithms to allocate limited resources to different tasks is challenging and requires human-generated heuristics. The paper "Resource Management with Deep Reinforcement Learning" [2] showed how to use RL to automatically learn to allocate and schedule computer resources to waiting jobs, with the objective to minimize the average job slowdown.

State space was formulated as the current resources allocation and the resources profile of jobs. For action space, they used a trick to allow the agent to choose more than one action at each time step. Reward was the sum of (-1/duration of the job) over all the jobs in the system. Then they combined REINFORCE algorithm and baseline value to calculate the policy gradients and find the best policy parameters that give the probability distribution of actions to minimize the objective.

<u>Traffic Light Control</u>

Researchers tried to design a traffic light controller to solve the congestion problem. Tested only on simulated environment though, their methods showed superior results than traditional methods and shed a light on the potential uses of multi-agent RL in designing traffic system.

Five agents were put in the five-intersection traffic network, with a RL agent at the central intersection to control traffic signalling. The state was defined as eight-dimensional vector with each element representing the relative traffic flow of each lane. Eight choices were available to the agent, each representing a phase combination, and the reward function was defined as reduction in delay compared with previous time step. The authors used DQN to learn the Q value of the {state, action} 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.

Web System Configuration

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 multitier 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

- "Reinforcement Learning: An Introduction", Richard S. Sutton and Andrew G. Barto, 2nd Edition
- "Probability, Statistics, and Random Processes for Electrical Engineering", 3rd Edition, Alberto Leon-Garcia
- B. "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/

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: CSE3009	Course Title: Optimization Techniques for Machine Learning	L-T- P- C	3-0	0	3
	Type of Course: Program Core& Theory Only				
Version No.	1.1				
Course Pre-	Fluency with reasoning and analysis	s using li	near a	algebra	and
requisites	probability is required. Familiarity w	ith Pyth	on is	preferra	ıble.
Anti-requisites	NIL				
Course Description	The course aims to equip students of methods in optimization that are ta and machine learning problems developments in first-order optimiz nonconvex, stochastic, and distribu- this course. Upon completing the co- be able to better formulate an optim desired structural properties smoothness, and sparsity), and to s- method under problem constra- distributed, and memory cost). The course aims to equip students of methods in optimization that are ta and machine learning problems developments in first-order optimiz nonconvex, stochastic, and distribu- this course. Upon completing the co- be able to better formulate an optimiz desired structural properties smoothness, and sparsity), and to s- method under problem constra distributed, and memory cost).	with adv illored to ation me uted set urse, stu- nization (for e- select an ints (for with adv illored to . A nu- ation me uted set urse, stu- nization (for e- select an ints (for select an ints (for e- select an)	ancec large imber ethod tings idents proble examp efficion ancec large imber ethod tings idents proble examp ethod tings	I techni e-scale of p s in the are ex are ex em by e ole, c ent opt cample, I techni e-scale of p s in the are ex em by e ole, c ent opt cample, c ent opt cample, c ent opt	ques and statistics rominent e convex, plored in pected to exploiting onvexity, imization online, ques and statistics rominent e convex, plored in pected to exploiting onvexity, imization onvexity, imization onvexity, imization
Course Objective	This course is designed to improve SKILLS by using PROBLEM SOLVINC	the learr G Methoo	iers' E lologi	EMPLOY es.	ABILITY

Course Out Comes	On successful	completion of	the course the students	s shall be able			
	to: 1] Understand standard supervised and unsupervised machine learning tasks as optimization problems [Understand] 2] Understand key definitions relating to convex functions, convex sets, and convex optimization [Understand] 3] Implement first-order and stochastic first-order solvers for convex optimization problems. [Application] 4] Apply machine learning techniques to real world problems. [Application]						
Course Content:							
Module 1	Fundamentals of Convex Analysis	Assignment	Programming Task	8 Sessions			
Topics: Review of basic linear weak duality, constra problems (regression	r algebra and pr int qualifications s, SVM, etc.)	obability, conv s, Optimality c	ex sets and functions – onditions for machine le	Strong and earning			
Assignment: Quiz on optimality conditions for machine learning problems.							
Module 2 F	irst order and / ligher Order lethods	Assignment	Data Collection/Excel	14 Sessions			
Topics: First Order Methods : Gradient descent convergence analysis – Convergence analysis for momentum-based 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, self-concordance), applications in regressions – Quasi-Newton Theory (Secant methods), convergence proofs for BFGS/DFP, L-BFGS in machine learning							
Assignment: Differe	nt first order me	chious and the	ir types with examples.				
Assignment: Differe Module 3 R P C S	nt first order me egularized / optimization & roximal and operator plitting	Assignment	ir types with examples. Programming/Data analysis Task	10 Sessions			

Assignment: Design of distributed algorithms with examples.

	Machine Learning		Task						
Topics: Coordinate descer optimization – Op Assignment: De	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 Applic Google Colab	ation & Tools th	at can be used	:						
Project work/A	ssignment:								
Creating a classifi Descent, Naïve ba Dataset etc.	ication system usi ayes Classifier, et	ing Machine Leai c.) using standa	rning methods (Stoch ard datasets like Iris	nastic Gradient Recognition					
T1. A. Beck, First 2017. T2. S. Bubeck, Co Trends in Optimiz T3. F. Bach, "Lean Foundations and	-Order Methods ir onvex Optimizatio ation, 2015. rning with Submo Trends in Machine	n Optimization, N n: Algorithms ar dular Functions: e Learning, Now	10S-SIAM Series on nd Complexity, Found A Convex Optimizat Publishers Inc., 2013	Optimization, lations and ion Perspective", 3.					
R1. S. Boyd, N. P the alternating di Learning, Now Pu R2. Y. Nesterov, Springer, 2004. P3 M Bazarra H	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.								
Algorithms," John	Wiley & Sons, 20)06.		. Theory and					
http://192.168.1.10/cgi-bin/koha/opac- detail.pl?biblionumber=11708&guery_desc=ti%2Cwrdl%3A%20MACHINE%20LEARNI NG									
Topics relevant Gradient descent LASSO, Logistic R Coordinate descent Topics relevant SKILLS": NIL	to development convergence ana tegression, nt methods and c to development	t of "SKILL": lysis, Quasi-New onvergence anal t of "ENVIRONI	ton Theory (Secant r ysis MENT AND SUSTAI	nethods), NABILITY					

Course Code: CSE3208	Course Title: Artificial Intelligence in Practice Type of Course: 1] Discipline Elective 2] Laboratory integrated	L- T- P- C	2	0	2	3		
Version No.	1.0			•				
Course Pre- requisites	CSE3001 Artificial Intelligence and Machine	Learning	5					
Anti-requisites	NIL							
Course Description	This course covers some of the applications in logic, searching, adversarial search, const networks, etc. Topic include: AI methodology, Logic in AI, Re Search techniques, Adversarial Search t Uncertainty and Probability, Reasoning in AI, ar	 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, and Sequence Labeling. 						
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Artificial Intelligence in Practice and attain SKILL DEVELOPMENT through Experiential Learning techniques.							
Course Out	On successful completion of the course the st	udents sł	nall b	e able	e to:			
Comes	Comes 1] Explain different methods of searching, proving, and analysis in Al. [Comprehension]							
2] Prove, by resolution, different situations in First Order Logic. [Ap						ation]		
	3] Implement various graphical and adversarial search algorithms [Application]							
	4] Solve sequence labeling problems using HM	4] Solve sequence labeling problems using HMM. [Application]						

Course Content:						
Module 1	Search Methods for Problem Solving	Assignment	Python Programming	No. of Classes L – 12 P – 16		
Topics: Introduction to Problem space and state space. State space search techniques. Solving Problems by Searching – Uninformed Search, Informed Search and Adversarial Search. Uninformed Search Techniques – Breadth-First Search, Depth-First Search, and Uniform Cost Search. Dijkstra's Single-Source Shortest Path. Applications of uninformed search. Informed Search Techniques – Greedy Best-First Search. A* Search. Adversarial Search – Game Playing, Minimax Search, Alpha-Beta Pruning, Ideal Ordering. Extensions of adversarial search – Expectiminimax, and MaxN. Constraint Satisfaction Problems – Constraints. Definition of a CSP. Examples of Constraint Satisfaction Problems. Arc consistency. Problem structure and problem decomposition. Backtracking. Backtracking heuristics. Local search. Timetable scheduling as a real-world example.						
Module 2	Knowledge- Based Logic Representation	Assignment	Python Programming	No. of Classes L-8 P-4		
Module 3 Uncertainty in Al Assignment /Quiz Programming using Keras/Sklearn No. of Classes L-10 P -10 Topics: Uncertainty in Al. Revision of Probability Basics and Bayes Theorem. Bayesian Networks. Hidden Markov 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						
List of Laboratory Experiment No. 1 Level 1: Read a te Level 2: Parse a te Experiment No. 2 Level 1 Implement Level 2 Implement Experiment No. 3 Level 1 Implement Level 2 Implement Level 1 Implement	y Tasks: y Tas	ing of Graph Algorithms by taking input from the by reading files. of Uninformed Search tweighted graphs eighted graphs of Heuristic Search Al Search	e console Algorithms gorithms			

Experiment No. 5: Implementation of Adversarial Search
Level 1 Implement a Game Tree
Level 2 Implement a Alpha-Beta Pruning
Experiment No. 6: Implementation of a CSP Solver
Level 1 Implement a CSP solver for solving a cryptarithmetic problem.
Level 2 Implement a CSP solver for solving map colouring problem.
Experiment No. 7: Using Python Packages for CSPs
Level 1 Implement a CSP solver using Python Constraints package.
Level 2 Implement a Sudoku solver using Python Constraints package.
Experiment No. 8: Implement a Decision Maker
Level 1 Implement a Minesweeper Solver
Level 2 Implement a Battleship Solver
Experiment No. 9: Implement a Hidden Markov Model
Level 1 Implement a generic HMM
Level 2 Calculate the forward probability of a sequence
Experiment No. 10: Implement a Hidden Markov Model for Part-of-Speech Tagging
Level 1 Implement a HMM for solving part-of-speech tagging
Level 2 Use a part-of-speech tagger from Python's NLTK
Targeted Application & Tools that can be used :
1 Google Colabor any other Python IDF
Project work/Assignment: Mention the Type of Project /Assignment proposed for this
course
Students will have to do NPTEL assignments for any one of the Al-related courses as given by the
Instructor-in-Charge for the semester. Some of the relevant courses are given below
Text Books
1 Stuart Pussel and Pater Nervig, Artificial Intelligence: A Modern Approach, Ath Edition
Porcen Education 2022
Pedison Education. 2022.
2. Lavika Goel. Antificial Intelligence. Concepts and Applications. 1 Edition. Wiley. 2021.
3. Flateer Joshi and Alberto Altasanchez. Altinciat intelligence with Fython. 2 Edition. Fackt.
A Arnaldo Perez Castano Practical Artificial Intelligence 1 st Edition Apress 2018
5 Elaine Rich Kevin Knight and Shivashankar B Nair Artificial Intelligence 4th Edition MedTech
Science Dress 2024
6 Mark Watson Practical Artificial Intelligence Programming with Java 6 th Edition Lean-pub
References
1 Deenak Khemani A First Course in Artificial Intelligence 1 st Edition 6 th Reprint 2018
2 Munesh Chandra Trivedi A Classical Approach to Artificial Intelligence 2 nd Edition Khanna
Publishere 2018
3 George Luger Artificial Intelligence: Structures and Strategies for Complex Problem Solving
6 th Edition, Pearson Education, 2021.

Other E-Resources (NPTEL and other video links):

- Mausam (IIT Delhi), "An Introduction to Artificial Intelligence". Link: <u>https://nptel.ac.in/courses/106102220</u>.
- 2. Shyamanta M. Hazarika (IIT Guwahati), "Fundamentals of Artificial Intelligence". Link: <u>https://nptel.ac.in/courses/112103280</u>.
- Deepak Khemani (IIT Madras), "Artificial Intelligence: Search Methods for Problem-Solving". Link: <u>https://nptel.ac.in/courses/106106226</u>.
- 4. Deepak Khemani (IIT Madras), "Artificial Intelligence: Knowledge Representation and Reasoning".
- Link: <u>https://nptel.ac.in/courses/106106140</u>.
 Deepak Khemani (IIT Madras), "AI: Constraint Satisfaction". Link: <u>https://nptel.ac.in/courses/106106158</u>.
- 6. IJCAI 2020 Talk by Eugene Freuder.
 - Link: https://ijcai20.org/excellence-research-award-session/.

Courses	
Course	Course little: lime Series Analysis
Code:	Type of Course: Laboratory
CSE 3012	Integrated
Version	1
No.	
Course	CSE 3001 Artificial Intelligence and Machine Learning
Pre-	
requisites	
Anti-	
requisites	
Course Descriptio n	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 models.
Course Objective	This course is designed to improve the learners "EMPLOYIBILITY SKILLS" by using EXPERIENTIAL LEARNING techniques. Lecturers on the Time Series Analysis facilitates the Peer Learning and group projects on real time applications.
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 u of the methods. Develop time ser Compare with [Comprehension]	use of time series [Understand] ies regression mo multivariate	s models for foreca odels. [Application] times series an	isting ai id oth	nd the er ap	limitations plications.
Course Content:						
Module 1	INTRODUCTION OF TIMESERIES ANALYSIS	Assignment	Data Collection/Interpre	etation	+P[2]	L[6] Sessions
Topics: Introduction time series- Examples of forecasting -	to Time Series an Models for time s Time series Nat Resources for for	nd Forecasting -D series analysis-A cure and uses of recasting.	ifferent types of da utocorrelation and f forecasting-Fored	ata-Inte I Partia casting	ernal str I autoc Procese	orrelation. S-Data for
Graphical Di Time Series Time Series Performance	splays -Time Serie Data - Use of Da Modeling and F	es Plots - Plotting Ita Transformatio forecasting- Eval	Smoothed Data - ons and Adjustmen uating and Monite	Numeri Its- Gen oring Fo	ical Des neral Ap orecast	cription of proach to ing Model
Module 2	TIME SERIES REGRESSION MODEL	Assignment/Qui z	Case studies		+P[3]	L[6] Session s
in Linear Reg Selection Me Models for G	gression- Predictio ethods in Regressi eneral Time Series	n of New Observa on - Generalized Data- Exponenti	ations - Model Adeo I and Weighted Le al Smoothing-First	quacy C ast Squ order a	hecking ares- F nd Seco	g -Variable Regression and order.
Module 3	AUTOREGRESSIV E INTEGRATED MOVING AVERAGE (ARIMA) MODELS	Quiz	Case studies		+P[2]	L[10] Session s
Topics:	MODELS					
Autoregressi Models - (Autoregressi Seasonal Da Introduction Criteria - In Impulse Res	ve Moving Averag Checking for Sta ve Integrated Mor ata - Seasonal A - Finding the "BE npulse Response ponse Functions fo	ge (ARMA) Mode tionarity using ving Average (Af RIMA Models- F ST" Model - Exar Function to Stuc or Competing Mod	ls - Stationarity a Variogram- Dete RIMA) Models - Fo orecasting using S mple: Internet Use dy the Differences dels .	nd Invecting N recastin Seasona rs Data in Moc	ertibility Nonstat ng using al ARIN - Mode dels - (of ARMA ionarity - g ARIMA - 1A Models I Selection Comparing
Module 4	MULTIVARIATE TIME SERIES MODELS AND FORECASTING	Assignment	Case studies	L[8] +	P[1] \$	Sessions
Topics: Multivariate ARIMA Mode Analysis - Ba	Time Series Mode els - Vector AR (ayesian Methods ir	ls and Forecastin VAR) Models - N NForecasting.	ig - Multivariate St Ieural Networks ar	ationary	y Proce casting	ss- Vector -Spectral
List of Labo 1. Loading,	pratory Tasks: Preprocessing and	l Handling Time s	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.

https://b-ok.cc/book/2542456/2fa941

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				
Lta. P2 Time Series Analysis by James D Hamilton Convright © 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 DOOK IINK R3: <u>https://d-ok.cc/dook/3685042/275671</u>				
Web resources:				
1. https://www.coursera.org/learn/practical-time-series-analysis				
2. https://ocw.mit.edu/courses/economics/14-384-time-series-analysis-fall-				
2013/download-course-materials/				
3. https://swayam.gov.in/nd1 noc19 mg46/preview				
Taniaa walayee at ta dagaalay waat af WOldU Dagaalay waa at "				
I opics relevant to development of "Skill Development":				
Autoregressive Models				
Exponential smoothing models or esms				
Generating forecasts on time series				
Topics relevant to development of "Employability Skills"				
Time series analysis to Monitor and access water resources.				

Remote Sensing time series analysis for Crop Monitoring. Satellite Image Time series Analysis. Waste Monitoring and Analysis.

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Course Code:	Course Title: ADVANCED NATURAL LANGUAGE PROCESSING	L- T-P-	2 -0	2	3
CSE 3015	Type of Course: Integrated	C			
Version No.	1.0				
Course Pre- requisites	CSE 3014 – Fundamentals of Natural Language P	rocessin	g		
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				
Course	natural language process	atural language processing, such as sentiment analysis, machine translation,			
Description	cognitive natural language	cognitive natural language processing, etc.			
	Topics include: Machine translation, Text summarization, Sentiment analysis, Cognitive NLP, Gaze behaviour, Evaluation Metrics, etc.				
Course	The objective of the cours	e is to familia	arize the learners with the c	oncepts	
Objective	of Advanced Natural Lan Experiential Learning tech	guage Proces nniques.	singand attain Employabili	ty through	
	On successful completion	n of the cours	se the students shall be abl	le to:	
	Understand how to solve [[Comprehension]	different prol	olems in natural language p	processing.	
Course Out Comes	Solve natural language ge text summarization. [Appl	neration prol lication]	olems such as machine tra	nslation and	
	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:					
Module 1	Pre-trained Language Models			4 Sessions	
Topics: Introducti Introduction to NI	on to Pre-Trained Languag _TK and Huggingface Trans	e Models. BE sformers.	RT. Multi-lingual variants of	f BERT.	
Module 2	Machine Translation and Text Summarization			7 Sessions	
Topics: Introduction to machine translation – source and target languages. Pivot-based machine translation. Using Transformers for machine translation. Monolingual machine translation examples. Machine translation evaluation metrics – BLEU. Implementation of BLEU score calculation using NLTK in Python. Other MT metrics – METEOR, TER, etc. Text summarization – definition. Types of summarizations – Extractive and Abstractive Summarization. Summarization					
evaluation metric	s – ROUGE score.				
Module 3	Sentiment Analysis			6 Sessions	
Topics: Introducti Classification of s based. Challenge sentiment analysi	on to Sentiment Analysis. sentiment analysis based o s in sentiment analysis – s is – Reviewer rating predict	Solving senti on different le arcasm, thw tion, short-te	ment analysis using text cla evels – polarity-based and i arting, negations. Case stu xt classifications, etc.	assification. ntensity- dies in	

Module 4	Cognitive NLP Using Gaze Behaviour			7 Sessions		
Topics: Eye-Mind prediction of trans text complexity, te Comparison of ga behaviour datase	Hypothesis and gaze beha slation complexity, sentim ext quality prediction, etc. ze behaviour across differ ts. Mitigation of recording	aviour termin lent analysis Challenges v rent people – gaze behavic	ology. Using gaze beh complexity, sarcasm vith recording gaze be normalization and bir our at run time using ty	aviour for understandability, haviour at run time. nning. Gaze /pe aggregation.		
List of Laboratory	Tasks:					
Familiarization wi preprocessing.	th Python. Using Python to	o read text file	es, basic tokenization	and other		
Introduction to NI	_TK and Huggingface Trans	sformers in P	ython.			
Using Huggingfac	e Transformers to create a	a simple MT a	pplication.			
Implementation c	f pivot-based machine tra	Inslation usir	ng Huggingface Transf	ormers.		
Calculation of BL	EU using NLTK – difference	e between se	ntence_bleu and corp	ous_bleu methods.		
Implementation c	f extractive summarizatio	n.				
Polarity classifica	tion of text using VADER.					
Intensity prediction	on of text using Weighted N	Normalized P	olarity Intensity.			
Estimating gaze b	ehaviour for a user using r	normalizatior	and binning			
Calculating gaze I	pehaviour for a text based	on type aggr	egation in multiple lar	iguages.		
Complex word ide	entification using gaze beh	aviour.				
Targeted Applicat	ion & Tools that can be use	ed:				
Google Colab						
Python IDE (Eg. Py	/Charm)					
Huggingface Trans	Huggingface Transformers					
NLTK						
Project work/Assi	gnment:					
Assignment: Stud The assignment to	ents will have to do a cour opics can be taken from M	rse group ass odules 2 or 3	ignment over the cou as per the instructor-	rse of the semester. -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/

R3 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: CSE 3108	Course Title: Expert Systems Course type : Theory Only	L-T- P- C	3 -0	0	3
Version No.	1.0			-	
Course Pre- requisites	"CSE 3108 – Expert systems" cou	irse			
Anti-requisites	NIL				
Course Description	The purpose of this course is to present the concepts of intelligent agents, searching, knowledge and reasoning, planning, learning and expert systems, to study the idea of intelligent agents and search methods, to study about representing knowledge, to study the reasoning and decision making in uncertain world, to construct plans and methods for generating knowledge, to study the concepts of expert systems.				
Course Objective	The objective of the course is to concepts of Expert Systems and Participative Learning techniques	familiari: attain	ze the lear Employab	ners w i lity t	ith the hrough

Course Out Comes	 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 A Natural language Uniformed search s	I: Intelligent age processing – trategies – Inforn	nts – Perception Problem – Solvi ned search strat	– ng agents – Searc egies.	hing for solutions:
Module 2	Knowledge and Reasoning	Assignment	Theory	9 Hours
Adversarial searc agents: Propositio logic – Inference in	h – Optimal and nal logic – First o first order logic.	imperfect decis order logic – Syr	ions – Alpha, Beta itax and semantics	pruning – Logical – Using first order
Module 3	Uncertain knowledge and Reasoning	Assignment	Theory	8 Hours
Uncertainty – Acti probability – Baye's	ing under uncerta s rule – Probabil i	inty – Basic prol i stic reasoning	bability notation – A – Making simple de	Axioms of ecisions.
Module 4	Planning and Learning	Assignment	Theory	9 Hours
Planning: Plannin deterministic doma Learning: Learnir Reinforcement lear	g problem – Pa ins – ng decision tree ning – Passive an	rtial order plan s – Knowledge d active.	ning – Planning a in learning – N	nd acting in non- Ieural networks –
Module Systems	Assignme 10hrs	5 nt	Theory	Expert
Definition – Featu Knowledge Represe Targeted Applica	res of an expert sentation in expert to the sentation in expert tion & Tools that	system – Organi systems – Expe t can be used:	zation – Characteris rt system tools – M	stics – Prospector – YCIN – EMYCIN.
Project work/Ass for this course	ignment: Menti	on the Type of	Project /Assignm	nent proposed

Text Book

- 1. Stuart Russel and Peter Norvig, 'Artificial Intelligence A Modern Approach', Second Edition, Pearson Education, 2003 / PHI.
- 2. 2. Donald A.Waterman, 'A Guide to Expert Systems', Pearson Education.

References

- 1. 1. George F.Luger, 'Artificial Intelligence Structures and Strategies for Complex Problem Solving', Fourth Edition, Pearson Education, 2002.
- 2. 2. Elain Rich and Kevin Knight, 'Artificial Intelligence', Second Edition Tata McGraw Hill, 1995.
- 3. 3. Janakiraman, K.Sarukesi, 'Foundations of Artificial Intelligence and Expert Systems', Macmillan Series in Computer Science.
- 4. 4. W. Patterson, 'Introduction to Artificial Intelligence and Expert Systems', Prentice Hall of India, 2003.

Links :

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

Topics relevant to "EMPLOYABILITY SKILLS": Optimal and imperfect decisions, Logical agents, for developing Employability Skills through Participative Learning Techniques. This is attained through Review of digital/e resource as mentioned in course handout.

Course Code: CSE3017	Course Title: Autonomous Navigation and Vehicles Type of Course : Theory	L-Т- Р- С	3 - 0	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 including machine learning, localization, mapping, communication and security. Hands-on imp and navigation algorithms on both sim platforms. This course covers the mathema the-art implementations of algorithms for autonomous vehicles (e.g., mobile robots, culminates in a critical review of recent adv project aimed at advancing the state-of-the Topics include: Autonomous driving te Recognition and Tracking, Localization w Perceptions In Autonomous driving, Deep le Perception, Prediction and Routing, Decision	g sensors, object lementation ulated a tical found or vision-l self-drivity vances in e-art. echnologie vith GNSS earning in n planning	sensir detection on of re nd ph dations based ing car the fie es ove 5, Visu Autono	ng algo ion, t obotic ysical and s naviga s, dro Id and rview, al Od omous ontrol	orithms, racking, sensing mobile tate-of- ation of nes). It a team Object ometry, Driving	
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 to: 1. Understand the Autonomous system' algorithm, sensing, object recog Autonomous system.	s the stud is and its r inition ar	equirer nd tra [Un	ments. cking dersta	e able Explain of an nd]	

	2. Do the error analysis of Localization systems and u	ise t	the tools and
	techniques,[Analyze]	- I	
	3. Explain, plan and control the trainc benavior, and	SHc FA	an be able to
	4 Explain Plan and control motion, choose proper d	iont	systems for
	automotive vehicles and understand	t	he cloud
	platform.[Application]		
Course			
content:			
Module 1		12	Sessions
Introduction to	o autonomous driving: Autonomous driving technol	oaie	s overview.
autonomous driv	ving algorithms: Sensing, Perception. Object Recognition	n ar	nd Tracking:
Autonomous driv	ing client system, driving cloud platform, Robot Operating	Syst	tem, HD Map
Production, Deep	learning Model Training, Localization with GNSS: GNSS	ove	rview, GNSS
error analysis, sa	atellite based augmentation systems, real time kinematic	an	d differential
GPS, precise poir	nt positioning, Visual Odometry: Stereo Visual Odometry, I	Mon	ocular Visual
Odometry, Visua	I Inertial Odometry, Dead Reckoning and Wheel Odometry	/.	
Module 2		8	Sessions
Sterio, Optical flo Convolutional Ne	w and Scene flow. Deep learning in Autonomous Drivi ural Networks, Detection, Semantic segmentation, Stereo a	ng and	Perception: optical flow.
Module 3		10	Sessions
Prediction and	Routing: Planning and control overview, Traffic predic	tior	1: Behaviour
prediction as clas	ssification, Vehicle trajectory generation, Lane level routin	ng:	Constructing
a weighted direct	ed graph for routing, typical routing algorithms, routing g	rap	h cost.
Module 4		08	Sessions
Decision planni	ng and control: Behavioral decisions, Motion planning, I	eed	back control
Reinforcement L	earning Based Planning and Control, Client systems i	or	Autonomous
Driving: Operati	ng systems and computing platform Cloud platform i	or	Autonomous
Targeted Applie	ation & Tools that can be used:		
Applications: 0	hstacle Avoidance, Path Planning, Autonomous Vehicles		
Tools: MIDGUA	RD A Simulation platform for Autonomous Vehicle navigation	ion.	
Project Work/			
1. Develop a sys	Assignment:		
2. To develop a	Assignment: tem that avoids obstacles in the path.		re chould he
considered, draw	Assignment: tem that avoids obstacles in the path. cloud based autonomous navigation, what are the param	nete	is should be
Text Book	tem that avoids obstacles in the path. cloud based autonomous navigation, what are the param a framework for the navigation system.	nete	
	tem that avoids obstacles in the path. cloud based autonomous navigation, what are the param a framework for the navigation system.	nete	
T1: Shaoshan Liu	tem that avoids obstacles in the path. cloud based autonomous navigation, what are the param a framework for the navigation system. , Liyun Li, Jie Tang, Shuang Wu, Jean-Luc, Creating Auto	nete nom	nous Vehicle
T1: Shaoshan Liu Systems Morgan	Assignment: tem that avoids obstacles in the path. cloud based autonomous navigation, what are the param a framework for the navigation system. u, Liyun Li, Jie Tang, Shuang Wu, Jean-Luc, Creating Auto & Claypool Publishers 2 nd Edition, 2019	nete non	nous Vehicle
T1: Shaoshan Liu Systems Morgan T2: Ronald K. Ju	tem that avoids obstacles in the path. cloud based autonomous navigation, what are the param a framework for the navigation system. J, Liyun Li, Jie Tang, Shuang Wu, Jean-Luc, Creating Auto & Claypool Publishers 2 nd Edition, 2019 rgen Autonomous Vehicles for Safer Driving SAE Internati	nete nom ona	nous Vehicle

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.

Course Code: UG COURSE: CSE3018	Course Title: Digital Health and Imaging Type of Course: Discipline elective Theory	L-T- P-C	3 ~0	0	3	
Version No.	1.0				<u> </u>	
Course Pre- requisites	MAT1003 Applied Statistics CSE3081 Digital image processing					
Anti~requisites	NIL					
Course Description	Digital health and Imaging course it focuses on the intersection of healthcare, technology, and medical imaging. This course provides an in- depth understanding of how digital technologies are transforming the field of healthcare, particularly in the areas of medical imaging, diagnostics, and patient care.					
Course Out Comes	 Upon successful completion of the Machine Vision course, students can expect to achieve the following outcomes: Understand the Role of Digital Health: Explain the concept and significance of digital health in modern healthcare. Understand how digital technologies are transforming healthcare delivery, patient care, and healthcare management. [Knowledge] Describe Medical Imaging Modalities: Identify and describe various medical imaging modalities, such as X-ray, CT scan, MRI, ultrasound, and nuclear medicine. Understand the principles, advantages, limitations, and clinical applications of each imaging modality. [Comprehension] Apply Digital Imaging processing Techniques on Medical images [Application] Application of Image processing in diagnosis of diseases using medical images from various medical imaging modalities. [Application] 					

Course				
Content:				
	Introduction to Digital			No. of
Module 1	Health	Assignment	Practical	Classes:8
Overview of dig	gital health and its impa	ct on healthcare, li	ntroduction to telemed	licine,
health	nearm monitoring devic	es, etnical and leg	al considerations in di	gitai
neann.				
	Medical Imaging			
Madula 2	Modalities	Assistant	Dua ati aal	No. of
Module 2		Assignment	rractical	Classes:10
Principles and a	prolications of various n	l redical imaging mo	 	19
computed tomo	graphy (CT), and magn	etic resonance ima	ging (MRI),Ultrasoun	d imaging
and nuclear me	dicine imaging, Imaging	z modalities for spe	ecific healthcare doma	ains (e.g.,
radiology, cardi	ology).			
	Digital Image			
Module 3	Processing	Assignment	Practical	No. of
Nourie 5	Fundamentais	Assignment	Tactical	Classes:14
D' '(1'		C I I		
filtering and res	epresentation and prope	tation and feature	extraction	nage
	ioration, intage segmen		entraction.	
	Image Analysis in			
Module 4	Healthcare	Assignment	Practical	No. of
Module 4		Assignment	Tactical	Classes:10
Image registrati	on and fusion technique	es. Ouantitative im	age analysis for diseas	se diagnosis
and treatment p	lanning, Computer-aid	ed detection and di	iagnosis in medical im	aging,
Machine learning	ng in medical image ana	alysis		
Group Project:				
1. OCT image dataset of retina, Retinal layer segmentation using CNN models.				
 MKI image dataset of Brain, lumor detection and classification. Fundus image dataset of eve Blood vessel segmentation 				
 a. Fundus image dataset of eye, blood vessel segmentation. 4. EEG Data analysis 				
5. ECG	Data analysis.			
6. CT I	Data set of Chest to detec	et COPD (Chronic]	pulmonary obstructive	disease).
Tools/Software	Paguinad .			
1. OpenCV	керинен. 14			
2. Python 3	3.7			

3. MATLAB

Text Books

- 1. "Biomedical Signal and Image Processing with Artificial Intelligence" by <u>Chirag</u> Paunwala, Mita Paunwala, Rahul Kher (2023)
- 2. "Biomedical Signal and Image Processing" by Kayvan Najarian and Robert Splinter 2nd edition(2012)

References

- "Digital Image Processing" by Rafael C. Gonzalez and Richard E. Woods 4th edition (2018).
- 3. "Digital Health: Scaling Healthcare to the World" by Paul Sonnier 2nd edition (2018)

Course Code:	Course Title: Stochastic Decision naking					
CSE3019		L- I- P- C	3	0	0	3
	Type of Course: Theory					
Version No.	1.0					
Course Pre- requisites	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 making 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 results, not on mathematical theory. This course emphasizes optimization models with uncertain parameter values. In contrast, the DMA course focuses on various deterministic optimization models and Monte Carlo simulation.					s will ve risk course e on n models urse Monte

Course Objective	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 to:	completion of the c	course the students	s shall be able		
	Gain basic kn domain. The s Markov proce chains, Poisso	owledge about stoc student has acquired sses with a discrete on processes and bir	hastic processes ir d more detailed kn state space, inclue th and death proce	the time owledge about ding Markov esses.		
	Know about queueing systems and Brownian motion, in addition to mastering the fundamental principles of simulation of stochast processes and the construction of Markov chain Monte Carlo (MCMC) algorithms.					
	formulate sim	ple stochastic proce	ess models in the t	ime domain		
	and provide q	and provide qualitative and quantitative analyses of such models.				
Course Content:	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	Simulation/Data Analysis	14 Sessions		
Use data to mo travelDemand, hedging strate Introduction to project: mana postpone, exp	odel currency e ; Brief introduct gies; Supply co decision tree; ging technology and, and contra	exchange rates, stoc tion to Monte Carlo ontract selection; Air Value of informatio y risk; Value a licens act.	k prices, commodi simulation; Optima rline booking contr n; Bayesian update se agreement; Opt	ty prices, air al financial ol. eValue an R&D ions to		
Module 2	sequential decision making: decision tree	Assignment	Simulation/Data Analysis	14 Sessions		

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 budgeti	ing: when proj	ects have uncertain	NPVs and uncerta	in 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 Laborato	ry Tasks					
Targeted Applic	ation & Tools t	that can be used:				
The course is th tools.	neory based ai	nd students will get h	ands on experien	ce in statistical		
Assignment:						
Text Book						
J Medhi, "Stochastic Processes"						
References						

A K Basu, "Introduction to Stochastic process"

Ming Liao, "Applied Stochastic Process"

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: Cognitive Science & L-T-						
CSE3103	Analytics Type of Course : Theory P-C 3 -0 0 3						
Version No.	1.1						
Course Pre-	CSE3008: Machine Learning Techniques						
requisites							
Anti-requisites	NIL						
Course Description	Overview of biological structure and artificial network, sensing algorithms, machine learning, localization. Hands-on implementation of cognitive recognition algorithms on both simulated and physical platforms. This course covers the mathematical foundations and state-of-the-art implementations of algorithms for cognitive analysis. It culminates in a critical review of recent advances in the field and a team project aimed at advancing the Reasoning.						
Course Objective	This course is designed to improve the learners' SKILLS by using PROBLEM SOLVING Methodolog	EMPLOYA jies.	ABILITY				
Course Out Comes	On successful completion of the course the students shall be able to: Understand the different neural network models. [Understand] Understand cognition systems and its requirements. [Understand] Apply dynamic System concepts in Cognitive Science and Neuroeconomics. [Application] Apply Cognitive Science in Learning and Reasoning. [Application]						
Course Content:							
Module 1	1	8 Sessior	าร				
Introduction to Biological Neuron: Structure of Neuron, Action Potential, Process of Action Potential, Process of Synaptic Transmission, Stimulate the synaptic vesicle, Depolarization of the neuron,							
Memory (Biological Basis): Theories of Memory Formation, System Consolidation Theory, Multiple-Trace Theory, Reconsolidation Theory,							

Artificial Neural Network: Models of single neurons, Different neural network models. Single Layer Perceptron: Least mean square algorithm, Learning curves, Learning rates, Perceptron.

Bayesian Network, Degree of Belief, Conditional Probability, Bayes's Rule

Module 2	12 Sessions

Cognitive Architecture: Fundamental Concepts, Cognitive View, Computers in Cognitive Science, Applied Cognitive Science, Interdisciplinary Nature of Cognitive Science, Nature of Cognitive Psychology, Notion of Cognitive Architecture, Global View of the Cognitive Architecture, Cognitive Processes, Working Memory, and Attention. Neuroscience: Brain and Cognition, Introduction to the Study of the Nervous System, Organization of the Central Nervous System, Neural Representation, Neuropsychology, Computational Neuroscience,

Module 3	10 Sessions
MODELSANDTOOLS: The Physical Symbol System Hypot	hocic :Intolligent

MO D E L S AN D TOO LS : The Physical Symbol System Hypothesis :Intelligent Action and the Physical Symbol System, Neural based Models of Information Processing. Cognitive Science and Dynamical Systems, Applying Dynamical Systems. Neuroeconomics: Perception as a Bayesian Problem, Neuroeconomics: Bayes in the Brain

Strategies for Brain Mapping, Studying Cognitive Functioning: Techniques from Neuroscience

Module 4

08 Sessions

Application: Models of Language Learning- Language Learning in Neural Networks, Bayesian 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. 2nd 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: CSE3348	Course Title: Generative AI Type of Course: 1] Discipline Elective 21 Laboratory integrated	L-T-P-C	2	0	2	3	
Version No.	1.0						
Course Pre- requisites	CSE3001 – Artificial Intelligence and Machine Learning						
Anti- requisites	NIL						
Course Description	This course builds the foundational insight of understanding generative AI models and to explore various architectures, algorithms and practices of Gen AI skills to accelerate strategic decision making with data and deliver cutting-edge products faster with GenAI-augmented software development and leverage Gen AI tools to optimize workflows.						
Course Objective	The objective of the course is to familiarize the learners to explore the competence in benchmarking and comprehend the potential generative AI models and techniques to revolutionize industries and create prominent Gen AI tools to attain Employability Skills through Experiential Learning techniques.						
Course Out Comes	On successful completion of the course t	he studen [.]	ts sha	ll be	able	to:	

	CO 1: Infer the concepts of generative AI models and prompt engineering in tailoring customized outputs [Understand].								
		CO 2: Demonstrate attention mechanism and transformers architecture with practical Applications. [Apply].							
			CO 3: Practice advanced generative AI techniques using Langchain Python framework [Apply].						
			CO 4: Solve real-time applications using multi-modal generative AI models [Apply].						
Cou Cor	ırse itent:								
Μοσ	dule 1	Introdu Genera	uction to ative Al	Participative Brainsto Learning session		Brainstorming session/Quiz	No. of classes L-6 P-8		
	Topics: Intr Application Models (LL variants, Go its variants	oductions, Type Ms) – In Dogle D by Antl	on to Generativ s of Generative stroduction, evo veepMind's, PaL nropic, Prompt	e models: Historica models for differen olution, Generative p .M2, LLaMa and its s Engineering-basic p	l pe t da ore- seri	erspective and evolution ata modalities, Large La trained transformers (C es of models by Meta A npting.	n, anguage GPT) and its I, Claud and		
Module 2		Text-based Generative models		Participative Learning	icipative Fish bowl, Think- ning share		No. of classes L-8 P-6		
	Topics: Text-based Generative models: State-of-the Art models, RNN, LSTM, Transformer Architecture, Transformer based Generative models: BERT, GPT, Training and Fine tuning LLMs for Generative task, Open AI's Pre-trained transformers for Text Generation: ChatGPTs, Limitations of LLMs: Lack of context and Hallucination risks, Techniques to mitigate these limitations: chaining and retrieval augmentation, Workflow of an LLM application.								
Module 3Introduction to Lang ChainExperiential LearningImplementation Gen AI mode Langchain Fr				Implementation of Gen AI models using Langchain Framework	No. of classes L-8 P-8				
	Topics: Introduction to Lang chain: Types, Components, Information retrieval using agents and tools in Lang chain, Retrieval Augmented Language Models (RaLM): Understanding Retrieval and vectors: Embeddings, Vector storage, Vector indexing, Vector Libraries, Vector Databases, Chatbot using memory and conversation buffer.								
Module 4Generative models for other Data modalitiesProject-based LearningMulti-Modal Gen AI models for Realtime ApplicationsNo. of classes L-8 P-8						No. of classes L-8 P-8			

Topics: Generative Adversarial Networks (GAN): GAN Architecture, GAN variants, Neural Style transfer with GAN, Training GANs and common challenges, GAN applications in image and text generation, Variational Auto Encoders (VAEs) and its variants, Image generation models: Dall-E, MidJourney and stable diffusion: Architecture and components of stable diffusion, Text-to-image Generation, Parameter tuning, Image-to-image generation, Training custom models, In-Painting: Exchanging classes, Multi-modal generative models using Whisper for Audio: Speech-to-Text generation.

List of Laboratory Tasks:

Experiment No.1: Setting up Python IDE(Spyder) and OpenAl API key. Introduction to OpenAl playground and prompting

Level 1: Document the installation and the process for generating models in OpenAI

Level 2: Solve various GenAI models of OpenAI from Playground using prompts

Experiment No.2: Text classification, summarization, sentiment analysis, chatbot application, code explanation with generating single and multiple response(S).

Level 1: **Practice** the text generation model of OpenAI and Spyder IDE to implement various applications.

Experiment No.3: Embeddings – for words, similarity between words, text embeddings, plagiarism check of documents

Level 1: Use generating embeddings for words, text and documents

Level 2: Apply the embeddings API to develop applications for plagiarism check

Experiment No.3: Image generation using Dall E. Using GPT-Vision model for text to image generation and image-to-text.

Level 1: Apply GPT-vision model for text-to-image generation and image-to-image

Experiment No.5: Transformer based text and email classification

Level 1: Develop transformer-based AI models for classifying text/email

Experiment No.6: BERT for masked token generation

Level 1: Develop BERT based model for generating masked tokens

Experiment No.7: Creating applications using different types of LangChains – Simple Sequential, Sequential and map reduce

Level 1: List the various types of chains in Langchain

Level 2: Practice different types of chains using Spyder IDE and OpenAI

Experiment No.8: Information retrieval using agents and tools in Langchain.

Level 1: Use agents and tools with Langchain for information retrieval

Experiment No.9: Custom Document loading and retrieval in LangChain using ChromaDB

Level 1: Understand ChromeDb

Level 2: Apply chromed with Langchain to generate information retrieval model from custom document

Experiment No.10: Create a GPT like Chatbot using the memory component and RALM in LangChain

Level 1: Show GPT like chatbot using memory component and retrieval augmented language model

Experiment No.11: Using action agents, human as a tool and plan and execute agents for information retrieval.

Level 1: Understand action agents and plan and execute agents

Level 2: Use agents and tools for information retrieval

Experiment No.12: Implement GAN for neural style transfer

Level 1: Demonstrate a style transfer algorithm using generative models and experiment with the transformation of images by applying different artistic styles, assessing both the technical aspects and the aesthetic outcomes

Experiment No.13: Text to Image generation using Dall-e/stable diffusion using prompts

Level 1: List various image generation models

Level 2: Use an image generation model to generate image from prompts

Experiment No.14: Image to Image generation using stable diffusion

Level 1: Apply stable diffusion to generate image from an image using prompts

Experiment No.15: Speech to text and multi-modal generative models using Whisper for Audio

Level 1: Identify the generative model for text, image and audio data

Level 2: Use Langchain to create models for generating different data modalities. Ex: Audioto-text

Targeted Application & Tools that can be used

Open AI Generative AI models: GPT 3.5 Turbo, GPT 4.0 vision model, Dall-E 3.0, Lang Chain Framework in Python, Python IDE, Stable Diffusion, Gemini, Hugging Face,

Mini-Project work

Mini-Project Titles:

- 1. Conversational Chatbot that interacts with documents: create a conversational chatbot to enage users in meaningful dialogues, answer queries, offer recommendations, and aid tasks using provided documents as inputs.
- 2. Sentiment Analysis/Intent Analysis/Toxicity Analysis
- 3. Natural Language Translation Instruction Tuning using FLAN (Finetuned language Net) model

4.	Questions and Answering systems – Extractive & Generative
5.	Text Summarization – Medicine – Med-PaLM
6.	Given the Academic guidelines of the University, generate the student Handbook with FAQs and solutions.
7.	Generating Cartoon based story telling
8.	Simulate various driving conditions to improve safety and performance in Autonomous vehicles
9.	In Financial management, generate synthetic financial data for stress testing and scenario analysis
10.	Personalized recommendations/Product suggestions/tailored content based personalized design studio
11.	Simulate characters for Games
12.	Create conversational agents
13.	Tutor in a range of preferred subjects
14.	Generate codes
15.	Draft documents
16.	Answer questions about any knowledge base
17.	Create an application which uses LangChain to connect OpenAI API to DALL-E. This image generation application turns written descriptions into lifelike pictures and artwork.
18.	Embark on building a personalized language model with Falcon-7b. Utilize personalized LLM technique to explore text generation capabilities by providing task examples as inputs.
19.	Use OpenAI's DALL-E and Gradio UI to develop an innovative logo builder. Th app creates unique and stunning logos from text prompts, revolutionizing the logo design process.
20.	Crafting an AI powered HR Assistant: Develop a virtual assistant designed to answer queries related to Audi HR policy. Leverage Python libraries and OpenAI's GPT model for accurate and efficient query responses.
ГЕХТ В	OOKS:
T1: Ge 346-8,	nerative Al with LangChain, Ist Edition by Ben Auffarth, Packt. Inc. ISBN: 978-1-83508-
Dec	emeber 2023.
T2 : Gei 978109	nerative Deep Learning, 2nd Edition by David Foster, O'Reilly Media, Inc. ISBN: 98134181,

T3: Prompt Engineering for Generative AI, by James Phoenix, Mike Taylor, O'Reilly Media,

Inc., ISBN:9781098153373, July 2024.

REFERENCES:

R1. Bandi, A., Adapa, P. V. S. R., & Kuchi, Y. E. V. P. K. (2023). The power of Generative AI: a review of requirements, models, Input–Output formats, evaluation metrics, and challenges. Future Internet, 15(8), 260. <u>https://doi.org/10.3390/fi15080260</u>

R2. Barachini, F., & Stary, C. (2022). From digital twins to digital selves and beyond. In Springer eBooks. <u>https://doi.org/10.1007/978-3-030-96412-2</u>

R3. Hadi, M. U., Tashi, Q. A., Qureshi, R., Shah, A., Muneer, A., Irfan, M., Zafar, A., Shaikh, M. B., Akhtar, N., Wu, J., & Mirjalili, R4. S. (2023). Large Language Models: A Comprehensive Survey of its Applications, Challenges, Limitations, and Future Prospects. https://doi.org/10.36227/techrxiv.23589741.v4

R4. Hai-Jew, S. (n.d.). Generative AI in Teaching and Learning. IGI Global.

R5. Salvaris, M., Dean, D., & Tok, W. H. (2018). Generative adversarial networks. In Apress eBooks (pp. 187–208). <u>https://doi.org/10.1007/978-1-4842-3679-6_8</u>

MOOC's/Swayam Courses/Online Courses:

h https://onlinecourses.swayam2.ac.in/imb24_mg116/preview

Certification Course by Google :

1. https://www.cloudskillsboost.google

- a. Introduction to Generative AI (Beginner)
- b. Gemini for Google Cloud (Intermediate)
- c. Generative AI for Developers (Advanced)

2. https://www.credly.com/badges/90e3eae0-87f3-44e3-af82-658e837aad3d/public_url

3. <u>https://www.coursera.org/learn/generative-ai-with-llms</u>

4. https://www.coursera.org/specializations/prompt-engineering

ONLINE RESOURCES:

W1. https://openai.com

W2: https://python.langchain.com/v0.2/docs/introduction/

W3: https://www.udemy.com/course/master-ai-image-generation-using-stable-diffusion/?kw=Image+generation+using&src=sac&couponCode=LETSLEARNNOWP

W4: https://huggingface.co/google-t5/t5-base

W5: <u>https://dominguezdaniel.medium.com/exploring-image-generative-ai-models-</u> 9359705b15d3

W6: https://cloud.google.com/use-cases/retrieval-augmented-generation?hl=en#

W7: <u>https://ig.ft.com/generative-ai/</u>

W8: https://medium.com/@samia.khalid/bert-explained-a-complete-guide-with-theoryand-tutorial-3ac9ebc8fa7c

Topics relevant to "EMPLOYABILITY SKILLS": Topics of all four modules will help in developing **Employability Skills** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course handout.

Course Code:	Cours	e Title: Business Intelligence					
CSE3088	and A	and Analytics		- 3 -0	0	3	
	Туре	of Course: Theory	С				
Version No.	1.1						
Course Pre-	NIL						
requisites							
Anti-requisites	NIL						
Course	Busir	ess Intelligence (BI) refers to te	echnolog	jies, ap	plication	s, and	
Description	pract	ices for the collection, integratio	n, analy	/sis, and	d preser	itation	
		silless illionnation. The purpose	ing Th				
	over	view of the technology of BI and	d the a	nnlicatic	n of BI	to an	
	organ	nization's strategies and goals.		spireacie			
Course Objective	The of	pjective of the course is to familia	rize the	learner	s with t	he	
-	concepts of Business Intelligence and Analytics and attain						
	Employability through Problem Solving Methodologies.						
Course Out	Course Out On successful completion of the course the students shall be abl					able	
Comes	Comes to:						
	1. Introduce the concepts and components of Business						
	Inteiligence (BI) [Knowledge]						
	2. Evaluate the technologies that make up BI (data						
	2 Define how BI will help an organization and whether it will						
	helpful [COMPREHENSION]						
	 Identify the technological architecture that makes up BI systems [COMPREHENSION] 						

Course Content:						
Module 1	Basics of Insights	Assignment	Programming Task	10 Sessions		
Topics:				_		
The importance of c	lata in the inforr	nation age – the able in the data	data value chain – tool	s for		
Modulo 2	Basics			12		
	Statistics: Foundation of Quantitative Insights	Assignment		Sessions		
Topics:						
Basic statistics – Va	riables - Measu	res of central ter	ndency - Measures of di	spersion -		
Normal distribution	and histograms	- The empirical i	rule - Covariance and c	correlation		
Module 3	Data Visualization	Assignment		10 Sessions		
Topics:	L		L	-		
Data visualisation a and Pie Charts	nd Anscombe's (Quartet - Data c	leaning using SAS Data	Studio - Bar		
Module 4	Advanced char and dashboard	ts s		13 Sessions		
and controls - KPIs Linear regression ar Targeted Applicat Professionally use	and targeted ba nalysis – Forecas ion & Tools tha ed software	ar charts - Dashb sting - Forecastir at can be used:	ooard theory – Demand ag and smoothing metho	forecasting - ods		
Project work/Ass	ignment:					
 Fext Book Business Intelligence Guidebook: From Data Integration to Analytics 1st Edition, Kindle Edition. Business Intelligence Roadmap: The Complete Project Lifecycle for Decision-Support Applications (Addison-Wesley Information Technology Series) 1st Edition, Kindle Edition 						
References 1. Successful Bu Data 2nd Editi	siness Intelligen ion, Kindle Editio	ice, Second Edition	on: Unlock the Value of	BI & Big		
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.						

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