

PROGRAMME REGULATIONS & CURRICULUM

2024-28

PRESIDENCY SCHOOL OF COMPUTER SCIENCE & ENGINEERING

BACHELOR OF TECHNOLOGY (B.TECH.) COMPUTER SCIENCE & ENGINEERING



PRESIDENCY SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

Program Regulations and Curriculum 2024-2028

BACHELOR OF TECHNOLOGY (B.Tech.) in COMPUTER SCIENCE & ENGINEERING

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

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

Regulation No: PU/AC-24.5/SOCSE04/CSE/2024-2028

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

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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 transforming Society.

1.4 Mission of Presidency School of Computer Science and Engineering

• Cultivate a practice-driven environment with a contemporary Learning-pedagogy, integrating theory and practice.

• Attract and nurture world-class faculty to excel in Teaching and Research, in the field of Core Computer Science and Engineering.

• Establish state-of-the-art facilities for effective Teaching and Learning-experiences.

• Promote Interdisciplinary Studies to nurture talent and impart relevant skill-sets 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 Industrial Based Project 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, 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 2024-2028.

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 2024-2028 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. "Dean" means the Dean / Director of the concerned School;

u. "Degree Program" includes all Degree Programs;

v. "Department" means the Department offering the degree Program(s) / Course(s) / School offering the concerned Degree Programs / other Administrative Offices;

w. "Discipline" means specialization or branch of B.Tech. Degree Program;

x. "HOD" means the Head of the concerned Department;

y. "L-T-P-C" means Lecture-Tutorial-Practical-Credit – refers to the teaching – learning periods and the credit associated;

z. "MOOC" means Massive Open Online Courses;

aa. "MOU" means the Memorandum of Understanding;

bb. "NPTEL" means National Program on Technology Enhanced Learning;

cc. "Parent Department" means the department that offers the Degree Program that a student undergoes;

dd. "Program Head" means the administrative head of a particular Degree Program/s;

ee. "Program Regulations" means the Bachelor of Technology Degree Program Regulations and Curriculum, 2024-2028;

ff. "Program" means the Bachelor of Technology (B.Tech.) Degree Program;

gg. "PSCS" means the Presidency School of Computer Science and Engineering;

hh. "Registrar" means the Registrar of the University;

ii. "School" means a constituent institution of the University established for monitoring, supervising and guiding, teaching, training and research activities in broadly related fields of studies;

jj. "Section" means the duly numbered Section, with Clauses included in that Section, of these Regulations;

kk. "SGPA" means the Semester Grade Point Average as defined in the Academic Regulations, 2021;

II. "Statutes" means the Statutes of Presidency University;

mm. "Sub-Clause" means the duly numbered Sub-Clause of these Program Regulations;

nn. "Summer Term" means an additional Academic Term conducted during the summer break (typically in June-July) for a duration of about eight (08) calendar weeks, with a minimum of thirty (30) University teaching days;

oo. "SWAYAM" means Study Webs of Active Learning for Young Aspiring Minds.

pp. "UGC" means University Grant Commission;

qq. "University" means Presidency University, Bengaluru; and

rr. "Vice Chancellor" means the Vice Chancellor of the University.

5. Program Description

The Bachelor of Technology Degree Program Regulations and Curriculum 2024-2028 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 2024-2028 offered by the Presidency School of Computer Science and Engineering (PSCS):

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

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

3. Bachelor of Technology in Computer Science and Technology (Big Data), abbreviated as B.Tech. Computer Science and Technology (Big Data);

4. Bachelor of Technology in Computer Science and Engineering (Block Chain), abbreviated as B.Tech. Computer Science and Engineering (Block Chain);

5. Bachelor of Technology in Computer Science and Technology (DevOps), abbreviated as B.Tech. Computer Science and Technology (DevOps);

6. Bachelor of Technology in Computer Science and Engineering (Cyber Security), abbreviated as B.Tech. Computer Science and Engineering (Cyber Security);

7. Bachelor of Technology in Computer Science and Engineering (Internet of Things), abbreviated as B.Tech. Computer Science and Engineering (Internet of Things);

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

9. 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);

10. Bachelor of Technology in Information Science and Technology, abbreviated as B.Tech. Information Science and Technology;

11. Bachelor of Technology in Computer Science and Information Technology, abbreviated as B.Tech. Computer Science and Information Technology;

12. Bachelor of Technology in Computer Science and Engineering (Networks), abbreviated as B.Tech. Computer Science and Engineering (Networks);

13. Bachelor of Technology in Computer Engineering (Artificial Intelligence and Machine Learning), abbreviated as B.Tech. Computer Engineering (Artificial Intelligence and Machine Learning);

14. 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

15. Bachelor of Technology in Computer Science and Engineering (Artificial Intelligence and Machine Learning) abbreviated as B.Tech. Computer Science and Engineering (Artificial Intelligence and Machine Learning);

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

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

5.3 The effect of periodic amendments or changes in the Program Regulations, on the students admitted in earlier years, shall be dealt with appropriately and carefully, so as to ensure that

those students are not subjected to any unfair situation whatsoever, although they are required to conform to these revised Program Regulations, without any undue favour or considerations

6. Minimum and Maximum Duration

6.1 Bachelor of Technology Degree Program is a Four-Year, Full-Time Semester based program. The minimum duration of the B.Tech. Program is four (04) years and each year comprises of two academic Semesters (Odd and Even Semesters) and hence the duration of the B.Tech. program is eight (08) Semesters.

6.2 A student who for whatever reason is not able to complete the Program within the normal period or the minimum duration (number of years) prescribed for the Program, may be allowed a period of two years beyond the normal period to complete the mandatory minimum credits requirement as prescribed by the concerned Program Regulations and Curriculum. In general, the permissible maximum duration (number of years) for completion of Program is 'N' + 2 years, where 'N' stands for the normal or minimum duration (number of years) for completions and Curriculum.

6.3 The time taken by the student to improve Grades/CGPA, and in case of temporary withdrawal/re-joining (Refer to Clause 16.1 of Academic Regulations), shall be counted in the permissible maximum duration for completion of a Program.

6.4 In exceptional circumstances, such as temporary withdrawal for medical exigencies where there is a prolonged hospitalization and/or treatment, as certified through hospital/medical records, women students requiring extended maternity break (certified by registered medical practitioner), and, outstanding sportspersons representing the University/State/India requiring extended time to participate in National/International sports events, a further extension of one (01) year may be granted on the approval of the Academic Council.

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 egulations) 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. A Teaching and Research Professional in the area of Computer science and engineering through lifelong learning.

PEO3. A Consultancy team member in the Computer Science and Engineering Industry.

PEO4. An entrepreneur in the computer science and other related areas of specialization.

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

8.1 Programme Outcomes (PO)

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

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

PO2. Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics,

natural sciences, and engineering sciences.

PO3. **Design/Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-Long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

8.2 Program Specific Outcomes (PSOs):

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

PSO1: Problem Analysis: Identify, formulate, research literature, and analyze complex engineering problems related to Software Engineering principles and practices, Programming and Computing technologies reaching substantiated conclusions using first principle

PSO2: Design/development of Solutions: Design solutions for complex engineering problems related to Software Engineering principles and practices, Programming and Computing technologies and design system components or processes that meet the specified needs

PSO3: Modern Tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities related to Software Engineering principles and practices, Programme.

9 Admission Criteria (as per the concerned Statutory Body)

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

9.1 An applicant who has successfully completed Pre-University course or Senior Secondary School course (+2) or equivalent such as (11+1), 'A' level in Senior School Leaving Certificate Course from a recognized university of India or outside or from Senior Secondary Board or equivalent, constituted or recognized by the Union or by the State Government of that Country for the purpose of issue of qualifying certificate on successful completion of the course, may apply for and be admitted into the Program.

9.2 Provided further, the applicant must have taken Physics and Mathematics as compulsory subjects in the Pre-University / Higher Secondary / (10+2) / (11+1) examination, along with either Chemistry / Biology / Electronics / Computer Science / Biotechnology subject, and, the applicant must have obtained a minimum of 45% of the total marks (40% in case of candidates belonging to the Reserved Category as classified by the Government of Karnataka) in these subjects taken together.

9.3 The applicant must have appeared for Joint Entrance Examinations (JEE) Main / JEE (Advanced) / Karnataka CET / COMED-K, or any other State-level Engineering Entrance Examinations.

9.4 Reservation for the SC / ST and other backward classes shall be made in accordance with the directives issued by the Government of Karnataka from time to time.

9.5 Admissions are offered to Foreign Nationals and Indians living abroad in accordance with the rules applicable for such admission, issued from time to time, by the Government of India.

9.6 Candidates must fulfil the medical standards required for admission as prescribed by the University.

9.7 If, at any time after admission, it is found that a candidate had not in fact fulfilled all the requirements stipulated in the offer of admission, in any form whatsoever, including possible misinformation and any other falsification, the Registrar shall report the matter to the Board of Management (BOM), recommending revoking the admission of the candidate.

9.8 The decision of the BOM regarding the admissions is final and binding.

10 Lateral Entry / Transfer Students requirements

10.1 Lateral Entry

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

10.1.1 Admission to 2nd year (3rd Semester) of the B.Tech. Degree program shall be open to the candidates who are holders of a 3-year Diploma in Engineering (or equivalent qualification as recognized by the University), who have secured not less than forty-five percentage (45%) marks in the final year examination (5th and 6th Semesters of the Diploma Program) in the appropriate branch of Engineering. Provided that, in case of SC / ST and OBC candidates from Karnataka the minimum marks for eligibility shall be forty percent (40%).

10.1.2 Provided further that, candidates seeking Lateral Entry may be required to complete specified bridge Courses as prescribed by the University. Such bridge Courses, if any, shall not be included in the CGPA computations.

10.1.3 All the existing Regulations and Policies of the University shall be binding on all the students admitted to the Program through the provision of Lateral Entry.

10.1.4 The Course requirements prescribed for the 1st Year of the B.Tech. Program shall be waived for the student(s) admitted through Lateral Entry and the duration of the B.Tech. Program for such students is three (03) years, commencing from the 3rd Semester (commencement of the 2nd Year) of the B.Tech. Program and culminating with the 8th Semester (end of the 4th Year) of the B.Tech. Program.

10.1.5 Provided that, if a Lateral Entry student misses any mandatory program specific courses that are typically offered in the 1st year (1st or 2nd semesters), then those courses must be cleared by the students as soon as possible, preferably during the Summer Term.

10.1.6 The existing Program Regulations of the concerned Program to which the student is admitted through the provision of Lateral Entry shall be binding on the student with effect from the 3rd Semester of the Program. i.e., the Program Structure and Curriculum from the 3rd to 8th Semesters of the Program concerned shall be binding on the student admitted through Lateral Entry. Further, any revisions / amendments made to the Program Regulations thereafter, shall be binding on all the students of the concerned Program.

10.1.7 All the Courses (and the corresponding number of Credits) prescribed for the 1st Year of the concerned B.Tech. Program shall be waived for the student(s) admitted to the 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) 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 for a student who joins the Program through the provision of the Lateral Entry, shall be "N – M" Credits.

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

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

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

10.2.1The concerned student fulfils the criteria specified in Sub-Clauses 10.1.1, 10.1.2 and 10.1.3.

10.2.2A 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:
10.2.3The student shall submit copies of the respective Marks Cards / Grade Sheets / Certificates along with the Application for Transfer.

10.2.4The 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. 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 Presidency University.

10.2.5The Branch / Discipline allotted to the student concerned shall be the decision of the University and binding on the student.

11 Change of Branch / Discipline / Specialization

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

11.1 Normally, only those students, who have passed all the Courses prescribed for the 1st Year of the B.Tech. Program and obtained a CGPA of not less than 6.50 at the end of the 2nd Semester, shall be eligible for consideration for a change of Branch.

11.2 Change of Branch, if provided, shall be made effective from the commencement of the 3rd Semester of the B.Tech. Program. There shall be no provision for change of Branch thereafter under any circumstances whatsoever.

11.3 The student provided with the change of Branch shall fully adhere to and comply with the Program Regulations of the concerned Branch of the B.Tech. Program, the Fee Policy pertaining to that Branch of the B.Tech. Program, and, all other rules pertaining to the changed Branch existing at the time.

11.4 Change of Branch once made shall be final and binding on the student. No student shall be permitted, under any circumstances, to refuse the change of Branch offered.

11.5 The eligible student may be allowed a change in Branch, strictly in order of *inter se* merit, subject to the conditions given below:

11.5.1 The actual number of students in the 3rd Semester in any particular Branch to which the transfer is to be made, should not exceed the intake fixed by the University for the concerned Branch;

11.5.2 The actual number of students in any Branch from which transfer is being sought does not fall below 75% of the total intake fixed by the University for the concerned Branch.

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

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

12.1 The academic performance evaluation of a student in a Course shall be according to the University Letter Grading System based on the class performance distribution in the Course.

12.2 Academic performance evaluation of every registered student in every Course registered by the student is carried out through various components of Assessments spread across the Semester. The nature of components of Continuous Assessments and the weightage given to each component of Continuous Assessments (refer Clause 8.8) shall be clearly defined in the Course Plan for every Course, and approved by the DAC.

12.3 Format of the End-Term examination shall be specified in the Course Plan.

12.4 Grading is the process of rewarding the students for their overall performance in each Course. The University follows the system of Relative Grading with statistical approach to classify the students based on the relative performance of the students registered in the concerned Course except in the following cases:

- Non-Teaching Credit Courses (NTCC)
- Courses with a class strength less than 30

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

Grading shall be done at the end of the Academic Term by considering the aggregate performance of the student in all components of Assessments prescribed for the Course. Letter Grades (Clause 8.10) 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.

C N -	Credit	T	C	CA CA	Mid	Term	End	-term	Dealerst	Tetel	
5.110	Structure	Туре	Theory	Practical	Theory	Practical	Theory	Practical	Project	Total	Exam Conducted by
1	2002	Percentage	25%	-	25%	-	50%	-	-	100%	Mid Term & End Term by CoE
1	5-0-0-5	Marks	50	-	50	-	100	-	-	200	Mid-Term & End Term by COE
2	2-0-2-3	Percentage	12.50%	12.50%	12.50%	12.50%	25%	25%	-	100%	Mid-Term & End Term by CoE
2	2-0-2-3	Marks	25	25	25	25	50	50	-	200	Wid-Term & End Term by COE
2	1042	Percentage	-	25%	5%	20%	10%	40%	-	100%	Mid Taum & End Taum by Sabaal
3	1-0-4-3	Marks	-	25	5	20	10	40	-	100	wid-Term & End Term by School
А	2044	Percentage	12.50%	12.50%	10%	15%	20%	30%	-	100%	*Mid Town & End Town by CoE
4	2-0-4-4	Marks	25	25	20	30	40	60	-	200	Ind-Term & End Term by COE
F	0043	Percentage	-	50%	-	-	-	-	50%	100%	Project evaluated by IC in School Javel
3	0-0-4-2	Marks	-	50	-	-	-	-	50	100	Project evaluated by IC In School level
c	0021	Percentage	-	100%	-	-	-	-	-	100%	Only CA in School Loval
0	0-0-2-1	Marks	-	100	-	-	-	-	-	100	Only CA In School Level
7	2024	Percentage	12.50%	12.50%	15%	10%	30%	20%	-	100%	Mid Town & End Town by CoF
1	5-0-2-4	Marks	25	25	30	20	60	40	-	200	Wid-Term & End Term by COE
	2002	Percentage	25%	-	25%	-	50%	-	-	100%	Mid Town & End Town by CoF
•	2-0-0-2	Marks	50	-	50	-	100	-	-	200	wild-Term & End Term by COE

12.5 Assessment Components and Weightage

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

Normally, for Practice/Skill based Courses, without a defined credit structure (L–T–P) [NTCC], but with assigned Credits (as defined in Clause 5.2**Error! Reference source not found.** of the cademic 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:

12.6.1Theory 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.

12.6.2Lab/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.

12.6.3A 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 8.9.1, 8.9.2) 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.** of Academic Regulations) and approved by the ean - 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:

13.3.1A 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 as prescribed by the Curriculum Structure of the concerned Program.

13.3.2SWAYAM/NPTEL/ other approved MOOCs as mentioned in Clause 13.3 shall be approved by the concerned Board of Studies and placed (as Annexure B) in the concerned PRC.

13.3.3Parent 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.

13.3.4Students 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.

13.3.5A 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.

13.3.7A 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.

13.3.8The credit equivalence of the SWAYAM/NPTEL/other approved MOOCs are based on Course durations and/or as recommended by the Course offering body/institute/university. The Credit Equivalence mapped to SWAYAM/ NPTEL approved Courses based on Course durations for transfer of credits is summarised in Table shown below. The Grade will be calculated from the marks received by the Absolute Grading Table 8.11 in the Academic Regulations.

Table	e 2: Durations and Cred SWAYAM-NPTEL/	it Equivalence for Transfer of Credits from 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
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13.3.9The maximum permissible number of credits that a student may request for credit transfer from MOOCs shall not exceed 20% of the mandatory minimum credit requirements specified by the concerned Program Regulations and Curriculum for the award of the concerned Degree.

13.3.10 The University shall not reimburse any fees/expense; a student may incur for the SWAYAM/NPTEL/other approved MOOCs.

13.4 The maximum number of credits that can be transferred by a student shall be limited to forty percent (40%) of the mandatory minimum credit requirements specified by the concerned Program Regulations and Curriculum for the award of the concerned Degree. However, the grades obtained in the Courses transferred from other Institutions/MOOCs, as mentioned in this Section (13.0**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) Program Structure (2024-2028) totaling 160 credits. Table 3 summarizes the type of baskets, number of courses under each basket and the associated credits that are mandatorily required for the completion of the Degree.

Table 3: B.Tech. (Computer Science & Engineering) 2024-2028: Summary of Mandatory Courses and Minimum Credit Contribution from various Baskets

SI. No.	Baskets	Credit Contribution
1	Humanities and Social Sciences including Management Courses (HSMC)	10
2	Basic Science Courses (BSC)	19
3	Engineering Science Courses (ESC)	23
4	Professional Core Courses (PCC)	65
5	Professional Elective Courses (PEC)	21
6	Open Elective Courses (OEC)	6
7	Project Work (PRW)	16
8	Mandatory Courses (MAC)	5 Courses
	Total Credits	160 (minimum)

In the entire Program, the practical and skill-based course component contribute to an extent of approximately 60% out of the total credits of 160 for B.Tech. (Computer Science and Engineering) 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 19.2.1 of Academic Regulations;

c. No dues to the University, Departments, Hostels, Library, and any other such Centers/ Departments of the University; and

d. No disciplinary action is pending against her/him.

PART C – CURRICULUM STRUCTURE

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

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

Tab	Table 3.1 : List of Humanities and Social Sciences including Management Courses (HSMC)							
S. No	Course Code	Course Name	L	т	Р	С		
1	ENG1002	Technical English	1	0	2	2		
2	PPS1001	Introduction to soft skills	0	0	2	1		
3	DES1146	Introduction to Design Thinking	1	0	0	1		
4	ENG2001/ FRLXXXX	Advanced English / Foreign Language courses	1	0	2	2		
5	PPS1012	Enhancing Personality Through Soft Skills	0	0	2	1		
6	MGTXXXX	Managerial Economics and Financial Analysis	3	0	0	3		
			Total N	o. of C	redits	10		

		Table 3.2 : List of Basic Science Courses (BSC)				
S.No	Course Code	Course Name	L	Т	Ρ	С
1	MAT1001	Calculus and Linear Algebra	3	0	2	4
2	PHY1002	Optoelectronics and Device Physics	2	0	2	3
3	MAT1003	Applied Statistics	2	0	0	2
4	MAT2501	Integral Transforms and Partial Differential Equations	3	0	0	3
5	MAT2605	Discrete Mathematics	4	0	0	4
6	MAT2602	Numerical Computations	3	0	0	3
		Τα	tal No	. of Cr	edits	19

	т	able 3.3 : List of Engineering Science Courses	(ESC)			
S.No	Course Code	Course Name	L	Т	Р	С
1	MEC1006	Engineering Graphics	2	0	0	2
2	CSE1004	Problem Solving Using C	1	0	4	3
3	ECE2007	Digital Design	2	0	2	3
4	CIV1008	Basic Engineering Sciences	2	0	0	2
5	CSE1006	Problem Solving using JAVA	1	0	4	3
6	EEE1007	Basics of Electrical and Electronics Engineering	3	0	2	4
7	ECE2010	Innovative Projects Using Arduino	-	-	-	1
8	CSE1500	Computational Thinking using Python	2	0	2	3
9	CSE2510	Competitive Programming and Problem Solving	0	0	4	2
			Total No	. of C	Credits	23

	Та	ble 3.4 : List of Professional Core Courses (PCC)				
S.No	Course Code	Course Name	L	Т	Ρ	С
1	CSE1508	Data Structures	3	0	0	3
2	CSE1504	Web Technologies	2	0	0	2
3	CSE1506	Data Communication and Computer Networks	3	0	0	3
4	CSE2501	Computer Organization and Architecture	3	0	0	3
5	CSE1509	Data Structures Lab	0	0	4	2
6	CSE1505	Web Technologies Lab	0	0	2	1
7	CSE1507	Data Communication and Computer Networks Lab	0	0	2	1
8	CSE1510	Database Management Systems	3	0	0	3
9	CSE1511	Database Management Systems Lab	0	0	2	1
10	CSE1512	Analysis of Algorithms	3	1	0	4
11	CSE1513	Analysis of Algorithms Lab	0	0	2	1
12	CSE1700	Essentials of AI	3	0	0	3
13	CSE1701	Essentials of AI Lab	0	0	4	2
14	CSE2511	Data Analytics	2	0	0	2
15	CSE2512	Data Analytics Lab	0	0	2	1
16	CSE2504	Scalable Application Development using Java	3	0	0	3
17	CSE2505	Scalable Application Development using Java Lab	0	0	4	2
18	CSE2500	Theory of Computation	3	0	0	3
19	CSE2502	Operating Systems	3	0	0	3
20	CSE2514	Operating Systems Lab	0	0	2	1
21	CSE2503	Cryptography and Network Security	3	0	0	3
22	CSE1704	Deep Learning Techniques	3	0	0	3
23	CSE1705	Deep Learning Techniques Lab	0	0	4	2
24	CSE2513	Object Oriented Analysis and Design	3	0	0	3
25	CSE2506	Cloud Computing	2	0	0	2
26	CSE2508	Mobile Application Development	2	0	0	2
27	CSE2000	Software Design and Development	3	0	0	3
28	CSE2507	Cloud Computing Lab	0	0	2	1
29	CSE2509	Mobile Application Development Lab	0	0	4	2
		Total	No. o	f Cre	dits	65

	Table 3	5 : List of course in Proj	ect Work	basket (PR	W)	
S.No	Course Code	Course Name	L	Т	Р	С
1	PIP4004	Internship				2
2	PIPXXXX	Mini Project				4
3	PIP2004	Capstone Project	-	-	-	10
				Total No. o	of Credits	16

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 Regulation, are simply assigned the number of Credits based on the quantum of work / effort required to fulfill the learning objectives and outcomes prescribed for the concerned Courses. Such courses are referred to as Non-Teaching Credit Courses (NTCC). These Courses are designed to provide students with hands-on experience and skills essential for their professional development. These courses aim to equip students with abilities in problem identification, root cause analysis, problem-solving, innovation, and design thinking through industry exposure and project-based learning. The expected outcomes are first level proficiency in problem solving and design thinking skills to better equip B.Tech. graduates for their professional careers. The method of evaluation and grading for the Practical / Skill based Courses shall be prescribed and approved by the concerned Departmental Academic Committee (refer Annexure A of the Academic Regulations). The same shall be prescribed in the Course Handout.

18.1 Internship

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

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

18.1.2 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;

18.1.3 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.

18.1.4 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.

18.1.5 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 The Project Work shall be approved by the concerned HOD and be carried out under the guidance of a faculty member.

18.2.2The 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:

18.3.1The Capstone Project shall be in conducted in accordance with the Capstone Project Policy prescribed by the University from time to time.

18.3.2The 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;

18.3.3The number of Capstone Project available for the concerned Academic Term. Further, the available number of Capstone Project shall be awarded to the students by the University on the basis of merit using the CGPA secured by the student. Provided further, the student fulfils the criteria, as applicable, specified by the Industry / Company or academic / research institution providing the Capstone Project, as stated in Sub-Clause 18.3.2 above.

18.3.4 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.

18.3.5 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.

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

The student may do the Research Project / Dissertation in an Industry / Company or academic / research institution of her / his choice subject to the above-mentioned condition (Sub-Clause 18.4.1). 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 3.6 : Professional Electives Courses/Specialization Tracks – Minimum of 18

 credits is to be earned by the student in a particular track and overall 21 credits.

 Track -1 Artificial Intelligence and Machine Learning

SI.N o	Course Code	Course Name	L	т	Ρ	С	S/E M		Prerequisit e [Old Code]	
1	CSE3400	Intelligent Systems with Machine Learning	2	0	2	3	S		CSE1700	
2	CSE3401	Advanced Deep Learning Techniques	3	0	0	3	S/ EM		CSE1700	
3	CSE3402	Computational Optimization for Intelligent Systems.	3	0	0	3	S		CSE1700	
4	CSE3403	Reinforcement Learning for AI Systems	2	0	2	3	S/EM		CSE1700	
5	CSE3404	Computational Linguistics Natural Language Processing	3	0	0	3	S		CSE1700	
6	CSE3405	Synergistic Neural Fuzzy Computing	2	0	2	3	S		CSE1700	
Track	-2 BioInfor	matics & Data Science								
SI.N o	Course Code	Course Name	L	т	Ρ	С	S/E M		Prerequisit e	
1	CSE3406	Introduction to Bioinformatics	3	0	0	3	S/ EM	-	Nil	-
2	CSE3407	Algorithms in Computational Biology	2	0	2	3	S/EM	-	CSE3406	-
3	CSE3408	Statistical Methods for BioInformatics	2	0	2	3	S/EM	-	CSE3406	-
4	CSE3409	Emerging Technologies in Big Data	2	0	2	3	S	-	CSE1510	-
5	CSE3410	Statistical Techniques for Data Science	2	0	2	3	S	-	MATXXXX	

6	CSF3411	Predictive Analytics and	2	0	2	3	S/EM	-	ΜΔΤΧΧΧΧ	_
7	CSE3412	Data Mining	2 7	0	0	י ר	S	-	ΜΔΤΧΧΧΧ	_
8	CSE3/12	No SQL Data Management	2	0	2	י ר	S	-	CSE1510	_
9	CSE2414		2	0	2	2	S/FM	_	Nil	
Track	2 Cloud 8		Z	0	Z	3	57 2141		INII	-
			1				с /г		Duouosuisit	
51.IN 0	Code	Course Name	L	т	Ρ	С	S/E M		e	
1	CSE3415	Cloud Data Engineering	2	0	2	3	S	-	CSE2506	
2	CSE3416	Federated Learning	2	0	2	3	S	-	CSE2506	
3	CSE3417	Edge Computing	2	0	2	3	S/EM	-	CSE2506	
Δ		Network Security and Firewall					S/FM	_		
	CSE3418	Management	2	0	2	3	5/ 11		CSE2503	
5	6652440	Information Security and	2	0	~	2	S		0052502	
	CSE3419	Management	3	0	0	3			CSE2503	
6	CSE3420	Prevention	3	0	0	3	S	-	CSE2503	
_		Principles and Practices of Web	-	•	•	•	- /			
7	CSE3421	Security	2	0	2	3	S/EM		CSE2503	
8		Penetration Testing and Risk					S/FM	-		
	CSE3422	Assessment	3	0	0	3	0, 2.01		CSE2503	
Track	4 - Fintech	Track 4 - Fintech and Blockchain								
			r						<u> </u>	
SI.N o	Course Code	Course Name	L	т	Ρ	с	S/E M		Prerequisit e	
SI.N o 1	Course Code CSE3430	Course Name Introduction to Fintech	L 2	т 0	Р 2	C 3	S/E M S/EM	_	Prerequisit e Nil	-
SI.N o 1 2	Course Code CSE3430 CSE3431	Course Name Introduction to Fintech Banking Technology	L 2 2	T 0	P 2 2	C 3 3	S/E M S/EM S/EM	-	Prerequisit e Nil NII	-
SI.N o 1 2 3	Course Code CSE3430 CSE3431 CSE3432	Course Name Introduction to Fintech Banking Technology Blockchain Technology	L 2 2 2	T 0 0	P 2 2 2	C 3 3 3	S/E M S/EM S/EM S/EM	-	Prerequisit e Nil NII Nil	-
SI.N o 1 2 3 4	Course Code CSE3430 CSE3431 CSE3432 CSE3433	Course Name Introduction to Fintech Banking Technology Blockchain Technology Embedded and Decentralized Finance	L 2 2 2 2	T 0 0 0 0 0	P 2 2 2 2	c 3 3 3	S/EM S/EM S/EM S/EM	-	Prerequisit e Nil NII Nil CSE3430	-
SI.N o 1 2 3 4 5	Course Code CSE3430 CSE3431 CSE3432 CSE3433 CSE3433 CSE3433	Course Name Introduction to Fintech Banking Technology Blockchain Technology Embedded and Decentralized Finance Financial and Capital Markets	L 2 2 2 2 2 2 2 2	T 0 0 0 0 0 0 0	P 2 2 2 2 2 2 2	c 3 3 3 3 3 3	S/EM S/EM S/EM S/EM S/EM S/EM	-	Prerequisit e Nil NII Nil CSE3430 CSE3430	
SI.N o 1 2 3 4 5 6	Course Code CSE3430 CSE3431 CSE3432 CSE3433 CSE3433 CSE3433 CSE3433 CSE3433	Course Name Introduction to Fintech Banking Technology Blockchain Technology Embedded and Decentralized Finance Financial and Capital Markets Blockchain Development and Programming	L 2 2 2 2 2 2 2 2 2 2 2	T 0 0 0 0 0 0 0 0	P 2 2 2 2 2 2 2 2 2	C 3 3 3 3 3 3 3 3 3	S/EM S/EM S/EM S/EM S/EM S	-	Prerequisit e Nil NII Nil CSE3430 CSE3430 CSE3432	-
SI.N 0 1 2 3 4 5 6 7	Course Code CSE3430 CSE3431 CSE3432 CSE3433 CSE3434 CSE3435 CSE3436	Course NameIntroduction to FintechBanking TechnologyBlockchain TechnologyEmbedded and DecentralizedFinanceFinancial and Capital MarketsBlockchain Development andProgrammingStatistics and Data Analysis forFinance	L 2 2 2 2 2 2 2 2 2 2 2	T 0 0 0 0 0 0 0	P 2	c 3 3 3 3 3 3 3 3 3 3	S/E S/EM S/EM S/EM S/EM S/EM S/EM S/EM S/EM	-	Prerequisit e Nil NII Nil CSE3430 CSE3430 CSE3432 CSE3430	-
SI.N 0 1 2 3 4 5 6 7 8	Course Code CSE3430 CSE3431 CSE3432 CSE3433 CSE3433 CSE3434 CSE3435 CSE3436 CSE3437	Course NameIntroduction to FintechBanking TechnologyBlockchain TechnologyEmbedded and DecentralizedFinanceFinancial and Capital MarketsBlockchain Development andProgrammingStatistics and Data Analysis forFinanceFinanceFinanceStatistics and Data Analysis forFinanceFinanceFinanceFinanceFinanceFinanceFinanceFinanceFinanceFinancial Regulations andCompliances	L 2 2 2 2 2 2 2 2 2 3	T 0 0 0 0 0 0 0 0	P 2 2 2 2 2 2 2 2 2 0	c 3 3 3 3 3 3 3 3 3 3 3 3	S/E S/EM S/EM S/EM S/EM S/EM S/EM S/EM S/EM S/EM S S S S S S S	-	Prerequisit e Nil NII Nil CSE3430 CSE3430 CSE3430 CSE3430 CSE3430 CSE3430 CSE3430	-
SI.N o 1 2 3 4 5 6 7 8 7 8 Track	Course Code CSE3430 CSE3431 CSE3432 CSE3433 CSE3433 CSE3435 CSE3436 CSE3437 -6 Program	Course Name Introduction to Fintech Banking Technology Blockchain Technology Embedded and Decentralized Finance Financial and Capital Markets Blockchain Development and Programming Statistics and Data Analysis for Finance Financial Regulations and Compliances	L 2 2 2 2 2 2 2 2 2 3	T 0 0 0 0 0 0 0	P 2 2 2 2 2 2 2 2 2 2 2 0	c 3 3 3 3 3 3 3 3 3 3 3	S/E S/EM S/EM S/EM S/EM S S S S S S S S S S S S S S	-	Prerequisit e Nil NII Nil CSE3430 CSE3430 CSE3430 CSE3430 CSE3430 CSE3430	-
SI.N o 1 2 3 4 5 6 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7	Course Code CSE3430 CSE3431 CSE3432 CSE3433 CSE3433 CSE3434 CSE3435 CSE3436 CSE3437 -6 Program Course Code	Course NameIntroduction to FintechBanking TechnologyBlockchain TechnologyEmbedded and DecentralizedFinanceFinancial and Capital MarketsBlockchain Development andProgrammingStatistics and Data Analysis forFinanceFinanceFinanceStatistics and Data Analysis forFinanceFinanceFinanceFinanceFormingCourse Name	L 2 2 2 2 2 2 2 2 3	T 0 <td< td=""><td>P 2 2 2 2 2 2 2 2 2 2 2 2 0 P</td><td>c 3 C</td><td>S/E S/EM S/EM S/EM S/EM S</td><td>-</td><td>Prerequisit e Nil NII CSE3430 CSE3430 CSE3430 CSE3430 CSE3430 CSE3430 Prerequisit e</td><td>-</td></td<>	P 2 2 2 2 2 2 2 2 2 2 2 2 0 P	c 3 C	S/E S/EM S/EM S/EM S/EM S	-	Prerequisit e Nil NII CSE3430 CSE3430 CSE3430 CSE3430 CSE3430 CSE3430 Prerequisit e	-
SI.N 0 1 2 3 4 5 6 7 8 Track SI.N 0 1	Course Code CSE3430 CSE3431 CSE3432 CSE3433 CSE3434 CSE3435 CSE3436 CSE3437 -6 Program Course Code CSE3423	Course NameIntroduction to FintechBanking TechnologyBlockchain TechnologyEmbedded and DecentralizedFinanceFinancial and Capital MarketsBlockchain Development andProgrammingStatistics and Data Analysis forFinanceFinancial Regulations andCompliancesmingCourse NameGo Programming	L 2 2 2 2 2 2 2 2 2 2 3 3 3	T 0 0 0 0 0 0 0 0 0 0 7 T	P 2 2 2 2 2 2 2 2 2 0 0 P	C 3 3 3 3 3 3 3 3 3 3 2 5 C 3	S/E S/EM S/EM S/EM S/EM S/E S S S S S S S S S S S S/E M S/E M S/E M S/E M	-	Prerequisit e Nil NII Nil CSE3430	-
SI.N 0 1 2 3 4 5 6 7 8 Track SI.N 0 1 2	Course Code CSE3430 CSE3431 CSE3432 CSE3433 CSE3434 CSE3435 CSE3436 CSE3437 -6 Program Code CSE3423 CSE3423	Course Name Introduction to Fintech Banking Technology Blockchain Technology Blockchain Technology Embedded and Decentralized Finance Financial and Capital Markets Blockchain Development and Programming Statistics and Data Analysis for Finance Financial Regulations and Compliances ming Course Name Go Programming Advanced Database Management Systems	L 2 2 2 2 2 2 2 3 3 3 3	T 0 0 0 0 0 0 0 0 0 0 0 7 T 0 0	P 2 2 2 2 2 2 2 0 0 P 0 2	C 3 3 3 3 3 3 3 3 3 3 3 3 3	S/E S/EM S/EM S/EM S/E S S S S S S S S S S S S S/E M S/E S/E S/E S/E S/E S/E S/E S/E S/E S S S S S S S S	-	Prerequisit e Nil NII Nil CSE3430 CSE3430	-

4	CSE3426	Front End Full Stack Development	2	0	2	3	S/ EM	-	CSE1504	-
5	CSE3427	Java Full Stack Development	2	0	2	3	S/ EM	-	CSE1514	-
6	CSE3428	.Net Full Stack Development	2	0	2	3	S/ EM	-	CSE1504	-
7	CSE3429	Rust Programming	2	0	2	3	S/ EM		CSE1502	-
Track	-6 Samsung	5								
SI.N o	New Course Code	Course Name	L	т	Ρ	с	S/E M		Prerequisit e	
SI.N o	New Course Code CAI3427	Course Name Language Models for Text Mining	L 2	т 0	P	c 2	S/E M S/ EM		Prerequisit e CSE 3001	
SI.N o 1 2	New Course Code CAI3427 CAI3428	Course Name Language Models for Text Mining Practical Deep Learning with TensorFlow	L 2 2	T 0	P 0 2	c 2 3	S/E M S/ EM S/ EM		Prerequisit e CSE 3001 CSE 3001	

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

	Table 3.7 : Open Elective Courses Baskets: Minimum Credits to be earned from this Basket is 9													
SI. No	Course Code	Course Name	L	т	Р	с	Typ e of Skill / Foc us	Cours e Cater s to	Prerequisit es/ Corequisite s	Ant requisit es	Future Courses that need this as a Prerequis ite	Course Catego ry		
							Chemis	stry Bask	et					
1	CHE100 3	Fundamenta Is of Sensors	3	0	0	3	SD	ES	-	-		OEC		
2	CHE100 4	Smart materials for IOT	3	0	0	3	SD	ES	-	-		OEC		
3	CHE100 6	Introduction to Nano technology	3	0	0	3	SD	ES	-	-		OEC		
4	CHE101 1	Chemical and Petrochemic al catalysts	3	0	0	3	SD	ES	-	-		OEC		
5	CHE101 3	Chemistry for Engineers	3	0	0	3	SD	ES	-	-		OEC		

		Surface and									
	CHE101	Coatings									
6	4	technology	3	0	0	3	SD	ES	-	-	OEC
	CHE101	Forensic									
7	6	Science	3	0	0	3	SD	HP	-	-	OEC
						Civ	il Engin	eering B	asket		
		Disaster									
		mitigation									
		and									
	CIV100	managemen						ES /			
1	1	t	3	0	0	3	SD	HP	-	-	OEC
		Environment									
		al Science									
	CI /4 CO	and Disaster									
2	CIV100	Managemen	2			2	50	50			050
2	2	t Catalantist	3	0	0	3	FC	ES	-	-	OEC
		Sustainabilit									
	CIV/200	y Concepts									
2	1	In Engineering	2	0	_	2	50	EC			050
5	1	Occupationa	3	0	0	3	30	ES	-	-	UEC
	CIV200	l Health and									
4	2	Safety	З	0	0	З	SD		_	_	OFC
	2	Sustainable	5	Ŭ	-	5	50				010
		Materials									
	CIV200	and Green					SD /				
5	3	Buildings	3	0	0	3	EM	ES	-	-	OEC
		Integrated									
		Project					SD /				
	CIV200	Managemen					EM	HP /			
6	4	t	3	0	0	3	/ EN	GS	-	-	OEC
		Environment									
	CIV200	al Impact					EM				
7	5	Assessment	3	0	0	3	/ EN	ES	-	-	OEC
		Infrastructur									
		e Systems									
	CIV200	for Smart					EM				
8	6	Cities	3	0	0	3	/ EN	ES	-	-	OEC
		Geospatial									
		Applications					/				
	CIV204	for	-	_	-	_	SD /				050
9	4	Engineers	2	0	2	3	ΕM	ES	-	-	OFC
		Environment									
10	CIV204	al	2	0	_	2	50	гс			050
10	5	Project	3		0	3	ענ	ES	-	-	UEC
		Project									
		Based									
11	6	Learning	2	0	0	2	SD	F٩	_	-	OFC
	CIV305	Sustainahilit	5		0		50	5			
12	9	v for	З	0	0	З	FN	FS	-	-	OFC
<u> </u>		,			, Ŭ	, J					2-0

		Professional										
		Practice										
				1	1		Comme	erce Bask	ket in the second se			
	COM20	Basics of										
	07	Accounting	3	0	0	3	FC	-	-	-		OEC
	1	Γ	1			Con	nputer	Science I	Basket	1		
		Problem										
	CSEXXX	Solving										
1	Х	Using C	2	0	0	2						ESC
		Problem										
	CSEXXX	Solving	_		-							
2	X	Using C Lab	0	0	2	1						ESC
		Problem										
2	005	Solving using	2	_	~		2					566
3	CSEXXXX	JAVA	2	0	0	1	2					ESC
		Problem										
	CCENNAR	Solving using	0	_	2	2	2					
4	CSEXXXX	JAVA Lab	0	0	2	2	Z					
	CCE200	Social										
E	2	Applytics	2	0	0	2	50	CS.				
5	5	Analytics	5	0	0	5	30	63	-	-		UEC
	005000	Web design					SD /					
6	CSE200	fundamental	2	_	2	2						050
6	5	S	2	0	2	3	/ EN	-	-	-		OEC
		Soarch										
		Methods For					<u>ر</u> م					
	CSE311	Problem					5D7					
7	1	Solving	з	0	0	З	/ FN	-	-	-		OFC
	-	Privacy And	Ū		Ū		, 2.1					010
		Security In					SD /					
	CSE311	Online Social					EM					
8	2	Media	3	0	0	3	/ EN	-	-	-		OEC
		Computation					SD /					
	CSE311	al					FM					
9	3	Complexity	3	0	0	3	/ EN	-	-	-		OEC
	-	Deep	-	-	-	-	,					
		Learning for					SD /					
	CSE311	Computer					EM					
10	4	, Vision	3	0	0	3	/ EN	-	-	-		OEC
		Learning					SD /					
	CSE311	Analytics					EM					
11	5	Tools	3	0	0	3	/ EN	-	-	-		OEC
- -				-			, Desig	n Basket	+	1	I	
<u> </u>	DES200	Design					- 0018		-			
1	1	Thinking	3	0	0	3	SD		-	-		OEC
<u> </u>	DES208	Art of Design										
2	0	Language	3	0	0	3	SD		-	-		OEC

	DES208	Brand Building in									
3	1	Design	3	0	0	3	SD		-	-	OEC
	DES208	Web Design									
4	5	Techniques	3	0	0	3	SD		-	-	OEC
		3D Modeling									
		for									
_	DES208	Professional	1	_		2	C D				050
5	9	S	1	0	4	3	SD		-	-	OEC
		Creative									
		Professional									
6	00000	c	3	0	0	2	SD		_	_	OFC
- 0	DES209	Idea	5	0	0	5	50				OLC
7	1	Formulation	3	0	0	3	SD		-	-	OEC
-	_		Fle	octri	cal	and	Flectro	nics Eng	ineering Baske	ot.	
		IoT based					Licetie				
		Smart									
	EEE100	Building									
1	2	Technology	3	0	0	3	SD	-	-	-	OEC
-	EEE100	Basic Circuit									
2	3	Analysis	3	0	0	3	SD	-	-	-	OEC
		Fundamenta									
		ls of									
	EEE100	Industrial									
3	4	Automation	3	0	0	3	SD	-	-	-	OEC
		Electric									
		Vehicles &									
	EEE100	Battery									
4	5	technology	3	0	0	3	SD	-	-	-	OEC
		Smart									
	555400	Sensors for									
_	EEE100	Engineering	2		~	2	C D				050
5	6	Applications	3	0	0	3	SD	-	-	-	OEC
		Ele	ectro	onic	s ai	nd C	.ommu	nication	Engineering Ba	isket	
	ECE100	Fundamenta									
1	5 CETOO	Electropics	2	0	0	2	EC	_	_	_	
	5	Microproces	3	0	0	3	гС	-	-	-	UEU
	ECE100	sor based									
2	4	systems	R	0	Λ	2	FC	_	_	_	OFC
<u> </u>		Artificial	5	0		5	10				010
	ECE308	Neural									
3	9	Networks	3	0	0	3	SD	-	-	-	OEC
Ĕ		Smart	Ť			۲, T					
		Electronics									
	ECE309	in					FC /				
4	7	Agriculture	3	0	0	3	ĒM	-	-	-	OEC
		Environment									
	ECE309	Monitoring					FC/				
5	8	Systems	3	0	0	3	EM	-	-	-	OEC

	ECE310	Consumer					FC /					
6	2	Electronics	3	0	0	3	EM	-	-	-		OEC
		Product					SD /					
		Design of					FC /					
	ECE310	Electronic					EM					
7	3	Equipment	3	0	0	3	/ EN	-	-	-		OEC
		Introduction										
	ECE310	to Data					FC /					
8	6	Analytics	3	0	0	3	EM	-	-	-		OEC
		Machine										
	ECE310	Vision for					FC /					
9	7	Robotics	3	0	0	3	EM	-	-	-		OEC
		·					Englis	h Baske	t			
		Reading										
	ENG100	Advertiseme										
1	9	nt	3	0	0	3	SD		-	-		OEC
		Verbal										
	ENG101	Aptitude for										
2	0	Placement	2	0	2	3	SD		-	-		OEC
		English for										
		Career										
	ENG101	Developmen										
3	1	t	3	0	0	3	SD		-	-		OEC
		Indian										
	ENG101	English										
4	3	Drama	3	0	0	3			-	-		OEC
		Logic and Art										
	ENG101	of										
5	4	Negotiation	2	0	2	3						OEC
							Kanna	da Baske	et			
	KAN100	Kannada										
1	3	Kaipidi	3	0	0	3	SD	-	-	-		OEC
		Anuvadha										
	KAN200	Kala										
2	5	Sahithya	3	0	0	3	SD	-	-	-		OEC
	KAN200	Vichara										
3	6	Manthana	3	0	0	3	SD	-	-	-		OEC
		Katha										
	KAN200	Sahithya										
4	7	, Sampada	3	0	0	3	SD	-	-	-		OEC
		Ranga										
	KAN200	Pradarshana										
5	8	Kala	3	0	0	3	SD	-	-	-		OEC
	1	I	<u> </u>		I	For	eign La	nguage F	Basket	1	1	
		Mandarin										
	FRL100	Chinese for										
1	9	Beginners	3	0	0	3	SD	-	-	-		OEC
<u> </u>			, Ŭ	Ŭ			214	Baskot	1	1	I	
	ΙΔ\//20	Introduction					Lavv	Bushet				
1	14	to	2	0	0	2	FC	нр	_	_		
1	14							1 111	-	-		/

		Competition Law									
	LAW20										
2	15	Cyber Law	3	0	0	3	FC	HP	-	-	OEC
						Ν	1athem	atics Bas	sket		
	MAT20	Mathematic									
1	08	al Reasoning	3	0	0	3	SD	-	-		 OEC
		Advanced									
		Business									
	MAT20	Mathematic	_	_	_	_					
2	14	S	3	0	0	3	SD	-	-	-	 OEC
		Functions of									
2	MAT20	Complex	2		~	2	50				050
3	41	Variables Brobability	3	0	0	3	20	-	-	-	UEC
	N/AT20	Probability									
Л	101A120 42		з	0	0	2	SD	_	_	_	OFC
-	72	Flements of	5	0	0	5	50				OLC
	MAT20	Number									
5	43	Theory	3	0	0	3	SD	-	-	-	OEC
		Mathematic	-	-	-	-					
		al Modelling									
	MAT20	and									
6	44	Applications	3	0	0	3	SD	-	-	-	OEC
		•			Me	echa	nical Er	ngineerir	ng Basket		
		Fundamenta									
		ls of									
	MEC10	Automobile									
1	01	Engineering	3	0	0	3	SD	-	-	-	OEC
		Introduction					cn /				
2	MEC10	to Matiab	2		~	2	SD /				050
2			3	0	0	3	EIVI	-	-	-	UEC
2		Drawing	1	0	л	2	SD	_	_	_	OFC
5	03	Renewable	1	0	4	5	30		-	-	 OLC
	MFC20	Energy									
4	01	Systems	3	0	0	3	FC	ES	-	-	OEC
		Operations	-	-	-	-					010
		Research &									
	MEC20	Managemen									
5	02	t	3	0	0	3	FC	-	-	-	OEC
		Supply Chain					SD /				
	MEC20	Managemen					EM				
6	03	t	3	0	0	3	/ EN	-	-	-	OEC
		Six Sigma for									
	MEC20	Professional					SD /				
7	04	S	3	0	0	3	EM	-	MEC2008	-	 OEC
	MEC20	Fundamenta									
8	05	ls of	3	0	0	3	FC	-	-	-	OEC

		Aerospace Engineering										
9	MEC20 06	Safety Engineering	3	0	0	3	SD / EM	ES	-	-		OEC
10	MEC20 07	Additive Manufacturi ng	3	0	0	3	FC / EM	-	-	-		OEC
11	MEC30 69	Engineering Optimisation	3	0	0	3	SD / EM	-	-	-		OEC
12	MEC30 70	Electronics Waste Managemen t	3	0	0	3	FC /	FS	_			OFC
13	MEC30	Hybrid Electric Vehicle	2	0	0	3	SD /	FS				OFC
15	MEC30	Thermal Managemen t of Electronic	5		0	5	SD /					
14	72	Appliances	3	0	0	3	EM	-	-	-		OEC
15	MEC32	Sustainable Technologies and Practices	3	0	0	3	SD / FM	_	_	_		OFC
16	MEC32 01	Industry 4.0	3	0	0	3	SD / EM	-	_			OFC
	_		-	-	Pe	trol	eum En	gineerin	g Basket			
1	PET101	Energy Industry Dynamics	3	0	0	3	FC / SD / FM	FS	_	_	_	OFC
2	PET101	Energy Sustainabilit	2	0	0	2	FC / SD /	FS	_		_	OFC
	-	y Huchees		Ŭ	Ŭ	5	Physic	cs Baske	t			010
		Mechanics					1 11931					
	PHY100	and Physics					FC /					
1	3	of Materials	3	0	0	3	SD		-	-		OEC
2	PHY100	Astronomy	2	0	0	2	EC		_	_		
	4 PHY100	Game	5	0	0	3	FC /		-	-		UEC
3	5	Physics	2	0	2	3	SD.		-	-		OEC
	PHY100	Physics of Nanomateria	_	_	_	~	50					050
4	7 0000110	IS	3	0	0	3	FC		-	-		OEC
5	4	Laser Physics	3	0	0	3	FC	ES	-	-		OEC

		Science and									
	PHY200	Technology	_			_					
6	5	of Energy	3	0	0	3	FC	ES	-	-	OEC
		Introduction	1	I	1		lanager	nent Bas	sket		
	MGT10	to									
1	01	Psychology	3	0	0	3	FC	HP	-	-	OEC
	MGT10	Business									
2	02	Intelligence	3	0	0	3	EN		-	-	OEC
		NGO									
2	MGT10	Managemen	2			2	60				050
3	03	t	3	0	0	3	SD		-	-	OEC
	MGT10	Essentials of					۲ ۲	<u> </u>			
4	04	Leadership	3	0	0	3	, EN	HP	-	-	OEC
		Cross	-		-	-					
		Cultural					SD /				
	MGT10	Communicat					EM				
5	05	ion	3	0	0	3	/ EN	HP	-	-	OEC
							SD /				
6	MGT20	Business	2		_	2	EM				050
6	01 MCT20	Analytics	3	0	0	3	/ EN		-	-	OEC
7	02	al Rehaviour	з	0	0	З	FC	НР	_	_	OFC
	MGT20	Competitive	Ĵ	Ŭ			10				010
8	03	Intelligence	3	0	0	3	SD	-	-	-	OEC
		Developmen					SD /				
	MGT20	t of					EM				
9	04	Enterprises	3	0	0	3	/ EN		-	-	OEC
		Economics					an (
10	MG120	and Cost	2	0	0	2	SD /				
10	05	Decision	3	0	0	3	EIVI		-	-	UEC
		Making									
	MGT20	Under									
11	06	Uncertainty	3	0	0	3	SD		-	-	OEC
		Econometric									
	MGT20	s for	_	_		_					0.50
12	08	Managers	3	0	0	3	SD		-	-	OEC
							SD /				
10	MG120	Managemen	2	0	0	2	EM / ENI				050
13	09	Managin	3	U	U	5			-	-	UEC
	MGT20	Ivianaging					SD /	μр /			
14	10	Performance	3	0	0	3	/ FN	/ ۱۳ GS	_	-	OFC
	MGT20	Personal					,				010
15	11	Finance	3	0	0	3	FC		-	-	OEC
	MGT20	E Business					SD /				
16	12	for	3	0	0	3	EM		-	-	 OEC

		Managemen t									
		Project						GS /			
	MGT20	Managemen					EN /	HP/			
17	13	t	3	0	0	3	EM	ES	-	-	OEC
	MGT20	Project					EN /				
18	14	Finance	3	0	0	3	EM	HP	-	-	OEC
10	MGT20	Engineering	_		~	_					050
19	15	Economics	3	0	0	3	SD		-	-	OEC
	MGT20	Entertainme					FМ				
20	16	nt	3	0	0	3	/ EN		-	-	OEC
		Principles of			-	_	, SD /				
	MGT20	Managemen					EM				
21	17	t	3	0	0	3	/ EN		-	-	OEC
		Professional					SD /				
	MGT20	and Business					EM				
22	18	Ethics	3	0	0	3	/ EN	HP	-	-	OEC
							SD /				
	MGT20	Sales					EM				
23	19	Techniques	3	0	0	3	/ EN	HP	-	-	OEC
		Marketing					SD /				
	MGT20	for		_		_	EM				
24	20	Engineers	3	0	0	3	/ EN	HP			OEC
							SD /				
25	MGT20	Finance for	2		_	2	EM				050
25	21	Customer	3	0	0	3	/ EIN	пр			UEC
		Relationshin					SD /				
	MGT20	Managemen					EM				
26	22	t	3	0	0	3	/ EN	HP			OEC
		People					SD /				
	MGT20	Managemen					EM				
27	23	t	3	0	0	3	/ EN	HP			OEC
		•			1	Μ	ledia St	udies Ba	sket		
	BAJ305	Digital									
1	1	Photography	2	0	2	3	EM	HP			OEC

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

21 List of MOOC (NPTEL) Courses for Computer Science and Engineering program with 12 weeks

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

SI. No.	Course Code	Course Name	L	т	Ρ	Credits	Contact Hours	Basket
Seme	ester 1 - Physi	ics Cycle	12	0	14	19	26	
1	MAT1001	Calculus and Linear Algebra	3	0	2	4	5	BSC
2	PHY1002	Optoelectronics and Device Physics	2	0	2	3	4	BSC
3	MEC1006	Engineering Graphics	2	0	0	2	2	ESC
4	CSE1004	Problem Solving Using C	1	0	4	3	5	ESC
5	ENG1002	Technical English	1	0	2	2	3	HSMC
6	PPS1001	Introduction to soft skills	0	0	2	1	2	HSMC
7	DES1146	Introduction to Design Thinking	1	0	0	1	1	HSMC
8	ECE2007	Digital Design	2	0	2	3	4	ESC
Seme	ester 2 - BES C	Cycle	11	0	12	15	23	
1	MAT1003	Applied Statistics	2	0	0	2	2	BSC
2	CIV1008	Basic Engineering Sciences	2	0	0	2	2	ESC
3	CSE1006	Problem Solving using JAVA	1	0	4	3	5	ESC
4	EEE1007	Basics of Electrical and Electronics Engineering	3	0	2	4	5	ESC
5	ENG2001/ FRLXXXX	Advanced English / Foreign Language courses	1	0	2	2	3	HSMC
6	PPS1012	Enhancing Personality Through Soft Skills	0	0	2	1	2	HSMC
7	CHE1018	Environmental Science	1	0	2	0	3	MAC
8	LAW1007	Indian Constitution and Professional Ethics for Engineers	1	0	0	0	1	MAC
9	ECE2010	Innovative Projects Using Arduino	-	-	-	1	0	ESC
Seme	ester 3		20	0	10	25	30	
1	MAT2501	Integral Transforms and Partial Differential Equations	3	0	0	3	3	BSC
2	MAT2605	Discrete Mathematics	4	0	0	4	4	BSC
3	CSE1508	Data Structures	3	0	0	3	3	PCC
4	CSE1504	Web Technologies	2	0	0	2	2	PCC
5	CSE1500	Computational Thinking using Python	2	0	2	3	4	ESC
6	CSE1506	Data Communication and Computer Networks	3	0	0	3	3	PCC
7	CSE2501	Computer Organization and Architecture	3	0	0	3	3	PCC
8	CSE1509	Data Structures Lab	0	0	4	2	4	PCC
9	CSE1505	Web Technologies Lab	0	0	2	1	2	PCC
10	CSE1507	Data Communication and Computer Networks Lab	0	0	2	1	2	PCC
Seme	ester 4		20	1	14	28	35	
1	MAT2602	Numerical Computations	3	0	0	3	3	BSC
2	CSE1510	Database Management Systems	3	0	0	3	3	PCC
------	---------	---	----	---	---	----	----	------
3	CSE1511	Database Management Systems Lab	0	0	2	1	2	PCC
4	CSE1512	Analysis of Algorithms	3	1	0	4	4	PCC
5	CSE1513	Analysis of Algorithms Lab	0	0	2	1	2	PCC
6	CSE1700	Essentials of AI	3	0	0	3	3	PCC
7	CSE1701	Essentials of AI Lab	0	0	4	2	4	PCC
8	CSE2511	Data Analytics	2	0	0	2	2	PCC
9	CSE2512	Data Analytics Lab	0	0	2	1	2	PCC
10	CSE2504	Scalable Application Development using Java	3	0	0	3	3	PCC
11	CSE2505	Scalable Application Development using Java Lab	0	0	4	2	4	PCC
12	CSEXXXX	Professional Elective – I	3	0	0	3	3	PEC
Seme	ester 5		21	0	6	26	25	
1	CSE2500	Theory of Computation	3	0	0	3	3	PCC
2	CSE2502	Operating Systems	3	0	0	3	3	PCC
3	CSE2514	Operating Systems Lab	0	0	2	1	2	PCC
4	CSE2503	Cryptography and Network Security	3	0	0	3	3	PCC
5	CSE1704	Deep Learning Techniques	3	0	0	3	3	PCC
6	CSE1705	Deep Learning Techniques Lab	0	0	4	2	2	PCC
7	CSE2513	Object Oriented Analysis and Design	3	0	0	3	3	PCC
8	CSEXXXX	Professional Elective – II	3	0	0	3	3	PEC
9	MGTXXXX	Managerial Economics and Financial Analysis	3	0	0	3	3	HSMC
10	CSE7000	Internship	-	-	-	2	0	PRW
Seme	ester 6		18	0	6	21	28	
1	CSE2510	Competitive Programming and Problem Solving	0	0	4	2	4	ESC
2	CSE2506	Cloud Computing	2	0	0	2	2	PCC
3	CSE2508	Mobile Application Development	2	0	0	2	2	PCC
4	CSE2000	Software Design and Development	3	0	0	3	3	PCC
5	CSE2507	Cloud Computing Lab	0	0	2	1	2	PCC
6	CSEXXXX	Professional Elective – III	3	0	0	3	3	PEC
7	CSEXXXX	Professional Elective – IV	3	0	0	3	3	PEC
8	XXXXXXX	Open Elective – I	3	0	0	3	3	OEC
9	CSE2509	Mobile Application Development Lab	0	0	4	2	4	PCC
10	PPSXXXX	Industry Preparedness Program	2	0	0	0	2	MAC
Seme	ester 7		12	0	0	16	12	
1	CSEXXXX	Professional Elective – V	3	0	0	3	3	PEC
2	CSEXXXX	Professional Elective – VI	3	0	0	3	3	PEC
3	CSEXXXX	Professional Elective – VII	3	0	0	3	3	PEC

4	xxxxxx	Open Elective – II	3	0	0	3	3	OEC
5	CSE7100	Mini Project	-	-	-	4	0	PRW
Seme	ester 8		0	0	0	10	0	
1	CSE7300	Capstone Project	-	-	-	10	0	PRW
						160		

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.







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						1	1	
Course Code: MAT1001_v03	Course Title: Algebra Type of Course Lab Integrated	Calculus and Line	ar L-T- C	P-	2	1	2	4
Version No.	3.0							
Course Pre- requisites	Basic Concepts	of Limits, Differentiation	on, Integra	atio	n			
Anti-requisites	NIL							
Course Description	The course focu to specific en analytical type concerned with	he course focuses on the concepts of calculus and linear algebra with reference o specific engineering problems. The course is of both conceptual and nalytical type in nature. The lab sessions associated with the course are oncerned with acquiring an ability to use the MATLAB software.						
Course Objective	The objective of Solving Technic	of the course is <u>Skill De</u> ques.	velopmer	<u>nt</u> o'	f stude	nt by u	sing <u>Pr</u>	<u>oblem</u>
Course Out Comes	On successful c 1) Comprehenc 2) Understand 3) Apply the pri 4) Adopt the 5) Demonstrat mathematical p	completion of the cours of the knowledge of appl the concept of partial d inciples of integral calcu e various analytical metl ce the use of MATLA problems.	e the stud lications o erivatives ulus to eva hods to so B softwar	lent of ma alua olve re t	s shall k atrix pr d their a te integ differen to deal	be able inciples applicat grals. ntial ec with	to: s. tions. juations a varie	s. ety of
Course Content:								
Module 1	Linear Algebra						10 0	lasses
Review: Types of m systems of linear eo rank method.	atrices, element quations: (Homo	ary transformations, ra genous and non-homog	nk of a m genous sy	atri ster	x, norm n) AX =	nal forr O and	n, Solut AX = B	tion of using
Linear Algebra: Eigenvalues and Eig and Eigenvectors – (form to canonical fo Engineering Applica	envectors of a re Cayley-Hamilton orm by orthogona tions of Linear Al	eal matrix – Characteris theorem – Diagonalizati al transformation – Nat Igebra.	stic equati ion of mat ure of qua	ion rice adra	– Prope s – Red tic forn	erties o uction ns.	of Eigen of a qua	values adratic
Module 2	Partial Derivatives						10 CL	ASSES
1								

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		
Module 3	Integral		12 Classes
	calculus		

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 integralschange of variables between Cartesian and cylindrical and spherical polar co-ordinates. Engineering applications of partial derivatives.

Module 4	Ordinary Differential Equations	Assignment	Programming	12 Classes
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Review: First order and first-degree Ordinary Differential Equations, Method of separation of variables, Homogeneous and Non- Homogeneous Equations reducible to Homogeneous form.

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/linear-algebra/
- 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.





Y

2.

Optoelectronics and Device Physics PHY1002

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 Description	The purpose of this course is to enable the students to understand the fundamentals, working and applications of optoelectronic devices and to develop the basic abilities to appreciate the applications of advanced microscopy and quantum computers. The course develops the critical thinking, experimental and analytical skills. The associated laboratory provides an opportunity to validate the concepts taught and enhances the ability to use the concepts for technological applications. The laboratory tasks aim to develop following skills: An attitude of enquiry, confidence and ability to tackle new problems, ability to interpret events and results, observe and measure physical phenomena, select suitable equipment, instrument and materials, locate faults in systems.			
Course Out Comes	 On successful completion of the course the students shared concepts of semiconductors, mage superconductors. CO2: Apply the concept of materials in the working of magnetic devices. CO3: Discuss the quantum concepts used in advant quantum computers. CO4: Explain the applications of lasers and optications of lasers and optications of lasers and optications. 	all be able gnetic ma f optoele ced micr al fibers	e to: aterials and ectronic and roscopy and in various	







GAIN MORE KNOWLEDGE REACH GREATER HEIGHTS		Approved by AICTE, New	w Delhi	WISDOM	
	CO5: Interpret t in optoelectron	he results of various ics and advanced dev	experiments t rices. [Lab orie	o verify the concepts used ented].	
Course Objective	The objective o "Optoelectronic Experiential Le	f the course is to fam cs and device physics carning techniques	iliarize the lea "and attain S	rners with the concepts of kill Development through	
Course Content:					
Module 1	Fundamentals	of Materials.	Assignmen t	Plotting of magnetization (M) v/s Magnetic field (H) for diamagnetic, paramagnetic and ferromagnetic materials using excel/ origin software.	No. of Classe s: 07
Topics: Concept of energe effect, Magnetic materials,	y bands, charge Superconductor	carriers, carrier con s:	centration, co	ncept of Fermi level, Hall	
Module 2	Advanced applications	Devices and	Assignmen t	Data collection on efficiency of solar cells.	No. of Classe s: 8
Topics: p-n junctions, Zer characteristics, and LEDs	ner diode, transi	stor characteristics,	Optoelectroni	c devices:, Solar cells, I-V	
Module 3	Quantum Applications	concepts and	Term paper	Seminar on quantum computers.	No. of classe s: 8
Topics: Planck's quantum properties. de-Broglie wa Schrodinger time independ	theory, application velength associa lent wave equati	ons of Quantum theo ated with an electro on. Particle in a box	ry: de-Broglie on. Heisenber	hypothesis, matter waves, g's uncertainty principle.	
Module 4	Lasers and Opt	ical fibers	Term paper	Case study on medical applications of Lasers.	No. of classe s :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 N0 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

Level 2: Finding the particle size of lycopodium powder.

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.

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- Level 1: Determination of Stefan's constant
- Level 2: Verification of Stefan-Boltzmann Law.

Targeted Application & Tools that can be used:

Areas of application are optoelectronics industry, Solar panel technologies, quantum computing 1. 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.)
- Quiz •
- End Term Exam .
- Self-Learning •

1. Prepare a comprehensive report on non-conventional energy resources in 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, 1st Edition, Pearson Publications, 2002.

2. Principles of Quantum Mechanics by R Shankar, 2nd edition, springer Publications, 2011.

3. Optoelectronics: An Introduction by John Wilson and John Hawkes, 3rd edition, Pearson Publications, 2017.

4. Engineering Physics by Gaur and Gupta, Dhanpat Rai Publications, 2012.

5. Introduction to Quantum Mechanics, David J <u>Griffiths</u>, Cambridge University Press, 2019

E-Resourses:

- 1. <u>https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=553045&site=ehost-live</u>
- 2. <u>https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=833068&site=ehost-live</u>
- 3. <u>https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=323988&site=ehost-live</u>

4. <u>https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1530910&site=ehost-live</u>

5. <u>https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=486032&site=ehost-live</u>

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.



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Course Code:	Course Title: Er	ngineering Graphi	ics		2	0	2
MEC1006	Type of Course	School Core &	Theory Only	L- P- C	2	0	2
Version No.	1.2						
Course Pre- requisites	NIL						
Anti-requisites	NIL						
Course Description	The course is d graphics. It is techniques use projection of p	lesigned with the introductory in ed to create en oints, lines, plane	e objective of givi nature and acq gineering drawir es and solids and i	ng an ov uaints tl ngs. The isometric	erview ne stud course project	ofengi entsw emphasions.	neering vith the sizes on
Course Objective	The objective of of "Engineering solving method	of the course is to g Graphics" and a lologies.	familiarize the le ttain SKILL DEVEL	arners w OPMENT	ith the d throug	concept h Probl	ts em
Course Outcome	 (1) Demonstra and standards. (2) Comprehe (2) Comprehe (3) Prepare m indifferent pos (4) Prepare pic visualizeobject 	te competency of nd the theory of s under different sultiview orthogra itions. ctorial drawings u s in three dimens	f Engineering Grap projection for dra conditions. aphic projections using the principle sions.	ohics as p wing pro of Solids s of isom	be able ber BIS co jections by visu etric pro	onventi of Poir alizing	ions nts, them ns to
		Course C	ontent:				
Module 1	Introduction to Drawing	Assignment	Standard teo	chnical dr	awing	02 Se	ssions
Topics: Introduction, dra Lettering, Lineco [02 Hours: Comp	awing instrument nventions, dime rehension Level]	ts and their uses, nsioning, Selectio	relevant BIS conv on of drawing she	entions a et size ar	nd stan Id scale.	dards,	
Module 2	Orthographic projections of	Assignment	Projection m	nethods A	nalysis	10 Se	ssions





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Points, Straight Linesand Plane Surfaces

Topics:

Introduction, Definitions – Elements of projection and methods of projection, Planes of projection,

reference line and conventions adopted. First angle and third angle projections. Projection of Points inall 4 quadrants.

Projections of Straight Lines (located in first quadrant/first angle projection only): True and apparent lengths, true and apparent Inclinations to reference planes. (No application problems). Projection of Plane surfaces (First angle projection): Regular plane surfaces – triangle, square, rectangle, pentagon, hexagon and circle – in different positions inclined to both the planes using change of position method only. [10 Hours: Application Level]

Module 3	Orthographic Projections of Solids	Assignment	Multi-view drawing Analysis	10 Sessions
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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.









Course Code:CSE1004	Course Title: Problem Solving Using	C			1	0	4	3
	Type of Course: School CoreLab Inte	egrated.		L- T-P-C				
Version No.	1.0							
Course Pre-requisites	NIL							
Anti requisites	NUL							
Anti-requisites								
Course Description	The course is designed to provide co to develop logics which will help the learning the basic programming cons to any other language in future.	omplete knowl em to create p structs they ca	edge of C lang programs and n easily switch	guage. Stud application 1 over	ents s in	s wi C. A	ll be CAI	able so by
Course Object	The objective of the course is to famil Using C and attain Employability thro	liarize the learr ough Problem :	ners with the c Solving Methc	concepts of odologies.	Prol	olen	n Sol	ving
Course Outcomes	On successful completion of this could1.Write algorithms and to dra2.Demonstrate knowledge ar2.Develop and implement app3.Develop and implement app4.Decompose a problem into5.Solve applications in C using6.Design applications using Set	urse the stude w flowcharts f nd develop sir plications using functions and g structures an equential and f	nts shall be al or solving pro mple applicati g arrays and st develop modu d Union Random Acces	ble to: blems ons in C pr rings ular reusabl s File Proce	rogra e co essin	amr de g.	ning	
Course Content:		·						
Module 1	Introduction to C Language C	Quiz P	roblem Solvin	g 9 Hrs.				
Topics: Introduction to Progra Directives (#define, #i Expressions – Managin Looping.	mming – Algorithms – Pseudo Code nclude, #undef) - Overview of C – ng Input and Output Operations – D	- Flow Chart - Constants, Va Decision Makir	- Compilation riables and D ng and Branch	– Execution ata types - ning - Decis	n – I – Op sion	Prep pera Ma	oroco ators Iking	essor and and
Module 2	Introduction to Arrays and Strings	Quiz P	roblem Solvin	g 9 Hrs.				
Topics: Arrays: Introduction – Sorting (Bubble Sort, S Dimensional Arrays. Ex Variables – Reading Str	One Dimensional Array – Initializati election Sort) – Searching (Linear Se ample Programs – Matrix operations, ings from Terminal – Writing String to	ion of One Di earch) - Two D . Strings: Intro o Screen – Strir	mensional Ari Dimensional A duction – Dec ng Handling Fu	rays – Exar rrays – Init laring and I inctions.	nple ializa nitia	Pro atio alizi	ogra n of ng Si	ms – Two tring
Ivioaule 3	Functions and Pointers Q	luiz P	robiem Solvin	g y Hrs.				
Functions: Introduction definition and function Variables – Initializatio Passing: Pass by Value,	n – Need for User-defined functions – call–Categories of Functions – Recurs n of Variables – Pointer Operators – P Pass by Reference.	Elements of L sion. Pointers: ointer Arithme	Jser-Defined F Introduction etic – Arrays a	unctions: d – Declaring nd Pointers	ecla Poir – Pa	rati nter arar	on, nete	ır



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CH GREATER HEIGHTS	Ar	pproved by AICTE, New De	elhi	WISDUM
Module 4	Structures and Union	Quiz	Problem Solving	9 Hrs.
Topics:	<u>.</u>			<u>.</u>
Structures: Intro	duction – Defining a Structure –	Declaring Structure	e Variable – Accessing Sti	ructure Members – Array
of Structures – A	Arrays within Structures – Unio r	1: Introduction – De	fining and Declaring Uni	on – Difference Between
Union and Struc	ture.			
Module 5	File handling	Case Study	Problem Solving	9 Hrs.
Topics:				
Files: Defining a	nd Opening a File – Closing a Fil	e – Input / Output (Operations on File – Rand	dom Access Files
List of Practical	Tasks Lab Sheet 1 (Module I)			
Programs using	IO Statements, Conditional Stat	ements and Loopin	g Statements	
Lab Sheet 2 (Mo	odule II)			
Programs using	Arrays and Strings			
Lab Sheet 3 (Mo	odule III)			
Programs using	Functions and Pointers			
Lab Sheet 4 (Mo	odule IV)			
Programs using	Structures and Unions			
Lab Sheet 5 (Mo	odule V)			
Programs using	Files			
Text Book(s):				
1. E. Balag	guruswamy, "Programming in A	ANSI C", 8th Editior	n, 2019, McGraw Hill Ed	ucation, ISBN: 978-93-
5316- 513-0.				
Reference Book	(s):			
1.	Yashwant Kanetkar, Let us C,	17th Edition, BPB	Publications, 2020.	
2.	ReemaThareja, "Programmin	ig in C", Oxford Uni	versity Press, Second Ec	lition, 2016.
3.	Kernighan, B.W and Ritchie,	D.M, "The C Program	mming language", Secor	nd Edition, Pearson
Education, 2015	i			
4.	Schildt Herbert, "C: The Com	plete Reference", T	ata McGraw Hill Educat	ion, 4th Edition, 2014.
5.	Stephen G. Kochan, "Program	nming in C", Addisc	on-Wesley Professional,	4th Edition, 2014.
Web Links and \	/ideo Lectures:			
1. https:/	/nptel.ac.in/courses/106/105/	106105171/		
2. https://	/archive.nptel.ac.in/courses/1	06/104/10610 <mark>4128</mark>	3/	



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Itgalpur, Rajankunte, Yelahanka, Bengaluru – 560064

Course Code: ENG1002	Course Title: Technical	English			
	Type of Course:1] School Con	re	L-T-P-	C 1-0-2	2-2
	2] Laborator	y integrated			
Version No.	1.0 V. 3			<u>.</u>	
Course Pre-requisites	Intermediate Level English				
Course	NIL				
Anti-requisites					
Course Description	Technical English course is des	signed to equip studen	ts with the langua	ge skills neces	sary
	for effective communication in	technical and scientific	c contexts. The co	urse focuses or	n the
	specialized vocabulary, writin	g styles, and commu	nication technique	es used in var	rious
	technical fields including engi	neering and informatio	n technology		
	teenneur nerus, meruding engi	and informatio	in teennology.		
Course Objectives	The objective of this course is	to develop the learners	s' EMPLOYABI	LITY SKILL	S by
Course Objectives	using EXPERIENTIAL I	FARNINC and	ΡΑΡΤΙCIΡΑΤΙ	T IFADNI	INC
					ING
	TECHNIQUES.				
~	O.,		4	-	
Course	On successful completion of t	ne course, the studen	ts shall be able to		
Outcomes	2 Apply language s	kills for better speakin	o skills in technic	al fields	
	3. Write technical	descriptions	5 skins in teenine		
	4. Demonstrate wi	riting skills in writi	ng technical do	cuments such	n as
	reports, manuals, and articles	s.	-		
Course Content:					
Module 1	Fundamentals of Technical	Worksheets&	Vocabulary	0 Classes	
	Communication	Quiz	building	9 Classes	
Introduction to Technical Eng	lish 1 English and Canaral English				
Technical Writing Basics	I English and General English				
Technical Vocabulary					
		1 1			
Module 2	Technical Presentation	Presentations S	Speaking Skills	12 Cla	sses
Introduction					
Planning the Presentation					
Creating the Presentation					
Giving the Presentation					





4-0 YEARS DF ACADEMIC WISDOM

Module 3	Technical Description	Assignment	Group Presentation	12 Classes						
Product Description	I									
Process Description										
User Manuals										
Transcoding: Diagrams, charts and images										
Module 4	Technical Writing	Assignment	Writing Skills	12 Classes						
Email Writing										
Persuasive and Descriptive Language	2									
Professional Email Etiquette										
Writing clear and concise technical e	mails									
Communicating technical information	n effectively									
Technical Report Writing										
Types of technical reports (Lab repor	rts, research reports, etc.)									
Components of technical reports										
Writing an abstract and executive sur	mmary									
Structure and content organization										
Transcoding: diagrams, charts and in	nages									
List of Laboratory Tasks:										
1. Module-1										
Level 1: Worksheets										
Level 2: Worksheets										
2. Module 2										
Level 1: Preparing Presentation	on									
Level 2: Giving Presentation	(Individual)									
3. Module-3	& User Menuel									
Level 2: Process Description	& User Manual & Transcoding									
4 Module 4	te Transcouling									
Level 1: Email Writing										
Level 2: Report Writing										
Targeted Applications & To	ols that can be used:									
1. Flipgrid										
2. Quizzes										
3. Youtube Videos										
4. Podcast										
Project work/Assignment: Mention the Type of Project /Assignment proposed for this course										
1. Bring out the essen	nce of technical communi	ication with refere	nce to the conventions	of technical						

1. Bring out the essence of technical communication with reference to the conventions of technical communication, with examples

2. Prepare a technical presentation on the importance of Technical Communication and its relevance in a





technical field, with real-life examples.

- The following individual, as well as group Assignments, will be given to the students.
- 1. Presentation
- 2. Describing a product/process
- 3. Individual Reports

Text Books

1. Kumar, Sanjay; Pushpalatha. *English Language and Communication Skills for Engineers*. Oxford University Press. 2018.

2. Brieger, Nick and Alison Paul. *Technical English Vocabulary and Grammar*.

https://nmetau.edu.ua/file/technical_english_vocabulary_and_grammar.pdf

Reference Book:

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

- 2. Sunder Jain. *Technical Report Writing*. Centrum Press, 2013.
- 3. 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&unique_id=JSTOR1_3 307.

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: Intro	oduction to	Soft Skills						
PPS 1001	Type of Course: [Practical Only		L- P- C	0	2	1		
	Type of Course. P		ycourse						
Version No.	1.0			L	I				
Course Pre- requisites	Students are expension Students should h	ected to und nave desire a	erstand Basic E and enthusiasm	nglish. to involve	, particip	ate and l	earn.		
Anti-requisites	NIL								
Course Description	This course is dea improve confiden a competitive ad world. The cours through various a	This course is designed to enable students understand soft skills concepts and improve confidence, communication and professional skills to give the students a competitive advantage and increase chances of success in the professional world. The course will benefit learners in presenting themselves effectively through various activities and learning methodologies.							
Course Objective	The objective of the course is to familiarize the learners with the concepts of "Soft Skills" and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.								
Course Out Comes	Out On successful completion of this course the students shall be able to: CO1: Recognize significance of soft skills CO2: Illustrate effective communication while introducing oneself and others CO3: List techniques of forming healthy habits CO4: A sele SMADE technique								
Course									
Module 1	INTRODUCTION SKILLS	TO SOFT	Classroom ac	tivity		04 Hour	s		
Topics: Setting E	xpectations, Ice Bre	eaker, Signifi	cance of soft sk	kills, Forma	al groomi	ing, punc	tuality		
Module 2	EFFECTIVE COMM	/UNICATION	Individual As	ssessment	1	10 Hour	S		
Topics: Different styles of communication, Difference between hearing and listening, Effective communication for success, Email etiquette, Self-introduction framework, Video introduction, email- writing. Resume Building- Digital Video Traditional									
Module 3 HABIT FORMATION Worksheets & Assignment 4 Hours									
Topics: Profess Loop, Unlearning	ional and personal g, standing up for w	ethics for su vhat is right	uccess, Identity	based hal	bits, Don	nino effe	ct, Habit		
Module 4	Goal setting Management	& Time	e Goal sheet			8 Hours			
A session where	students will be int	troduced to	Time managem	ent, settin	g SMART	Goals,			
Introduction to OKR Techniques, Time Management Matrix, steps to managing 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.



40 YEARS OF ACED FAILS WISDOM

Itgalpur, Rajanukunte, Yelahanka, Bengaluru – 560064

Course		Course Title: Introduction to Design									
Code:		Thinking			L-T-P-	C	1	0	0	1	
DES1146		Type of Cou	neory								
Version N	Io.		1.0			I				1	
Course Pr requisites	re-		NIL	NIL							
Anti- requisites			NIL								
Course Descriptio)n		The course aims to introduce students to the fundamental principles and processes of Design Thinking and will learn to apply Design Thinking methodologies to real-world challenges. The course emphasizes empathy, creativity, and collaboration, equipping students with essential skills for successful engineering practice.								
Course Objective		This course is designed to develop and familiarize the learners with the concepts of creating thinking and attain Entrepreneurship by using Participative Learning techniques.									
Course Outcomes	CourseOn successful completion of the course the students shall be able to:1)Understand the concept and importance of Design Thinking.2)Differentiate between traditional problem-solving and Design Thinking.3)Identify the core stages of the Design Thinking process): ç. gn				
Course Content:			All ass availal OPAC	signments and projects ble from the PU e-reso C, NPTEL Videos, etc.	must be o burce datab	deve base	loped us – JSTOI	ing the 1 R, EBSC	reference CO, Libr	e materials ary	
Module 1 Design Th		Introduction Design Thin	to king	Visual journal, book of essays, context-specific assignment/projectVisual output generation, by Visual Journal and narrative development.3 h					3 hours		
Topic 1) I 2) I	Topic 1) Definition and Introduction to Design Thinking 2) Understand the Design Thinking Process										
Module 2		Design Thin in Action	n Thinking tion Visual journal, book of essays, context-specific			Visu by vi narra	al outpu isual jou ative dev	t genera rnal and relopmen	tion, nt.	12 hours	

	assignment/project								
Topics:									
1) Introduction to the steps of Design Thinking Process									
2) Understand use cases of Design thinking									
3) Des	Design Thinking and Research Tools pertaining to Consumer Tech., He	ome Tech., Pers	sonal						
Tech., Aut	auto Tech. or Extended Reality.								
Targeted Application & Tools that can be used:									
1) Des	Design ideation tools like Miro, SCAMPER etc.								
2) Res	esearch Tools for Human Centric Design using forecasting tools like V	VGSN							
3) Fee	eedback tools like Google Forms , etc.								
4) Exp	xpert Lectures								
Text Book	ok								
Thinking D	g Design by S Balaram. New Delhi [India]: Sage Publications Pvt. Ltd.	2010. eBook., E	Database:						
eBook Coll	ollection (EBSCOhost)								
https://puni	university.informaticsglobal.com:2284/ehost/detail/detail?vid=6&sid=1	8ab1f43-1f92-4	d02-ae2e-						
a9c06dc06	06d8c%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=3	354920&db=nle	<u>bk</u>						
References	ces								
Design Thi	hinking by Clarke, Rachel Ivy. Series: Library Futures, Vol. 4. Chicag	o: ALA Neal-Sc	human.						
2020. eBoo	ook., Database: eBook Collection (EBSCOhost)								
https://puni	university.informaticsglobal.com:2282/ehost/detail/detail?vid=4&sid=c	:80a7d79-eda4-4	<u>4b7e-</u>						
a0d6-afafe4	fe437962b%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#4	AN=2433506&d	lb=nlebk						
The Pocket	cet Universal Methods of Design: 100 Ways to Research Complex Prob	olems, Develop							
Innovative	ve Ideas, and Design Effective Solutions by Bruce Hanington; Bella Ma	artin. Minneapol	lis:						
Rockport P	t Publishers. 2017. eBook., Database: eBook Collection (EBSCOhost)								
https://puni	iniversity.informaticsglobal.com:2282/ehost/detail/detail?vid=11&sid=	<u>=f086b8c2-260e</u> -	-4 <u>caa-</u>						
8c48-d732c	32c21a7724%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#	<u>+AN=1638693&</u>	db=nlebk						
What Is De	Design Thinking and Why Is It Important? By Rim Razzouk and Valer	ie Shute - Revie	w of						
Educationa	nal Research, Vol. 82, No. 3 (September 2012), pp. 330-348 (19 pages)), Published by:	American						
Educationa	nal Research Association								
https://puni	iniversity.informaticsglobal.com:2054/stable/23260048?Search=yes&r	esultItemClick=	true&sear						
<u>chText=des</u>	design+thinking&searchUri=%2Faction%2FdoBasicSearch%3FQuery%	<u>%3Ddesign%2B</u>	<u>thinking</u>						
<u>%26so%3E</u>	3Drel&ab_segments=0%2FSYC-6168%2Ftest&refreqid=fastly-								
default%3Acb1be24976e25734cb5fc13a8af6fdfb&seq=1#metadata_info_tab_contents									
Abductive	e Thinking and Sensemaking: The Drivers of Design Synthesis by Joh	n Kolko, Desigr	n Issues,						
Vol. 26, No	No. 1 (Winter, 2010), pp. 15-28 (14 pages), Published by: The MIT Pre-	ess							
https://puni	university.informaticsglobal.com:2054/stable/20627839?Search=yes&r	esultItemClick=	true&sear						

chText = design + thinking & searchUri = % 2 Faction % 2 FdoBasicSearch % 3 FQuery % 3 Ddesign % 2 Bthinking & searchUri = % 2 Faction % 2 FdoBasicSearch % 3 FQuery % 3 Ddesign % 2 Bthinking & searchUri = % 2 Faction % 2 FdoBasicSearch % 3 FQuery % 3 Ddesign % 2 Bthinking & searchUri = % 2 Faction % 2 FdoBasicSearch % 3 FQuery % 3 Ddesign % 2 Bthinking & searchUri = % 2 Faction % 2 FdoBasicSearch % 3 FQuery % 3 Ddesign % 2 Bthinking & searchUri = % 2 Faction % 2 FdoBasicSearch % 3 FQuery % 3 Ddesign % 2 Bthinking & search W a state with a stat

%26so%3Drel&ab_segments=0%2FSYC-6168%2Ftest&refreqid=fastly-

 $\underline{default\%3A0b89336ea274d63c010536b01316d7bb\&seq=1 \# metadata_info_tab_contents}$

Designerly Ways of Knowing: Design Discipline versus Design Science by Nigel Cross, Design Issues,

Vol. 17, No. 3 (Summer, 2001), pp. 49-55 (7 pages), Published by: The MIT Press

hText=design+thinking&searchUri=%2Faction%2FdoBasicSearch%3FQuery%3Ddesign%2Bthinking%

26so%3Drel&ab_segments=0%2FSYC-6168%2Ftest&refreqid=fastly-

default%3A0d5b607b163f60876ca973ed90e22b1c&seq=1#metadata_info_tab_contents



(Established under the Presidency University Act, 2013 of the Karnataka Act 41 of 2013) [2024-25 ODD SEMESTER] COURSE PLAN [Revision 12-7-24]

SCHOOL: School of Design	DEPT.: SOD	DATE OF ISSUE: 23-7-2024				
NAME OF THE PROGRAM	: B.E -CSE					
P.R.C. APPROVAL REF	:					
SEMESTER/YEAR	: 1 st /1 st Year [Batch 2024-2028]					
COURSE TITLE & CODE	: Introduction to Design	Thinking (DES1146)				
COURSE CREDIT STRUCTURE	:1-0-1(LPC)					
CONTACT HOURS	: 1 Hour/week					
COURSE IC	:					
COURSE INSTRUCTOR	:TBD					
COURSE URL	: https://					

PROGRAM OUTCOMES:

P0 01 An ability to apply knowledge of fundamental principles of design

P0 02 An ability to design and conduct experiments, as well as to analyze and interpret design data

P0 03 An ability to design a system, program, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability

P0 04 An ability to function in multidisciplinary teams

P0 05 An ability to identify, formulate and solve design problems

P0 06 An understanding of professional and ethical responsibility

P0 07 An ability to communicate effectively

P0 08 The broad education necessary to understand the impact of design solutions in a global, economic, environmental and societal context

P0 09 Recognition of the need for and an ability to engage in lifelong design learning

P0 10 Knowledge of contemporary design issues

P0 11 An ability to use the techniques, skills and modern design tools necessary for design practice

P0 12 An ability to apply the design principles and management principles to manage the project of multidisciplinary nature.

COURSE PREREQUISITES: NA

COURSE DESCRIPTION:

The course aims to introduce students to the fundamental principles and processes of Design Thinking and will learn to apply Design Thinking methodologies to real-world challenges. The course emphasizes empathy, creativity, and collaboration, equipping students with essential skills for successful engineering practice.

COURSE OUTCOMES: On successful completion of the course the students shall be able to:

 TABLE 1:COURSE OUTCOMES

CO Number	СО	Expected
		BLOOMS
		LEVEL
CO1		
CO2		
CO3		

MAPPING OF C.O. WITH P.O.:

C.O.	P.O.	P.O.	P.O.	P.O.	P.O.	P.O.	P.O.	P.O.	P.O.	P.O.	P.O.	P.O.
NO.	01	02	03	04	05	06	07	08	09	10	11	12
CO1	Н	М	Н	М	М	Н	М	М	М	Н	М	Н
CO2	М	L	Н	М	Н	Н	М	М	М	Н	Н	М
CO3	М	М	М	М	Н	L	L	Н	М	Н	Н	М

COURSE CONTENT (SYLLABUS):

Module 1: Deliberate on what is Design thinking	[05 periods] [Remember]	CO1
Module 2: Indicate grey areas in designs.	[05 periods] [Understand] CO2	
Module 3: Appreciate ancient Design thinking	[05 periods] [Apply] CO2/C03	

DELIVERY PROCEDURE (PEDAGOGY):

TA	TABLE 3:SPECIAL DELIVERY METHOD/PEDEGOGY PLANNED WITH TOPICS									
S.	Lecture	Subtopic as per lesson	Pedagogy title/short	Activity						
No	Number	plan	explanation of adopted	status after						
			pedagogy	completion						
1	L7									
2	L13									
3	L15									

REFERENCE MATERIALS:

T1 -

L14 -- https://presiuniv.knimbus.com/user#/home

Thinking Design by S Balaram. New Delhi [India]: Sage Publications Pvt. Ltd. 2010. eBook., Database: eBook Collection (EBSCOhost)

R1 - Universal Design: A new paradigm—S.Balaram- design plus,vol-11,December 2003

T2- The Design of Everyday things- By Don Norman. Basic Books, Perseus Books Group

R2 - Design Thinking by Clarke, Rachel Ivy. Series: Library Futures, Vol. 4. Chicago: ALA Neal-Schuman. 2020. eBook., Database: eBook Collection (EBSCOhost)

R3 - The Pocket Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions by Bruce Hanington; Bella Martin. Minneapolis: Rockport Publishers. 2017. eBook., Database: eBook Collection (EBSCOhost)

R4 - What Is Design Thinking and Why Is It Important? By Rim Razzouk and Valerie Shute - Review of Educational Research, Vol. 82, No. 3 (September 2012), pp. 330-348 (19 pages), Published by: American Educational Research Association

R5 - Abductive Thinking and Sensemaking: The Drivers of Design Synthesis by John Kolko, Design Issues, Vol. 26, No. 1 (Winter, 2010), pp. 15-28 (14 pages), Published by: The MIT Press

R6 - Designerly Ways of Knowing: Design Discipline versus Design Science by Nigel Cross, Design Issues, Vol. 17, No. 3 (Summer, 2001), pp. 49-55 (7 pages), Published by: The MIT Press

L1- FacebookTwitterLinkedInReddit

L2-Article "The problems with unwanted clothes!" by ethicagear.com on August 11, 2017 on

https://ethicalgear.com/environment/unwanted_clothes

L3- Bill on the fight against waste and circular economy, July 9, 2019 on <u>https://www.senat.fr/leg/etudes-impact/pjl18-660-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-600-ei/pil18-60</u>

L4- Buchanan, R., Wicked Problems in Design Thinking, Design Issues, Vol. 8, No. 2, (Spring, 1992), pp. 5-21, Published by: The MIT Press, available on <u>https://web.mit.edu/jrankin/www/engin_as_lib_art/Design_thinking.pd</u>

L5- Friedman, K., Lou, Y., Norman, D., Stappers, P. J., Voûte, E., & Whitney, P. (2014). DesignX: A Future Path for Design. In. Retrieved from <u>http://www.jnd.org/dn.mss/designx_a_future_pa.html</u>

L6- Kenton Will gives us a more topical definition of Fast-Fashion in an article in Investopedia in May 2019. By Will Kenton, Updated May 27, 2019: <u>https://www.investopedia.com/terms/f/fast-fashion.asp</u>

L7- Kolko, J., "Information Architecture and Design Strategy: The Importance of Synthesis during the Process of Design" IDSA 2007 Educational Conference Proceedings, San Francisco. Jon Kolko, "Information Architecture and Design Strategy: The Importance of Synthesis during the Process of Design" IDSA 2007 Educational Conference Proceedings, San Francisco on http://www.jonkolko.com/writingInfoArchDesignStrategy.php

L8- Norman, D. A. [Psychology of everyday things] Design of Everyday Things-Revised and expanded edition.

(2013:6th chapter) Published by Basic Books, A Member of the Perseus Books Group, available on:

https://vahiidl.ir/wp-content/uploads/2019/04/TheDesign-of-Everyday-Things-Revised-and-Expanded-Edition.pdf Norman, D. and Spencer, E. (2019). Community-based and human-centred des

L9- Norman, D. and Spencer, E. (2019). Community-based and human-centred design. Paper presented at the 2019 Government World Summit, Dubai, United Arab Emirates on https://jnd.org/community-based-human-centered-design/

L10- Statista 2019 Europe total textile waste produced per person according to the figures from Statista.com, and

presented by Tugba Sabanoglu, Mar 5, 2020) available on https://www.statista.com/statistics/1090566/textile-waste-

generated-in-theeuropean-union-per-person/

L11- https://indiadesigncouncil.org/

- L12- https://www.linkedin.com/pulse/design-thinking-ancient-indian-texts-dr-bhavleen-rekhi
- $L13- \underline{https://lookinbard.medium.com/knowledge-process-ancient-indian-model-for-design-thinking-c2ccfa4dbb26$

SPECIFIC GUIDELINES TO STUDENTS: 1. Students need to read the resources and make notes. 2. Students should becine to read the resources and make notes. 2. Students should be a student of the student

brainstorm with fellow student about concepts.

COURSE SCHEDULE:

SL. NO.	ACTIVITY	PLANNED STARTING DATE	PLANNED CONCLUDING DATE	TOTAL NUMBER OF PERIODS
01	Course Overview			01
02	Module 01			05
03	Module 02			05
04	Mid-term examination			NA
05	Module 03			05
06	End term examination			NA

TABLE 5:DETAILED COURSE SCHEDULE/LESSON PLAN							
	TOPIC	SUBTOPIC	CO	Reference			
SESSION			Number				
L1							
L2							
L3							
L4							
L5							
L6							
L7							
L8							
L9							
L10							
L11							
L12							
L13							
L14							
L15							

|--|

	Assessment type	Contents	Course Outcome	Duration in Hours	Marks	weighta ge	Jury Venue,
			number				Date &Time
1	Continuous Assessment-1	Module - 1	CO 1, CO 2	As per Assessment Time	25 Marks	12.5%	Will be notified
2	Mid-term	According to planned Module Coverage	CO 1, CO 2	As Per Jury Max (10 Mins Per student)	50 Marks	25%	Will be notified
3	Continuous Assessment-2	Module 1 and 2	CO 1, CO 2	As per Assessment Time	25 Marks	12.5%	Will be notified
5	End Term Examinations	All modules	CO 1, CO 2 & CO 3	As Per Jury Max (10 Mins Per student)	100 Marks	50%	Will be notified

ASSESSMENT SCHEDULE:

COURSE CLEARANCE CRITERIA: AS PER ACADEMIC REGULATIONS OF THE UNIVERSITY. MAKEUP EXAM POLICY: AS PER ACADEMIC REGULATIONS OF THE UNIVERSITY CONTACT TIMINGS IN THE CHAMBER FOR ANY DISCUSSIONS: Wednesday – 3:00 pm to 3:30 pm.

Sl.	Question	Course
No.		Outcome No.
1	Do you think ancient culture knew more about design thinking ?-Justify	1,2,3
2	Design outcomes are what we create in our minds! -Discuss	1
3	Big doors open on small hinges—Discuss metaphor as design component.	2

Target set for course Outcome attainment:

SI. No	C.O. No.	Course Outcomes	Target set for attainment in percentage
01	CO 1		
02	CO 2		
03	CO 3		

Signature of the Course Instructor:

This course has been duly verified Approved by the D.A.C.

Signature of the Chairperson D.A.C.





Itgalpur, Rajankunte, Yelahanka, Bengaluru – 560064

	· · · · · · · · · · · · · · · · · · ·						-		
Course Code:	Course Title: Digital Design		L- T-P- C	2	0	2	2		
ECE2007	Type of Course: Theory & Integrated Laboratory 2 0 2 3						5		
Version No. Course Pre-	2.0 [1] Elements of Electronics/Electrical Engineering, 2] Basic concepts of number representation, Boolean Algebra								
Anti-requisites	NIL								
Course Description	The purpose of this course is to enable the students to appreciate the 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.								
Objective	Design and attain the SKIL LEARNING.	L DEVELO	PMENT the	roug	gh E	EXPERI	ENTIAL		
Course	On successful completion of this co	urse the stude	nts shall be a	ble t	o:				
Outcomes	i. Describe the concepts of number systems, Boolean algebra and logic gates.								
	i. Apply minimization techniques to simplify Boolean expressions.								
	Demonstrate the Combinational circuits for a given logic								
	. Demonstrate the Sequential and programmable logic circuits								
	<i>Implement</i> various combinational and sequential logic circuits using gates.								
Course Content:									
Module 1	Module 1Fundamentals of Number systems- Boolean algebra and digital logicApplication AssignmentData Analysis task06 classes								
Topics: Review of Number systems and logic gates, Number base conversions, Overview of Boolean functions and simplifications, two, three, four variable K-Maps- Don't care conditions- Both SOP and POS- Universal Gates (NAND & NOR) Implementations. Introduction to HDL.									
Module 2	Boolean function simplification	Application Assignment	Data Analys	is tas	k	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:ApplicationProgramming Task & Data Analysis task08 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 state machines - Registers & Counters. HDL Models of Sequential circuits.									

List of Laboratory Tasks: Experiment NO 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

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.

2. 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)

3. 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.

4. 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.







Itgalpur, Rajankunte, Yelahanka, Bengaluru – 560064

Course Code:	Course Title: Applied	d Statistics					
MAT1003			LTPC	1	0	2	2
	Type of Course: Scho	ool Core					
Version No.	3.0						
Course Pre- requisites	None						
Anti-requisites	None						
Course Description	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 Objective	The objective of the course is to familiarize the learners with the concepts of "Applied Statistics" and attain <u>Skill Development</u> Through <u>Problem</u> <u>Solving</u> techniques.						
Expected	At the end of this course, students will be in a position to						
Outcome:							
	1. apply the techniques of descriptive statistics effectively						
	2. interpret the	2. interpret the ideas of probability and conditional probability					
	3. demonstrate	e the knowledge o	of probabil	ity dis	tributio	ns	
	4. Compute s	statistical parame	eters, co	rrelati	on and	d regre	ession,
	probability and samp	oling distributions	using R so	oftware	2.		
Module 1	Descriptive Statistics	Assignment	Coding needed			10 0	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	bability, Probability	of an event, Ad	dition Pri	nciple	, Multi	plicatio	n law,
Conditional Probabili	ty, Total Probability a	nd Baye's theorem	n with exa	mples			
Module 3	Random Variables and Probability DistributionsCoding needed14 classes						



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Introduction to Random variables, Discrete Random Variables and Continuous Random Variables, Probability Distributions, Probability Mass Function and Probability Density Function, Various Probability distributions, Binomial, **Negative Binominal (Self Study)**, Poisson, Normal and Exponential distributions

Module 4	Sampling Theory	Coding	15 classes
		needed	

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



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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.


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Itgalpur, Rajankunte, Yelahanka, Bengaluru - 560064

Course Code:	Course Title: Basic Engine	eering Sciences	I_T_P_C	2	0	0	2	
CIV1008	Type of Course: Theory C	Inly	Lanac	2	0	0	Z	
Version No.	1.0							
Course Pre-	NIL	JIL						
requisites								
Anti-requisites	NIL	NIL						
Course	This basic course on engin	his basic course on engineering science is designed to introduce students to the fields						
Description	of civil, mechanical and	f civil, mechanical and petroleum engineering. Student will be exposed to various						
	machinery for newer pr	elds in civil engineering and different manufacturing techniques in addition to						
	getting an overview of va	nachinery for power production and consumption. Additionally, students will be						
	students to basics of Ind	ustry 4.0 and Const	ruction 4.0	. The c	course a	ims to e	nable	
	students to appreciate	the multidisciplina	ry nature	of eng	gineering	g desigr	n and	
	operations in the current	era with mechaniza	tion and di	gitizati	on trans	forming	every	
	aspect of engineering.					Dealist		
Course Objective	Learning techniques.	irse is skill develop	ment of st	udent	by using	; Particij	pative	
Course Outcomes	On successful completion	of this course the st	udents sha	ll he al	nle to:			
course outcomes	1] Recognize the signification	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 fundame	ntal concept and ter	minology a	ssociat	ed with t	ne Petro	bieum	
	5] Distinguish between co	onventional and mod	lern manuf	acturin	g techni	aues.		
Course Content:					0	1		
	Introduction to various		Case stu	udies	on			
Module 1	fields in Civil	Assignment	different		Civil 6	Sessions	5	
	Engineering		Engineerin	g Proje	cts			
Topics: Introduction	n to Civil Engineering: Defir	nition, scope and bra	anches of C	ivil Eng	gineering	g, Role o	of Civil	
	Current Trends and							
Module 2	Evolution in Civil	Assignment	Article Rev	iew	6	Sessions	5	
	Engineering	U						
Topics: Mechanizat	ion in Construction, Applica	ation of Digital Tech	nologies in	Planni	ng, Desi	gn, exec	ution,	
monitoring and mai	ntenance of Construction.	Overview of Smart C	ities.					
	Power Production and	Assignment &						
Module 3	Consumption	Quiz	Data Colle	ction	6	Sessions	5	
Topics: Energy and i	ts types. Engines and their	applications, Pumps	-Compress	ors and	 their ar	plicatio	ns.	
	Overview of Petroleum	Assignment &						
Module 4	Engineering	Quiz	Article Rev	iew	6	Sessions	5	
Overview of the Pet	roleum Industry, Importanc	e of Petroleum Engi	neering, life	ecycle c	of Petrole	eum pro	ducts,	
Classifications of E&	P activities: Key difference	between Offshore a	nd Unshore	e, Onsh	ore facil	ities, off	shore	
piacioniis, Digitizati	on of perioleum engineerir	ıб						

Module 5	Industry 4.0	Assignment & Quiz	Data Collection	6 Sessions				
Topics: Conventiona	al manufacturing process: N	Metal forming, meta	I removal and metal joi	ning process.				
Modern Manufacturing process: 3D Printing / Additive Manufacturing.								
Targeted Application & Tools that can be used:								
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: Colle	Assignment 1: Collect data and prepare report on various Mega Projects in Civil Engineering							
Assignment 2: Revie	w Articles on current evolu	utions in Civil Engine	eering.					
Assignment 3: Colle	ct data related to renewab	le energy generatio	n (Wind, Solar)					
Assignment 4: Prepa	are an energy consumption	h chart for a compre	ssor or pumps.					
Assignment 5: Prepa	are a report on role of 3D p	printing across vario	us industries.					
Assignment 6: Prepa	are an assignment on geop	olitical influence on	oil and gas industries.					
Text Book:								
11. Elements of Civi	l and Mechanical Engineeri	ing, L.S. Jayagopal &	R Rudramoorthy, Vikas	Publishers				
T2. Elements of Me	chanical Engineering, by VK	K Manglik Ginners by Semir De	bi Nation Drace 1st or	dition				
TS. Fulluamentais C		ginners by Sanni Da						
References 1 K P Rov S K	Haira Choudhury, Niribar	Roy "Flements of N	Achanical Engineering"	' Media				
Promoters and Publ	ishers Pyt Itd. Mumbai.	Roy, Liements of N		, Meula				
2. Nontechnica PennWell Books: 3rd	I Guide to Petroleum Geol d Revised edition	ogy, Exploration, Dr	illing & Production by N	Jorman J. Hyne,				
Web-resources:								
1. Basic Civil Er	Igineering							
https://search.	.ebscohost.com/login.aspx	?direct=true&db=nl	ebk&AN=2706932&site	=ehost-live				
2. Post-parame	etric Automation in Design	and Construction						
https://search.	.ebscohost.com/login.aspx	?direct=true&db=nl	ebk&AN=1155197&site	<u>=ehost-live</u>				
3. Smart Cities	: Introducing Digital Innova	ation to Cities						
https://search.	.ebscohost.com/login.aspx	?direct=true&db=nl	ebk&AN=1993146&site	<u>=ehost-live</u>				
4. Innovation E	nergy: Trends and Perspec	tives or Challenges	of Energy Innovation					
https://search.	.ebscohost.com/login.aspx	<u>?direct=true&db=nl</u>	ebk&AN=2323766&site	<u>=ehost-live</u>				
5. Mechanical	Engineering							
https://presiuniv.kn	imbus.com/user#/viewDet	tail?searchResultTyp	De=ECATALOGUE BASE	<u> 2&unique_id=EB</u>				
SCO106 REDO 170	<u>5</u>							
6. Additive Ma	nufacturing: Opportunities	, Challenges, Implica	ations					
https://search.ebsc	ohost.com/login.aspx?dire	<u>ct=true&db=nlebk&</u>	<u>AN=1134464&site=eho</u>	<u>st-live</u>				
7. Society of Pe	etroleum Engineers (SPE)							
https://www.spe.or	g/en/							
8. PetroWiki: A	comprehensive online re	source created by 1	the Society of Petroleu	m Engineers that				
provides informatio	n on various aspects of pet	roleum engineering	5.					
	<u>ie.org/Petrowiki</u>	mation abaut the - '		ding ich nasting -				
and industry trends	esource for news and infor	mation about the of	i and gas moustry, inclu	ung job postings				
	•							

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: Problem	Solving using J	AVA		1	1	3
CSE1006	Type of Course: Integr	ated		L- P- C		-	-
Version No.	2.0						
Course Pre-	CSE1004 – Problem	Solving Usin	g C				
requisites		2011118 0 011	80				
Anti-requisites	Nil						
Course Description	This course introduces the core concepts of object-oriented programming. This course has theory and lab component which emphasizes on understanding the implementation and application of object-oriented programming paradigm. It helps the student to build real time secure applications by applying these concepts and also for effective problem solving. The students interpret and understand the need for object oriented programming to build applications.						
Course	The objective of the	course is to fa	amiliarize the	e learner	s with t	he con	cepts of
Objective	Problem-Solving usir	ng JAVA and	d attain S	KILL DI	EVELOPI	MENT	through
	EXPERIENTIAL LEARN	ING techniques	5				
Course Out Comes	On successful complete C.O. 1: Describe the C.O. 2: Apply the corproblems. [Applicat C.O. 3: Apply the cor C.O. 4: Implement in applications. [Applic C.O. 5: Apply the cor [Application]	tion of the cou basic program oncept of class ion] oncept of array nheritance and ration] oncepts of inte	rse the stude nming conce ses, objects a ys and string l polymorph orface and er	ents shall epts. [Ku and meth ss. [Appl ism buil ror hand	be able nowledg nods to s ication] ding se ling me	to: ge] solve cure cchanis	m.
Course Content:							
Module 1	Basic Concepts of Programming and Java	Assignment	Data Collection/In	iterpreta	tion	12 :	Sessions
Topics: Introduct	ion to Principles of P	rogramming:	Process of P	roblem	Solving	, Java _J	program
structure, Down	nload Eclipse IDE t	o run Java j	programs, S	Sample	progran	n, Data	a types,
Identifiers, Varia	ables, Constants in jav	va, Operators,	Assignment	ts and Ex	pressio	n, Bas	ic Input/
Output functions	s, Control Statements	: Branching an	nd Looping.				
Module 2	Classes, objects, methods and Constructors	Case studies / Case let	Case stu	dies / Cas	se let	12 9	Sessions
Topics: Classes,	Objects and Method	s: Introductio	n to object (Oriented	Princip	oles, de	fining a
class, adding dat	ta members and meth	nods to the cla	uss, access sj	pecifiers	, instan	tiating	objects,
reference variab	le, accessing class me	embers and me	ethods.				
Static Polymor	phism: Method ove	rloading, con	nstructors,	construc	tor ove	erloadi	ng, this
keyword, static l	keyword, Nested clas	ses, Accessing	g members i	n nested	classes	•	
Module 3	Arrays, String and String buffer	Quiz	Case stu	dies / Cas	se let	14 3	Sessions
Topics: Arrays: D	Defining an Array, Ini	tializing & Ac	cessing Arr	ay, Mult	i –Dime	ensiona	al Array,
Array of objects.	String: Creation & O	peration. Strin	ng builder cl	ass, met	nods in	String	Buffer <mark>.</mark>
Module 4	Inheritance and Polymorphism	luiz	Case stud let	lies / Cas	e 14 S	essions	
Topics: Inherita	nce: Defining a sub	class, Types	of Inheritan	ce, supe	er keyw	vord. E	Dynamic
Polymorphism:	Method overriding.	Final keywo	ord: with o	data me	mbers,	with	member

function	ns and wi	th class. Abstract l	keyword: with d	ata members, with m	ember functions and
with cla	iss, Excep	ption handling.			1
Module	5	Input & Output Operation in Java	Quiz	Case studies / Case let	14 Sessions
Input/o	utput Ope	ration in Java(java.io) Package), Stream	ns and the new I/O Cap	abilities,
Underst	anding Str	eams, working with	File Object, File I/	O Basics, Reading and	Writing to Files, Buffer
and Buf	fer Manag	ement, Read/Write	Operations with F	ile Channel, Serializing	Objects, Observer
and Obs	ervable In	terfaces.			
List of L	aboratory	Tasks:			
P1 - Pr	oblem So	olving using Basic (Concepts.		
P2 - Pr	oblem So	olving using Basic (Concepts and Co	ommand Line Argume	ents.
P3 - Pr	ogrammi	ng assignment with	n class, objects, r	nethods and Construc	ctors.
P4 - Pr	ogrammi	ng assignment with	n method overloa	ading.	
P5 - Pr	ogrammi	ng assignment with	n constructor ove	erloading.	
P6 - Pr	ogrammi	ng assignment with	n Static members	s and static methods.	
P7 - Pro	ogramming	g assignment with Ne	ested classes.		
P8 - Pr	ogrammi	ng assignment usin	ıg Arrays.		
P9 - Pr	ogrammi	ng assignment usin	ıg Strings.		
P10 - Pr	rogrammir	ng assignment using	String Builder.		
P11 - F	' rogramm	ing assignment usi	ing Inheritance a	nd super keyword.	
P12 - F	' rogramm	ing assignment usi	ing Method over	riding and Dynamic r	nethod invocation.
P13 - F	' rogramm	ing assignment usi	ing Final keywor	rds.	
P14 - F	' rogramm	ing assignment usi	ing Abstract key	words.	
P15 - F	' rogramm	ing assignment usi	ing Interface.		
P16 - Pr	rogrammir	ng assignment using	Interface.		
P17 - Pr	rogrammir	ng assignment Chara	cterStream Classe	25	
P18 - Pr	ogrammir	ng assignment Read	/Write Operation	s with File Channel	
Targete	d Applicat	ion & Tools that car	be used : JDK /	eclipse IDE/ net Bean	is IDE.
Text Bo	ok				
T1 Her	bert Schi	ldt, "The Complete	e Reference Java	2", Tata McGraw Hi	ll Education.
Referen	ces				
R1 : Cay	S Horstn	nann and Cary Gor	nell, "CORE JA	VA volume I-Fundan	nentals", Pearson
R2: Jam	es W. Co	oper, "Java TM De	esign Patterns –	A Tutorial", Addison-	-Wesley
Publish	ers.				
Ebo	ok link R1	: <u>http://rmi.yaht.n</u>	<u>et/bookz/core.jav</u>	<u>va/9780134177373-Vo</u>	<u>F</u>
<u>1.pdf</u>					
E DOOK I	ink R2: Jay	va(tm) Design Patter	ns: A Tutorial([PL	<u> </u>	<u>)C.pub)</u>
Mok	racaurca	~			
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Topics r	olovant ta	development of "S	AI.COIII:2229/10gi	n.aspx ".	
	Static Poly	morphism		•	
1. ว	Mothod o	vorloading construc	torc		
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з. 4	this keyne	ard			
5	static kow	word and Inner class	e s		
5.	Static KEY		CJ		

6. Inheritance and Polymorphism.

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

component ment	
Catalogue	Mr. Mrutyunjaya M S
prepared by	
Recommended	BOS NO: 12∗ BOS, held on 04/08/2021
by the Board of	
Studies on	
Date of Approval	Academic Council Meeting No. 16, Dated 23/10/2021
by the Academic	
Council	



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Itgalpur, Rajankunte, Yelahanka, Bengaluru - 560064

Course Code:	Course Title: Basics of Electri Engineering.	ical and Electronics			0				
EEE1007	Type of Course: Engineering	Science - Theory &	L-I-P-C	3	0	2	4		
	Integrated Laboratory								
Version No.	1.0								
Course Pre-requisites	NIL								
Anti-requisites	NIL								
Course Description	electrical and electronics engineering principles occurs in various fields of Engineering. The course emphasis on the characteristics and applications of Electrical and Electronics devices, working, analysis and design of electrical circuits using both active & passive components, fundamentals of electrical machines and basics of transistors and its application. The associated laboratory provides an opportunity to validate the concepts taught and enhances the ability to visualize the real system performance, using both hardware and simulation tools.								
Course Objective	The objective of the course is to familiarize the learners with the concepts of Basics of Electrical and Electronics Engineering and attain Skill Development through Experiential Learning techniques								
Course Outcomes	On successful completion of this course the students shall be able to: 1. Explain basic laws of Electrical Engineering to compute voltage, currents and other parameters in the circuits. 2. Discuss various fundamental parameters appearing in the characteristics of semiconductor devices and their applications. 3. Summarize the operations of different biasing configurations of BJTs an amplifiers. 4. Summarize the performance characteristics and applications of variou electrical Machines. 5. Demonstrate the working of electrical machines to observ performance characteristics 6. Demonstrate the working of electronic circuits to obtain the V						and ious erve V-I		
Course Content:									
Module 1	Introduction to Electrical Circuits	Assignment/ Quiz	Numerical solving Task		10	Sessi	ions		
DC Circuits: Concept of Circuit and Network, Types of elements, Network Reduction Techniques- Series and parallel connections of resistive networks, Star–to-Delta Transformations, Mesh Analysis, Numerical examples. AC Circuits: Fundamentals of single phase circuits - Series RL, RC and R-L-C Circuits, Concept of active power, reactive power and Power factor, Numerical examples. Introduction to three phase system and relation between line and phase values in Star & Delta connection. Numerical examples.									
Module 2	Semiconductor and Diode	Assignment/Quiz	Memory Re	call	11	Sess	ions		





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		applications				based Qui	zzes	
Mass Action Law, 0	Char	ge densities in a sem	iconducto	or, Types of	SC, Jund	tion diodes	-Ideal	and practical
behaviour, Modelling the Diode Characteristic, and Diode applications like rectifiers, Clipping and clamping								
circuits. Zener diode, characteristics and its applications like voltage regulator.								
Module 3		Fundamentals of		Assignme	nt/ Quiz	Memory I	Recall-	12 Sessions
Electrical Machines based Quizzes								
Electrical Machines: Single phase transformers: principle of operation and EMF equation, Numerical								
Principle operation	of In	inciple of operation, induction Motors and i	Back EIVIF	, torque equations	uation, N	umerical ex	ampies	. AC Motor:
Special Machines	ntro	duction to special ele	ectrical m	actions. achines and	its annli	rations		
	Tra	nsistors and its			Numeri	cal solving		
Module 4	Ар	plications	Assignr	nent/ Quiz	Task		12 Se	essions
Transistor characte	risti	cs, Current compone	nts, BJT (Configuratio	ns (CB, (CC, CE confi	iguratio	ons) and their
current gains. Oper	atin	g point, Biasing & sta	bilization	techniques	s: Fixed E	sias, Voltage	e divide	er bias and its
stability factor and	load	line analysis. Single a	ind multis	stage amplif	ier, Darli	ngton pair.		
JFET (Construction,	prin	cipal of Operation an	d Volt –A	mpere char	acteristic	s). Pinch- of	ff voltag	ge,
Comparison of BJT	and	FET. MOSFET (Constru	uction, pr	incipal of O	peration	and symbol), MOSI	FET
characteristics in Er	han	cement and Depletio	n modes.					
List of Laboratory T	asks		<i>с</i> .	DQ · · ·				
Experiment No 1: V	eriti	cation of KVL and KCl	tor a giv	en DC circui	t. .:+			
Level 1: Study and	vern no ci	y KVL and KCL for the	given ele	form the sin	nulation	using NI		
LabVIEW/Multisim/		ΓLΔR	vei 1, pei	IOTTI LITE SIT	luiation			
Experiment No 2: A	naly	vse AC series circuits -	- RL, RC a	nd RLC .				
Level 1: Conduct ar	ı exp	eriment to perform a	nd verify	the impeda	nce, curr	ent and pov	wer of S	Series RL and
RC circuits								
Level 2:								
Exporiment No 2: (`əlcu	lation of nowor and r	ower fac	tor of the gi		ircuit		
Level 1: Conduct ar	aicu o ovn	eriment to measure t	the nowe	r and nowe	factor fo	ncuit. Srigiven resi	stive lo	ad
Level 2: Conduct an	i exp	eriment to measure t	the powe	r and power	factor fo	or given indi	uctive le	oad.
				perre.		8.1.6.1.1.6.		
Experiment No 4: P	erfo	rm the experiments o	on given T	ransformer				
Level 1: Verify the E	EMF	equation of a transfo	rmer and	compute th	ne voltage	e transform	ation ra	atio.
Level 2: Study the e	effect	t of load on the secon	idary side	of the tran	sformer a	and verify th	ne EMF	equation
under load conditio	ns.							
	+	on DC chunt motor						
Experiment 5: LOad	1 LEST	st on DC shunt motor	r and find	lits officion	wat diff	aront loads		
Level 2: Conduct loa	au ie ad te	st on DC shunt motor	and nlot	the nerforn	ly at unit	aracteristics	:	
				the periori				
Experiment 6: Stud	lv of	PN-Junction Diode C	haracteri	stics in Forw	ard and	Reverse Bia	s Condi	tions.
Level 1:Carry out a	n ex	periment to plot VI	Character	istics and h	ence fin	d the cut-in	voltag	e on forward
characteristics for t	he S	ilicon P-N Junction die	ode.					
Level 2: Carry out a	n ex	periment to plot VI Cl	haracteris	stics of Zene	er diode a	nd hence fi	nd the	zener voltage
		•						





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on reverse characteristics for the Silicon P-N Junction zener diode.

Experiment 7: To observe the output waveform of half wave and full wave rectifier circuit and compute ripple factor and efficiency

Level 1:Identify the components required for a rectifier circuit, rig up the circuit, and sketch the output waveforms without filter.

Level 2: Rig up the rectifier circuit with RC filter, observe the output waveforms, determine the efficiency and ripple factor.

Experiment 8: To construct clipping and clamping circuits for different reference voltages and to verify the responses.

Level 1:Identify the components required for building a Clipper / Clamper circuit. Rig up the circuit according to the circuit diagram given and sketch the output waveform.

Level 2: Given a sinusoidal input of 10 V p-p, implement a positive / negative clipper with output clipped at 2 V.

Experiment 9: To calculate various parameters of emitter follower circuit using BJT

Level 1: Identify the components required to implement an emitter follower circuit. Rig up the circuit and observe the variations in output waveform with respect to the variations in input waveform.

Level 2: Determine the values of Z_{in} input impedance and Z_{out} output impedance for Emitter Follower.

Experiment 10: To Implement RC Coupled amplifier using a BJT and sketch the frequency response.Level 1: Identify the components required to implement an RC coupled amplifier circuit. Rig up the circuit and sketch the frequency response.

Level 2: From the frequency response curve determine the value of the mid band gain and the bandwidth.

Targeted Application & Tools that can be used:

Targeted Applications: Application Area includes all electrical and electronic circuits (power supply unit, regulator unit, embedded devices, hardware electronics etc.). The students will be able to join a profession which involves basics to high level of electronic circuit design.

Professionally Used Software: Matlab/Multisim/ PSpice

Besides these software tools hardware equipment such as Multimeters, Function Generators, Power Supplies, Oscilloscopes etc., can be used to perform component/circuit testing and analysis..

Text Book(s):

1. Kothari D. P. & Nagrath I. J., "Basic Electrical and Electronics Engineering", Tata McGraw-HillEducation.

2. Theraja B.L. and Theraja A.K., "A Textbook of Electrical Technology: Basic Electrical Engineering" in S.I. System of Units, 23rd ed., New Delhi: S. Chand, 2002.

3. A.P.Malvino, Electronic Principles,7thEdition, Tata McGraw Hill,2007

4. J. Millman, C. C. Halkias and C. D. Parikh, "Millman's Integrated Electronics", McGraw Hill Education, 2nd Edition.

5. Basics of Electrical & Electronics Laboratory Manual.

Reference Book (s):

1. John Hiley, Keith Brown and Ian McKenzie Smith, "HUGHES Electrical and Electronic



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440 YEARS OF ACREEMIC WISDOM

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Technology", 10th Edition (Indian Edition published by Dorling Kindersley), Pearson,2011
Samarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2nd Edition, Prentice Hall India, 2007.

3. K Uma Rao, A Jaya Lakshmi, "Basic Electrical engineering" IK International publishing house Pvt. Ltd

4. R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education India 7th Edition.

5. A K. Maini, V. Agrawal, "Electronic Devices & Circuits", Wiley, 2nd Edition

6. A.S Sedra, K. C. Smith, "Microelectronic Circuits", Oxford University Press, 6th Edition

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

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

2. https://www.digimat.in/nptel/courses/video/108105112/L01 "Fundamentals of Electrical Engineering-Basic Concepts, Examples"

3. Seminar Topic: https://nptel.ac.in/courses/108/105/108105153/ "Electrical Measurements"

4. Video lectures on "Electronic Devices" by Prof.Dr. A. N. Chandorkar, IIT Bombay <u>http://www.satishkashyap.com/2013/03/video-lectures-on-electron-devices-by.html</u>

5. Video lectures on "Analog Electronics" by Prof. S.C. Dutta Roy, IIT Delhi <u>https://nptel.ac.in/courses/108/102/108102095/</u>

6. Video lectures on "Diodes", by Prof.ChitralekhaMahanta, IIT Guwahati, <u>https://nptel.ac.in/courses/117/103/117103063/</u>

7. "Introduction to Electrical Machines <u>https://nptel.ac.in/courses/108/102/108102146/</u>"

8. M. -Y. Kao, H. Kam and C. Hu, "Deep-Learning-Assisted Physics-Driven MOSFET CurrentVoltageModeling," in IEEE Electron Device Letters, vol. 43, no. 6, pp. 974-977, June 2022, doi: 10.1109/LED.2022.3168243

https://ieeexplore-ieee-org-resiuniv.knimbus.com/document/9758727

9. F. Bonet, O. Aviñó-Salvadó, M. Vellvehi, X. Jordà, P. Godignon and X. Perpiñà, "Carrier

Concentration Analysis in 1.2 kV SiCSchottky Diodes Under Current Crowding," in IEEE Electron DeviceLetters, vol. 43, no. 6, pp. 938-941, June 2022, doi: 10.1109/LED.2022.3171112. https://ieeexplore-ieeeorg- presiuniv.knimbus.com/document/9764749

10. M. Chanda, S. Jain, S. De and C. K. Sarkar, "Implementation of Subthreshold Adiabatic Logic for Ultralow-Power Application," in IEEE Transactions on Very Large Scale Integration (VLSI) Systems, vol. .23, no. 12, pp. 2782-2790, Dec. 2015.

https://ieeexplore.ieee.org/document/7018053

11. R. Raut and O. Ghasemi, "A power efficient wide band trans-impedance amplifier in submicron CMOS integrated circuit technology," 2008 Joint 6th International IEEE Northeast Workshop on Circuits and Systems and TAISA Conference, 2008, pp. 113-116, doi: 0.1109/NEWCAS.2008.4606334. https://ieeexplore.ieee.org/document/4606334

Topics relevant to "SKILL DEVELOPMENT": Performing suitable experiments to compute the Electrical and electronics circuit parameters, performance operation of Machines, and semiconductor devices for **Skill Development** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course plan.





Itgalpur, Rajankunte, Yelahanka, Bengaluru – 560064

ENGZ	001	Advanced English		L- T- P- C	1	0 2	2	
Versio	on No.	1.3						
Course requis	e Pre- ites	ENG1002 Technica	al English					
Anti-re	equisites	NIL						
Course	e	The course emp	hasizes on technical con	nmunication at	advance	ed lev	vel by	
Descri	ption	exploring critical r of the course is to article and deliver equip to express Technical presents of interests and e effectively.	exploring critical reading, technical presentation and review writing. The purpose of the course is to enable learners to review literature in any form or any technical article and deliver technical presentations. Extensive activities in practical sessions equip to express themselves in various forms of technical communications. Technical presentations and the module on career setting focus on learners' area of interests and enhance their English language writing skills to communicate effectively.					
Course	e Out Come	 On successful completion of the course the students shall be able to: 1. Develop a critical and informed response reflectively, analytically, discursively, and creatively to their reading. 						
		2. Communicate effectively, creatively, accurately and appropriately in their writing.						
		3. Deliver technical presentations						
4. Design resume and create professional portfolio to find a suitable career								
Course	e Content: Th	eory						
		Critical Reasoning and Writing Essays Critical Reading 4 Classes						
Modu	le 1	Reasoning and Writing	Writing Essays	Critical Reading	5	4 C	lasses	
Modu Topics	le 1	Reasoning and Writing	Writing Essays	Critical Reading	5	4 C	lasses	
Modu Topics	le 1 : A Catalog of	Reasoning and Writing Reading Strategies	Writing Essays	Critical Reading	g	4 C	lasses	
Modu Topics •	le 1 : A Catalog of The Myth of	Reasoning and Writing Reading Strategies Multitasking	Writing Essays	Critical Reading	g	4 0	lasses	
Modu Topics •	le 1 : A Catalog of The Myth of A Guide to V	Reasoning and Writing Reading Strategies Multitasking Vriting Essays Specu	Writing Essays	Critical Reading	g	4 C	lasses	
Modu Topics • •	le 1 : A Catalog of The Myth of A Guide to V Is Google Ma	Reasoning and Writing Reading Strategies Multitasking Vriting Essays Specu aking Us Stupid (Sel	Writing Essays ulating about Causes or Effo f Study)	Critical Reading	g	4 C	lasses	
Modu Topics • • • • • • •	le 1 : A Catalog of The Myth of A Guide to V Is Google Ma le 2	Reasoning and Writing Reading Strategies Multitasking Vriting Essays Spect aking Us Stupid (Sel Technical Presentation	Writing Essays ulating about Causes or Effo f Study) Presentation	Critical Reading ects Oral Skills	g 	4 C 3 C	lasses	
Modu Topics • • • • • • • • • • • • • • • • • • •	le 1 : A Catalog of The Myth of A Guide to V Is Google Ma le 2 :	Reasoning and Writing Reading Strategies Multitasking Vriting Essays Specu aking Us Stupid (Sel Technical Presentation	Writing Essays ulating about Causes or Effe f Study) Presentation	Critical Reading ects Oral Skills	g	4 C	lasses	
Modu Topics • • • • Modu Topics •	le 1 .: A Catalog of The Myth of A Guide to V Is Google Ma le 2 .: Planning the	Reasoning and Writing Reading Strategies Multitasking Vriting Essays Specu aking Us Stupid (Sel Technical Presentation	Writing Essays ulating about Causes or Effe f Study) Presentation	Critical Reading ects Oral Skills	g	4 C	lasses lasses	
Modu Topics • • • • • • • • •	le 1 : A Catalog of The Myth of A Guide to V Is Google Ma le 2 : Planning the Creating the	Reasoning and Writing Reading Strategies Multitasking Vriting Essays Specu aking Us Stupid (Sel Technical Presentation presentation	Writing Essays ulating about Causes or Effo f Study) Presentation	Critical Reading ects Oral Skills	g	4 C	lasses	
Modu Topics • • • • • • • • • •	le 1 : A Catalog of The Myth of A Guide to V Is Google Ma le 2 : Planning the Creating the Giving the pr	Reasoning and Writing Reading Strategies Multitasking Vriting Essays Specu aking Us Stupid (Sel Technical Presentation presentation resentation	Writing Essays ulating about Causes or Effo f Study) Presentation	Critical Reading ects Oral Skills	g	4 C	lasses	
Modu Topics • • • Modu Topics • • • • •	le 1 : A Catalog of The Myth of A Guide to V Is Google Ma le 2 : Planning the Creating the Giving the pr le 3	Reasoning and Writing Reading Strategies Multitasking Vriting Essays Speculation Technical Presentation e presentation presentation Writing Reviews	Writing Essays ulating about Causes or Effe f Study) Presentation Prezi	Critical Reading ects Oral Skills Review Writing	g 	4 C 3 C	lasses	
Modu Topics • • • Modu Topics • • • • • • •	le 1 : A Catalog of The Myth of A Guide to V Is Google Ma le 2 : Planning the Creating the Giving the pl le 3 : Review Writ	Reasoning and Writing Reading Strategies Multitasking Vriting Essays Speculating Us Stupid (Selection) Technical Presentation presentation resentation Writing Reviews	Writing Essays ulating about Causes or Effo f Study) Presentation Prezi	Critical Reading ects Oral Skills Review Writing	g 	4 C 3 C	lasses	
Modu Topics • • • Modu Topics • • • Modu Topics •	le 1 : A Catalog of The Myth of A Guide to V Is Google Ma le 2 : Planning the Giving the pr le 3 : Review Writ Short film re	Reasoning and Writing Reading Strategies Multitasking Vriting Essays Specu aking Us Stupid (Sel Technical Presentation presentation resentation Writing Reviews	Writing Essays ulating about Causes or Effo f Study) Presentation Prezi	Critical Reading ects Oral Skills Review Writing	g g	4 C 3 C	lasses lasses	
Modu Topics • • • Modu Topics • • • • • • • • • • • • • • • • • • •	le 1 : A Catalog of The Myth of A Guide to V Is Google Ma le 2 : Planning the Giving the pr le 3 : Review Writ Short film re Advanced Er	Reasoning and Writing Reading Strategies Multitasking Vriting Essays Speculating Us Stupid (Sel Technical Presentation presentation resentation Writing Reviews ing views nglish Grammar (Se	Writing Essays ulating about Causes or Effo f Study) Presentation Prezi	Critical Reading ects Oral Skills Review Writing	g g	4 C 3 C	lasses lasses	

Topics: • Preparing a Resume Writing Effective Application Letter **Creating a Professional Portfolio** • **Course Content: Practical Sessions** Module 1 **Critical Reasoning and Writing** 8 Classes **Reading and Analyzing** 1. Level 1 – Annotation Level 2 - Assumptions 2. Writing Narrative Essays Level 1 – Draft 1 Level 2 – Draft 2 Module 2 **Technical Presentation 10 Classes** 3. Fishbowl In Fishbowl, students form concentric circles with a small group inside and a larger group outside. Students in the inner circle engage in an in-depth discussion, while students in the outer circle listen and critique content, logic, and group interaction. Level 1 – within group Level 2 – Among 2 group 4. **Technical Group Presentation** Module 3 **Writing Reviews** 4 Classes **Practice Worksheets** 5. Level 1 – Eliminating the Passive Voice Level 2 – Simple, compound and complex sentences Writing Short Film Reviews 6. Module 4 **Starting your Career** 6 Classes 7. **Collaborative Project** Job search and writing report Writing Resume Module 1-4 **Academic Journal** 2 Classes 8. Academic Journal Writing Level 1- Mid Term Level 2 - End Term Targeted Application & Tools that can be used: Writing reports, Review writing, Group Discussion, Dyadic interviews, Grammarly.com

Project work/Assignment:

Academic Journal – Assignment

In Academic Journal (CIJ), students compile task and activities completed in each module and submit to the instructor at the middle and end of the semester.

References

1. Hering, Heik. *How to Write Technical Reports: Understanding Structure, Good Design, Convincing Presentation*. Springer.

2. Johnson, Richard. (2010) *Technical Communication Today*. Pearson, 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</u> Accessed on 10 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



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Itgalpur, Rajankunte, Yelahanka, Bengaluru - 560064

Course Code-	Course Title: Basic French			2-0-0-2			
FRL1002	Type of Course: Open Elective		L- 1-P- C	2-0-0-2			
Version No.	4.0						
Course Pre- requisites	Not Applicable						
Anti-requisites	Not Applicable						
Course Description	This Course is for beginners and gives an introduction of the French Language (basic grammar, conjugation, daily used vocabulary words, and basic conversations) and French culture. This Course is designed to build up all of the basic skills of French listening, reading, speaking, and writing introduced in the lessons. Besides, this Course offers an access to the French world, helping students to break cultural boundaries and raise cultural literacy.						
Course Objective	This course is designed to improve participative learning techniques and cross-cultural competence by	This course is designed to improve the learners Employability skills by using participative learning techniques to develop students' language proficiency and cross-cultural competence by active and participatory teaching methods					
	On successful completion of the o	course the s	udents sha	ll be able to:			
Course Outcomes	 e Outcomes 1) Identify the basics of French Grammar, vocabulary and Conjugation 2) Apply the basics strategies of listening, reading, speaking and writing skills 3) Use of French on everyday topics such as greetings, personal information, time and schedule 4) Practice conversations in French language with peer speakers in 						
Course Contenti	Learning of Basic French skills						
Module 1	Greetings and Introducing yourself	[Rememb er]	6 Periods			
Chapter 1. Greetings Objectives: Greetings, Grammar: Construction Chapter 2. Introducing Objectives: Introduce Grammar: Mas or Fen Usage of audio visual	Chapter 1. Greetings Objectives: Greetings, introducing yourself, how to welcome someone, Grammar: Construction of a sentence, the days of the weeks and the months Chapter 2. Introducing yourself Objectives: Introduce oneself / ask for someone's personal information. Grammar: Mas or Fem noun, adjectives, present tense of the 1 st group						
Module 2	Expressing likes/dislikes and introducing someone	[Apply]	6 Periods			
Chapter 3. Expressing Objectives: How to ex Grammar: Negative fo Culture: The polite wa Assignment Chapter 4. Introducing Objectives: How to de Grammar: Vocabulary	likes and dislikes pressing what you like and dislike. orm, singular and plural. by to address people in French g someone escribe someone, of the family, Demonstrative adiec	tives,					

Present tense of verbs of the 2 nd and 3 rd group							
Module 3	Inviting someone and asking questions		[Apply]	9 Periods			
Chapter 5. Inviting someone Objectives: How to invite someone, accept or refuse the invitation, Read the time, Grammar: Future tense, Interrogation. Culture: The art of accepting and declining an invitation politely in French Internal Chapter 6. Asking for information, Objectives: How to ask for information, giving information							
Module 4	Module 4 Making a reservation and giving directions [Apply] 9 Periods						
Chapter 7: Making a R Objectives: How to ma Chapter 8 : Giving dire Objectives: How to asl Group discussions Targeted Application	eservation ake a reservation, future tense actions < for directions, Imperative tense & Tools that can be used						
Project work /Assignr	nents						
 Assignment (Es Internal Group work / G 	ssay writing / presentation) Group discussions						
Text Book L'Atelier 1 Méthode de Français Niveau A1 (Didier – 2019) Festival 1 Méthode de Français Niveau A1 (CLE International – 2005)							
References	igned by the instructor						
Topics relevant to dev	relopment of 'Employability Skills'	through n	articipative	learning techniques:			
Foreign language pro methods.	ficiency and cross-cultural compe	tence by a	active and p	articipatory teaching			



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Course Code: PPS 1012	Course Title: Enhancing Per through Soft Skills Type of Course: Practical Only C	sonality Course	L- T - P- C	0	0	2	1			
Version No.	1.0	1.0								
Course Pre- requisites	 Students are expected to understand Basic English. Students should have desire and enthusiasm to involve, participate and learn. 									
Anti-requisites	NIL									
Course Description	This course is designed to enable students understand soft skills concepts and improve confidence, communication and professional skills to give the students a competitive advantage and increase chances of success in the professional world. The course will benefit learners in presenting themselves effectively through various activities and learning methodologies.									
Course					_					
Objective	The objective of the course is to familiarize the learners with the concepts of "Personality Development through Soft Skills" and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.									
Course Out Comes	On successful completion of the CO 1 Identify the stages of team CO 2 Demonstrate effective processional social methods of the constrate of th	iis course m format esentatio nedia profi	the students ion (Rememb n skills (Apply le (Apply)	s shall ber) /)	be able	e to:				
Course Content:										
Module 1	Team Building	Classroo team bui	m and o Iding activiti	utbou es.	nd 6 I	Hours				
Topics: Importar	nce of team, stages of Team Forn	nation, Tr	rust and collab	ooratio	n, Virt	ual Te	am.			
Activity: Team	Building outbound activity									
Module 2	Art of Questioning	Role pla	ys		4 9	Session	IS			



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Topics: Framing Questions, 5W1H Technique, Open-ended and Close-ended questions, Funnel technique, Probing questions, Leading questions							
1							
Module 3Presentation SkillsPractice and evaluation of individual / group presentation10 SessionsImage: Second secon							
Topics: Content development, Delivery techniques, Audience Analysis, Timing and Pacing, handling questions and challenges.							
Activity: Individ	ual present	ations and team pres	sentation				
Module 4	Pro Bu	ofessional Branc ilding	d Brand Framework Activity 4 Sessions				
Topics: Personal brand definition, Crafting a compelling LinkedIn profile, Networking strategies.							
Module 5	Red /Fe	cap / Revision eedback Session		1 Sessi	on		
Targeted Applica	tion & Too	ls that can be used:					
1. TED Talks							
2. You Tube	Links						
3. Activities							
Project work/Ass	ignment: N	Aention the Type of	Project /Assignment prop	osed fo	r this course		
3) Presentat	tion Evalua	tion					
Targeted Applica	ation & Too	ols that can be used	:				
1. TED Talks							
2. YouTube	Links						
3. Videos by	/ L&D Team	n shared on Edhitch/	YouTube.com				
4. LMS							
Assignments pro	Assignments proposed for this course						
1. Evaluatio	n on Presei	ntation					
2. Assignme	nt on Linke	edIn Post					



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YouTube Links: <u>https://youtu.be/z_jxoczNWc</u> (Steve Jobs Introducing the iPhone 4 in June 2010) References

1. "Talk Like TED - The 9 Public-Speaking Secrets of the World's Top Minds" By Carmine Gallo St. Martin's Press Copyright © 2014 Carmine Gallo All rights reserved. ISBN: 978-1-250-04112-8

2. "The Presentation Secrets of Steve Jobs: How to Be Insanely Great in Front of Any Audience" MP3 CD – Import, 22 April 2014

3. "The Definitive Book of Body Language: The Hidden Meaning Behind People's Gestures and Expressions" Hardcover – Illustrated, 25 July 2006

"Crucial Conversations: Tools for Talking When Stakes Are High" Paperback – Import, 1 July
 2002

Web links:

1. <u>https://www.wordstream.com/blog/ws/2014/11/19/how-to-improve-presentation-skills</u> <u>https://www.cbs.de/en/blog/15-effective-presentation-tips-to-improve-presentation-skills/</u>

2. <u>https://hbr.org/2022/05/the-art-of-asking-great-questions</u>

Topics relevant to development of "SKILL": Art of Presentation, Team building, Art of questioning and Personal Branding for Skill Development through Participative Learning Techniques. This is attained through assessment component mentioned in course handout.



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Course	Course Title: Environmental Science						
<mark>Code:</mark> CHE1018	Type of Course: School Core- Theory and Lab		Contact hours	1	0	2	3
Version No.	2.0					1	
Course Pre- requisites	NIL						
Anti- requisites	NIL						
Course Description	This course emphasizes the need to conserve biodiversity and adopt a more sustainable lifestyle by utilizing resources in a responsible way. Topics covered include basic principles of ecosystem functions; biodiversity and its conservation; human population growth; water resources, pollution; climate change; energy resources, and sustainability; Sustaining human societies, policies, and education.						
Course	The objective of the course is to familiarize the learners with the concepts of						
Objective	"Environmental Science" and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING techniques.						
Course Outcomes	 On successful completion of this course the students shall be able to: 1) Appreciate the historical context of human interactions with the environment and the need for eco-balance. 2) Describe basic knowledge about global climate change with particular reference to the Indian context. 3) Understand biodiversity and its conservation 4) Develop an understanding on types of pollution and ways to protect the environment 5) Loarn about various strategies on Global environmental management systems 						
Course Content:			<u> </u>				
Module 1	Humans and the Environment	Assignment	Data Collectic	n	01 d	lass	



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Topics: The man-environment interaction: Mastery of fire; Origin of agriculture; Emergence of city-states; Great ancient civilizations and the environment.

Self-learning topics: Humans as hunter-gatherers; Industrial revolution and its impact on the environment; Environmental Ethics and emergence of environmentalism.

Module 2	Natural Resources and Sustainable	Assignment	03 Classes
	Development		

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.

Module 3	Environmental Issues: Local, Regional and Global	Case study	02 Classes
Tonics			

Environmental Pollution: Types of Pollution- air, noise, water, soil<mark>, municipal solid waste</mark>, hazardous waste; Transboundary air pollution; <mark>Acid rain; Smog.</mark>

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		
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		



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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 <mark>aquatic life and mitigation</mark>, 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 Assignment/case 02 Classes	Module 6 Climate Change: Impacts, Adaptation and Mitigation	Assignment/case	02 Cla	isses
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Topics:

Understanding climate change: Natural variations in climate; Projections of global climate change with special reference to temperature, rainfall and extreme events<mark>; Importance of 1.5 °C and 2.0 °C limits to global warming;</mark> 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 Ma	anagement	Case study	Data analysis	02 Classes	
Тор	pics:						
Environmental management system: ISO 14001; Environmental risk assessment Pollution control and management;							
Wa	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 Classes	

Topics:

Major International Environmental Agreements: <mark>Convention on Biological Diversity (CBD), Major Indian Environmental</mark> Legislations: Environmental Protection Act, <mark>Forest Conservation</mark> 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.

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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.

GAIN MORE KNOWLEDGE REACH GREATER HEIGHTS

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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; <u>https://www.ipcc.ch/report/sixth-assessment-report-cycle/</u>

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=ECATALOGUE_BASED&unique_id=DO
AB_1	<u>06082022_18126</u>

- 2. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO</u> <u>AB_1_06082022_8761</u>
- 3. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO</u> AJ 1 02082022 3333
- 4. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO</u> AB 1 06082022 3063
- 5. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO</u> AB_1_06082022_20719
- 6. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO</u> AB 1 06082022 16824
- 7. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO</u> AB 1 06082022 3954
- 8. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO</u> AB_1_06082022_491

9. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=CU</u> STOM_PACKAGE_16012023_WORLD_BUSINESS_COUNCIL_SUSTAINABLE_488

10. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=CU</u> <u>STOM_PACKAGE_16012023_WORLD_BUSINESS_COUNCIL_SUSTAINABLE_583</u>

11. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=SP</u> <u>RINGER_INDEST_1_171</u>

12. https://presiuniv.knimbus.com/user#/searchresult?searchId=3R%20principle&_t=1687427221129

13. https://presiuniv.knimbus.com/user#/searchresult?searchId=eco%20labelling&_t=1687427279979

- 14. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=TE</u>
- XTBOOK_LIBRARY01_06082022_395&xIndex=4
- 15. <u>https://www.ugc.gov.in/oldpdf/modelcurriculum/env.pdf</u>



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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.



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Course Code: LAW1007	Course Title: Indian Constitution and Professional Ethics for Engineers Type of Course: Theory	L-T- P-C	1	0	0	0
Itgalpur, Rajankun	e, Yelahanka, Bengaluru – 560064					
Version No.						
Course Prerequisites						
Anti-requisites	NIL					
Course Description	The purpose of this course is to introduce the students to the theory, concepts and practice of Constitution of India which is the law of the land. Further, the course aims at acquainting the students with basic approaches and methodologies to analyse and decide on the ethical dilemma in the field of engineering. The course is both conceptual and analytical. The course develops critical thinking skills by augmenting the student's ability to comprehend the conceptual and legal framework of Constitution of India. Ethics and values are very beautifully weaved into the tapestry of the Indian Constitution. Therefore, the course provides an introduction to the essential theoretical basis of engineering ethics and its application through a range of industry relevant topics responsibility for safety and risks, responsibility of employers, rights of					
Course Objective	To introduce the students to the conceptual fram India and engineering ethics. To enthance the practical knowledge on responsibi professionals as citizens of India. To atquaint the student with the relevant con surrounding constitutional values and profession To offent the students about the ethical concepts them to identify the codes and moral values relevant	nework of lity of er tempora al ethics s and fra vant to t	of Co ngine ary is mew :he p	nstit ering sues vorks rofes	utior g s ena ssion	bling



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Course	
Outcomes	On successful completion of this course the students shall be able:
	1. To understand foundational Indian constitutional law concepts and values.
	2. To identify the different pillars of democracy and their functions.
	3. To analyse the role of the engineers' responsibility in ensuring safety of the
	society and the employer.



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Module 1	Introduction to the Indian Constitution	Knowledge	Quiz	5 Classes
Course Content:				

Meaning of Constitution, Constitutional Law and Constitutionalism, India before and after adoption of Constitution, Preamble, Salient Features, Concept and Relevance of Fundamental Rights, Fundamental Duties and Directive Principles of State Policy in brief.

	Pillars of			
	Democracy:			
Module 2	Legislature	Knowledge	Short Essay	5 Classes
	Executive and			
	Judiciary			

Federalism, Union and State Executive, Parliament and State Legislature, Union and State Judiciary, Amendment of the Constitution

Module 3	Engineering Ethics	Analysis	Presentation on conceptual understanding 5 Classes and problem based scenarios
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Scope & Aims of Engineering & Professional Ethics, Code of Ethics as defined in the website of Institution of Engineers (India), Profession, Professionalism, and Professional Responsibility, Conflicts of Interest, Engineering Standards, the impediments to Responsibility, IPRs (Intellectual Property Rights), Necessity of responsible experimentation ,Case Studies on Challenger, Chernobyl, and Boeing.

Project work/Assignment: Quiz on Fundamental Rights, Short Essay on Judicial Activism in India, Problem based assignments of engineering ethics.



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Resources:

M.P.**1**ain, Indian Constitutional Law, 8th Edition, Lexis Nexis, 2022.

M.W2Martin and R. Schinzinger, Ethics in Engineering, 4thEdition, McGraw Hill Education, 2015.



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References:

- 1. Durga Das Basu, Commentary on the Constitution of India, 9th Edition, Lexis Nexis, 2019.
- 2. Rowan, John, and Zinaich Jr., Ethics for the Professions, Wadsworth, 2003.
- 3. R.C. Sekhar, Ethical Choices in Business, Response Books, Sage Publications, 1997.



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Itgalpur, Rajankunte, Yelahanka, Bengaluru – 560064

Course Code: ECE2010	Course Title: Arduino	Innovative Projects	using	L- T-P- C	-	-	-	1
Version No.	1.0							
Course Pre- requisites	NIL							
Anti- requisites	NIL							
Course	This course is desig	gned to provide an in-o	depth ur	nderstanding	of Are	duino		
Description	microcontrollers ar	nd their application in	various	real time proj	ects iı	nvolvii	ng	
	sensors. Throughout	ut the course, students	will lear	rn the fundan	nental	ls of		
	Arduino programm	ning and gain hands-o	n experi	ence with a w	vide ra	ange o	f	
	sensors. Students will explore how to connect and interface sensors with							
	Arduino boards, read sensor data, and use it to control various output devices							
	This course is suitable for beginners who are interested in exploring the world							
	of electronics and developing practical applications using Arduino and sensors.							
Course	The objective of the course is Employability Skills of student by using							
Objective	PARTICIPATIVE LEARNING techniques.							
Course	On successful com	pletion of the course	the stud	ents shall be	able	to		
Outcomes	1) Explain the main features of the Arduino prototype board							
	2) Demonstrate the hardware interfacing of the peripherals to Arduino							
	system.							
	3) Understand the types of sensors and its functions							
	4) Demonstrate the functioning of live projects carried out using Arduino							
	system.							
Course Content:								
Module 1	Basic concepts of Arduino	Hands-on	Interfacing Task and Analysis			4 Sessions		
Topics:								
Concept of digi	ital and analog por	ts, Familiarizing with	ecture, I h Ardui	Device and p no Interfacin	platfoi	rm fea ard, A	Itur	es, s,
Introduction to	Embedded C and A	rduino platform, Ardu	uino Dat	atypes and v	ariabl	les, Ar	dui	no
i/o Functions, A	rduino Communicat	tions, Arduino IDE, Va	arious Cl	loud Platform	IS.			
Module 2	Devices	Hands-on	Analysis	ng Task	and	4 Ses	ssio	ns
Arduino Soncor	Andring Conserve Humidity Conserve Tomographics Conserve William Delectory / Conserve DD C						or	
Ultrasonic Sensor, Connecting Switches and actuators, sensor interface with Arduino.								
Introduction to	Introduction to 3D Printer: 3D Printer technology and its working Principles, Applications.						ns.	

Introduction to online Simulators: Working with Tinkercad Simulator.

Topics: Types of Arduino boards, sensors, 3D Printer

Targeted Application & Tools that can be used:

Application Area:

Home Automation, Environmental Monitoring, Agriculture and Farming, Industrial Automation, Internet of Things (IoT), Robotics, Wearable Devices, Security Systems, Education and Learning. These are just a few examples of the many application areas where Arduino and sensors can be applied. The flexibility and affordability of Arduino, 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 < <u>https://onlinecourses.swayam2.ac.in/aic20_sp04/preview></u>
- 3. Case studies on Wearable technology< <u>https://www.hticiitm.org/wearables></u>

E-content:

1. Cattle Health Monitoring System Using Arduino and IOT <mark>(</mark>April 2021 | IJIRT | Volume 7 Issue 11 | ISSN: 2349-6002)

2. 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<u>.</u>

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.



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Itgalpur, Rajankunte, Yelahanka, Bengaluru – 560064

Course Titles Internal Transforms and Partial								
Course Code:	Course	Title: Integral Transforms and Partial		•	•	•		
MAT2501	Differen	Course: 11 School Core				3		
	Type of	Course:1] School Core						
Version No.		1.0						
Course Pre- requisites		Calculus and Differential Equations						
Anti-requisites		NIL						
Course Description		This course aims to introduce various tra	nsform techr	iques	such	as Lap	blace	
		transform, Fourier transform and Z-transfor	m in addition	to exp	ressin	g func	tions	
		in terms of Fourier series. The course covers	applications	of Lap	lace ti	ansfor	m to	
		LCR circuits and solutions of different equ	ations using 2	L-trans	form.	The co	ourse	
		also deals with the analytical methods for sol	ving partial d	itteren	tial eq	uations	sand	
		The classical applications of partial different	al equations.		the		ta of	
Course Objective		"Transform Techniques Partial Differ.	e the learner	ions"	and a	oncep	ts of Skill	
		Development through Problem Solving T	chniques	10115	and c	iiiaiii	JKIII	
				1 11				
Course Out Comes		On successful completion of the course the s	students shall	be able	e to:			
		1. CO1 - Express functions in terms of uniformly convergent Fourier						
		2 CO2 - Apply I aplace transform technique to solve differential equations						
		 CO3 - Employ Z-transform techniques to solve difference equations. 						
		4. CO4 - Solve a variety of partial diff	erential equat	ions ar	alytic	ally.		
Course Content:			•		2	2		
Module 1	Laplace	e Transforms			(1	2 Cla	sses)	
Definition and Laplac	e transfor	m of elementary functions. Properties of Lapl	ace transform	, and I	Laplace	e trans	form	
of periodic function,	unit-step	function and Impulse function - related pro	blems. Invers	e Lap	lace tr	ansfor	m of	
standard functions -	problems	, initial and final value theorem. Convolut	ion theorem,	soluti	on of	linear	and	
simultaneous differen	tial equati	ons and LCR Circuit.						
Module 2	Fourier	· Series A	ssignment		(8 Classes)			
Fourier Series: Peri	odic func	tions, Dirichlet's condition. Fourier series of	of periodic fi	unctior	is peri	od 2π	and	
arbitrary period. Half	range Fou	rier series. Practical harmonic analysis.						
Module 3 Fourier Transforms and Z - Transforms (13 Classical states)					13 Cla	sses)		
Fourier Transforms: Definitions, infinite Fourier transforms, Fourier sine and cosine transforms, inverse Fourier						urier		
transforms, Problems.								
Difference equations and Z-transforms: Z-transforms – Basic definitions, Standard Z-transforms, Linearity								
property, Damping rule, Shifting rule, Initial value theorem, Final value theorem, Inverse Z-transforms. Difference								
equations – Basic definitions, Application of Z-transforms to solve difference equations.								
Module 4	Partial	Differential Equations A	ssignment		(1	2 Cla	sses)	
Formation of PDE, Solution of non-homogeneous PDE by direct integration, Solution of homogeneous PDE								
involving derivative with respect to one independent variable only (Both types with given set of conditions) Method								
of separation of variables. (First and second order equations) Solution of Lagrange's linear PDE, of the type P p + $Q_{p} = -P$								
Qq = K.								
Applications of PDE: Derivation of one-dimensional wave and heat equations. Various possible solutions of these has the method of comparison of variables. D'Alembert's relation of variables. The dimensional Leabort's relation of variables are also been as the method of comparison of variables.								
by the method of separation of variables. D'Alembert's solution of wave equation. Two-dimensional Laplace's aquation, various possible solutions. Solution of all these equations with aposified houndary conditions.								
equation – various possible solutions. Solution of all these equations with specified boundary conditions (Boundary value problems)								
Value provients).								
Targeted Application & Tools that can be used:						ticel		
I ne objective of the course is to familiarize students with a variety of numerical techniques and the theoretical concepts of probability and statistics to equip them with the pecessary numerical approaches and basic statistical								
concepts of probability and statistics to equip them with the necessary numerical approaches and basic statistical tools to tackle engineering and real-life problems								
Assignment.	tools to tackle engineering and real-life problems.							

3. Newton-Raphson Methods, Gauss-Seidel Method, LU Decomposition, Trapezoidal Rule, Simpson's rule, Runge-Kutta 4 th Order.
Text Book
1. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc. 10th Edition
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
E-resources/ Web links:
1. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_i</u>
<u>d=EBSC095_30102024_140238</u>
2. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_1</u>
$\frac{d=EBSC095-50102024-255298}{2}$
3. <u>https://presiuniv.knimbus.com/user#/viewDetail/searchResultType=ECATALOGUE_BASED&unique_1</u> d=EBSCO95_30102024_204892
<u>d=EBSCO75_50102024_204072</u>
d=EBSCO95_30102024_246791
5. https://presjuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_i
d=EBSCO95 30102024 223548
6. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_i
d=EBSCO95_30102024_134719
7. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_i</u>
<u>d=EBSCO95_30102024_32614</u>
8. <u>https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html</u>
9. <u>https://www.scu.edu.au/study-at-scu/units/math1005/2022/</u>
Topics relevant to SKILL DEVELOPMENT: The course focuses on the concepts of calculus and differential equation with reference to specific engineering problems. The course is of both conceptual and analytical type in nature through Problem solving. This is attained through the assessment component mentioned in course handout



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Itgalpur, Rajankunte, Yelahanka, Bengaluru – 560064

Course Code: MAT2605Course Title: Discrete Mathematics Type of Course:1] School CoreL-T- P- C40	0	4				
Version No. 1.0	1.0					
Course Pre-						
requisites Linear Algebra	Linear Algebra					
Anti-requisites NIL	NIL					
Course DescriptionThe course explores the study of mathematical structures that are full	The course explores the study of mathematical structures that are fundamentally					
discrete (not continuous), focusing on concepts like set theory, logic, g	discrete (not continuous), focusing on concepts like set theory, logic, graph theory,					
science fields like algorithms software development and cryptogram	combinatorics, and number theory, with applications primarily in computer science fields like algorithms software development and cryptography; it covers					
topics such as propositional logic, proof techniques, relations, function	is, cour	nting				
principles, and basic graph algorithms, providing a foundation f	principles, and basic graph algorithms, providing a foundation for analyzing					
discrete problems and structures within computer science.						
Course Objective The main objective of the course is that students should learn a par	cular s	et of				
mathematical facts and how to apply them. It teaches students h)W to t athema	tical				
reasoning, combinatorial analysis, discrete structures, algorithmic t	inking.	and				
applications and modeling. A successful discrete mathematics of	urse sh	ould				
carefully blend and balance all five themes.	carefully blend and balance all five themes.					
Course Outcomes On successful completion of the course the students shall be able to:	On successful completion of the course the students shall be able to:					
CO1 - Explain logical sentences through predicates, quantifiers and I	CO1 - Explain logical sentences through predicates, quantifiers and logical					
CO2 - Deploy the counting techniques to tackle combinatorial proble	ns					
CO3 - Comprehend the basic principles of set theory and different ty	es of					
relations.						
CO4 - Apply different types of structures of trees for developing p	ogramr	ming				
skills						
Course Content:						
Module 1 Fundamentals of Logic	10 Clas	sses)				
Basic Connectives and Truth Tables, Propositional Logic, Applications of Propositional Logic, I	ropositi	ional				
Methods and Strategy	0015, 1	1001				
Module 2 Principle of Counting Assignment (15 Clas						
The Well Ordering Principle – Mathematical Induction	<u>10 010</u>	5565)				
The Basics of Counting, Permutations and Combinations, Binomial Coefficients and Identities, Generalized						
Permutations and Combinations, Generating Permutations and Combinations						
Advanced Principle Counting: The Principle of Inclusion and Exclusion, Generalizations of the Decomposition of the	e Princ	nple,				
Defangements – Nothing is in its Right Place, Rook Polynomials. (10 Channel)						
Cartesian Products and Relations European One-to-One Onto European The Pigeon-hole Princip	e Fund	sses)				
Composition and Inverse Functions.	ic, i uik	ction				
Relations, Properties of Relations, Computer Recognition - Zero-One Matrices and Directed Gr	phs, Pa	artial				
Orders, Lattice, Hasse Diagrams, Equivalence Relations and Partitions.						
Module 4 Recurrence Relations and Generating Functions Functions </td <th>10 Clas</th> <td>sses)</td>	10 Clas	sses)				
Homogeneous and inhomogeneous recurrences and their solutions - solving recurrences using generat	ng funct	tions				
- Repertoire method - Perturbation method - Convolutions - simple manipulations and tricks						
Repetione method i ertarouton method Convolutions Simple manipulations and areas.						
Module 5 Graph Theory & Algorithms on Networks Assignment	15 Clas	sses)				
Module 5 Graph Theory & Algorithms on Networks Assignment Definitions and basic results - Representation of a graph by a matrix and adjacency list - Trees - Cycles	15 Clas - Prope	sses) erties				
Module 5 Graph Theory & Algorithms on Networks Assignment Definitions and basic results - Representation of a graph by a matrix and adjacency list - Trees - Cycler - Paths and connectedness - Sub graphs - Graph Isomorphism - Operations on graphs - Vertex and Vertex and edge connectivity. Fuller and Hamilton Paths. Shortest Paths	15 Clas - Prope edge c	sses) erties uts -				
Module 5Graph Theory & Algorithms on NetworksAssignmentDefinitions and basic results - Representation of a graph by a matrix and adjacency list - Trees - Cycle- Paths and connectedness - Sub graphs - Graph Isomorphism - Operations on graphs - Vertex and Vertex and edge connectivity, Euler and Hamilton Paths, Shortest-Paths.Tree - Definitions, Properties, and Examples, Routed Trees, Binary search tree, Decision tree, spanning	15 Clas - Prope edge c g tree: I	sses) erties uts - BFS.				

Algorithms on Networks - Shortest path algorithm- Dijikstra's algorithm, Minimal spanning tree- Kruskal algorithm and Prim's algorithm.

Targeted Application & 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.

Assignment:

- 4. Assignment 1: Logic Equivalences and Predicate calculus.
- 5. Assignment 2: Equivalence Relations and Lattices

6. Assignment 3: Recurrence Relations

Text Book

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", McGraw-Hill, 88th Edition, 2019.

2. Harary – Graph Theory, Addison-Wesley Publishing Company.

References:

- 1. Arthur Gill, "Applied Algebra for Computer Science", Prentice Hall.
- 2. K.D. Joshi, "Discrete Mathematics", Wiley Eastern Ltd.

3. Ralph. P. Grimaldi., "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia.

E-resources/ Web links:

10. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_i</u> d=EBSCO95_30102024_54588

11. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_i</u> d=EBSCO95_30102024_375

- 12. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html
- 13. https://www.scu.edu.au/study-at-scu/units/math1005/2022/

14.

Topics relevant to SKILL DEVELOPMENT: The course focuses on the concepts of calculus and differential equation with reference to specific engineering problems. The course is of both conceptual and analytical type in nature through Problem solving. This is attained through the assessment component mentioned in course handout.




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Course Code:	Course Title: Data Struct	ures	L-T- P- C	3	0	0	3		
Version No.	1.0								
Course Pre-									
requisites									
Anti-requisites	NIL								
Course Description	This course introduces the the importance of choosin development . This course understanding the imple programming language data structures and practice effective designer, development	e fundamental c ng an appropriat se has theory a mentation and With a good k cal experience in oper for new sof	oncepts of data struct te data structure and to and lab component applications of data mowledge in the fun n implementing them ftware applications.	tures and techniqu which e structur damenta , the stu	l to em le for p mphas es usin al cono dent ca	phas progr izes ng J cepts an be	size ram on ava s of e an		
Course	The objective of the c	ourse is <mark>SKILI</mark>	L DEVELOPMENT	of stuc	lent by	y u	sing		
Objective	EXPERIENTIAL LEARNI	XPERIENTIAL LEARNING techniques							
Course Out Comes	 CO1 :Describe the concept of basic data structure, stacks, queues, and arrays and their operations. [Understand] CO2: Utilize linked lists for real-time scenarios. [Apply] CO3: Apply an appropriate non-linear data structure for a given scenario. [Apply] CO4: Demonstrate different searching and sorting techniques. [Apply] 								
Course Content:									
Module 1	Introduction to Data Structure and Linear Data Structure – Stacks and Queues	Assignment	Program activity			9 Ha	ours		
Introduction –	Introduction to Data Struct	ures, Types and	l concept of Arrays .						
Stack -Concep	ots and representation, S	tack operations	s, stack implementa	tion usi	ng arı	ay	and		
Applications of	Stack.								
Oueues -Repres	sentation of queue. Queue	Operations, Ou	ieue implementation	using a	rrav. T	vne	s of		
Queue and Appl	ications of Queue.	- <u>-</u>			j , _	J F			
Module 2	Linear Data Structure -Linked List	Assignment	Program activi	ty	1	2 Ho	ours		
Topics: Linked	List - Singly Linked L	ist, Operation of	on linear list using	singly l	inked	stor	age		
structures. Circu	lar List. Applications of L	inked list.							
Recursion - Recursive Definition and Processes.									
Module 3	Non-linear Data Assignment Program activity 12 Hours								
Topics: Trees	- Introduction to Trees, B	Sinary tree :Te	rminology and Prope	erties, U	Jse of	Dou	ıbly		

Linked List, Binary tree traversals :Pre-Order traversal, In-Order traversal, Post - Order traversal, . Heaps, Expression Tree, Red Black Tree - AVL Trees, Binary Serach Tree

			r	
Module 4	Non-linear Data Structures - Graphs and Hashing	Assignment	Program activity	6 Hours

Topics: Graphs: Basic Concept of Graph Theory and its Properties, Representation of Graphs . ADT, Elementary graph operations, Minimum Cost spanning trees, Shortest path and Transitive closure. **Hashing**: Introduction, Static Hashing, Dynamic Hashing

Module 5	Searching & Sorting	Assignment	Program activity	6 Hours
----------	------------------------	------------	------------------	---------

Topic: Sorting & Searching - Sequential and Binary Search, Sorting – Selection and Insertion sort,

Quick sort, Merge Sort, Bubble sort.

List of Laboratory Tasks:

Lab sheet -1

Level 1: Prompt the user, read input and print messages.Programs using class, methods and objectsLevel 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 on Stack application – Evaluation of postfix

Lab sheet -5

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

Level 2: -

Lab sheet -6

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 -7

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

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

Lab sheet -8

Level 1: Programming Exercises on factorial of a number

Level 2: Programming the tower of Hanoi using recursion

Lab sheet -9

Level 1:

Level 2: Programming the tower of Hanoi using recursion

Lab sheet -10

Level 1: Programming Exercise on Doubly linked list and its operations

Level 2: Lab sheet -11 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 postorder(and implement BFS and DFS Lab sheet -12 Level 1: Program to Implement the Linear Search & Binary Search Level 2: Program to Estimate the Time complexity of Linear Search Lab sheet -13 Program to Implement and Estimate the Time complexity of Selection Sort Level 1: Level 2: Program to Implement and Estimate the Time complexity of Insertion Sort Lab sheet -14 (Beyond syllabus activity) Level 1: Program to Construct AVL Tree Level 2: Lab sheet -15 (Beyond syllabus activity) Level 1: Program to Construct RED BLACK Tree **Targeted Application & Tools that can be used** Use of PowerPoint software for lecture slides and use of Modern IDE like VS Code and Eclipse for lab programs to execute. **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 Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Edition, Universities Press, reprint 2018. T2 Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014. References Data structures and program design in C by Robert Kruse, Tondo C L, Bruce Leung, Pearson **R1**

education publishers, 2017.

R2 Programming and Data Structure by Jackulin C Salini etal., Ane books publishers, 2019.

Web resources:

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

Topics relevant to development of "Skill Development":

Linked list and stacks

Topics relevant to development of "Environment and sustainability: Queues





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Course Coo CSE1504	de:	Course Prograi	Title: Web m core The	Technologies Type ory	e of Course:	L-T- P- C	2	0	0	2
Version No	D.		1.0							
Course Pre requisites	9-									
Anti-requi	sites		NIL							
Course De	scription		This course used for cr The associa enhance cr	e highlights the con eating web-based ated laboratory pro ritical thinking and	nprehensive introdu applications. ovides an opportunit analytical skills.	iction to s ty to imple	cripting ement t	langua he conc	ges that cepts and	are
Course Ob	jective		The object <mark>Technolog</mark>	ive of the course i <mark>y</mark> and attain <mark>Skill D</mark>	s to familiarize the <mark>Jevelopment</mark> throug	learners v gh <mark>Experie</mark>	with the <mark>ential Le</mark>	e conce earning	pts of <mark>W</mark> techniqu	' <mark>eb</mark> ues.
Course Ou	tcomes		On successful completion of this course the students shall be able to:CO1: Implement web-based application using client-side scripting languages.(Apply)CO2: Apply various constructs to enhance the appearance of a website. (Apply)CO3: Apply server-side scripting languages to develop a web page linked to a database.(Apply)							base.
Course Co	ntent:									
Module 1		Introdu XHTML	iction to	Quizzes and Assignments	Quizzes on v XHTML, simp applications	arious fea ble	tures of		Ses	20 sions
Ва ХН Те: ХН	sics: Wel I TML: Or xt Marku TML, De	b, WWW igins and ip, Imag emonstra	V, Web brov d Evolution es, Hyperte ation of app	wsers, Web servers of HTML and XHTN xt Links, Lists, Tabl plications using XH	s, Internet. /IL: Basic Syntax, Sta es, Forms, Frames, S TML for Responsive	indard XH Syntactic web page	TML Do Differen es.	cument	: Structur ween HT	re, Basic ГМL and
Module 2		Advanc	ced CSS	Quizzes and assigr	Comprehens nments and assignm of CSS in designing we	sion based ents; App ebpages	l Quizze lication	S	Ses	20 isions
Ad Lay	vanced (youts, Ap	C SS: Lay oproache	out, Norma es to CSS La	l Flow, Positioning yout, Responsive [Elements, Floating Design, CSS Framew	Elements, orks	Constru	ucting N	Aulticolu	ımn

XML: Basics, Dem	nonstration of applica	ations using XML with XSLT.	
Module 3	PHP – Application Level	Quizzes and assignments Application of PHP in web designing	20 Sessions
PHP: Introductio	on to server-side Dev	velopment with PHP, Arrays, Superglobal Arrays, \$GET a	nd \$ POST,
\$_SERVER Array,	\$_Files Array, Read	ding/Writing Files, PHP Classes and Objects, Object Ori	ented Design,
Working with Da Applications.	atabases, SQL, Data	base APIs, Managing a MySQL Database. Accessing N	lySQL in PHP,
List of Laboratory	y Tasks:		
Experiment No. 1	L: Demonstration of	XHTML features	
Level 1: Demonst Level 2: Design ar	ration of various XHT nd develop static wel	ראן Tags (Level 1) ס pages for an online Book store (Level 2).	
Experiment No. 2	2: Application of CSS	in web designing	
Level 1: Design a	document using XH	TML and CSS to create a catalog of items for online electro	onic shopping.
Level 2: Create a sheet.	nd save XML docume	ent for students' information and display the same using c	ascaded style
Experiment No. 3	3: Application of PHP	in web designing.	
Level 1: Write a P permanent addro information from	HP program to read ess, and pin code e the database and di	the personal information of a person such as first name, I entered by the user into a table created in MySQL. R isplay it on the front end.	ast name, age, ead the same
Level 2: Using PH edition, and publ	P develop a web pag isher and store infor	e that accepts book information such as ISBN number, titl mation submitted through the web page in MySQL databa	e, authors, ase.
Experiment No. 4	I: Building a website		
Build a website fo the author's deta	or organizing an Inter ils and upload a file.	national Conference. The conference website must be ab	le to collect
Targeted Applica	tion & Tools that ca	n be used: Xampp web server to be used to demonstrate	PHP.
Project work/Ass	ignment:		
Assignments are stipulated deadli	given after complet ne.	ion of each module which the student need to submit w	ithin the
Textbook(s):			
1] Robert. W. S 2]Paul Deitel, I	ebesta, " <i>Programmi</i> Harvey Deitel, Abbey	ng the World Wide Web", Pearson Education, 9th Edition, y Deital,"Internet & World Wide Web How to Program"	2016. , Fifth Edition,
Pearson Educatio	n, 2021.		
3]CSS Notes for P 20, 2022)	rofessionals, ebook a	available at https://books.goalkicker.com/CSSBook/ (Retri	ieved on Jan.
4]Deitel, Deitel, G	oldberg,"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 https://presiuniv.knimbus.com/user#/home

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 Title: Computational	Thinking Using									
CSE1500	Python			L- T-P-	2	0	2	R			
				С	2	U	2	5			
	Type of Course: Integrated										
Version No.	1.0	0									
Course Pre-	NIL										
requisites											
Anti-requisites	NIL										
Course	his course introduces students to the essential skills of computational thinking										
Description	and their practical applicatior	n through the Pyth	on p	rograi	nmi	ng la	ngua	ge . By			
	combining problem-solving strategies with coding, students will learn							rn to			
	decompose complex challenges, identify patterns, abstract general princip										
	and design algorithms to build	functional program	ms								
Course	The objective of the course is	s to familiarize the	lear	ners v	vith	the c	once	pts of			
Objective	Computational Thinking and u	ise the Computatio	nal T	Thinkir	ng Pr	incip	les to	solve			
	he computational Problems using Python Language										
Course	Upon successful completion	n of this course, st	uder	nts wi	ll be	able	to:				
Outcomes	I I I I I I I I I I I I I I I I I I I	· · · · · · · · , · · · , · · · ,									
	• Explain and apply the	ne core principles	of c	ompii	tati	onal	thin	king.			
	Decompositi	on	01 0	ompu	· uu	onai	UIIII	<u>8</u> .			
	Bettern Page	onition									
	• Fattern Reco	gintion									
	• Adstraction										
	• Algorithm D	esign									
	• Use Python to impl	ement solutions to	o rea	l-wor	ld pi	oble	ms.				
	• Write and debug Py	thon code using fu	incti	lons, l	oop	s and					
	conditions										
	 Design simple progr 	ams and algorithr	ns to	o auto	mate	e repo	etitiv	e or			
	complex tasks.										
	Collaborate effective	ely and communic	cate	proble	em-s	solvii	ng				
	approaches using pseudoco	de and Python.		-			-				
		•									
Course Content:						_					
Module 1	Pillars of Computational Thinking	Comprehension				9	Sessi	ions			
What is comput	tational thinking? Why is it	important? Pillar	s of	com	outa	tiona	thi	nking			
decomposition n	attern recognition: data repre	sentation and abstr	ractio	n. alg	orith	nms					
Applying compute	ational thinking to case studies		uctiv	511, 015	ontri						
	Algorithm Design &										
Module 2	Problem-Solving Strategies	Application				9	Sessi	ions			
Introduction to A	Igorithms, Introduction to Pro	blem Solving techn	nique	s: Bru	te Fo	orce,	Divid	e and			
conquer, Commo	n algorithms: find-max, linear	search, binary search	ch ar	nd oth	er sir	nple	Algor	ithms			
	Applied Computational	· · · ·									
Module 3	Thinking using Python	Application				12	Sess	sions			
Introduction to P	vthon. Data representation: va	riables, lists. Condi	tiona	als. Loo		nd It	eratio	on			
Basic Example pro	ograms to illustrate the progra	mming constructs		, _0	- 1000						
- abie Example pro											

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

Text Book

1. "Computational Thinking for the Modern Problem Solver" – David D. Riley & Kenny A. Hunt

2. "Mastering Python 3 Programming: Ultimate Guide to Learn Python Coding

Fundamentals and Real-World Applications" Subburaj Ramaswamy, BPB publications

References

1. • Sweigart, Al.

Automate the Boring Stuff with Python: Practical Programming for Total Beginners. No Starch Press, 2015. https://automatetheboringstuff.com

• Severance, Charles.

Python for Everybody: Exploring Data Using Python 3. CreateSpace Independent Publishing, 2016. https://www.py4e.com

• Wing, Jeannette M.

"Computational Thinking." *Communications of the ACM*, vol. 49, no. 3, 2006, pp. 33–35. https://doi.org/10.1145/1118178.1118215

• Downey, Allen B.

Think Python: How to Think Like a Computer Scientist. Green Tea Press, 2015. http://greenteapress.com/wp/think-python-2e/

E-Resources

https://edu.google.com/resources/programs/exploring-computational-thinking **Topics relevant to "SKILL DEVELOPMENT":** Decomposition, Abstraction, Pattern recognition, Data Representation ,Algorithms



Page 1 of 327

			-								
Course Code:	Course Title: Data Co	mmunications and									
CSE1506	Computer Networks		L-T-P-C	3	0	0	3				
				5	U	0	3				
Varaian Na	1 of Course: Theorem	1 ype of Course: Theory									
Version No.	1.0 Digital Dagian										
Course Pre-	Digital Design										
Anti requisites	NII										
Ann-requisites											
Course	The objective of this co	urse is to provide knowl	ledge in data	comr	nuni	cation	s and				
Description	computer networks, its	organization and its in	nplementation	i, and	d gai	in pra	ctical				
	experience in the install	ation, monitoring, and the	roubleshootin	g of		syste	ms.				
	The associated laborator	ry is designed to implem	ent and simul	ate v	for	is netv	vorks				
	fundamentals of creating	acci, NS2. All the la a multiple networks ton	ologies and a	mm rylen	ing t	he net	work				
	traffics	g muniple networks, top	ologies and a	laryz	ing t	ne net	WOIK				
	numes.										
0	The shire time of the second	······	1	41			Dete				
Course	ne objective of the course is to familiarize the learners with the concepts of Data										
Objective	Problem Solving Metho	Communications and Computer Networks and attain Employability through									
Course	On successful completion	on of the course, the stud	lents shall be	able	to						
Outcomes	1] Ilustrate the Basic Co	oncepts Of Data Commu	nication and	Com	nutei	r					
Outcomes	Networks	sheepts of Data Commu	inication and	Com	puter	L					
	2] Analyze the function	alities of the Data Link l	Laver.								
	3] Apply the Knowledg	e of IP Addressing and I	Routing Mech	nanis	ms ii	1					
	Computer Networks.	C	U								
	4] Demonstrate the wor	king principles of the Tr	ansport layer	and							
	Application Layer.										
Course											
Content:			I								
	Introduction and					-	7				
Module 1	Physical Layer-	Assignment	Problem Sol	lving		Sess	ions				
Introduction to C	COI	Nete and the second	tana ala Carana		4.5						
Introduction to C	omputer Networks and L	Pata communications, No	etwork Comp	onen	its –						
Physical Laver	Analog and Digital Sign	als Digital and Analog	- ICF/IF Su Signals Tr	ne.	nicció	n					
Multiplexing and	Spread Spectrum	als – Digital and Analog		ansn	115510	лі -					
what the provide and	spread Speed ann.										
	Reference Models and					_	-				
Module 2	Data Link Layer –	Assignment	Problem Sol	lving		2	/				
	CO2	0		U		Sess	ions				
Data Link Layer - Error Detection and Correction – Parity, LRC, CRC, Hamming Code,											
Flow Control and Error Control, Stop and Wait, ARO, Sliding Window, Multiple Access											

Protocols, CSMA	A/CD,CSMA/CA, I	IEEE	802.3, IEEE 802	.11 Ethe	ernet.			
Module 3	Network Layer –	CO3	Assignment		Problem Solvin	ng	10 Sessions	
Network Layer S	ervices - Network	Laye	r Services, Swite	ching Te	chniques, IP Ad	ldressir	ıg	
methods- IPv4 IPV6 – Subnetting. Routing, - Distance Vector Routing – RIP-BGP-Link								
State Routing –C	SPF-Multi cast Ro	outing	-MOSPF- DVM	RP – Br	oad Cast Routin	g. EVP	'N-	
VXLAN, VPLS,	ELAN.							
Module 4	Transport and Application Layer -CO3	Assig	nment	Probler Solving	n g	10	Sessions	
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.								
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								
Problem Solving network concepts Programming: Si	: Choose and appros. s. imulation of any ne	opriate etwork	e devices and im	plement	various			
 Text Book(s): 1. 1. Behrouz A. Forouzan, "Data Communications and Networking 5E", 5 th Edition, Tata McGraw-Hill, 2017. 2. Andrew S Tanenbaum, Nick Feamster & amp; David J Wetherall, "Computer Networks" Sixth Edition, Pearson Publication, 2022 								
Reference(s): 1.References 1. "Computer Net Kurose, Keith W 2. William Stalli Education, 2007. 3. Larry L. Peter Approach, 4th Education	tworking: A Top-I . Ross, Pearson puings, Data and Con rson and Bruce S. I dition, Elsevier, 20	Down blicati nputer Davie: 07.	Approach", Eigl on, 2021. Communicatior Computer Netw	nth Editi n, 8th Ec vorks – 4	on, James F. lition, Pearson A Systems			

E- Resources:

1. https://archive.nptel.ac.in/courses/106/105/106105183/

- 2. <u>http://www.nptelvideos.com/course.php?id=393</u>
- 3.<u>https://www.youtube.com/watch?v=3DZLItfbqtQ</u>
- 4.<u>https://www.youtube.com/watch?v=_fIdQ4yfsfM</u>
- 5. https://www.digimat.in/keyword/106.html
- 6. <u>https://puniversity.informaticsglobal.com/login</u>





Cours CSE25	<mark>e Code:</mark> 601	Cours Archite	<mark>e Title:</mark> Co ecture	omputer	Organizati	on and	L- T-P- C	3	0	0	3
		Туре	of Course: Prog	gram Co	re, Theory	v based					
Versio	on No.		2.0								•
Cours requis	e Pre- sites		CSE2015 - Digita	l Design							
Anti-r	equisites		NIL								
Course Descri	e iption		This course intro to intermediate between compu assembly-level in concepts of com	course introduces the core principles of computer architecture and organization frombasic intermediate level. This theory based course emphasizes on understanding the interaction ween computer hardware and software. It equips the students with the intuition behind embly-level instruction set architectures. It helps the students to interpret the operational cepts of computer technology as well as performance enhancement.							
Cours	e		The objective o	f the cou	urse is to fa	miliarize	the learners	with the	concep	ts of Co	mputer
Object	tive		Organization an techniques.	sanization and Architecture and attain Skill Development through Participative Learnin hniques.							earning
Cours	е		On successful co	mpletion	of the cours	e the stud	ents shall be a	ble to:			
Outco	utcomes 1] Describe the basic components of a computer and their interconnections. [Remember]								ember]		
	2] Explain Instruction Set Architecture and Memory Unit[Understand]										
			3] Apply appro	priate te	chniques to	o carry ou	t selected ari	ithmetic	operati	ons [App	oly]
			4] Explain the o	organizat	tion of mem	nory and	processor su	b-systen	n [Unde	rstand]	
Cours Conte	e nt:										
Modu	le 1	Basic	Structure	Assignm	nent		Data Analy	sis task		12 S	essions
	Topics: Computer Performan Operations Memory In	Types, Fi ce – Proc on Signe struction	unctional Units, E cessor Clock, Basi ed numbers. Instru s.	Basic Ope c Perforn Ictions an	rational con nance Equat d Instruction	cepts, Bu ion, Clock Sequenci	s Structures, Rate, Perforing, Instruction	Compute mance M n formate	er systen 1easuren 5,	ns RISC a nent. Ari	& CISC, thmetic
		Instruct	tion								
Modu	le 2	t Archite Memor	Se cture and ry Unit	Assignn	nent	Analysis,	Data Collecti	on		Se	12 ssions
	Topics:		-						•	·	
	Instruction	Set Arch	itecture: Addressi	ng Modes	s, Stacks and	Subroutin	es.				
	Memory S	ystem: N	lemory Location	and Addr	esses, Mem	ory Opera	itions, Semico	nductor	RAM M	emories,	Internal
	Organizatio	on of Mer	nory chips, Cache	memory r	mapping Tec	hniques.					
		Arithm	etic								
Modu	le 3	and Design	Input/output	Case St	udy	Data ana	Ilysis task			Se	10 ssions
	Topics:										
	Arithmetic Input/outp Interface C	: Carry lo ut Desigr ircuits	okahead Adder, Si n: Accessing I/O De	gned-Ope evices, I/(erand Multip D communic	lication, In ation, Inte	iteger Division errupt Hardwa	, and Flo re, Direc	ating poi t Memor	ntoperat y Access	ions. , Buses,
Modu	le 4	BPU and	l Pipelining	Assignn	nent	Analysis,	Data Collecti	on		11 Sess	sions

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
Project work/Assignment:
Each batch of students (self-selected batch mates – up to 4 in a batch) will be allocated case studies/assignments
 Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", Sixth Edition, McGraw-HillHigher Education, 2023 reprint. William Stallings, "Computer Organization & Architecture – Designing for Performance", 11thEdition, Pearson Education Inc., 2019.
References1.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/1061051632.NPTEL Course on "Computer Organization", IIT Madras By Prof. S. Raman. https://nptel.ac.in/courses/1061060923.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 Developmentthrough Participative Learning techniques. This is attained through assessment component mentioned in course handout.





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Course	Course Title: Data Structures Lab					1					
Code:	Type of Course: Lab		L-T- P- C	0	0 4	2					
CSE1509	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			•							
Version No.	1.0				1						
Course Pre-											
requisites											
Anti-	NIL										
requisites											
Course Description	Se ription set introduces the fundamental concepts of data structures and to emphasize the importance of choosing an appropriate data structure and technique for program development. This course has theory and lab component which emphasizes on understanding the implementation and applications of data structures using Java programming language. With a good knowledge in the fundamental concepts of data structures and practical experience in implementing them, the student can be an effective designer, developer for new software applications.										
Course	The objective of the course is SKILL	DEVELOPMENT of st	udent by using <mark>H</mark>	EXPE	RIENT	<mark>(AL</mark>					
Objective	LEARNING techniques	EARNING techniques									
Course Out Comes	On successful completion of the course the students shall be able to: CO1 :Describe the concept of basic data structure, stacks, queues, and arrays and their operations. [Understand] CO2: Utilize linked lists for real-time scenarios. [Apply] CO3: Apply an appropriate non-linear data structure for a given scenario. [Apply] CO4: Demonstrate different searching and sorting techniques. [Apply]										
Course											
Content:		1	1								
Module 1	Introduction to Data Structure and Linear Data Structure – Stacks and Queues	Assignment	Program activit	y	9 Ho	ours					
Introduction Stack -Cond Applications Queues -Re Queue and A	n –Introduction to Data Structures, cepts and representation, Stack opera of Stack. presentation of queue, Queue Opera Applications of Queue.	Types and concept of ations, stack implement tions, Queue implement	Arrays . ntation using arr ntation using ar	ray an rray, 1	ιd Γypes α	of					
Module 2	Linear Data Structure -Linked List	Assignment	Program activ	/ity	Но	12 ours					
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.											
Module 3	Non-linear Data Structures - Trees	Assignment	Program activ	/ity	Ho	12 ours					
Topics: Tre Linked List, .Heaps , Exp	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, -Heaps , Expression Tree .Red Black Tree - AVL Trees .Binary Serach Tree										
Module 4	Non-linear Data Structures - Graphs and Hashing	Assignment	Program activity 6 Hours								

Topics: Graphs: Basic Concept of Graph Theory and its Properties, Representation of Graphs . ADT, Elementary graph operations, Minimum Cost spanning trees, Shortest path and Transitive closure. duction Static Hashing Dynamic Hashing

Hashing: In	troduction, Static Hashing, Dynamic	: Hashing		
Module 5	Searching & Sorting	Assignment	Program activity	6 Hours
Topic: Sor sort, Quick s	ting & Searching - Sequential and I sort, Merge Sort, Bubble sort.	Binary Search, Sorting	- Selection and	Insertion
List of Labora	atory Tasks:			
Lab sheet -1				
Level 1: Pror	npt the user, read input and print mess	ages.Programs using cla	ss, methods and o	bjects
Level 2: Prog	gramming Exercises on fundamental Da	ta structure - Arrays bas	ed on Scenario.	
Lab sheet -2				
Level 1: Prog	gramming Exercises on Stack and it	s operations		
Level 2: Pro	gramming Exercises on Stack and i	ts operations with con	dition	
Lab sheet -3		~ ~ .		
Level 1: Pro	ogramming on Stack application infi	to postfix Conversion	n	
Level 2: -				
Lab sheet -4		1		
Level 1: Prog	gramming on Stack application – Ev	aluation of postfix		
Lab sheet -5		1 '4		
Level 1: Pro	ogramming Exercises on Queues an	d its operations with c	onditions	
Level 2: -				
Lap sneet -	ogromming Everging on Linked list	and its onerstions		
Level 1: FI	ogramming Exercises on Linked list	and its operations with	various position	ne -
Level 2. Fit		and its operations with	i various position	15
Lavel 1. Pr	cogramming Exercises on Circular I	inked list and its opera	tions	
Level 1. 11	ogramming Exercises on Circular L	nked list and its operation	tions with various	s positions
		liked list and its operation		positions
Lab sheet -8				
Level 1: Pr	ogramming Exercises on factorial of	f a number		
Level 2: Pr	ogramming the tower of Hanoi using	g recursion		
Lab sheet -9)			
Level 1: -				
Level 2: P	rogramming the tower of Hanoi usin	g recursion		
Lab sheet -1	.0			
Level 1: P	rogramming Exercise on Doubly lin	ked list and its operation	ons	
Level 2: -				
Lab sheet -1	1			
Level 1: H	Program to Construct Binary Search	Tree and Graph	• -	
Level 2: F	rogram to traverse the Binary Searc	h Tree in three ways)in	n-order, pre-order	r and post-
order(and ir	nplement BFS and DFS			
Lab sheet -1	2			
Level 1:	rogram to Implement the Linear Sea	arch & Binary Search		
Level 2: F	rogram to Estimate the Time compl	exity of Linear Search		
Lab sheet -1	.5	(h. T	f C - 1 - C	
Level 1: P	rogram to implement and Estimate	the 11me complexity of	or Selection Sort	

Level 2: Program to Implement and Estimate the Time complexity of Insertion Sort Lab sheet -14 (Beyond syllabus activity) Level 1: Program to Construct AVL Tree

Level 2:

Lab sheet -15 (Beyond syllabus activity)

Level 1: Program to Construct RED BLACK Tree

Targeted Application & Tools that can be used

Use of PowerPoint software for lecture slides and use of Modern IDE like VS Code and Eclipse for lab programs to execute.

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 Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Edition, Universities Press, reprint 2018.

T2 Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.

References

R1 Data structures and program design in C by Robert Kruse, Tondo C L, Bruce Leung, Pearson education publishers, 2017.

R2 Programming and Data Structure by Jackulin C Salini etal., Ane books publishers, 2019. **Web resources:**

- 3. For theory :<u>https://onlinecourses.nptel.ac.in/noc20_cs85/preview</u>
- 4. <u>https://puniversity.informaticsglobal.com/login</u>

Topics relevant to development of "Skill Development":

Linked list and stacks

Topics relevant to development of "Environment and sustainability: Queues





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	Course Title: Web	Technologies Lab						
CSE1505	Type of Course: Pi	ogram core lab cou	irse	L-T- P- C	0	0	2	1
Version No.	1.0							
Course Pre- requisites								
Anti-requisites	NIL							
Course Description	This course used for cr The associa enhance cr	e highlights the comp eating web-based ap ated laboratory prov ritical thinking and a	prehensive introd oplications. ides an opportuni nalytical skills.	uction to s ity to imple	cripting ement th	languaş ne conc	ges that a	are I
Course Objective	The object <mark>Technolog</mark>	ive of the course is <mark>y</mark> and attain <mark>Skill De</mark>	to familiarize the <mark>velopment</mark> throu	learners v gh <mark>Experie</mark>	with the <mark>ential Le</mark>	concer arning	ots of <mark>W</mark> techniqu	<mark>eb</mark> Jes.
Course Outcomes	On success CO1: Imple (Apply) CO2: Apply CO3: Apply (Apply)	s ful completion of th ement web-based ap v various constructs t v server-side scripting	is course the stud plication using clic co enhance the ap g languages to de	dents shal ent-side sc pearance velop a we	l be able ripting l of a web b page l	e to: anguago osite. (A inked to	es. . pply) o a datak	base.
Course Content:								
Module 1	Introduction to XHTML Features	Quizzes and Assignments	Quizzes on v XHTML, sim applications	various fea ple	tures of		Ses	8 sions
Standard XH and semant	ITML Document S ic tags.	tructure, Basic Text	Markup such as I	neadings,	paragrap	ohs, list	s, tables	, forms
		Quizzes and assignn	Comprehen nentsand assignm	sion based ients; App	d Quizzes lication	S	:	10

XML: Basics, Dem	onstration of applica	ations using XML with XSLT.	
Module 3	PHP – Application Level	Quizzes and assignments Application of PHP in web designing	12 Sessions
PHP: Introductio	on to server-side Dev	velopment with PHP, Arrays, Superglobal Arrays, \$GET a	nd \$ POST,
\$_SERVER Array,	\$_Files Array, Read	ding/Writing Files, PHP Classes and Objects, Object Ori	ented Design,
Working with Da Applications.	atabases, SQL, Data	base APIs, Managing a MySQL Database. Accessing N	lySQL in PHP,
List of Laboratory	/ Tasks:		
Experiment No. 1	: Demonstration of	XHTML features	
Level 1: Demonsti Level 2: Design an	ration of various XHT nd develop static wel	רML Tags (Level 1) b pages for an online Book store (Level 2).	
Experiment No. 2	Application of CSS	in web designing	
Level 1: Design a	document using XH ⁻	TML and CSS to create a catalog of items for online electro	onic shopping.
Level 2: Create ar sheet.	nd save XML docume	ent for students' information and display the same using c	ascaded style
Experiment No. 3	Application of PHF	P in web designing.	
Level 1: Write a P permanent addre information from	HP program to read ess, and pin code e the database and di	the personal information of a person such as first name, la entered by the user into a table created in MySQL. Re isplay it on the front end.	ast name, age, ead the same
Level 2: Using PHI edition, and publi	P develop a web pag isher and store infor	e that accepts book information such as ISBN number, titl mation submitted through the web page in MySQL databa	e, authors, ase.
Experiment No. 4	Building a website		
Build a website fo the author's deta	or organizing an Inter ils and upload a file.	mational Conference. The conference website must be ab	le to collect
Targeted Applica	tion & Tools that ca	n be used: Xampp web server to be used to demonstrate	PHP.
Project work/Ass	ignment:		
Assignments are stipulated deadline	given after complet ne.	ion of each module which the student need to submit w	ithin the
Textbook(s):			
1] Robert. W. S 2]Paul Deitel, H	ebesta, " <i>Programmi</i> Harvey Deitel, Abbev	ng the World Wide Web", Pearson Education, 9th Edition, y Deital,"Internet & World Wide Web How to Program",	2016. , Fifth Edition,
Pearson Educatio	n, 2021.		
3]CSS Notes for Pi 20, 2022)	rofessionals, ebook a	available at https://books.goalkicker.com/CSSBook/ (Retri	ieved on Jan.
4]Deitel, Deitel, G	oldberg,"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 https://presiuniv.knimbus.com/user#/home

Topics related to development of "FOUNDATION":

- 4. Web, WWW, Web browsers, Web servers, Internet.
- 5. CSS, PHP.
- 6. 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.



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Course Code:	Course Title: Data Com	munications and					
CSE1507	Computer Networks		LTDC	2	0	0	Δ
			L- I-F- C	2	U	0	U
	Type of Course: LAB						
Version No.	1.0						
Course Pre-	Digital Design						
requisites							
Anti-requisites	NIL						
Course	This lab-based course prov	vides hands-on experience	in the principle	es and	l prac	ctices o	of data
Description	communications and com	nputer networking. It is	designed to co	omple	emen	t theor	retical
	concepts covered in the	associated lecture cours	se. Inrough a	a seri	les o	of struc	ctured
	experiments and practical	at exercises, students wi	n gain prone	iency	111	coning	uring,
	Key topics include network	rk topology design IP add	lessing and su	hnatt	ing	Ethorn	at and
	I AN technologies routir	ng and switching TCP/II	P protocol sui	te an	nig, i id ba	sic ne	twork
	security measures Stude	ents will work with indu	strv-standard	tools	and	equin	ment
	including routers, switche	s, protocol analyzers, and	network simul	ation	soft	ware si	ich as
	Cisco Packet Tracer or W	ireshark.			~		
Course	The objective of this lab co	ourse is to provide student	s with practica	l, han	ds-o	n expe	rience
Objective	in the configuration, operation	ation, and troubleshooting	of data comm	unica	tion	system	ns and
	computer networks. Throu	ugh guided experiments ar	nd real-world s	cenar	ios, s	student	ts will
	reinforce theoretical know	wledge, develop essential	technical skill	lls, ar	nd ga	ain a d	leeper
	understanding of netwo	rking concepts, protoco	ols, and devi	ces i	ised	in m	odern
	communication systems.						
Course	On successful completion	of the course, the student	s shall be able	to:	• 1		1
Outcomes	1. Design and config	ure basic network topolog	ies using route	ers, sv	vitch	es, and	end
	A polyze and troubleshoot	requirements.	norformonco	0.011.00		a tool	anah
	as Wireshark and network	simulators	performance	.55uc5	usin	ig tools	such
	Demonstrate understandin	of key networking prote	ocols (e.g. TC	P/IP	ARP	ICM	р
	DHCP) through practical i	implementation and obser	vation.	· / ,		, 10111	•
	Apply IP addressing and s	subnetting techniques to effect to effect the subnetting techniques techniques to effect the subnetting techniques	fficiently alloc	ate ar	nd ma	anage	
	network resources in vario	ous networking scenarios.	2			U	
Course							
Content:						1	
	Physical Layer,					2	4
Module 1,2,3,4	Network Layer,	Lab Assignment	Problem Solv	ving		Sess	ions
	Transport Laye						
List of Laboratory	Tasks:						
Lab sheet 1 M 1	2 [2 Hours]						
Experiment No 1:	, 5 [2 Hours]						
Level 1. Study of	hasic network commands at	nd network configuration	commands				
	ousie network commands a	na notwork comiguration	communus.				
Lab sheet -2. M-1	[2 Hours]						
Experiment No 1:	[=o ••••o]						
Level 1: Identify a	and explore Network device	s, models and cables. Intro	oduction to Ci	sco			
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 & amp; 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 Problem Solving: Choose and appropriate devices and implement various network concepts. Programming: Simulation of any network using NS2.

Text Book(s): 1. 1. Behrouz A. Forouzan, "Data Communications and Networking 5E", 5 th Edition, Tata McGraw-Hill, 2017. 2. Andrew S Tanenbaum, Nick Feamster & amp; David J Wetherall, "Computer Networks" Sixth Edition, Pearson Publication, 2022 **Reference**(s): 1.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.https://www.youtube.com/watch?v=3DZLItfbqtQ 4.https://www.youtube.com/watch?v=_fIdQ4yfsfM 5. https://www.digimat.in/keyword/106.html 6. https://puniversity.informaticsglobal.com/login



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Course Code:	Course Title: Numerical Computing	L-T-P-C	3	0	0	
Varsion No	Type of Course.1] School Core	1.0				Т
Course Pre- requisites	MAT2301 & MAT2302	1.0				-
Anti-requisites	NIL					
Course	The course explores mathematical techniques use	ed to approxim	ate solut	tions to co	omplex	1
Description	problems that are difficult to solve analytically calculations, including methods for root finding, in integration, solving systems of linear equations, an equations, with applications across various scienti understanding the theoretical basis behind the programming languages, and analyzing their accura	, often utilizin terpolation, num ad approximatin fic and enginee ese methods, acy and stability	g compunerical di g solutionering fiel their im	uters to p ifferentiations to diffe ds. It focu plementat	erform on and erential ises on ion in	
Course	The objective of the course is to equip students	with understand	ding and	l ability to	apply	
Objective	various numerical techniques to approximate solut	tions to comple	x mather	matical pro	oblems	
	that are difficult of impossible to solve analytical solving systems of equations finding roots	ally, particulari	y focusii	ng on are	as like	
	differentiation, and integration, often utilizing c	omputational to	ools to	implemen	t these	
	methods.	r		r		
Course Out	On successful completion of the course the student	s shall be able t	0:			
Comes	CO1 - Calculate errors induced in the values by tru	ncation of a ser	ies expa	nsion.		
	CO2 - Demonstrate the applications of numerical n	nethods to find	the roots	of		
	polynomial equations and eigen values of real sym	metric matrices	c ·		1	
	CO3 - Apply the knowledge of numerical methods	in modelling of	t various	physical a	and	
	CO4 - Apply various numerical methods for solvin	g linear Ordina	rv & Par	tial differe	ntial	
	equations arising in engineering field.	g inical Ordina	iy œ i ai		Innai	
Course Content:						1
Module 1	Solution of Linear Systems of Equation			(12 C	lasses)	-
Numerical Compu	tation: Motivation and Objectives, Number Repre-	sentation, Macl	hine Pre	cision, Ro	ound-of	-
Error, Truncation H	Error, Random Number Generation.			·		
Solution of algebra	aic and transcendental equations: Various types of	errors - Bisect	ion meth	od, Regul	la-Falsi	
method, Newton-R	aphson method, Graffe's method - Bairstow's metho	d - Newton's m	ethod for	r solving f	$\mathbf{x}(\mathbf{x},\mathbf{y}) =$	
0 and $g(x,y) = 0$, s	secant method, Fixed point iteration method, Soluti	on of linear sy	stem of	equations,	Gauss	
elimination metho	d, Pivoting, Gauss Jordan method, Iterative meth	ods of Gauss J	acobi ai	nd Gauss	Seidel,	
Sufficient condition	ns for convergence - LU decomposition method, Ei	genvalues of a	matrix b	by Power 1	method	
Modulo 2	Intermolection and Approximation	Aggiggment		(9.0	loggag)	-
Internalation with	agual intervals. Nouton's forward and hadward	Assignment	mulaa Ir	(ð L	hasses)	-
unequal intervals I	agrange's interpolation Newton's divided difference	e interpolation	Cubic Sr	nterporatio	ference	
operators and relati	ions.	e interpolation,	euole of		lerenee	
Module 3	Numerical Differentiation and Integration			(10 C	lasses)	1
Numerical differen	tiation, Approximation of derivatives using interpola	ation polynomia	als, Num	erical inte	gration	-
using Trapezoidal	rule, Simpson's one-third rule, Simpson's three-	eighth rule, W	eddle's	rule, Ron	aberg's	
Method, Two poin	t and three point Gaussian quadrature formulae, Eval	uation of double	e integral	ls by Trap	ezoidal	
rule and Simpson's	one-third rule			_		ļ
Module 4	Initial & Boundary Value Problems for Ordinary & Partial Differential Equations	Assignment		(15 C	lasses)	

Single step methods — Taylor's series method, Modified Euler's method, Fourth order Runge-Kutta method for solving first order equations, Multi step methods, Milne's and Adams, Bash forth predictor corrector methods for solving first order equations.

Finite difference methods for solving second order, two-point linear boundary value problems, Finite difference techniques for the solution of two-dimensional Laplace's and Poisson's equations on rectangular domain, One-dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods, One-dimensional wave equation by explicit method.

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: Python.

Assignment:

7. 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. C.F.Gerald and P.O.Wheatley, "Applied Numerical Analysis", McGraw-Hill, 1981
- 2. Cheneg and Kincaid, "Introduction to Numerical Computing", Tata McGraw-Hill, 1998

References:

- 1. SRK Iyengar & RK Jain, Numerical Methods, New Age Internationals.
- 2. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition
- 3. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.

E-resources/ Web links:

- 1. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_135224</u>
- 2. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_141727</u>
- 3. <u>https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSC095_30102024_217628</u>
- 4. <u>http://.ac.in/courses.php?disciplineID=111</u>
- 5. <u>http://www.class-central.com/subject/math(MOOCs)</u>
- 6. <u>http://academicearth.org/</u>
- 7. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html
- 8. <u>https://www.scu.edu.au/study-at-scu/units/math1005/2022/</u>

Topics relevant to SKILL DEVELOPMENT: The course focuses on the concepts of calculus and differential equation with reference to specific engineering problems. The course is of both conceptual and analytical type in nature through Problem solving. This is attained through the assessment component mentioned in course handout.







Course Code:	Course Title: Database Mana	agement Systems						
C3E1310	Type of Course: Theory			L-T-P-C	3	0	0	3
Version No.				1		1		
Course Pre- requisites	Foundational understanding familiarity with operating sys and discrete mathematics to	of data types, dat tems and file mana understand relatio	a structures, l gement. Basic onal algebra a	basic progr knowledg nd query fo	amn e of ormu	ning set t Ilati	knov heory	vledge, y, logic,
Anti-requisites	NIL							
Course Description	This course introduces the including data models, scher on the relational model of da data definition, manipulatio complex queries. The cours relational databases and mo the students to gain insigh	foundational prin mas, and architectu ata and the use of r on, and control, e dern database tech nts into data stor	nciples of da ures. This cou relational alge nabling stude the concept nnologies like age structure	tabase ma rse provide bra. It deve ents to con of object NoSQL. The s and ind	anage elops nstru orier ne als exin	eme solic s ski ict a nted so c g st	ent sy d four lls in t and e l and ourse rateg	vstems, ndation SQL for execute object allows ies for
Course Objective	optimizing query performand The objective of the course Management Systems and at	ce. is to familiarize t ttain Employability	he learners w through Prot	vith the co lem Solvir	ncep ng M	ots o etho	of Dat odolo	tabase gies.
Course OutComes	On successful completion of 1. Describe the fundamenta [Understand] 2. Examine databases using 3. Design simple database s demonstrate the database tr 4. Interpret the concept of a	the course the stud al elements of relat SQL query process ystems applying th ransaction processi advanced database	dents shall be ional database ing and Optin e normalization ng, recovery, es and its appli	able to: e managen nization. [A on constrai and securi ications. [A	nent opply ints a ty. [A opply	syst] and Appl]	tems. y]	
Course Content:								
Module 1	Introduction to Database Modelling and Relational Algebra(Understand)	Assignment	Problem Solvi	ing 1	.0 Se	ssio	ns	
Topics: Introduction to D Data isolation pro Relationship (ER) N Relational Algebra joins), and division	atabase: Schema, Instance, S blem in traditional file system Model, ER Model to Relationa with selection, projection, re operator. Examples on Relat	3-shema architectu m, advantages of c I Model, Examples ename, set operatio ional Algebra Oper	ure, physical a latabase over on ER model. ons, Cartesian rations.	and logical traditiona product, j	data I file oins	a ind sys (inn	deper tems er an	idence, . Entity d outer
Module 2	Fundamentals of SQL and Query Optimization (Apply)	Assignment	Programmiı	ng	11	Se	sions	5

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.

Relational Database Desigr & Transaction Managemen Module 3 (Apply)	t Assignment	Problem Solving	12 Sessions
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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), Join Dependencies (Fifth Normal Form), lossy and lossless decompositions, Database De-normalization.

Transaction Management: The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concurrency Control; Performance of locking; Transaction support in SQL; Introduction to crash recovery; 2PL, Serializability and Recoverability; Lock Management; The write-ahead log protocol; Check pointing; Recovering from a System Crash; Media Recovery; Other approaches and interaction with concurrency control.

Module 4	Advanced DBMS Topics (Apply)	Assignment	Case Study	12 Sessions
----------	---------------------------------	------------	------------	-------------

Topics:

Advanced topics: Object oriented database management systems, Deductive database

management systems, Spatial database management systems, Temporal database management systems, Constraint database management systems.

New database applications and architectures such as Data warehousing, Multimedia, Mobility, NoSQL, Native XML databases (NXD), Document-oriented databases, Statistical databases.

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.

 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 MySQL.

Text Books:

T1. Elmasri R and Navathe S B, "Fundamentals of Database System", Pearson Publication, 7th Edition, 2018.

T2. RamaKrishna & Gehrke, "Database Management Systems" 3rd Edition, 2018, McGraw-Hill Education.

T3. 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

R1 Avi Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill ,7th Edition, 2019. R2 M. Kleppmann, "Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems", O'Reilly, 2017. Topics relevant to development of "FOUNDATION SKILLS": S - Skill Development: Relational database design using ER- Relational mapping, Implementation of given database scenario using MYSQLDB.

Topics relevant to development of Employability: Develop, test and implement computer databases, creating sophisticated, interactive and secure database applications

Topics relevant to "HUMAN VALUES & PROFESSIONAL ETHICS": Nil







Presidency University Act, 2013 of the Karnataka Act No. 41 of 2013 | Established under Section 2(f) of UGC Act, 1956 Approved by AICTE, New Delhi

Itgalpur, Rajankunte, Yelahanka, Bengaluru - 560064

Course Code:	Course Title: Database Management Systems Laboratory					
CSE1511	Type of Course: Lab	L-T-P-C	0	0	2	1
Version No.	1.0					
Course Pre- requisites	Foundational understanding of data types, basic programmin systems and file management.	ng knowledg	e, o	per	ating	
Anti-requisites						
Course Description Course Objective	The Database Management Systems (DBMS) Laboratory is de hands-on experience in database design, implementation, a database management tools such as MySQL. The lab con learned in database courses by allowing students to practice of optimization techniques. The DBMS Lab enables students to in database management, preparing them for careers in engineering, and database administration . The objective of the course is to familiarize the learners Management Systems and attain Employability through Pro	signed to pr nd manager nplements th database cre develop ind software with the co blem Solving	nen heor atio lustr dev ncer g Me	t us retion n, q ry-ro elop	ing S cal cc ueryi eleva omen of Da	ALL and Oncepts ng, and nt skills t, data atabase gies.
Course OutComes	On successful completion of the course the students shall be 5. Demonstrate the database concepts, practice, and SQL q 6. Design and implement database schemas while applyin optimize structure. [Apply]] 7. Develop and implement stored procedures, triggers, a efficiency. [Apply] 8. To Design and build database applications for real world	able to: ueries. [App ng normaliza and views fo problems. [A	ly] ation or a Appl	n te iuto y]	chnic matio	ques to on and
Course Content:						

List of Laboratory Tasks:

Create Employee, Student, Banking and Library databases and populate them with required data. Do the following experiments of different lab sheets on those databases.

Labsheet-1 [3 Practical Sessions]

Experiment No 1: [1 Session]

1. To study and implement the different language of Structured Query Language.

Level 1: Perform operations using Data Definition Language and Data Manipulation Language commands including different variants of SELECT on Student DB.

Level 2: Identify the given requirements; valid attributes and data types and Perform DDL and DML operations on a given scenario. [Banking Databases]

Experiment No. 2: [2 Sessions]

2. To study and implement the concept of integrity constraints in SQL.

Level 1: Create tables on Banking database using PRIMARY KEY, NOT NULL, UNIQUE, FOREIGN KEY and demonstrate the working of relational, logical, pattern matching, BETWEEN, IS NULL, IN and NOT IN Special Operators on Student Database.

Level 2: Enforce different types of data and referential integrity constraints. Then try queries with special operators based on the student database. [Banking Database].

Labsheet-2 [3 Practical Sessions] Experiment No. 3: [1 Session]

3. Implement complex queries in SQL.

Level 1: Implement the conjugate of GROUP BY, ORDER BY and aggregate functions on Banking Database. Level 2: Implement MySQL DB queries on library database using appropriate clauses and aggregate functions. Also order the data either in ascending and descending order using corresponding clause. [Library databases].

Experiment No. 4: [2 Session]

4. To study and implement different types of Set and Join Operations [2 Slots] Level 1: Demonstrate different types of Set Operations (UNION, UNION ALL, INTERSECT, MINUS) and Join

Operations (INNER JOINs, OUTER JOINS, CROSS JOIN, NATURAL JOIN) on two or more tables of Airline Database. Level 2: Use Set and Join operations to retrieve the data from two or more relations(tables) as per the given

scenario. [Airline Database]

Labsheet-3 [2 Practical Sessions]

Experiment No. 5: [2 sessions]

5. To study and implement Views, and Procedures in MySQL DB.

Level 1: Implement MySQL Views, and Procedures in ORACLE DB on Employee database. Level 2: Analyze the requirement and construct views, and Procedures on Mini Project Domain. [Banking Database]

Labsheet-4 [2 Practical Sessions]

Experiment No. 6: [2 Sessions]

6. To study and implement Functions, and Triggers in MySQL DB.

Level 1: Implement Oracle Functions and Triggers in Oracle on Employee database.

Level 2: Analyze the requirement and construct Functions and Triggers. [Supply chain Database]

Labsheet-5 [2 Practical Sessions]

Experiment No. 7: [2 Sessions]

7. To study and implement Functions, and Triggers in MySQL DB.

Level 1: Implement Oracle Functions and Triggers in Oracle on Employee database.

Level 2: Determine the requirement and construct Functions and Triggers. [Supply chain Database]

Labsheet-6 [4 Practical Sessions]

Experiment No. 8: [2 Sessions]

To implement the concept of forms and reports.
 Level 1: Implement the concept of forms and reports.
 Level 2: Examine the schema relationship.

Experiment No. 9: [2 Sessions]

9. Create the database using the given schema. (Flight Management)

Level 1: Implement a relational database based on the provided schema for the Flight Management system, including the creation of tables, relationships, and constraints.

Level 2: Demonstrate schema relationships by defining primary and foreign keys to ensure data integrity within the Flight Management database.

Labsheet-7 [4 Practical Sessions]

Experiment No. 10: [2 Sessions]

10. Create the database using the given schema. (Company database)

Level 1: Implement the database schema by defining tables, relationships, and constraints according to the given Company Database schema.

Level 2: Demonstrate the schema's relationships and data integrity by creating and linking tables as per the specified requirements.

Experiment No. 11: [2 Sessions]

11. Create the database using the given schema. (Student Library)

Level 1: Implement forms and reports based on the provided Student Library database schema, ensuring effective data entry and reporting mechanisms.

Level 2: Demonstrate the schema relationships within the Student Library database, demonstrating how these relationships influence the creation and functionality of forms and reports.

Labsheet-8 [1 Sessions]

12. 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.

Problem Solving: Constructing ER-Diagrams for a given real time requirements, Normalizing the databases, querying the databases using relational algebra.

4. Programming: Implementation of any given scenario using MySQL.

Text Books:

T1. Elmasri R and Navathe S B, "Fundamentals of Database System", Pearson Publication, 7th Edition, 2018.

T2. RamaKrishna & Gehrke, "Database Management Systems" 3rd Edition, 2018, McGraw-Hill Education. T3. 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

R1 Avi Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill ,7th Edition, 2019. R2 M. Kleppmann, "Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems", O'Reilly, 2017.

Topics relevant to development of "FOUNDATION SKILLS": S - Skill Development: Relational database design using ER- Relational mapping, Implementation of given database scenario using MYSQLDB.

Topics relevant to development of Employability: Develop, test and implement computer databases, creating sophisticated, interactive and secure database applications

Topics relevant to "HUMAN VALUES & PROFESSIONAL ETHICS": Nil

REMEMBER	UNDERSTAND	APPLY	ANALYZE	EVALUATE	CREATE
Arrange	Classify	Apply	Analyze	Appraise	Arrange
Define	Compare	Change	Appraise	Argue	Assemble
Describe	Compute	Choose	Break down	Assess	Construct
Duplicate	Convert	Calculate	Calculate	Choose	Collect
Identify	Contrast	Classify	Categorize	Compare	Compose
Label	Defend	Demonstrate	Compare	Contrast	Create
List	Describe	Determine	Contrast	Criticize	Design
Match	Differentiate	Employ	Criticize	Defend	Develop
Name	Distinguish	Examine	Debate	Discriminate	Formulate
Order	Estimate	Illustrate	Diagram	Estimate	Integrate
Outline	Explain	Interpret	Differentiate	Evaluate	Manage
Recite	Extrapolate	Modify	Discriminate	Explain	Organize
Recognize	Generalize	Operate	Distinguish	Interpret	Plan
Relate	Interpolate	Practice	Examine	Judge	Prepare
Repeat	Locate	Predict	Experiment	Measure	Prescribe
Reproduce	Paraphrase	Prepare	Identify	Predict	Produce
Select	Predict	Produce	Infer	Rank	Propose
State	Recognize	Restructure	Inventory	Rate	Specify
Tabulate	Review	Schedule	Relate	Recommend	Synthesize
Tell	Summarize	Sketch	Separate	Select	Write
1060000	Translate	Solve	Subdivide	Support	770732377678957
	e	Use	Test	Validate	

Course	Course Title: Analysis of Al	gorithms						
Code: CSE1512	Type of Course: Theory		L- T-P- C	3	1	0	4	
Version No.	1.0			I	L	I	<u> </u>	
Course Pre-								
requisites	NU							
requisites								
Course	This course introduces techn	iques for the design and analysis of	of efficient algor	rithms	and me	ethods	of	
Description	applications. This course dis-	cusses the classic approaches for a	algorithm design	such a	as Divi	de anc	1	
	Conquer, Dynamic Programming, Greedy method. This course also describes other basic strategies							
searching solution space. The core concepts of analyzing algorithms and classifying them into variou								
	complexity classes is covered	d in the end.						
Course	The objective of the course	is to familiarize the learners with	the concepts of	⁻ <mark>Analy</mark>	sis of /	<mark>Algori</mark> t	. <mark>hms</mark>	
Objective	and attain <mark>Skill Developmen</mark>	<mark>it</mark> through <mark>Problem Solving</mark> Metho	odologies.					
Course Out Comes	On successful completion of 1. Compute efficiency of a g	the course the students shall be a iven algorithm.[Apply]	able to:					
	2. Apply divide and conque	r technique for searching and sorti	ng Problems.[A	pply]				
	3. Apply the Dynamic Progr	ramming technique for a given pro	oblem. [Apply]					
	4. Apply greedy technique f	for solving a Problem.[Apply]						
	5. Demonstrate Back tracking	ng technique and limitations of Alg	gorithms.[Apply	/]				
Course Content:								
Module 1	Introduction	Assignment	Simulation/Da Analysis	ita	1	0 Sess	ions	
Introduction, Sorting; Math Theorem.	Asymptotic Notations and its p ematical analysis for Recursiv	properties, Best case, worst case ar e and Non-recursive algorithms: S	nd average case- Substitution met	- Sequ hod and	iential d Mast	search er's	ι,	
Module 2	Divide-and-conquer	Assignment	Simulation/Da Analysis	ita	0	8 Sess	ions	
Introduction.	Insertion Sort; Merge sort, Qui	ick sort, Binary search.						
Module 3	Dynamic programming	Term paper/Assignment	Simulation/Da Analysis	ita	1	0 Sess	ions	
Introduction Warshall's Al	with examples, Principles of M gorithms. Chain Matrix Multip	Iemoization, 0-1 Knapsack Proble plication.	m, Bellman-For	d algo	rithm, Ì	Floyd	-	
Module 4	Greedy technique	Term paper/Assignment	Simulation/Da Analysis	ita	0	9 Sess	ions	
Introduction, Single-source	Fractional Knapsack Problem, Shortest Path: Dijkstra's Algo	Minimal Spanning Tree: Prim's A	Algorithm and K	ruskal	's Algo	orithm,	,	
Module 5	Complexity Classes	Term paper/Assignment	Simulation/Da Analysis	nta	0	8 Sess	ions	
Complexity Cl Branch and Bo	asses- P,NP- NP Hard and NP (ound: Knapsack problem; Back	Complete - Boolean Satisfiability P xtracking, - N-Queens problem.	roblem (SAT).				_	

Text Book

Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd edition, Pearson Education, 2018.

2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, *"Introduction to Algorithms*", 4th edition, MIT Press, 2022.

References

1. J. Kleinberg and E. Tardos, "Algorithm Design", Addison-Wesley, 2005.

2. Tim Roughgarden, "Algorithms Illuminated" (books 1 through 3), "Operating Systems Design and

Implementation", Soundlikeyourself Publishing, 2017-2019.

- 3. AV Aho, J Hopcroft, JD Ullman, "The Design and Analysis of Algorithms", Addison-Wesley, 1974.
- 4. Donald E. Knuth, "The Art of Computer Programming", Volumes 1and 3 Pearson.

Web-Resources

- 1. <u>NPTEL: https://onlinecourses.nptel.ac.in/noc19_cs47/preview</u>
- 2. Coursera: Analysis of Algorithms by Princeton University
- 3. Algorithms Specialization in Coursera by Stanford University(Group of 4 courses).
- 4. Algorithms Coding Contest Links maintained by Prof Gerth Stølting Brodal of Aarhus University

Topics relevant to "SKILL DEVELOPMENT": knapsack, prim's, kruskal's algorithm, quick sort, binary search for Skill **Development** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.

r			-	1 1		
Course	Course Title:				-	1
	Analysis of Algorithms Laboratory	L- T-P- (0	0	2	1
Version No.	L CCE2001 D-4- C4m-4-map LAlas					
Course Pre- requisites	CSE2001 - Data Structures and Algorithms.					
Anti-	NIL					
requisites						
Course Description	This course introduces techniques for the design and analysis of efficie of applications. This course discusses the classic approaches for algori and Conquer, Dynamic Programming, Greedy method. This course strategies searching solution space. The core concepts of analyzing a them into various complexity classes is covered in the end.	nt algori thm des also des algorithr	thm ign crib ns a	suc suc es	nd m h as other class	ethods Divide basic sifying
Course	The objective of the course is to familiarize the learners with the	concep	ots (of	Analy	ysis of
Objective	Algorithms and attain Skill Development through Experiential Learni	<mark>ng</mark> Meth	node	olo	gies.	
Course Out Comes	 On successful completion of the course the students shall be able to Compute efficiency of a given algorithm. [Applying] Apply divide and conquer technique for searching and sorting Prob Apply the Dynamic Programming technique for a given problem. [A Apply greedy technique for solving a Problem. [Applying] Demonstrate Back tracking technique and limitations of Algorithms 	: lems. [A Applyin] s. [Appl]	oppl g] ying	yir ;]	ng]	
Course Content						
Module 1	Introduction				3 Se	ssions
Measuring ru such as bubb	inning time of an algorithm, Compare running time of algorithms, Imp le sort, selection sort	lement s	sort	ing	algo	rithms
Module 2	Divide-and-conquer				3 Se	ssions
Compare sea Merge Sort, (rching algorithms: Linear Search, Binary Search; Compare Sorting algo QuickSort.	rithms:	Inse	rti	on So	rt,
Module 3	Dynamic programming				3 Se	ssions
Introduction	and memorization: Factorial; Coin Change Problem ; Floyd-Warshall's	Algorith	m.			
Module 4	Greedy technique				3 Se	ssions
Fractional Kn	apsack Problem; Minimal Spanning Tree Algorithms-Prim's Algorithm,	Kruskal	's al	go	rithm	
Module 5	Complexity Classes				3 Se	ssions
Branch and B	ound: Knapsack problem; Backtracking, - N-Queens problem.					
List of Labora 1. Measuring Objective: To 1000, etc. by 2. Compare r Objective: To better algori 3. Implemen Objective: To 4. Compare a	atory Tasks: g running time of an algorithm o experimentally determine the running time of basic algorithms for i taking difference of starting time and ending time. running time of algorithms o execute two algorithms to solve the same problem, and to compara thm for large values of N. t sorting algorithms such as bubble sort, selection sort o implement comparison based sorting strategies.	nput siz Itively e	e n: valu	=1(), 100 e the),
H. Compare s) implement two searching strategies and compare their performance	ρ.				
5. Compare	Sorting algorithms					
Objective: To	o implement searching strategies that follow top down design approx	ch(Inse	rtio	n s	ort, r	nerge

sort).

6. Quick Sort

Objective: To demonstrate Quick sort and its variants, and their impact on running time.

7. Dynamic Programming

Objective: To demonstrate Dynamic Programming approach with the help of Factorial algorithm. 8. Coin Change Problem

Objective: To implement an efficient algorithm for the Coin Change problem.

9. Floyd-Warshall's Algorithm

Objective: To demonstrate how dynamic programming is used with the help of Floyd-Warshall's algorithm.

10. Fractional Knapsack Problem

Objective: To demonstrate how greedy method can be used to solve the Fractional Knapsack Problem. 11. Minimal Spanning Tree Algorithm

Objective: To implement greedy strategy to solve the Minimal Spanning Tree problem using Prim's Algorithm.

12. Kruskal's Minimal Spanning Tree Algorithm

Objective: To implement greedy strategies to solve the Minimal Spanning Tree problem using Kruskal's Algorithm.

13. Knapsack Problem

Objective: To implement Knapsack problem using branch and bound technique.

14. N-Queen's Problem

Objective: To demonstrate backtracking method with the help of N-Queen's problem.

15. Case Study

Objective: To demonstrate how various techniques can be used to solve the same problem with the help of Knapsack problem.

Targeted Application & Tools that can be used

PyTorch/Jupyter Notebook – For Python programming

Text Book

T1 Anany Levitin, *"Introduction to the Design and Analysis of Algorithms"*, 3rd edition, Pearson Education, 2018.

T2 Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "*Introduction to Algorithms*", 4th edition, MIT Press, 2022.

References

R1. J. Kleinberg and E. Tardos, "Algorithm Design", Addison-Wesley, 2005.

R2. Tim Roughgarden, "*Algorithms Illuminated*" (books 1 through 3), "Operating Systems Design and Implementation", Soundlikeyourself Publishing, 2017-2019.

R3. AV Aho, J Hopcroft, JD Ullman, "*The Design and Analysis of Algorithms*", Addison-Wesley, 1974. R4. Donald E. Knuth, "*The Art of Computer Programming*", Volumes 1 and 3 Pearson.

Web Based Resources and E-books:

W1. NPTEL: https://onlinecourses.nptel.ac.in/noc19_cs47/preview

W2. <u>Coursera: Analysis of Algorithms by Princeton University</u>

W3. <u>Algorithms Specialization in Coursera by Stanford University(Group of 4 courses)</u>.

W4. Algorithms Coding Contest Links maintained by Prof Gerth Stølting Brodal of Aarhus University

Topics relevant to "EMPLOYABILITY SKILLS": The lab experiments and assessments enable the student to acquire Skill Development through Experiential Learning techniques



PRESIDENCY UNIVERSITY

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Comme Codes	Commo Titles Essent	iala of AI							
Course Code:	Course Inte: Essent	als of Al			L-T-P-C	3	0	0	3
CSE1700	2.0	ory							
Version No.	2.0 Desie knowledge of n		mathamati		ndonaton din a of	data	home	11:00	
Course Pre-	Basic knowledge of p	rogramming,	, mameman	cs, un	iderstanding of	uata	nanc	inng	
Anti requisites	NII								
Anti-requisites									
Course	This course is a comp	prehensive in	troductory of	course	e designed to e	quip	learı	ners w	ith the
Description	fundamental Python	programming	g skills nece	essary	y to work with	arti	ficial	intell	igence
	(AI) technologies. Thi	is course is a	imed at indi	vidua	als who are new	to A	I but	have a	a basic
	understanding of prog	ramming cor	icepts. It cor	nbine	es Python progra	amm	ing f	undam	nentals
	with hands-on experience in implementing AI techniques such as machine learning,								
C	neural networks, and i	natural langu	age process	$\frac{1}{1}$ ng.		•	Г	1	4 1
Course	The objective of the	course is i	to Understa	ind P	Python Program		g Fi	indam	entais,
Objective	Duild and Train Nour	ss Data with	Python, Imp	bleme	ent Machine Lea	irnin	g Al	goriini	ns and
Course	On successful comple	tion of the of	ourse the stu	Idanta	nis. g ghall ha abla t				
Outcomes	CO(1) Apply Python	Programmin	g to AI Proi	ecte	s shall be able w	5.			
Outcomes	CO 2: Ruild and Trair	n Machine I e	e to Al 110j	lels					
	CO 3: Develop Deen	Learning Mc	dels with N	eural	l Networks				
	CO 4: Deploy AI Solu	tions and Ur	nderstand Ef	thical	I Implications				
Course									
Content:									
Content.									
Madula 1	Introduction to Python		A	t Tu				1	10
Module 1	Introduction to Python Programming for AI		Assignme	nt Ir	mplementation			1 Ses	10 sions
Module 1 Topics:	Introduction to Python Programming for AI		Assignmen	nt Ir	mplementation			1 Ses	10 sions
Module 1 Topics: Python Basics: Var	Introduction to Python Programming for AI iables, Data Types, Op	erators, and	Assignmer Control Flo ^y	nt Ir w Fu	mplementation unctions, Loops,	and	Con	1 Sess dition	10 sions als
Module 1 Topics: Python Basics: Var statements, Data St	Introduction to Python Programming for AI iables, Data Types, Op tructures: Lists, Tuples	erators, and , Dictionarie	Assignmer Control Flov s, Sets ,Intro	nt Ir w Fu oducti	mplementation inctions, Loops, ion to Libraries	and Nu:	Con mPy	Sess ditiona and Pa	10 sions als andas
Module 1 Topics: Python Basics: Var statements, Data St for data manipulati	Introduction to Python Programming for AI tiables, Data Types, Op tructures: Lists, Tuples on, Basic Input/Output	erators, and , Dictionaries t and File Ha	Assignmer Control Flor s, Sets ,Intro ndling	nt Ir w Fu oducti	mplementation anctions, Loops, ion to Libraries	and Nu:	Con mPy	1 Ses dition and Pa	10 sions als andas
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Module 1 Topics: Python Basics: Var statements, Data St for data manipulati Introduction to Pyt Module 2	Introduction to Python Programming for AI iables, Data Types, Op tructures: Lists, Tuples on, Basic Input/Output hon for AI: Libraries a Data Processing, Visu	erators, and , Dictionaries t and File Ha nd Framewo alization	Assignmer Control Flor s, Sets ,Intro ndling rks Overvie Assignmer	nt Ir w Fu oducti w nt Ir	mplementation anctions, Loops, ion to Libraries mplementation	and Nu:	Con mPy	ditiona and Pa 10 Sessi	10 sions als andas ons
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Module 1Topics:Python Basics: Varstatements, Data Stfor data manipulatiIntroduction to PytModule 2Topics:cleaning and prepro	Introduction to Python Programming for AI riables, Data Types, Op tructures: Lists, Tuples on, Basic Input/Output hon for AI: Libraries a Data Processing, Visu	erators, and , Dictionaries t and File Ha nd Framewo alization Handling mis	Assignmen Control Flov s, Sets ,Intro ndling rks Overvie Assignmen sing data, o	nt Ir w Fu oducti w nt Ir utliers	mplementation inctions, Loops, ion to Libraries: mplementation	and Nu:	Con mPy	ditiona and Pa 10 Sessi	10 sions als andas ons
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Module 1 Topics: Python Basics: Var statements, Data St for data manipulati Introduction to Pyt Module 2 Topics: cleaning and preprot transformation (Not Exploratory Data A	Introduction to Python Programming for AI riables, Data Types, Op tructures: Lists, Tuples on, Basic Input/Output hon for AI: Libraries a Data Processing, Visu occessing with Pandas, Formalization, Encoding Analysis (EDA), Visual	erators, and , Dictionaries t and File Ha nd Framewo alization Handling mis), Introductio izing dataset	Assignmen Control Flov s, Sets ,Intro ndling rks Overvie Assignmen sing data, or on to Matplo s to underst	nt Ir w Fu oducti w nt Ir utliers otlib a and p	mplementation inctions, Loops, ion to Libraries mplementation rs, and duplicate and Seaborn for patterns and rela	and Nu: s, D Dat	Con mPy ata a Vis ships	ditiona and Pa 10 Sessi ualizat	10 sions als andas ons tion,
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Topics:									

Introduction to Neural Networks and Deep Learning, Perceptron Model and Backpropagation									
Deep Neural Networks and Activation Functions, Introduction to TensorFlow and Keras, Building and									
Training Neural Networks for Image and Text Classification, Overview of Convolutional Neural Networks									
(CNNs) and Recurrent Neural Networks (RNNs)									
Targeted Application & Tools that can be used:									
Applications:									
• Data Preprocessing : Clean and manipulate data from various sources such as CSV, Excel, SQL									
databases, and APIs.									
• Exploratory Data Analysis (EDA): Gain insights into datasets by identifying trends, patterns, and									
outliers.									
• Predictive Modeling : Build models for classification (e.g., spam detection) and regression (e.g.,									
house price prediction).									
• Clustering : Group data into clusters for unsupervised learning tasks (e.g., customer segmentation).									
• Model Evaluation : Assess model performance using appropriate metrics such as accuracy,									
precision, recall, and F1-score.									
Tools:									
• Pandas : For data manipulation and cleaning (e.g., handling missing values, merging datasets).									
• NumPy : For numerical operations and working with arrays and matrices.									
• Matplotlib : For creating static, animated, and interactive visualizations.									
• Seaborn: For advanced data visualizations (e.g., heatmaps, pair plots).									
• Plotly : For creating interactive visualizations, especially useful for large datasets.									
• Scikit-learn: The go-to library for implementing machine learning algorithms (e.g., linear									
regression, decision trees, k-means clustering).									
• XGBoost : For advanced gradient boosting models, particularly for large-scale machine learning									
tasks.									
• TensorFlow (for deep learning in Module 4): A powerful open-source library for building machine									
learning and deep learning models.									
• Keras: High-level neural network API, built on top of TensorFlow, to easily create deep learning									
NLIK: The Natural Language Toolkit for various text processing tasks like tokenization, stemming, and									
part-of-speech tagging.									
spacy: A fast NLP library for advanced NLP tasks such as named entity recognition and dependency									
parsing. Transformers (by Ungring Feed): A new of 1 library feeducing and trained Transformers have dela libra									
BERT, GPT, and others for advanced NLP tasks.									
Text Book(s):									
T1: Essentials of Python for Artificial Intelligence and Machine Learning by Pramod Gupta and									
Anupam Bagchi									
Reference(s):									
1. "Artificial Intelligence with Python" – Prateek Joshi									

- 2. 3. 4.
- "Artificial Intelligence with Python" Prateek Joshi "Python Machine Learning" Sebastian Raschka & Vahid Mirjalili "Hands-On Artificial Intelligence with Python" Teet Straus "Deep Learning for Coders with Fastai and PyTorch" Jeremy Howard & Sylvain Gugger







Itgalpur, Rajankunte, Yelahanka, Bengaluru – 560064

RESIDENCY UNIVER

	Course Title: Essentials of AI Lab								
Course Code:	Type of Course:	L-T-P-C	0	0	4	2			
CSE1701	Engineering Sciences Core - Lab		_	-					
Version No.	1.0								
Course Pre- requisites									
Anti- requisites	NIL								
Course Description	This course introduces the student to the basics of artificial intelligence. In this course, the student first learns the various search methods for problem-solving, followed by knowledge-based logic representations. After that, the student will earn about uncertainty in AI, as well as approaches to solve such challenges such as Naïve Bayes Classifier and Hidden Markov Models. Fopics: Uninformed search, Heuristic search, Local search, Adversarial search, Constraint satisfaction, logic, First Order Resolution, Probability, Naïve Bayes Classifier and Hidden Markov Model (HMM).								
Course Objectives	The objective of the course is EMPLOYBILITY of ELEARNING techniques.	student by	' using	EXP	ERIE	ENTIAL			
Course OutComes	 On successful completion of this course the students shall be able to: 1. Explain different methods of searching, proving, and analysis in AI [Understand] 2. Implement various graphical and adversarial search algorithms. [Apply] 3. Prove, by resolution, different situations using First Order Logic [Apply] 4. Solve sequence labeling problems using HMM [Apply] 								
Course Content:	Ν	lo. of Sess	ions: 3	0 (6	0 ho	ours)			

NOTE: Each experiment will be run across **TWO** lab sessions. In the first lab session, the students will have to do a preliminary experiment (Eg. Implement an uninformed search algorithm like BFS). In the second lab session, they will have to test their solution using a given input which is read from a file.

Experiment No. 1: File Handling

Level 1: Read text files using Python Level 2: Parse text files using Python

Experiment No. 2: Implementation of Graph Representations

Level 1: Implement graph representations by taking input from the console Level 2: Implement graph representations by taking input from files.

Experiment No. 3 & 4: Implementation of Uninformed Search Algorithms

Level 1: Implement uninformed search algorithms – BFS and DFS – on unweighted graphs. Level 2: Implement uninformed search algorithms – Uniform Cost Search and Dijkstra's SSSP – on weighted graphs

Experiment No. 5: Implementation of Heuristic Search Algorithms

Level 1: Calculate the upper-bounds of admissible heuristics using Dijkstra's SSSP. Level 2: Implement Greedy Best-First Search and A* Search Algorithms.

Experiment No. 6 & 7: Implementation of Adversarial Search

Level 1: Implement a Game Tree

Level 2: Perform Alpha-Beta Pruning and Ideal Ordering

Experiment No. 8 & 9: Implementation of a CSP Solver

Level 1: Implement a CSP solver to solve a cryptarithmetic problem Level 2: Implement a CSP solver for map colouring

Experiment No. 10: Using Python Packages for CSP

Level 1: Implement a CSP solver for Sudoku Level 2: Implement a CSP solver for Addoku

Experiment No. 11: Implement a Family Tree Parser

Level 1: Perform logic programming using logpy. Level 2: Implement a family tree parser

Experiment No. 12 & 13: Implement a Decision Maker

Level 1: Implement a Minesweeper solver Level 2: Implement a Battleship solver

Experiment No. 14 & 15: Hidden Markov Model

Level 1: Implement a generic HMM

Level 2: Build a PoS Tagger using a HMM with the Brown Corpus and the Universal Dependencies Tagset.

Targeted Application & Tools that can be used:

1. Google Colab

2. Python IDEs like PyCharm

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

The course is a lab-based course with all the assessments centrally evaluated. Every experiment consists of **two sessions**. The first session involves exploring a solution to the problem. The second session involves solving a particular problem.

Textbook(s):

1. Stuart Russel and Peter Norvig. *Artificial Intelligence: A Modern Approach*. 4th Edition. Pearson Education. 2022.

Prateek Joshi and Alberto Artasanchez. *Artificial Intelligence with Python*. 2nd Edition. Packt.
 2020.

References:

1. Deepak Khemani. *A First Course in Artificial Intelligence*. 1st Edition. 6th Reprint, 2018.

2. Munesh Chandra Trivedi. *A Classical Approach to Artificial Intelligence*. 2nd Edition. Khanna Publishers. 2018.

Course Code: CSE2511	Course Title: [Data Analytics			2	0	0	2
	Type of Cours	e: Theory		L-T-P- C				
Version No.	1.0							
Course Pre-requisites	MAT1003 Ap	plied Statistics						
Anti-requisites	NIL							
Course Description	Fundamentals transforming, and supports pre-processing an intuitive w the knowledg	of Data Analytics and modeling data wi in decision-making. Th g, and transformation ay to analysis the data e on data analysis to a	is designed for th the goal of disco ne course begins bo . It delivers the ba a. This course will n wide range of app	or inspe overing u y coverin asic statis help the plications	ectii sefi g D tics stu s.	ng, ul ir ata an der	clea nform extra d tau nts to	nsing atior ctior ght i appl
Course Objective	The objective Fundamentals PROBLEM SOI	of the course is to fa of Data Analytics VING Methodologies.	amiliarize the lear and attain SKILI	ners with DEVEL	n th DPN	ne (Men	conce NT th	pts o roug
	CO1:Describe CO2: Explain c CO3: Demons application an CO4: Apply the	different types of data lata using appropriate trate the collection, p d illustrate various cha e Data Analysis technic	and variables. statistical methods rocessing and ana irts using visualizat ques by R Programi	s. Ilysis of c ion meth ming	lata	1 fo 5.	r any	give
Course Content:								
Module 1	Introduction to Data Analysis- CO1	Assignment	Data Collection, o Programming	data analy	/sis	,	06 c	lasse
"Opics: Introducing Da "Vs" of Data, Structur Variables, Central Ten R Studio: Base R-R Stu and Comments-R Vari save-Data I/O in Base	ata, overview of a red Data and U dency of Data, S idio IDE-Introduc iables. Data I/O R.	data analysis: Data in tr Instructured Data, Typ Scales of Data, Sources Ction to R Projects and Working Directories-I	ne Real World, Data bes of Data, Data of Data. Data prep R Markdown. Basio Importing Data Exp	a vs. Infor Analysis baration. c R: R as a porting D	ma Def a ca ata	ine ine lcul	d, Ty d, Ty ator-S ore w	Script
	Data Analysis and	Case studies	Programming				10 c	
Module 2	Visualization- CO2							lasse
Module 2 Topics: Data Summari Data Classes-Data Fra Recoding Variables. I Plotting with ggplot2-	Visualization- CO2 ization: One Qu ames and Matu Manipulating D Plotting with Ba	antitative and Categor rices-Lists. Data Clean ata in R: Reshaping I ase R	rical Variable. Data ing: Dealing with Data-Merging Dat	a Classes: Missing asets. Da	Or Da ata	ne E nta- Vis	Dimen String Sualiza	siona siona s an ations

Module 3	Statistical Analysis -CO3	Case studies	R programming	7 classes

Topics:	Proportion test	s-Chi squared	test-Fisher exac	t test-Correlation-T test-V	Vilcoxon Rank sum tests-
Wilcoxon	signed rank te	st- one-way A	NOVA test- Krus	kal Wallis test	
Module 4	1	Predictive Analysis-CO4	Case studies	Programming	7 classes
Topics:	Linear least-sq	uares – imple	mentation – the	goodness of fit – testing a	linear model – weighted
resampliı	ng. Regression	using Stats	models – multip	ole regression – nonlinea	r relationships – logistic
regressio	n – estimating	parameters –	accuracy. Time s	eries analysis – moving av	erages – missing values –
serial cor	relation – auto	correlation. Ir	ntroduction to su	rvival analysis	
Targeted	Application &	Tools that ca	n be used:		
Applicati	on Area are De	ecision making	g in business, hea	alth care, financial sector,	Medical diagnosis etc.
Text Boo	ks				
1. G	lenn J. Mvatt a	and Wavne P.	Johnson. "Makir	ng Sense of Data I: A Pract	ical Guide to Exploratory
Data Ana	lysis and Data I	Mining Paperk	back", Import, 22	July 2014.	·····,
2. lı	ntroduction to	statistics and	Data analytics, C	hristian H, Michael S, Sprin	ger,2016
3. lı	ntroduction to	R- Robert Park	ker, John Mushce	lli and Andrew Jaffe, Johns	Hopkins University, 2020
(E-resour	ce)				
4. lı	ntroduction to	Time Series ar	nd Forecasting (S	pringer Texts in Statistics),	Peter Brockwell, Richard
A. Davis,	Springer, 2016		0.		
Referenc	es				
1. N	/Jaking Sense o [.]	f Data I: A Prac	ctical Guide to Ex	ploratory Data Analysis and	d Data Mining Paperback,
Glenn J. N	Myatt and Way	ne P. Johnson	, Import, 22 July	2014.	
2. Т	he R Software-	Fundamentals	s of Programming	g and Statistical Analysis -Pi	erre Lafaye de Micheaux,
Remy Dro	ouilhet, Benoit	Liquet, Spring	er 2013.		
Online re	sources:				
http://ww	ww.modernsta	tisticswithr.co	m/solutions.htm	l#solutionsch3	
https://jo	hnmuschelli.co	om/intro_to_r	-/		
https://u	sers.phhp.ufl.e	du/rlp176/Co	urses/PHC6089/	R_notes/	
Topics re	levant to deve	lopment of "F	OUNDATION SK	ILLS":	
1. S	tatistical Conce	epts for data, v	visualization tech	iniques.	
2. C	oata collection	for project bas	sed assignments.		
3. lı	nferential Statis	stics (T test, Z	test)		
4. P	robability Calc	ulation			
for Skill E	Development t	hrough Proble	em Solving meth	odologies. This is attained	through assessment
compone	ent mentioned	in course han	dout.		

Course Code:	Course Title: F	undamentals of Data A	nalytics					
CSE2512	Type of Cours	Type of Course: Lab L-T-P- C 0 0 2 1						1
Version No.	1.0	.0						
Course Pre-requisites	МАТ1003 Ар	plied Statistics						
Anti-requisites	NIL							
Course Description	Fundamentals transforming, and supports i pre-processing an intuitive wa the knowledge	Fundamentals of Data Analytics is designed for inspecting, cleansing, transforming, and modeling data with the goal of discovering useful information, and supports in decision-making. The course begins by covering Data extraction, pre-processing, and transformation. It delivers the basic statistics and taught in an intuitive way to analysis the data. This course will help the students to apply the knowledge on data analysis to a wide range of applications.						
Course Objective	The objective Fundamentals PROBLEM SOL	The objective of the course is to familiarize the learners with the concepts of Fundamentals of Data Analytics and attain SKILL DEVELOPMENT through PROBLEM SOLVING Methodologies.						
course out comes	 CO1:Describe different types of data and variables. CO2: Explain data using appropriate statistical methods. CO3: Demonstrate the collection, processing and analysis of data for any given application and illustrate various charts using visualization methods. CO4: Apply the Data Analysis techniques by R Programming 							
Course Content:								
Module 1	Introduction to Data Analysis- CO1	Assignment	Programming				09 c	lasses
List of Laboratory Task	s:		L					
Experiment No. 1: Intro Level 1: Getting Starte Installing R and Basic R syntax a Level 2: Working with I Understanding Creating and m	oduction to R a d with R and RS RStudio. and commands RStudio the RStudio int anaging R scrip	nd RStudio Studio :erface. .ts.						
Experiment No. 2: Basi	c Data Handling	g in R						
Level 1: Data Types and	d Structures in I	2						
 Vectors, matri 	ces, and data	frames.						
Lists and factor	ors.							
Level 2: Data Import ar	nd Export							
Reading data	from CSV, Exc	el, and text files.						
Exporting data	a to different f	ormats.						

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

Module 2		Data Analysis and Visualization- CO2	Assignment	Programming	13 classes
Experiment	t No. 1: Dat	a Cleaning and	Preprocessing		
Level 1: Ha	ndling Miss	ing Data in R			
• Ide	ntifying mis	sing values.			
• Imp Level 2: Dat	outing missi ta Transforr	ng values using mation in R	mean, median, or othe	er methods.	
• Sta	ndardizing	and normalizing	g data.		
• Log	-transform	ations and scali	ng.		
Experiment	t No. 2 : Exp	loratory Data A	nalysis (EDA) with R		
Level 1: De	scriptive Sta	atistics			
• Cal	culating me	an, median, an	d standard deviation.		
• Vis	ualizing dat	a using histogra	ams, box plots, and scat	ter plots.	
Experiment Level 1: Der Level 2: Cre generated o	t No. 3 : Dat monstrate v eate 500 rar data using g	a Visualization various graphs t ndom temperat gplot2 package	with ggplot2 that can be made and a ure readings for six citions in R	Itered using the ggplot2 package es over a season and then plot th	е
Module 3		Statistical Analysis -CO3	Assignment	programming	10 classes
Experiment	t No. 1: Per	form Tests of H	ypotheses hypothesis t	est (parametric)	
Level 1: How the p-value Level 2: A t than people randomly a	w to perforn . Explore th eacher clain e who work ssigned the	n tests of hypot e connection b ns that people for ten hours p m to one or tw	theses about the mean etween the critical regi who work for only five er week on a quantitati to groups. In one group	when the variance is known. How on, the test statistic, and the p-va hours per week will score signific ve abilities test. He brings twenty he has participants who work fo	to compute alue. cantly lower people and or ten hours
and in anot	her group, l	ne has participa	nts who work for five h	ours. He conducts the test for all j	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 2: 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 3: 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 in a sales of cotton clothes. Also explain the reason if there is any relationship.

Module 4	Predictive Analysis-CO4	Assignment	Programming	10 classes
Experiment No 1: Reg	ression 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. 2: 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

5. 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.

6. Introduction to statistics and Data analytics, Christian H, Michael S, Springer, 2016

7. Introduction to R- Robert Parker, John Mushcelli and Andrew Jaffe, Johns Hopkins University, 2020 (E-resource)

8. 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.



Itgalpur, Rajankunte, Yelahanka, Bengaluru - 560064

Course Code: CSEXXXX	Course Title: Scalable Application Development using Java Type of Course: Lab	n	L- T-P- C	3	0	0	3
Version No.	2.0						
Course Prerequisites	Basic Java Programming Knowledg and fundamentals of web developm	ge, Java frame nent, basics of	ework, unders f multithreadir	tandi 1g an	ng o d coi	f datał ncurre	bases ncy.
Anti-requisites	NIL						
Course Description	This course provides a comprehensi scalable Java applications, cover systems, microservices, cloud deplo	This course provides a comprehensive guide to designing, developing, and deploying scalable Java applications, covering high-performance architectures, distributed systems, microservices, cloud deployment, and DevOps integration.					
Course Objective	The objective of the course is to Understand Scalability Principles, developing high performance Java applications, design and implement scalable architecture, deploy and manage scalable data.						
Course Outcomes	On successful completion of the course the students shall be able to:CO 1: Design and Develop Scalable Java ApplicationsCO 2: Design and Implement Scalable Architectures and Micro servicesCO 3: Implement Scalable Data Management TechniquesCO 4: Deploy and Monitor Applications in Cloud Environments						
Course Content:							
Module 1	Foundations of Scalable Java Applications	Assignment	Implementat	ion] Ses	10 sions
Topics:	1					l	

Introduction to Scalability - Defining scalability: vertical vs. horizontal scaling, Monolithic vs. Microservices Architecture, Performance bottlenecks and solutions.

Java Performance Optimization - JVM internals and tuning, Garbage Collection (GC) strategies, Profiling and monitoring Java applications

Concurrency and Multithreading - Java concurrency model and thread management, Executor framework, ForkJoinPool, Thread safety, locks, and synchronization.						
Module 2	Scalable Architectures a Microservices	ind	Assignment	Implementation	n	10 Sessions
Topics:						
Microservices an communication (F	d Distributed Systems - REST, gRPC, Kafka), API	· Principles I Gateway	s of microserv , Service Disc	vices, Service-to- overy, and Load	service, Balancir	ng
Design Patterns Responsibility Seg	for Scalability - Singleton gregation), Circuit Breake	n, Factory er and Ret	, and Builder ry patterns (R	patterns, CQRS (esilience4j)	(Comma	nd Query
Event-Driven Ar and Reactive Prog	chitecture & Asynchron gramming, Handling failu	ious Proce	e ssing - Event ributed systen	Sourcing with K	Kafka, W	ebSockets
Module 3	Scalable Data Managen Caching	nent and	Mini - Project	Implementation	n	10 Sessions
Topics:		I				
Database Scalab i Sharding, Replica	i lity - SQL vs. NoSQL da tion, and Partitioning stra	ntabases (N ategies, Op	AySQL, Postg otimizing quer	reSQL, MongoD ies (Indexing, Q	OB, Cassa uery Cac	andra), ching)
Caching Strategi Cache Invalidation	es - In-memory caching v n and Eviction Policies	with Redi s	s, Memcache	d, Distributed cae	ching tec	chniques,
Data Streaming for large-scale dat	& Batch Processing - Ap a processing.	oache Kafl	ka for event-d	riven data pipelir	nes, Apao	che Spark
Module 4	Cloud Deployment Qu and DevOps for Scalability	uiz	Impl	ementation	10 Sessi	ons
Topics:	<u> </u>					
Cloud-Native De Cloud deploymen	velopment - Containeriza t strategies (AWS, GCP, A	ation with Azure),	Docker, Kub	ernetes for scalin	ig and or	chestration,
CI/CD & DevOp Canary & Blue-G	s for Scalable Application reen Deployments, Infras	ons - Build structure as	ding CI/CD pi s Code (Terrat	pelines (Jenkins, form, Kubernetes	, GitHub s Helm)	Actions),
Security & Reliability - Securing APIs with OAuth2, JWT, API Gateway, Load Balancing & Rate Limiting, Monitoring with Prometheus, ELK Stack						
Targeted Applica	tion & Tools that can be	e used:				
Applications:						
The course will fo	cus on building and scali	ing the foll	lowing types of	of applications:		

- E-Commerce Platforms Handling high traffic, product catalogs, and real-time inventory.
- **Banking & FinTech Applications** Secure and high-availability transactions.
- Streaming & Event-Driven Applications Using Kafka for real-time data processing.
- Social Media & Messaging Platforms Scalable messaging and real-time updates.
- SaaS & Cloud-Native Applications Multi-tenant, API-based scalable solutions.
- 1.

Tools:

Programming & Frameworks

- Java 17+ Core programming language for scalable applications.
- Spring Boot Microservices development, REST APIs, and dependency injection.
- **Spring Cloud** Service discovery, load balancing, and resilience patterns.
- **Quarkus** Lightweight, high-performance microservices alternative.

Database & Caching

- **SQL Databases:** MySQL, PostgreSQL Scalable relational data management.
- NoSQL Databases: MongoDB, Cassandra High-availability distributed databases.
- **Redis** / **Memcached** In-memory caching for faster response times.

Messaging & Event-Driven Architecture

- Apache Kafka Real-time event streaming and asynchronous communication.
- **RabbitMQ** Message brokering for decoupling services.
- **gRPC** High-performance inter-service communication.

Cloud & Deployment

- 1. **Docker** Containerization for application portability.
- 2. **Kubernetes** Scaling, orchestration, and auto-recovery.
- 3. AWS / GCP / Azure Cloud deployment and auto-scaling.

CI/CD & DevOps

- **GitHub Actions / Jenkins** Automated build and deployment pipelines.
- **Terraform** Infrastructure as Code for cloud provisioning.
- **Helm** Kubernetes package management for scalable applications.

Text Book(s):

T1: "Designing Data-Intensive Applications" – By Martin Kleppmann

T2: "Java Concurrency in Practice" – By Brian Goetz

T3: "Spring Microservices in Action" – *By John Carnell*

T4. "Cloud Native Java" – By Josh Long & Kenny Bastani

Reference(s):

- "Designing Data-Intensive Applications" Martin Kleppmann
- "Java Performance: The Definitive Guide" Scott Oaks
- "Spring Microservices in Action" John Carnell
- "Kubernetes Up & Running" Kelsey Hightower, Brendan Burns, Joe Beda



Itgalpur, Rajankunte, Yelahanka, Bengaluru - 560064

Course Code:	Course Title: Scalable Application						
	Development using Java						
CSE2505		L- T-P- C	0	0	4	2	
	Type of Course: Lab						
Version No.	2.0		•				
Course Prerequisites	Basic Java Programming Knowledge, Java fra databases and fundamentals of web development concurrency.	mework, undeent, basics of	ersta mult	nding ithre	g of ading	and	
Anti-requisites	NIL						
Course Description	This course provides a hands-on, practical apperformance applications using Java and rel designed to complement theoretical concepts be focused on the development of microser applications, and distributed systems. In this lab-intensive course, students will work applications using Spring Boot, Spring Cloud Kafka. Students will gain experience in asynchronous messaging, data caching, and applications can handle increased traffic and so cover essential techniques for optimizing per database optimization, and memory managem	oproach to but lated technolo by offering rea vices archite on building an , Docker, Kul d load balan cale efficiently rformance, in-	ildin ogies al-wo ecture nd de berne ing cing cing cludi	g sca . Th orld 1 es, o eploy etes, RES to e cou	alable, is cou ab exe cloud- ving sc and A STful ensur urse wi VM t	high- nrse is ercises native calable pache APIs, e that ill also uning,	
Course Objective	The primary objectives of the course are to Develop hands-on expertise in building scalable applications using Java and modern frameworks like Spring Boot, Spring Cloud, and Apache Kafka, Implement microservices architectures that enable applications to handle increasing loads efficiently through distributed systems and cloud-native practices, Gain practical experience in optimizing performance by leveraging tools for JVM tuning, database optimization, and memory management to improve application responsiveness and scalability. Work with containerization technologies such as Docker and Kubernetes to deploy Java applications in cloud environments with automated continuous integration/continuous deployment (CI/CD) pipelines, Master service discovery load balancing, and caching mechanisms to ensure high availability, fault tolerance, and low-latency operations in production grade applications and Apply						

	event-driven architectures to bui	event-driven architectures to build scalable and resilient systems using tools like						
	Apache Kafka for real-time data processing and messaging.							
Course	On successful completion of the	On successful completion of the course the students shall be able to:						
Outcomes	2. Implement Performance	Optimization '	Techniques					
	3. Design and Build Scalab	le Microservic	ces					
	4. Integrate Event-Driven A	Architectures a	nd Caching.					
	5. Deploy and Scale Applic	ations in Clou	d Environments.					
Course								
Content:								
Module 1	Foundations of Scalable Java Applications	Assignmen t	Implementation	10 Sessions				
Lab Assignment 1: S	Setting Up Development Environment							
Objective: Set us scalability testing Tasks:	Objective: Set up the Java development environment and configure a Spring Boot project for scalability testing. Tasks:							
• Install Ja	va 17, Maven, and IDE (IntelliJ	or Eclipse).						
• Set up a b	basic Spring Boot project using S	Spring Initiali	zr with RESTful end	points.				
• Verify ap Postman or curl	plication functionality by running I.	a local server	and testing API respon	nses via				
• Add a bas	sic Spring Boot Actuator to mon	itor applicatio	n health and performan	nce.				

- **Deliverables:**
- Working **Spring Boot application** with basic endpoints.
- Screenshots of successful tests (Postman or curl).

Lab Assignment 2: Performance Optimization with JVM

Objective: Profile and optimize a Java application for better performance. **Tasks:**

1. Implement a **simple Java application** that performs a memory-intensive task (e.g., sorting a large dataset).

2. Use VisualVM to monitor JVM memory usage, CPU usage, and garbage collection.

3. Optimize the application by adjusting **JVM flags** (e.g., **heap size**, **garbage collection strategy**).

4. Measure the impact of optimizations on **execution time and memory usage**. **Deliverables:**

5. Profiled and optimized **Java application** with performance comparison charts.

6.	Detailed report on JVM tuning and optimization strategies.						
Lab Ass	Lab Assignment 3: Implementing Multi-threading						
Object tasks. Tasks:	Objective: Understand Java's concurrency model and implement multi-threading for parallel tasks. Tasks:						
1. process	Implemer sing large	nt a multi-threaded Java applica files, image processing).	tion that simu	llates multiple tasks (e.	g.,		
2.	Use the E	Executor framework to manage the	hread pools.				
3. thread Delive	Measure the execution time and compare the performance of single-threaded vs multi- aded approaches. werables:						
4.	Source co	ode for multi-threaded applicatio	on with explar	nations of thread manag	gement.		
5.	Execution	n time comparison chart.					
		Scalable Architectures and	Assignmen	Implementation	10		
Modu	le 2	Microservices	t	-	Sessions		
Lab Ass	ignment 4: E	Building a Simple Microservice with Spr	ing Boot				
Object Tasks:	tive: Deve	lop a basic microservice with Sp	ring Boot.				
1. service	Create a S	Spring Boot microservice that pr	ovides a RES	Γful API (e.g., a book c	or customer		
2.	Implemen	nt basic CRUD operations (Creat	te, Read, Upda	ate, Delete).			
3.	Use Sprin	ng Data JPA to interact with an S	QL database	(e.g., MySQL).			
4. Delive	Write uni rables:	t tests using JUnit for API endpoi	nts.				
5.	Working	Spring Boot microservice with A	API documenta	ation.			
6.	Source co	ode with unit tests.					
Lab Ass	ignment 5: I	mplementing Service Discovery & Load	Balancing				
Object Tasks:	tive: Enabl	le service discovery and load bal	ancing using	Spring Cloud Eureka			
•	Set up a S	Spring Cloud Eureka server for	service discov	ery.			
•	Create tw	o Spring Boot microservices tha	t register with	the Eureka server.			
• instanc	Implemer es of the n	nt load balancing with Spring Cl nicroservices.	oud Ribbon b	by making API calls to	different		

•	Test and verify load balancing behavior using Postman or curl .
Delive	rables:

- Spring Cloud **Eureka server** and two **microservices**.
- Load balancing validation and test results.

Lab Assignment 6: Building an Event-Driven System with Kafka

Objective: Implement an **event-driven architecture** using **Apache Kafka** for inter-service communication.

Tasks:

• Set up Apache Kafka locally or in Docker.

• Create two Spring Boot applications: one as a **Kafka producer** and the other as a **consumer**.

- Implement asynchronous message communication where the producer sends messages (e.g., order events) and the consumer processes them.
- Add error handling and retry logic using **Spring Kafka**.

Deliverables:

- Kafka producer and consumer applications with **message processing logic**.
- Screenshots or logs showing messages being passed from producer to consumer.

Module 3	Scalable Data Management	Mini -	Implementation	10
	and Caching	Project		Sessions

Lab Assignment 7: Integrating SQL and NoSQL Databases

Objective: Learn to integrate **relational (SQL)** and **non-relational (NoSQL)** databases with Spring Boot applications.

Tasks:

• Integrate a **MySQL** database into a **Spring Boot microservice** and implement CRUD operations.

• Set up a **MongoDB** instance (locally or via Docker) and create a second microservice using **Spring Data MongoDB**.

- Compare the performance and scalability aspects of both databases. **Deliverables:**
- Source code for Spring Boot microservices using MySQL and MongoDB.
- Database performance comparison with benchmarks.

Lab Assignment 8: Implementing Redis Caching

Objective: Improve application performance using **Redis** as an in-memory cache. **Tasks:**

1. Integrate **Redis** with your Spring Boot application.

2. Cac	he frequently	accessed data (e.g	., product information	, user profiles) in Redis
--------	---------------	--------------------	------------------------	---------------------------

- 3. Implement cache expiration and cache invalidation strategies.
- 4. Measure the performance improvement by comparing **cache hits vs. misses**.

Deliverables:

- 5. Redis-integrated Spring Boot application with caching logic.
- 6. Performance comparison between cached and non-cached operations.

Lab Assignment 9: Data Streaming with Kafka

Objective: Implement a **data streaming pipeline** with Kafka for real-time data processing. **Tasks:**

- Build a **data pipeline** where **Kafka producers** stream events (e.g., logs, transactions) to **Kafka brokers**.
- Use **Kafka consumers** to process these events in real-time (e.g., updating a database or triggering a workflow).
- Implement Kafka Streams to process data within the Kafka ecosystem. Deliverables:
- Kafka producer-consumer setup with real-time data flow.

Module 4	Cloud Deployment	Quiz	Implementation	10 Sessions
	and DevOps for			
	Scalability			

Lab Assignment 10: Dockerizing a Spring Boot Application

Objective: Containerize a Spring Boot application using **Docker** for scalability. **Tasks:**

- Write a **Dockerfile** for your Spring Boot application.
- Build a **Docker image** and run the application in a Docker container.
- Test the application running in the container and compare performance to local deployment.

Deliverables:

- Dockerized **Spring Boot application** with a functional test.
- Docker image and run command documentation.

Lab Assignment 11: Deploying with Kubernetes

Objective: Deploy a Spring Boot microservice to a **Kubernetes cluster** for horizontal scaling. **Tasks:**

• Deploy the **Dockerized Spring Boot application** to a **Kubernetes cluster** (local Minikube or cloud-based).

• Set up Kubernetes Pods, Services, and Deployments to scale the microservice.

- Implement **auto-scaling** based on CPU or memory usage. **Deliverables:**
- Kubernetes **deployment YAML files** for Spring Boot application.
- Running Kubernetes cluster with auto-scaling behavior.

Lab Assignment 12: Setting Up CI/CD for Scalable Applications

Objective: Automate the deployment process using **CI/CD pipelines**. **Tasks:**

• Set up a **Jenkins** or **GitHub Actions** CI/CD pipeline to automate the build, test, and deployment process.

• Implement **continuous deployment** (CD) for deploying a **Dockerized microservice** to a Kubernetes cluster.

• Test the pipeline by pushing changes to a GitHub repository and triggering the deployment process automatically.

Deliverables:

- **CI/CD pipeline configuration** (Jenkins or GitHub Actions).
- Deployment automation logs and screenshots.

Targeted Application & Tools that can be used:

Applications:

The course will focus on building and scaling the following types of applications:

- E-Commerce Platforms Handling high traffic, product catalogs, and real-time inventory.
- **Banking & FinTech Applications** Secure and high-availability transactions.
- Streaming & Event-Driven Applications Using Kafka for real-time data processing.
- Social Media & Messaging Platforms Scalable messaging and real-time updates.
- SaaS & Cloud-Native Applications Multi-tenant, API-based scalable solutions.

Tools:

Programming & Frameworks

- 1. **Java 17**+ Core programming language for scalable applications.
- 2. Spring Boot Microservices development, REST APIs, and dependency injection.
- 3. **Spring Cloud** Service discovery, load balancing, and resilience patterns.
- 4. **Quarkus** Lightweight, high-performance microservices alternative.

Database & Caching

- **SQL Databases:** MySQL, PostgreSQL Scalable relational data management.
- **NoSQL Databases:** MongoDB, Cassandra High-availability distributed databases.
- **Redis** / **Memcached** In-memory caching for faster response times.

Messaging & Event-Driven Architecture

- Apache Kafka Real-time event streaming and asynchronous communication.
- **RabbitMQ** Message brokering for decoupling services.
- **gRPC** High-performance inter-service communication.

Cloud & Deployment

- **Docker** Containerization for application portability.
- Kubernetes Scaling, orchestration, and auto-recovery.
- **AWS / GCP / Azure** Cloud deployment and auto-scaling.

CI/CD & DevOps

- **GitHub Actions / Jenkins** Automated build and deployment pipelines.
- **Terraform** Infrastructure as Code for cloud provisioning.
- **Helm** Kubernetes package management for scalable applications.

Text Book(s):

T1: "Spring in Action" by Craig Walls

T2: "Java Performance: The Definitive Guide" by Scott Oaks

T3: "Designing Data-Intensive Applications" by Martin Kleppmann

T4. "Spring Microservices in Action" by John Carnell

Reference(s):

- 4. "Designing Data-Intensive Applications" Martin Kleppmann
- 5. "Java Performance: The Definitive Guide" Scott Oaks
- 6. "Spring Microservices in Action" John Carnell
- 7. "Kubernetes Up & Running" Kelsey Hightower, Brendan Burns, Joe Beda



Itgalpur, Rajankunte, Yelahanka, Bengaluru – 560064

Course Code: CSE2500	Course Title: Theory of Comput Type of Course: Theory Only	ation	L- T-P- C	3	0	0	3
Version No.	2.0						<u>.</u>
Course Pre- requisites							
Anti-requisites	NIL						
Course Description	The course deals with introduction of formal languages and the correspondence between language classes and the automata that recognize them. Topics include: Formal definitions of grammars and acceptors, Deterministic and Nondeterministic systems, Grammar ambiguity, finite state and push-down automata; normal forms; Turing machines and its relations with algorithms.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Theory of Computation as mentioned above and attain Skill Development through Problem Solving Methodologies.						
Course Outcomes	On successful completion of the course the students shall be able to: 1. Describe various components of Automata. (Knowledge) 2. Illustrate Finite Automata for the given Language. (Application) 3. Distinguish between Regular grammar and Context free grammar. (Comprehension) 4. Construct Push down Automata. (Application) 5. Construct Turing machine for a Language. (Application)						
Course Content:							
Module 1	Introduction to automata theory	Assignment	Problems or and Languag operations	n Stri ge	ngs	6 cl	asses
Topics:							
Introduction to Automata Theory, Applications of Automata Theory, Alphabets, Strings, Languages & operations on languages, Representation of automata, Language recognizers, Finite State Machines (FSM): Deterministic FSM, Regular languages, Designing FSM, Nondeterministic FSMs							
Module 2	Finite Automata	Assignment	Assignment Problems or NFA's	n DFA	Α,	13 Sessi	ons

Topics: Basic concepts of Finite automata, DFA- definitions of DFA, Deterministic Accepters Transition Graphs and Languages and DFA's, Regular Languages, NFA- Definition of a Nondeterministic Accepter, Languages and NFA's Why Non- determinism? Equivalence of Deterministic and Nondeterministic Finite Accepters, Reduction of the Number of States in Finite Automata. **Regular Expressions & Context** Assignment Problems on RE, 12 CFG, PT, PL and Sessions Free Grammar Module 3 Ambiguity **Topics:** Formal Definition of a Regular Expression, Languages Associated with Regular Expressions, Languages, Regular Languages (RL) and Non-regular Languages: Closure properties of RLs, to show some languages are not RLs, Closure Properties of Regular Context Free Grammars-Examples of Context-Free Languages, Leftmost and Rightmost Derivations, Derivation Trees, Relation Between Sentential Forms and Derivation Trees, Ambiguity in Grammars and Languages: Ambiguous Grammars, Removing Ambiguity, Chomsky Normal Form, Gribiche Normal Form. Module 4 08 Sessions Push down Problems on Assignment Automata pushdown Automaton **Topics:** Definition of a Pushdown Automaton, Language Accepted by a Pushdown Automaton, Acceptance by Final State, Acceptance by Empty Stack, From Empty Stack to Final State, From Final State to Empty Stack Equivalence of PDA's and CFG's: From Grammars to Pushdown Automata. Module 5 Turing Machine Assignment Problems on Turning 07 Sessions Machine **Topics:** Definition of a Turing Machine, Turing Machines as Language Accepters, Example Languages to construct Turing machine, Turing Machines as Transducers, Halting Programming Techniques for Turing Machines **Targeted Application & Tools that can be used: Targeted Application:**

- 1. Text Processing
- 2. Compilers
- 3. Text Editors
- 4. Robotics Applications
- 5. Artificial Intelligence

Tools:

1. JFLAP (Java Formal Language and Automata Package) Software simulation tool. It's interactive educational

software written in Java to experiment topics in automata theory.

2. Turing machine Online simulators.

Text Book(s):

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

Reference(s):

1. Aho, Ullman and Hopcroft, "Theory of Computation", Pearson India 3rd Edition 2008.

2. Michael Sipser, "Theory of Computation", Cengage India 3rd Ed, 2014.

E-Resources

 $NPTEL\ course - https://online courses.nptel.ac.in/noc21_cs83/preview$

Course Code: CSE2502	Course Title: Or Type of Course:	perating Systems Program Core and	Theory	L-T- P- C	3	0	0	3
	Only							
Version No.	1.0							
Course Pre- requisites	CSE2009- Compo Students should h hardware, and Co recommended.	uter Organization ave basic knowledge omputer Organization.	on compu Prior prog	ters, compute gramming ex	er so peri	oftwa ence	re & in C is	8
Anti-requisites	NIL							
Course	This course introd	luces the concepts of c	perating s	vstem operat	ions	, ope	rating	system
Description	structure and its d internal algorithm and recovery and solving, systems	tructure and its design and implementation. It covers the classical operating systems nternal algorithms such as process scheduling, synchronization, deadlocks detection and recovery and memory management. The course also enhances the problem solving, systems programming ability and case studies.						
Course Object	The objective of Operating Syste Methodologies.	The objective of the course is to familiarize the learners with the concepts of Depending Systems and attain Employability through Problem Solving Methodologies.						
Course Out Comes	On successful con 1] Describe the fu [Knowledge] 2] Demonstrate v 3] Apply various 4] Demonstrate d 5] Illustrate vario	npletion of the course indamental concepts of arious CPU schedulin tools to handle synch eadlock detection and bus memory managem	the studes of operating g algorithm ronization recovery ent techni	nts shall be a g Systems ar ms[Applic problems.[A methods [Ap ques.[Appli	ble nd ca catio Applo plic cati	to: ase st on] licati cation on]	on]	
Course Content:								
Module 1	Introduction to Operating System	Assignment	Program	ming			9 H	Iours
Topics: Introduction to C types, <mark>Operating</mark> OS design and ir	DS, Operating-Syst System Structure, nplementation, Ope	em Operations, Operations, Operations, Operations, Operations, Operations, Operations, Operations, State of the state of t	ating Syste its types, ystem	em Services, Linkers and	, Sy Loa	rstem ders,	Calls Overv	and its view of
Module 2	Process Management	Assignment/Case Study	Program	ming/Simula	tion		11 H	Hours
Topics: Process Concept server systems Libraries, Threa Algorithms: FCF	, Operations on Pr (sockets, RPC, Pi ding Issues, Proce FS, SJF, SRTF, RR	ocesses, Inter Process pes), Introduction to ss Scheduling– Basic and Priority.	Commun threads concepts	ication, Con - Multithread , Scheduling	nmu ding g Cr	nicat Mo iteria	ion in dels, ' , Sche	client- Thread eduling
Module 3	Process Synchronization and Deadlocks	Assignment	Program	ming			11 H	ours
Topics: The Critical-Sec Problems of Syn problems, Dinin deadlock, Resou Implementation, Deadlock.	tion Problem- Pete chronization with S ng Philosopher's P nrce allocation Gra Deadlock Avoida	erson's Solution, Synd Semaphore Solution- roblem, . Introduction aph, Methods for has nce and Implementat	chronizatio Producer-(on to Dea ndling dea ion, Dead	on hardware, Consumer Pr dlocks, Neca adlock: Dead llock detectio	Ser oble essa dloc on d	maph em, R ry co k Pro & Re	ores, (eader- onditic eventic covery	Classic -Writer ons for on and y from
Module 4	Memory Management	Assignment	Program	ming/Simula	tion		10 H	Hours

Topics:

Introduction to Memory Management, Basic hardware-Base and Limit Registers, Memory Management Unit(MMU), Dynamic loading and linking, Swapping, Contiguous and Non-Contiguous Memory Allocation, Segmentation, Paging - Structure of the Page Table – Virtual Memory and Demand Paging – Page Faults and Page Replacement Algorithms, Copy-on-write, Allocation of Frames, Thrashing

Introduction to File system management: File System Interface (access methods, directory structures), File system implementation.

Targeted Application:

Application area is traffic management system, banking system, health care and many more systems where in there are resources and entities that use and manage the resources.

Software Tools:

Oracle Virtual Box/VMWare Virtualization software [Virtual Machine Managers]. Used to install and work on multiple guest Operating Systems on top of a host OS.

Intel Processor identification utility: This software is used to explain about multi-core processors. It helps to identify the specifications of your Intel processor, like no of cores, Chipset information, technologies supported by the processor etc.

Project work/Assignment

Demonstrate process concepts in LINUX OS.

Simulation of CPU scheduling algorithms.

Develop program to demonstrate use of Semaphores in threads.

Develop program to demonstrate use of deadlock avoidance algorithms.

Develop program to demonstrate use of page replacement algorithms.

Simulation of memory allocation strategies [first fit, best fit and worst fit].

Text Book

Silberschatz A, Galvin P B and Gagne G, "Silberschatz's Operating System Concepts", Paperback, Global Edition Wiley, 2019

References

Silberschatz A, Galvin P B and Gagne G, "<mark>Operating S</mark>ystem Concepts", 10th edition Wiley, 2018. William Stallings, "<mark>Operating S</mark>ystems",Ninth Edition, By Pearson Paperback ,1 March 2018.

Sundaram RMD, Shriram K V, Abhishek S N, B Chella Prabha, "Cracking the Operating System skills", Dreamtech, paperback, 2020

Remzi H. Arpaci-Dusseau Andrea C. Arpaci-dusseau, "Operating Systems: Three Easy Pieces, Amazon digital Services", September 2018.

E-resources/Weblinks

https://www.os-book.com/OS9/

https://pages.cs.wisc.edu/~remzi/OSTEP/

https://codex.cs.yale.edu/avi/os-book/OS10/index.html

Course Code: CSE2514	Course Title: Operating Systems Lab Type of Course: Lab Only	L-T- P- C	0	0	2	1		
Version No.	1.0		1	1	I			
Course Pre- requisites	CSE2009- Computer Organization Students should have basic knowledge on computers, computer software & hardware, and Computer Organization. Prior programming experience in C is recommended.							
Anti-requisites	NIL							
Course Description	operating systems through practical assignments, simulations, and case studies. It covers foundational aspects such as system calls, process and thread management, inter-process communication, synchronization, deadlocks, memory management, and file systems. Students will implement and simulate real-time OS components and scheduling algorithms, fostering deeper understanding of OS architecture and design. The lab also introduces modern OS tools, programming interfaces, and the basics of open-source OS environments.							
Course Object	The objective of the course is to familiarize the learners with the concepts of Operating Systems and attain Employability through Problem Solving Methodologies.							
Course Out Comes	On successful completion of the course the students shall be able to: 1] Demonstrate system-level programming using system calls and OS structures. [Apply] 2] Simulate process scheduling and multithreading techniques. [Apply] 3] Apply various tools to handle synchronization problems using semaphores and shared memory. [Apply] 4] Demonstrate memory management and file system concepts using simulation or scripting. [Apply]							
Course Content:								
Targeted Applic Application area systems where in Software Tools:	ation: a is traffic management system, banking system a there are resources and entities that use and n	, health care nanage the r	e an eso	d m urco	any mo es.	ore		

Oracle Virtual Box/VMWare Virtualization software [Virtual Machine Managers]. Used to install and work on multiple guest Operating Systems on top of a host OS.

Intel Processor identification utility: This software is used to explain about multi-core processors. It helps to identify the specifications of your Intel processor, like no of cores, Chipset information, technologies supported by the processor etc.

List of Laboratory Tasks: Lab sheet -1

L1: Write a program to demonstrate the use of fork() and exec() system calls in process creation. L2: A system has limited memory and high-priority real-time processes. Design a scheduling algorithm that ensures responsiveness while preventing starvation. Lab sheet -2

L1: Implement First-Come-First-Serve (FCFS) process scheduling using C or Python.

L2: You are designing a server that handles thousands of client connections. Compare multithreading and multiprocessing for this task and implement a basic server model. Lab sheet -3

L1: Implement Round Robin Scheduling with a fixed time quantum.

L2: In a banking system, concurrent access to accounts leads to data corruption. Design a synchronization solution to avoid race conditions.

Lab sheet -4

L1: Write a program to create threads using Pthreads or Python's threading module.

L2: You're tasked with building a file access tracker in an OS. Implement a system to log

file access patterns and identify frequent accesses.

Lab sheet -5

L1: Demonstrate inter-process communication (IPC) using pipes.

L2: A simulation tool needs to emulate process suspension and resumption. Design and implement such a mechanism using signals or condition variables.

Lab sheet -6

L1: Simulate the Producer-Consumer problem using semaphores.

L2: You're developing a system where sensor devices (producers) generate temperature readings, and data processors (consumers) store and process these readings. To prevent race conditions and ensure buffer safety, implement a synchronization mechanism using semaphores.

Lab sheet -7

L1: Implement Dining Philosophers Problem using threads and synchronization.

L2: In a multi-threaded cafeteria simulation, five philosophers sit around a circular table, each alternating between thinking and eating. To eat, a philosopher must hold two forks (represented by shared resources). Your task is to avoid deadlock and ensure no philosopher starves using thread synchronization techniques.

Lab sheet -8

L1: Write a program to simulate First Fit, Best Fit, and Worst Fit memory allocation strategies.

L2: A system with limited memory blocks needs to allocate memory to processes arriving with various size requests. Your task is to implement three classic memory allocation strategies—First Fit, Best Fit, and Worst Fit—to allocate memory to each process efficiently. Simulate and compare how memory gets allocated in each strateg

Lab sheet -9

L1: Demonstrate paging using a simple page table simulation.

L2: A program has a logical address space divided into pages. The system's memory is divided into equal-sized frames. When a program executes, its pages are loaded into available frames in main

memory. Simulate the address translation process using a page table and demonstrate how a logical address is converted to a physical address.

Lab sheet -10

L1: Write a program to simulate page replacement algorithms like FIFO and LRU.

L2: In a virtual memory system, a process accesses pages in a specific order. The memory can only hold a limited number of pages (frames). When a page is needed and the memory is full, a page replacement algorithm is used to decide which page to evict. Simulate and compare FIFO and LRU algorithms for a given page reference string.

Lab sheet -11

L1: Simulate file directory structure (single level/two level).

L2: A university campus computer lab has limited memory space available for each student login session. When students open files or run programs, memory pages are loaded into available memory frames. Due to the limited number of frames, some pages must be replaced when new ones are needed. The lab system uses page replacement algorithms to decide which pages to evict when memory is full..

Lab sheet -12

L1: Write a shell script to demonstrate file handling commands in Linux.

L2: Design a command-line mini shell that can run background and foreground processes and handle basic built-in commands like cd, pwd, exit.

Project work/Assignment

Demonstrate process concepts in LINUX OS.

Simulation of CPU scheduling algorithms.

Develop program to demonstrate use of Semaphores in threads.

Develop program to demonstrate use of deadlock avoidance algorithms.

Develop program to demonstrate use of page replacement algorithms.

Simulation of memory allocation strategies [first fit, best fit and worst fit].

Text Book

Silberschatz A, Galvin P B and Gagne G, "Silberschatz's Operating System Concepts", Paperback, Global Edition Wiley, 2019

References

Silberschatz A, Galvin P B and Gagne G, "Operating System Concepts", 10th edition Wiley, 2018. William Stallings, "Operating Systems", Ninth Edition, By Pearson Paperback, 1 March 2018.

Sundaram RMD, Shriram K V, Abhishek S N, B Chella Prabha, "Cracking the Operating System skills", Dreamtech, paperback, 2020

Remzi H. Arpaci-Dusseau Andrea C. Arpaci-dusseau , "Operating Systems: Three Easy Pieces, Amazon digital Services", September 2018.

E-resources/Weblinks

https://www.os-book.com/OS9/

https://pages.cs.wisc.edu/~remzi/OSTEP/

https://codex.cs.yale.edu/avi/os-book/OS10/index.html





Presidency University Act, 2013 of the Karnataka Act No. 41 of 2013 | Established under Section 2(f) of UGC Act, 1956 Approved by AICTE, New Delhi



Itgalpur, Rajankunte, Yelahanka, Bengaluru – 560064

Course Code:	Course Title: Cryptograp	hy and Network	L-T-P-				
CSE2503	Security		C	3	0	0	3
	Type of Course: Theory		Ũ				
Version No.	2.0						
Course Pre-							
requisites							
Anti-requisites	NIL						
Course	The Course deals with the	principles and practice	e of cryptog	graphy	and net	work see	curity,
Description	focusing in particular on th	ne security aspects of t	he web and	Intern	let		
Course Objective	The objective of the co	urse is to familiariz	e the lear	ners v	vith the	concer	ots of
	Problem Solving methodo	ork Security above a logies.	nd attain S	SK1II I	Jevelop	ment th	rough
Course	On successful completion	of this course the stude	ents shall be	e able	to:		
Outcomes	1. Describe the basic conce	ept of Cryptography					
	2. Classify different types	of Cryptographic Algo	orithms				
	3. Solve Mathematical pro	blems required for Cry	yptography				
	4. Illustrate Network Secur	rity concepts					
Course Content:							
Module 1	Introduction to	Assignment	Recognize	e the		7 Ses	sions
	Cryptography	Assignment	technique	S		7 505	510115
Introduction to Cry	ptography, Model of Networ	k Security, OSI Securi	ity architect	ure, S	ecurity A	Attacks:	active
attacks, passive at	tacks, services: Authentica	tion, Access Control,	Data Con	fident	iality, L	Data Inte	egrity,
Nonrepudiation, Si	ibstitution Ciphers : Play-fa	air and Hill Cipher, V	Vigenere ci	pher,	Introduc	tion to	Block
Cipher and Stream	Cipher, Feistel Structure, EC	B modes of block cip	her.			1	
Module 2	Symmetric Encryption Algorithm	Assignment	Analysis o	of solu	tions	9 Sessi	ons
Overview of Public	: Key Cryptography, RSA, D)iffie-Helman Key exc	hange, Mar	n in the	e middle	attack,	
Cryptographic Has	h functions, Secure Hash Alg	gorithm, Message Auth	nentication	Codes	– HMA	.C, Digit	al
Signature, Ei-gama	l Encryption, Elliptic curve	cryptography overviev	V.				
Module 3	Public Key Cryptography	Assignments	Analysis of	soluti	ns	9 Sessi	ions
Overview of Public	$\sim Key Cryptography RSA \Gamma$)iffie-Helman Key eye	hange Mar	$\frac{1}{10000000000000000000000000000000000$	e middle	attack	.0115
Cryptographic Has	h functions Secure Hash Al	porithm Message Aut	nange, Mai	Codes	- HMA	C Digit	tal
Signature Ei-gama	1 Encryption Elliptic curve	cryptography overview	v	Codes	111012	ie, Digi	,ui
Module 4	Network Security	Assignment	Analysis of	f	05 Sess	ions	
			solutions	<u> </u>	00 0000	10110	
Topics:	1						
Network Security f	undamentals, Network Secu	rity applications: Auth	entication:	Kerbe	ros, PKI	, Netwo	rk
Security application	ns: e-mail security: PGP, MI	ME, Network Security	application	ns: IP S	Security	: IPSec	
architecture, Netwo	ork Security applications: DN	NS Security.					
Targeted Applicat	ion & Tools that can be use	ed:					
Students get the kn	owledge about cryptography	techniques followed,	the algorith	ms us	ed for en	ncryption	n and
decryptions & the t	echniques for authentication	and confidentiality of	messages.			_	
Text Book(s):							
T1 William Stalling	gs, "Cryptography and Netwo	ork Security - Principl	es and Prac	tices",	7th Edi	tion, Pea	arson
publication, ISBN: 978-93-325-8522-5, 2017							

Reference(s):

R1 Bruice Schneier, "Applied Cryptography – Protocols, Algorithms and Source code in C", Second Edition, Wiley

Publication, ISBN: 978-81-265-1368-0, 2017

R2 Cryptography and Network Security, Express Learning, ITL Education Solution Limited.

R3 e-pg pathshala UGC lecture series

Web references:

https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2233842&site =ehost-live

https://nptel.ac.in/courses/106105031.

Topics relevant to "Skill Development": Topics relevant to "Skill Development":

- 1. Play-fair and Hill Cipher
- 2. Euclidean and Extended Euclidean Algorithm
- 3. Secure Hash Algorithm
- 4. Diffie-Helman Key exchange
- 5. Totient Function.
- 6. Fermat's little theorem

CSE1704Type of Course: TheoryT- P- CT- P- C3003Version No.1.0Course Pre- requisitesAnti- requisitesMIL requisitesCourse DescriptionThis course introduces students to the concepts of deep neural networks and state of the art approaches to develop deep learning models. In this course students will be given exposure to the details of neural networks as well as deep learning architectures and to develop end-to-end models for such tasks. It will help to design and develop application-specific deep learning models and provide practical knowledge handling and analyzing end user realistic applications. Topics include Fundamental concepts of deep neural networks, Convolutional Neural Networks, Recurrent Network structures, Deep Unsupervised Learning, Generative Adversarial Networks and applications in various problem domains.Course OutcomesOn successful completion of this course the students shall be able to: CO1: Learn the Fundamental Principles of Deep Learning. (Remember). CO2: Identify the Deep Learning Algorithms for Various Types of Learning Tasks in various domains (Apply).
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CO2: Identify the Deep Learning Algorithms for Various Types of Learning Tasks in various domains (Apply).
Tasks in various domains (Apply).
Tasks in various domains (Apply).
cO3: Build Supervised and Unsupervised Deep Learning techniques to implement
effective models for prediction or classification tasks. (Apply).
Lugherented Deer Nerrel Network (Annle)
Course Contents
Course Content.
Module 1 and Neural Networks Assignment 8
Classes
Topics:
Fundamentals of Deep Learning, Perceptron, Multilaver Perceptron, Optimizing Perceptions
using Activation Functions, Loss Functions, Gradient Descent Feedforward Neural Network.
Training Neural Network with Back-propagation. Hyper parameters, Regularization, Dropouts,
Batch Normalization, Practical Issues in Neural Network Training -The Problem of Overfitting.
The Vanishing and Exploding Gradient Problems
The Charles and Expressing of which is restricted
Common Deep Learning
Module 2 Architectures: Assignment Classes
Topics:
Convolutional Neural Network, Transfer learning Techniques, Variants of CNN: ResNet, AlexNet
Sequence Modelling: Recurrent Neural Network and its variants - Long Short-Term Memory
(LSTM), Gated Recurrent Unit (GRU)
Widdle 5 Deep Generative Models Assignment Classes
Topics:
Generative Adversarial Networks, Kohonen Networks, Autoencoders, Boltzman, Machine
Constraine intervention intervention intervention intervention polizinant internet

	Advanced Deep Learning			7	
Module-4	Architectures	Assignment		Classes	
Topics:					
Hopfield Netw	vork, Probabilistic Neural Ne	etwork, Deep Rein	forcement L	earning - The Basic	
Framework of	Reinforcement Learning				
D I .	1 T			1.1.6	
Deep Learning	applications: Image segmenta	tion, Object detection	on, Attention	model for computer	
Vision tasks, Sp	eech Recognition, video Anal	ytics			
1 Assign	ment 1 on (Module 1 and Mod	dula 2)			
2. Assign	ment 2 on (Module 3 and Mod	dule 4)			
REFERENCE	ATERIALS:	<i>aute 1</i> ,			
TEXTBOOKS					
1. Fra	nçois Chollet, "Deep Learning	g with Python", 2n	d Edition, M	anning Publications,	
2022					
2. Ian	Goodfellow, Yoshua Bengio,	Aaron Courville, "	Deep Learnir	ng", MIT Press, 2017.	
REFERENCES					
1.	Amlan Chakrabarti Amit K	umar Das, Saptars	i Goswami, F	'abitra Mitra, "Deep	
Learning", Pear	rson Publication, 2021.				
2.	David Foster, "Generative I	Deep Learning" O'F	Reilly Publish	ers, 2020.	
3.	John D Kellehar, "Deep Lea	rning", MIT Press,	2020.		
IOURNAI S/M	IAGAZINES				
1. IEEE Tr	ansactions on Neural Network	ks and Learning Sy	vstems		
https://ieeexp	lore.ieee.org/xpl/RecentIssue	.jsp?punumber=59	62385		
2. IEEE Tr	ansactions on Pattern Analysi	s and Machine Inte	elligence		
https://ieeexp	lore.ieee.org/xpl/RecentIssue	.jsp?punumber=34	http://ijaerc	l.com/papers/speci	
al_papers/IT03	32.pdf				
3. Interna	tional Journal	of	Intelligent	: Systems	
https://online	library.wiley.com/journal/109	98111x			
SWAVAM/NIP	TEL/MOOCe.				
• Swavar	n Notel - T	Deep Learnin	ησ –	IIT Ropar	
https://online	courses.nptel.ac.in/noc21 cs3	5/preview	6	in nopul	
Course	ra – Neural Networks and Dee	ep Learning Andre	w Ng		
• Coursera - Neural Networks for Machine Learning by Geoffrey Hinton in Coursera					

Course Code: CSE1705	Course Title: Deep Learning Methods Lab	L- T- P- C	0	0	4	2	
	Type of Course: LABORATORY						
Version No.	1.0				•		
Course Pre- requisites							
Anti-requisites	NIL						
Course Description	This course introduces students to the concepts of deep neural networks and state of the art approaches to develop deep learning models. In this course students will be given exposure to the details of neural networks as well as deep learning architectures and to develop end-to-end models for such tasks. It will help to design and develop application-specific deep learning models and provide practical knowledge handling and analyzing end user realistic applications. Topics include Fundamental concepts of deep neural networks, Convolutional Neural Networks, Recurrent Network structures, Deep Unsupervised Learning, Generative Adversarial Networks and applications in various problem domains.						
Course	On successful completion of this cours	se the stud	ents s	hall b	e able	to:	
Outcomes	 CO1: Learn the Fundamental Principles of Deep Learning. (Remember). 1. CO2: Identify the Deep Learning Algorithms for Various Types of Learning Tasks in various domains (Apply). 						
	• CO3: Build Supervised and Unsup implement effective models for predictio	oervised De n or classifi	ep Lea cation	rning tasks	techniq . (Apply)	ues to).	
Course Content	• CO4: Make use of appropriate performance of Implemented Deep N	validation eural Netv	metri vork. (ics to Apply	evaluat /)	te the	

List of Laboratory Tasks:

Experiment No. 1: Working with Deep Learning Framework

Level 1: Explore various Deep Learning Frameworks and identify deep learning frameworks (Keras, Tensorflow, Matplotlib, etc) with various methods available in DL Frameworks to develop a Model.

Experiment No. 2: Build a Basic Artificial Neural Network

Level 1: Create an ANN with DL frameworks and identify suitable ANN Layers using Keras and Tensorflow for pima-indians-diabetes.

Level 2: Create an ANN with DL frameworks and identify suitable ANN Layers using Keras and Tensorflow for any image dataset.

Experiment No. 3: Build a Multi-Layer Perceptron

Level 1: Create a MLP for classification task by identify suitable model for house price

prediction.

Level 2: Design a MLP for implementing classification and fine-tuning for speech recognition

Experiment No. 4: Build a Convolutional Neural Network

Level 1: Build CNN architecture for Dog-Cat classification problem. **Level 2:** Build Convolution Neural Network (CNN) for fine tuning hyperparameter for improving the performance of model.

Experiment No. 5: Build ResNet Model **Level 1:** Build ResNet Model for Medical Imaging Datasets ChestX-ray14 **Level 2:** Build ResNet Model for Video datasets

Experiment No. 6: Build AlexNet Model **Level 1**: Build ResNet Model for CIFAR10 Datasets. **Level 2**: Build ResNet Model for Video datasets

Experiment No. 7: Build a Time-Series Model **Level 1:** Build RNN/LSTM Model for predicting time series data for sentiment analysis model on IMDB dataset.

Experiment No. 8: Build a Time-Series Model Level 1: Build RNN/GRU Model for predicting time series data for sentiment analysis model on IMDB dataset.

Experiment No. 9: Build GANs for CIFAR10 Level 1: Develop a GAN to Generate CIFAR10 Small Color Photographs

Experiment No. 10: Build a Transfer Learning Model. Level 1: Create a Seq2Seq Model. Create Hugging-face API using Transfer learning model.

Experiment No. 11: Build an Auto-Encoder model Level 1: Implement an Encoder-Decoder Recurrent neural network model for Neural Machine Translation.

Experiment No. 12: Build Generative Adversarial Networks.Level 1: Design GAN Architecture for Image generations.Level 2: Design a Age Prediction model by Applying Generative Adversarial

REFERENCE MATERIALS:

TEXTBOOKS

3. François Chollet, "Deep Learning with Python", 2nd Edition, Manning Publications, 2022

Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press,
 2017.

REFERENCES
Amlan Chakrabarti Amit Kumar Das, Saptarsi Goswami, Pabitra Mitra , "Deep Learning", Pearson Publication, 2021.
 David Foster, "Generative Deep Learning" O'Reilly Publishers, 2020.

6. John D Kellehar, "Deep Learning", MIT Press, 2020.

JOURNALS/MAGAZINES

1. IEEE Transactions on Neural Networks and Learning Systems

https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=5962385

2. IEEE Transactions on Pattern Analysis and Machine Intelligence

https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=34http://ijaerd.com/papers/special_papers/IT032.pdf

3. International Journal of Intelligent Systems https://onlinelibrary.wiley.com/journal/1098111x

SWAYAM/NPTEL/MOOCs:

• Swayam Nptel – Deep Learning – IIT Ropar https://onlinecourses.nptel.ac.in/noc21_cs35/preview

- Coursera Neural Networks and Deep Learning Andrew Ng
- Coursera Neural Networks for Machine Learning by Geoffrey Hinton in Coursera

Course Code: CSE2513	Course Title: Obje	ct Oriented Analys	is and Design	L- T-	3	0	0	3		
	Type of Course: P	rogram Core and T	heory	P- C						
Version No.	1.0					I				
Course Pre- requisites	CSE 1006 Probler	n Solving using Java	Э							
Anti-requisites	NIL									
Course Description	This course covers convey a good un unified process. Si classes and their interdependence application of the emphasized. This in all the stages of	inis course covers the analysis and design methodology in sufficient depth to convey a good understanding of object-oriented analysis and design using the unified process. Students will be able to design a use case model, identify the classes and their responsibilities, use interaction models to capture the interdependence among objects/classes and design an efficient solution. The application of the design axioms and the iterative nature of the process are emphasized. This course will enable students to apply object oriented concepts in all the stages of the software development life cycle.								
Course objective	This course is designed to improve the learners "SKILL DEVELOPMENT "by using EXPERIENTIAL LEARNING techniques.									
Course Outcomes	On successful completion of the course the students shall be able to:1]Describe the basics of object oriented system development [Knowledge]2]Identify the various techniques for object-oriented analysis techniques[Comprehension]3] Apply the design axioms to create appropriate UML diagrams.[Application]4]Apply the design process to develop implementation models.									
Course Content:										
Module 1	Introduction to Object oriented system	Assignment	Identify proble objects f application do	em dom or main	ain an		9 Cla	asses		
Topics: Object Basics-Object Oriented System Development Life Cycle- Use case driven approach- Rumbaugh Object Model- Booch Methodology-Jacobson Methodology-Unified Approach, Static and Dynamic Modeling-Unified Modeling Language										
Module 2	Object oriented analysis	Assignment	Identification candidate cla various appro-	sses us aches	of ing	1	L2 C	lasses		
Topics:										

Identifying use cases-Object Analysis-Classification: Theory-Approaches for Identifying Classes: Noun Phrase approach, Common Class pattern approach, Use case driven approach, Classes, Responsibilities and Collaborators- Identifying Object relationships: Associations, Super–sub class relationships, Aggregation. UML diagrams: Use case Diagram, Class diagram.

Module 3	Introduction to axiomatic design	Assignment	Apply axioms to create class diagram	12 Classes
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Topics:

Object Oriented Design Axioms-Designing Classes -Class visibility -Redefining attributes -Designing methods and protocols -Packages and managing classes, UML Diagrams: Interaction diagram, Sequence diagram, Collaboration diagram, State-chart diagram, Activity diagram

Module 4	Object oriented Design process	Assignment	Apply process compor deployn	the and de ient nent di	design evelop a and agram.	12 Classes
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Topics:

Access Layer- Object Storage Persistence - Object oriented Database System-Designing view layer classes -Macro level process -Micro level process- Prototyping the user interface UML diagrams: component diagram, Deployment diagram, Quality Assurance Tests-Testing Strategies.

Tools that can be used:

Tools:

Microsoft visio, Rational software architect(RSA) ArgoUML, Rational Rose, StarUML, Umbrello Project work/Assignment:

Term Assignments:

identify Use Cases and develop the Use Case model

Identity the conceptual classes and develop a UML Class diagram

Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams

Identify the business activities and develop an UML Activity diagram

Text Book

1. Ali Behrami, "Object Oriented Systems Development using Unified Modeling

Language" McGraw Hill International Edition, July 2017.

References

1. Craig Larman, "Applying UML and Patterns", Pearson Education.

2.Grady Booch, "Object Oriented Analysis and Design with Applications", Addison-Wesly.

3.Simon Bennett, Steve McRobb, Ray Farmer, "Object Oriented Systems Analysis and Design using UML", McGrawHill Education

Topics related to development of "FOUNDATION": Object Basics-Object Oriented System Development Life Cycle- Use case driven approach-Rumbaugh Object Model- Booch Methodology-Jacobson Methodology-Unified Approach, Static and Dynamic Modeling-Unified Modeling Language

Topics related to development of "SKILL DEVELOPMENT": UML diagrams: Use case Diagram, Class diagram, Interaction diagram, Sequence diagram, Collaboration diagram, State-chart diagram, Activity diagram, component diagram, Deployment diagram using the tool StarUML software

Course Code: CSE7000	Course Title: Internship Type of Course:	L- T-P- C	-	-	-	2		
Version No.	1.0							
Course Pre-requisites	Knowledge and Skills related to all the course	s studied in p	orevio	ous se	mester	·s.		
Anti-requisites	NIL							
Course Description	Students observe science and technology in action, develop an awareness of the method of scientific experimentation, and often get an opportunity to see, study and operate sophisticated and costly equipment. They also learn about the implementation of the principles of management they have learnt in class, when they observe multidisciplinary teams of experts from engineering, science, economics, operations research, and management deal with techno-economic problems at the micro and macro levels. Finally, it enables them to develop and refine their language, communication and inter-personal skills, both by its very nature, and by the various evaluation components, such as seminar, group discussion, project report preparation, etc. The broad-based core education, strong in mathematics and science and rich in analytical tools, provides the foundation necessary for the student to understand properly the nature of real-life problems							
Course Objectives	The objective of the course is to familiarize the lear Practice and attain Employability Skills through	rners with the DEXperienti	conce al Lea	epts of arnin	f Profe g techr	ssional niques.		
Course Outcomes	On successful completion of this course the studer 1. Identify the engineering problems relate needs. (Understand) 2. Apply appropriate techniques or mod problem. (Apply)	nts shall be ab d to local, reg ern tools fo	le to: gional r solv	, nati ving	onal or the int	global tended		
	 Design the experiments as per the standards and specifications. (Analyze) Interpret the events and results for meaningful conclusions. (Evaluate) 							







Presidency University Act, 2013 of the Karnataka Act No. 41 of 2013 | Established under Section 2(f) of UGC Act, 1956 Approved by AICTE, New Delhi

Course Code: CSE2510	Course Title:CompetitiveProgrammingandProblem SolvingType of Course:Program Core	L-T-P-C	0	0	4	2				
Version No.	1.0	1	1	1	I					
Course Pre-requisites	NIL									
Anti-requisites	NIL									
Course Description	The Competitive Programming and Problem Solving course equips students with efficient problem-solving skills for coding competitions and real-world challenges. Starting with brute-force solutions, students learn to optimize time and space complexity using advanced techniques like dynamic programming, greedy algorithms, and backtracking. Hands-on practice on platforms like CodeChef and Codeforces helps tackle problems involving number theory, data structures, and algorithmic paradigms. By understanding CP constraints and fostering a strategic mindset, students gain the confidence to excel in competitions, technical interviews, and practical applications.									
Course Out Comes	On successful completion of the course the students shall be able to:									
	 CO1 : Understanding the issues of online platforms and Competitive Programming (CP) and developing brute force coding for commonly asked CP problems. CO2 : Analyzing the space and time complexity of brute force solutions and designing efficient solutions. 									
	CO3 : Evaluating the applicability of suitable algorithn problems.	nic approac	hes t	o solv	e rele	evant CP				
	CO4: Creating efficient solutions of CP problems using	the learnt a	algori	thmi	сарр	roaches.				
Course Objective	The objective of the course is to familiarize the learners Programming and Problem Solving and attain Skill Learning techniques.	with the co Developme	ncept ent th	s of rough	Com Exp	petitive <mark>eriential</mark>				
Module 1: Introduction	to Competitive Programming									
Overview of Efficient Coc complexity analysis; intr	ling for Problem Solving and CP: Introduction to compe oduction to online platforms such as codechef, code	etitive prog forces etc a	ramm and c	ning (Inline	CP); r subi	evisit of mission;				

Module 2: Number Theory for Problem-Solving

constraints during CP, online testing process and common errors such as TLE; use of STL



Use of Number Theory for problem-solving: reducing time/space complexity of brute force coding solution of Sieve Method, Inverse Module, Euclidian Method of factorization; efficient coding for Permutation Combination; XORing based and pattern-based solutions.

Module 3: Optimizing Time & Space Using Sequential Storage

Coding for Optimizing time and Space using Sequential Storage: two pointer approach; problem-solving using arrays and strings such as rotation on sorted arrays, duplicate removal, string matching algorithms; Kadane's algo, stacks, priority-queues and hashing based efficient coding; median based problems and alternate solutions.

Module 4: Non-Linear Data Structures

Applying Non-Linear Data Structures for real-life problems: design of efficient solutions for problems such as finding loops in a linked list, memory efficient DLL, block reversal in LL; problem solving using trees and binary trees, Catalan numbers, applications of graphs, spanning tree and path algos for CP problems with reduced time/space complexity.

Module 5: Problem Solving using Advanced Topics

CP Problem Solving using Advanced Topics: concept of disjoint sets and their efficient representation, algorithmic approaches such as Greedy, Backtracking, Dynamic Programming and applying them for CP problems using bottom-up dynamic programming.

List of Laboratory Tasks:

1. You are given the finishing times of 'N' runners in a marathon. Write a program to find the runner who finished in the third position. **Focus:** Basic data structures (arrays), sorting algorithms (e.g., insertion sort, selection sort), and basic input/output.

2. In the same marathon, you are given the finishing times of 'N' runners and their bib numbers. Write a program to efficiently find the top 10 runners and their corresponding bib numbers. **Focus:** Efficient sorting algorithms (e.g., merge sort, quick sort), data structures like priority queues, and optimizing for large datasets.

3. A library maintains a list of books with their unique IDs. Write a program to check if a given book ID is present in the library. Focus: Searching algorithms (linear search), basic data structures (arrays or lists).

4. The library wants to implement a system to quickly find books by their titles. Suggest an efficient data structure (e.g., a hash table or a trie) and explain how to implement it to achieve fast book lookups. Focus: Understanding the trade-offs between different data structures, choosing the most appropriate data structure for a specific problem, and implementing efficient search operations.

5. An online store sells products with different prices. Write a program to calculate the total cost of a given list of products. **Focus:** Basic arithmetic operations, working with arrays or lists to store product prices.

6. The online store offers discounts based on the total purchase amount. Design an algorithm to efficiently calculate the final cost of an order, considering different discount rules (e.g., percentage discounts, fixed amount discounts, tiered discounts). Focus: Algorithmic design, conditional statements, handling complex scenarios with multiple rules, and potentially using dynamic programming techniques for optimization.



7. You are given two integers, 'a' and 'm'. Calculate 'a' raised to the power 'm' modulo a large prime number 'p'. **Focus:** Basic modular arithmetic operations (modular exponentiation), understanding the modulo operator.

8. In a secure communication system, you need to efficiently compute the modular exponentiation for very large values of 'm'. Implement and analyze the efficiency of the binary exponentiation algorithm for this task. **Focus:** Efficient algorithms for modular exponentiation (binary exponentiation), time complexity analysis, and understanding the importance of efficient algorithms in cryptography.

9. You have a deck of 'N' cards. Calculate the total number of possible hands of size 'K' that can be drawn from the deck. **Focus:** Basic combinatorics (combinations), factorial calculations.

10. In a card game, you need to calculate the probability of drawing certain combinations of cards (e.g., a pair, a three-of-a-kind) from a shuffled deck. Design an efficient algorithm to calculate these probabilities. **Focus:** Advanced combinatorics (permutations and combinations with repetitions), probability calculations, and optimizing calculations to avoid overflows.

11. You are given a network of devices represented as a graph. Determine if there is a path between two given devices in the network. **Focus:** Graph traversal algorithms (depth-first search or breadth-first search).

12. In a secure network, you need to detect and isolate compromised devices. Design an algorithm that efficiently identifies devices that exhibit anomalous behavior (e.g., unusual traffic patterns) using XOR-based techniques for data comparison and pattern matching. **Focus:** Applying XOR operations for data comparison and pattern recognition, understanding the properties of XOR (e.g., commutative, associative), and designing algorithms for network anomaly detection.

13. You are given an array representing the speeds of cars on a highway. Find the minimum time required for all cars to pass a certain point. **Focus:** Basic array traversal, finding the minimum element in an array.

14. In a more realistic scenario, cars have different lengths. Implement a two-pointer approach to simulate the movement of cars and determine the minimum time for all cars to pass a given point. **Focus:** Two-pointer technique, simulating real-world scenarios with arrays, optimizing time complexity.

15. Given a string, find the number of occurrences of a specific substring within the string. **Focus:** Basic string manipulation, string matching (brute-force approach).

16. Implement the KMP (Knuth-Morris-Pratt) string matching algorithm to efficiently find all occurrences of a given pattern within a large text document. **Focus:** Advanced string matching algorithms, understanding the concept of the "next" array in KMP, optimizing for large input sizes.

17. An online auction platform receives bids for different items. Implement a data structure (e.g., a priority queue) to efficiently track the highest bid for each item. **Focus:** Priority queues, insertion and extraction operations on priority queues, basic implementation of a priority queue using an array or a suitable library.

18. The auction platform needs to handle a large number of bids concurrently. Design and implement a system that efficiently processes bids, updates the highest bid for each item, and handles potential race conditions. **Focus:** Concurrent data structures and algorithms, thread safety, handling race conditions, optimizing for high-throughput scenarios.

19. A social network can be represented as a graph where users are nodes, and connections between users are edges. Write an algorithm to find if two given users are connected in the network. **Focus:** Graph traversal



algorithms (depth-first search or breadth-first search), basic graph representation (adjacency list or adjacency matrix).

20. In a large social network, efficiently finding the shortest path between two users is crucial. Implement Dijkstra's algorithm to find the shortest paths between users in the network, considering edge weights (e.g., representing the strength of connections). **Focus:** Shortest path algorithms (Dijkstra's algorithm), graph algorithms with weighted edges, optimizing for large graphs.

21. A file system can be modeled as a tree structure. Implement a function to traverse the file system and print the names of all files and directories. **Focus:** Tree traversal algorithms (depth-first search or breadth-first search), basic tree representation (using nodes and pointers).

22. Design and implement a file system that supports efficient operations like creating directories, deleting files, and finding files based on their names or paths. Consider using a combination of tree structures and hash tables for efficient indexing and searching. **Focus:** Designing and implementing file system structures, using multiple data structures together, optimizing for common file system operations.

23. An online shopping cart can be represented as a tree, where each node represents an item or a category of items. Write an algorithm to calculate the total price of all items in the shopping cart. **Focus:** Tree traversal, calculating sums within a tree structure.

24. Implement a system that allows customers to apply discounts and coupons to their shopping carts. Consider using a combination of trees and other data structures (e.g., hash tables) to efficiently apply discounts and calculate the final price. **Focus:** Applying discounts and promotions to tree-like structures, efficient implementation of discount rules, optimizing for complex pricing scenarios.

25. In a social network, users can form groups. Given a list of friendships, determine if all users in a specific group are connected (directly or indirectly) through friendships. **Focus:** Disjoint set union (DSU) data structure, basic connectivity checks.

26. Design an efficient algorithm to find the minimum number of new friendships needed to connect all users in the social network into a single, connected component. **Focus:** Applying DSU for finding connected components, greedy algorithms, optimization for minimizing connections.

27. A treasure hunt involves a series of clues leading to the final treasure. Given a list of possible paths and their associated costs, find the cheapest path to reach the treasure. **Focus:** Greedy algorithms (e.g., Dijkstra's algorithm for shortest paths), basic graph representation.

28. In a more complex treasure hunt, there are time constraints associated with each path. Design an algorithm to find the fastest path to the treasure while considering both path costs and time constraints.

Focus: Combining greedy approaches with other techniques (e.g., priority queues), handling multiple constraints, optimizing for time-critical scenarios.

29. In a simplified chess game with only rooks, determine the minimum number of moves required for a rook to reach a specific target square on an empty board. **Focus:** Breadth-first search (BFS) on a graph (the chessboard), basic graph traversal.

30. In a more realistic chess game with multiple pieces and obstacles, implement a minimax algorithm with alpha-beta pruning to determine the best move for a player. **Focus:** Game tree search, minimax algorithm,





optimization techniques like alpha-beta pruning, handling complex game states.

Targeted Application & Tools that can be used:

1. C or C++ Compiler (g++): The standard compiler for CP. Familiarize students with compilation flags (e.g., - O2 for optimization).

2. IDE (Integrated Development Environment): Code:: Blocks, Visual Studio, CLion, or similar IDEs. These provide debugging capabilities, code completion, and other helpful features.

3. Online Judges (CodeChef, Codeforces, LeetCode, HackerRank): Essential for practicing and submitting solutions.

4. Debugger (gdb): Crucial for understanding code execution and finding bugs. Origin, excel and Mat lab soft wares for programming and data analysis.

5. Number Theory Libraries: Some libraries provide pre-built functions for number theory operations (though often it's better to implement them yourself for learning).

6. Wolfram Alpha: A useful tool for verifying number theory calculations and exploring concepts.

7. **String Libraries:** Familiarize students with the string manipulation functions available in C++.

8. **Graph Visualization Tools:** Tools like Graphviz can be helpful for visualizing graphs and understanding graph algorithms.

9. **DP Debugging Techniques:** Practice debugging DP solutions, as they can be complex. Visualizing the DP table can be helpful.

Text Books:

1 Guide to Competitive Programming: Learning and Improving Algorithms Through Contests" (3rd Edition), Antti Laaksonen, springer, 2024

2 "Data Structures and Algorithms in Java: A Project-Based Approach" – Dan S. Myers, Cambridge University Press

Reference Books:

1. Data Structures and Algorithmic Thinking with Python/C++/Java", *Narasimha Karumanchi, 5th Edition, Career Monk, 2017.*

2. Introduction to Algorithms, <u>Thomas H. Cormen</u> (Author), <u>Charles E. Leiserson</u> (Author), <u>Ronald L.</u> <u>Rivest</u>, fourth edition April 2022

Web Resources

1. <u>https://nptel.ac.in/courses/106106231</u>

2.

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

<mark>Assessment Type</mark>





Presidency University Act, 2013 of the Karnataka Act No. 41 of 2013 | Established under Section 2(f) of UGC Act, 1956 Approved by AICTE, New Delhi



Midterm exam

- Assignment (review of digital/ e-resource from PU link given in references section mandatory to submit screen shot accessing digital resource.)
- Quiz
- End Term Exam
- Self-Learning



Relevance and Usefulness of the Syllabus for Computer Science Students

Enhanced Problem-Solving Skills:

• **Algorithmic Thinking:** CP heavily emphasizes algorithmic thinking, which is fundamental to computer science. Students learn to break down complex problems into smaller, manageable parts and design efficient solutions.

• **Analytical Skills:** CP problems often require careful analysis of constraints, edge cases, and potential optimizations. This strengthens students' analytical abilities, which are crucial for debugging, testing, and ensuring code quality.

• **Creative Problem-Solving:** Many CP problems require creative and out-of-the-box thinking. Students learn to explore different approaches, adapt existing algorithms, and devise novel solutions.

2. Deep Understanding of Data Structures and Algorithms:

• **Practical Application:** CP provides a practical context for learning data structures and algorithms. Students don't just learn about them in theory; they apply them to solve real problems, solidifying their understanding.

• **Performance Analysis:** CP forces students to consider the efficiency of their solutions. They learn to analyze time and space complexity, choose appropriate data structures, and optimize their code for performance.

• **Implementation Skills:** CP requires students to implement data structures and algorithms from scratch. This strengthens their coding skills and deepens their understanding of how these concepts work under the hood.

3. Improved Coding Proficiency:

• **Coding Fluency:** CP involves a lot of coding practice. Students become more fluent in their chosen programming language, improving their coding speed and accuracy.

• **Debugging Skills:** CP problems often require careful debugging to identify and fix errors. Students develop strong debugging skills, which are essential for any software developer.

• **Code Optimization:** CP emphasizes writing efficient and optimized code. Students learn to write code that is not only correct but also performs well under different input conditions.

4. Preparation for Technical Interviews:

• Algorithm and Data Structure Questions: Many technical interviews at top tech companies heavily feature questions on algorithms and data structures, similar to those found in CP.

• **Problem-Solving Assessment:** CP experience demonstrates a student's problem-solving abilities, coding skills, and algorithmic thinking, all of which are highly valued by employers.

• Competitive Edge: Students with CP experience often have a competitive edge in



technical interviews, as they are better prepared to tackle challenging coding problems.

5. Development of Valuable Soft Skills:

• **Time Management:** CP contests often have time constraints, forcing students to manage their time effectively and prioritize tasks.

• **Pressure Handling:** CP contests can be stressful, requiring students to perform under pressure and maintain focus.

• **Persistence:** Many CP problems require significant effort and persistence to solve. Students learn to persevere through challenges and not give up easily.

Bench Mark:

> The syllabus is framed based on referring the syllabus from National Institute of

Technology, Kurukshetra, University of Arkansas - Fort Smith, Carnegie Mellon,



Itgalpur, Rajankunte, Yelahanka, Bengaluru – 560064

Page **1** of 327

Course Code:	Course Title: Cloud computing			0	0				
CSE2506	Type of Course: Theory	L- T-P- C	3	0	0	3			
Version No.	2.0		•						
Course Pre- requisites									
Anti-requisites	NIL								
Course Description	This Course is designed to introduce the as a new computing paradigm. Cloud Cor- years as a new paradigm for hosting an Internet. The students can explore terminology, principles and applications. of the Cloud Computing such as theoretic aspects. Topics include: Evolution of cloud available today, Introduction, Archite Infrastructure, platform, software, Type cloud services, Collaborating using cloud cloud, Security, Standards and Application	This Course is designed to introduce the concepts of Cloud Computing as a new computing paradigm. Cloud Computing has emerged in recent vears as a new paradigm for hosting and delivering services over the internet. The students can explore various Cloud Computing cerminology, principles and applications. Understanding different views of the Cloud Computing such as theoretical, technical and commercial aspects. Topics include: Evolution of cloud computing and its services available today, Introduction, Architecture of cloud computing, infrastructure, platform, software, Types of cloud, Business models, cloud services, Collaborating using cloud services, Virtualization for							
Course Objective	The objective of the course is to fam concepts of Could computing and Virtuali through Participative Learning technique	iliarize the l zation and at s.	earr tain	ners Emp	with ployal	the oility			
Course Outcomes	On successful completion of the course the course the second complete second seco	he students s	shall	be a	able t	o:			
	computing services.	utilig, virtua	nzati			iouu			
	Discuss high-throughput and data-intensive computing.								

	· Explain secur	ity an	d standards in	cloud	computing.		
	· Demonstrate	the ir	nstallation and	config	guration of virtu	ial ma	ichine.
Course Content:							
Module 1	Introduction to Cloud and Virtualization		Assignment		Virtualization		10 Sessions
Topics:						1	
Introduction to Cloud and Virtualization Cloud Computing at a Glance, Historical Developments, Building Cloud Computing Environments, Computing Platforms and Technologies, Virtualization, Characteristics of Virtualized Environments Taxonomy of Virtualization Techniques, Virtualization and Cloud Computing, Technology Examples, Cloud Computing Architecture, IaaS, PaaS,							
Module 2	High Throughp and Data Intens Computing	ut sive	Assignment	Assignment Virtualization			10 Sessions
Topics:						I	
High Throughp Task based pro Reduce Program	out and Data Inte gramming, Intro mming.	nsive ductio	Computing: T on to DIC, Tec	`ask co hnolog	mputing, MPI a gies for DIC, Ai	applica neka N	ations, ⁄Iap
Module 3	Cloud Security Standards	and	Assignment		Virtualization		9 Sessions
Topics:						I	
Cloud Security and Standards: Cloud Security Challenges, Software-as-a-Service Security, Application standards, Client standards, Infrastructure and Service standards.							
Module 4	Cloud Platforms	Assig	nment	Virtualization 9		9 S	Sessions
Cloud Platforms, Advances in cloud: introduction to Amazon Web Services: Introduction to Google App Engine, Introduction to Microsoft Azure. Media Clouds - Security Clouds - Computing Clouds - Mobile Clouds – Federated Clouds – Hybrid Cloud							

Targeted Application & Tools that can be used:

Text Book(s):

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

Security", CRC Press.

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

Hill Education.

Reference(s):

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

2. Anthony T Velte, Toby J Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw-Hill. Web resources: https://presiuniv.knimbus.com/user#/home



Itgalpur, Rajankunte, Yelahanka, Bengaluru – 560064

Course Code:	Course Title: Mobile App	plication Development							
CSE2508	Type of Course: Theory		L- T-P- C	2	0	0	2		
Version No.	2.0								
Course Pre- requisites	The student needs to have concepts with Java/C#, XN	fundamental understandi ML, usage of any integrat	ing of object-o ted developme	riente nt en	ed pr viror	ogram nment.	ming		
Anti- requisites	NIL								
Course Description	The course deals with the b of the course is to develop the following phone mater simple GUI applications a Topics include user inter handling; network technic application framework and interface, Store data on the	The course deals with the basics of android platform and application life cycle. The goal of the course is to develop mobile applications with Android containing at least one of the following phone material components: GPS, accelerometer or phone camera, use simple GUI applications and work with database to store data locally or in a server. Topics include user interface design; user interface building; input methods; data handling; network techniques and URL loading; GPS and motion sensing. Android application framework and deployment. Power management, Screen resolution, Touch interface, Store data on the device.							
Course Objective	The objective of the course is to familiarize the learners with the concepts of Mobile Applications and Development as mentioned above and attain Employability Skills through Experiential Learning Techniques.								
Course Outcomes	 On successful completion of the course the students shall be able to: 1. Discuss the fundamentals of mobile application development and its architecture. (Comprehension) 2. Illustrate mobile applications with appropriate android view. (Application) 3. Demonstrate the use of services, broadcast receiver, Notifications and content provider.(Application) 4. Apply data persistence techniques, to perform CRUD operations. (Application) 5. Use advanced concerts for mobile application development (Application) 								
Course Content:									
Module 1	Introduction and Architecture of Android	Assignment	Simulation/E Analysis	Data		1 Sess	0 sions		

Topics:								
Android: History and features, Architecture, Development Tools, Android Debug Bridge (ADB), and Life cycle.								
Module 2	User Interfaces, Inter and Fragments	nt	Term paper/Assignme	ent	Simulation/D Analysis	ata	15 Sessions	
Topics:								
Views, Layout,	Menu, Intent and Frag	ment	s.					
Module 3	Components of Andr	roid	Term paper/Assignment		Simulation/D Analysis	ata	15 Sessions	
Topics:			L					
Activities, Servi	ces, Broadcast receive	ers, C	ontent providers,	User 1	Navigation			
Module 4	Notifications and T Data Persistence p	erm aper/	Assignment	Simul Analy	ation/Data sis	15 Ses	Sessions	
Topics:								
Notification, Sh	ared Preferences, SQL	Lite da	atabase, Android	Room	with a View, Fir	ebase.		
Module 5	Advance App Development	Term	paper/Assignmer	nt Simu Anal	llation/Data ysis	15 Se	Sessions	
Topics:								
Graphics and An Views, Canvas.	nimation, App Widgets	s, Ser	nsors, Performanc	e, Loc	ation, Places, M	apping, (Custom	
Targeted Appli	cation & Tools that c	an be	e used:					
Applications:								
Native Andr	oid Applications							
Native iOS A	Applications							
Cross Platfo	Cross Platform mobile Apps							
Mobile web	Applications							

Text Book(s):

T1. Pradeep kothari "Android Application Development - Black Book", dreamtechpress

T2. Barry Burd (Author), "Android Application Development" ALL - IN - ONE FOR Dummies

T3. Jeff Mcherter (Author), Scott Gowell (Author), "Professional mobile Application

Development" paperback, Wrox - Wiley India Private Limited

T4. Wei-Meng Lee (Author) "Beginning Android Application Development" Wrox - Wiley

India Private Limited

Reference(s):

1. Bill Phillips, Chris Stewart, and Kristin Marsicano (Author) "Android Programming" 3rd edition,

2017. The Big Nerd Ranch Guide, Big Nerd Ranch LLC, 5. The Big Nerd Ranch Guide, by"

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

2014.

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

4. J F DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition, Wiley India Pvt

Ltd, 2016. ISBN-13: 978-8126565580

5. Anubhav Pradhan, Anil V Deshpande, "Composing Mobile Apps" using Android, Wiley 2014,

ISBN: 978-81-265-4660-2

6. Reto Meier "Professional Android Application Development"

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

Course Code: CSE2000	Course Title: Software De Type of Course: School Co	sign and Deve re [Theory On	lopment ly]	L-T- P- C	3.	-0-0-3
Version No.	1.0			-		
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The objective of this cours	e is to provide	the fundame	entals con	cepts of S	oftware
	Engineering process and p	rinciples.				
	The course covers softwar	e requirement	engineering	processes	, system a	analysis,
	The course covers softwar	e quality confi	iguration mar	nagement	and main	itenance
Course Obiectives	The objective of the course	e is to familiari	ze the learne	rs with th	e concept	s of
·····	Software Engineering and	d attain Skill De	evelopment tl	hrough Pa	rticipative	e Learning
	techniques.		-	-	-	_
Course Out Comes	On successful completion	of this course t	the students s	shall be at	ole to:	
	1] Describe the Sof	tware Engin	eering prin	ciples,	ethics a	and process
	models(Knowledge)					ç .
	2] Identify the requireme	ents, analysis	and appropr	late desig	gn model	s for a given
	3] Understand the Agile Pr	inciples(Knowl	ledge)			
	4] Apply an appropriate planning, scheduling, evaluation and maintenance princ					
	involved in software(Appli	cation)				
	Introduction to Software					
Module 1	Engineering and Process	Quiz				10 Hours
	Wodels (Knowledge level)					
Introduction: Need for Sof	tware Engineering. Profes	l sional Softwar	l e Developme	nt. Softw	are Engin	eering Ethics.
Software Engineering Pract	ice-Essence of Practice, Ger	neral Principles	s Software De	evelopme	nt Life Cyc	le g
Models: Waterfall Model	- Classical Waterfall Mo	del, Iterative	Waterfall Mo	odel, Evo	lutionary	model-Spiral,
Prototype.	1	1	1			
	Software Requirements,	A	Developmen	t of SRS		12.11
iviodule 2	Analysis and Design	Assignment	documents f	or a given		12 Hours
Requirements Engineering	r: Eliciting requirements	Eunctional ar	nd non- Fun	ctional re	equireme	nts. Software
Requirements Specification	(SRS), Requirement Analy	sis and validat	ion. Requirer	nents mo	delling- In	troduction to
Use Cases, Activity diagram	and Swim lane diagram.	CASE support i	n Software L	ife Cycle,	Character	ristics of CASE
Tools, Architecture of a CAS	E Environment.					
Design: Design concepts, A	rchitectural design, Compo	nent based des	sign, User inte	erface des	sign.	[
	Agile Principles &	Qui				10.11
iviodule 3	Devops (Knowledge level)	Quiz				10 Hours
		· · ·				o
Agile: Scrum Roles and a	ctivities, Sprint Agile softw duct backlogs, Stake bolder	ware developr	nent method	ds - Scalii volonmont	ng, User	Stories, Agile
Devops: Introduction, defin	ition, history, tools,	Toles, Dynami	c System Dev	elopment	l Methou.	
	Coffuero Testine and					
Module 4	Maintenance	Assignment	Apply the tes	sting conc	epts	13 Hours
	(Application Level)		using Progra	ming		10 110013
l	· · · · · · · · · · · · · · · · · · ·	1	1			

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] R1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", VII Edition, McGraw-Hill, 2017.

2] B2. Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", VI Edition, McGraw-Hill, 2018.

References

- 1. Rajib Mall, "Fundamentals of Software Engineering", VI Edition, PHI learning private limited, 2015.
- 2. Ian Sommerville, "Software Engineering", IX Edition, Pearson Education Asia, 2011.

3. 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



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Course Code:	Course Title: Cloud co	omputing								
CSE2507	Type of Course : Lab		L- T-P- C	0	0	2	1			
Version No.	1.0									
Course Pre- requisites										
Anti-requisites	NIL									
Course Description	This course is designed services, and deploymed manage cloud environin Google Cloud. The co- computing, cloud stee assignments, students managing cloud resource effective cloud solution	This course is designed to give hands-on experience with cloud platforms, services, and deployment models. Students will learn to set up, configure, and nanage cloud environments using platforms like AWS, Microsoft Azure, and Google Cloud. The course covers virtualization, containerization, serverless computing, cloud storage, security, and scalability. Through practical assignments, students will develop skills in deploying cloud applications, managing cloud resources, automating cloud workflows, and implementing cost- effective cloud solutions.								
Course Objective	The objective of the co manage virtual machin applications, optimize c	ourse is to Understand es, implement cloud cost and performance.	d Cloud Infrast storage, develo	tructu p an	ure, d d de	deploy ploy a	/ and cloud			
Course Outcomes	On successful completion CO1 · Deploy and Mar CO2. Develop and Dep CO3. Optimize Perform CO4. Implement Secu	 On successful completion of the course the students shall be able to: CO1 · Deploy and Manage Cloud Resources. CO2. Develop and Deploy Cloud-based Applications CO3. Optimize Performance and Cost in the Cloud CO4. Implement Security and Automation in Cloud Environments 								
Course Content:										
Module 1	Introduction to Cloud and Virtualization	Assignment	Virtualization			1 Sess	0 sions			

Lab Assignment	1: Setting Up Virtual Ma	achines on Cloud					
• Create a Virtual Machine (VM) on AWS/Azure/GCP Configure OS, storage, and network settings							
• Connect to the VM using SSH/RDP Install web server (Apache/Nginx) and deploy a static webpage							
Lab Assignment	2: Containerization Usin	g Docker					
• Install D	ocker on a local or cloud	VM					
• Create an	id run a Docker containe	er					
• Build a c	ustom Docker image wi	th a simple Python/No	de.js application				
• Push the	image to Docker Hub a	nd deploy it on a new	VM				
Module 2	High Throughput and Data Intensive Computing	Assignment	Virtualization	10 Sessions			
Lab Assignment	1: Setting Up a Distribut	ed Computing Environ	nment				
• Launch a	a Hadoop or Spark clus	ter on AWS EMR / Az	zure HDInsight / Google	Dataproc			
• Configur	re HDFS (Hadoop Distr	ibuted File System) f	or big data storage				
• Run a ba	asic MapReduce job on	sample data					
Lab Assignment	2: Data Preprocessing w	ith Cloud Storage					
• Store lar	ge datasets in Amazon S	3 / Azure Blob Storag	ge / Google Cloud Stora	nge			
• Use Apa	iche Spark or Hadoop t	o read, clean, and proc	ess data				
• Convert	datasets into Parquet or	Avro formats for effi	cient storage				
Lab Assignment	3: Batch Processing with	n Apache Spark					
• Load lar	ge datasets (e.g., logs, tw	eets, transaction data)	into Spark DataFrame				
• Perform	ETL (Extract, Transfo	rm, Load) operations	on the data				
• Use Spa	rkSQL for querying larg	ge datasets					
Lab Assignment	4: Real-Time Data Proce	essing with Spark Strea	aming				
• Set up K	afka / AWS Kinesis / G	oogle Pub/Sub for rea	l-time data ingestion				
• Process s	streaming data using Spa	ark Streaming					

•	Perform windowed aggregations and visualize real-time trends					
Lab As	b Assignment 5: Cloud-Based Machine Learning with Big Data					
• training	Use Google BigQuery ML / AWS SageMaker / Azure Machine Learning for model ining					
•	Train a li	inear regression or class	sification model on a l	arge dataset		
•	Deploy the trained model as an API for real-time predictions					
Lab As	signment	6: Running Parallel Mac	hine Learning Worklo	ads		
•	Impleme	ent distributed ML train	ing using Spark MLI	ib or TensorFlow on Cl	oud TPUs	
•	Train mo	dels on a large dataset an	d optimize performanc	e using distributed exec	ution	
Lab As	signment	7: Auto-Scaling and Loa	d Balancing for Data I	Processing		
•	Deploy a	a serverless Spark job u	sing AWS Glue / Azu	re Synapse		
•	Impleme	ent auto-scaling for high	-throughput jobs			
•	Measure	performance improveme	ents using cloud monite	oring tools		
Lab As	signment	8: Cost Optimization for	High-Throughput Dat	a Processing		
•	Analyze	cloud cost reports for da	ata-intensive workload	S		
•	Optimize	e cloud storage and comp	oute resources for cost-	efficiency		
•	Compare	e on-demand vs. reserve	ed vs. spot instances fo	or cost savings		
Modul	e 3	Cloud Security and Standards	Assignment	Virtualization	9 Sessions	
Lab As	signment	9: Configuring Identity a	and Access Manageme	nt (IAM)		
•	Set up IAM roles and policies in AWS / Azure / Google Cloud					
•	Create and assign users with least privilege access					
•	Implement Multi-Factor Authentication (MFA) for added security					
•	Audit IAM policies using AWS IAM Access Analyzer / Azure Security Center					
Lab Assignment 10: Setting Up Single Sign-On (SSO) and Role-Based Access Control (RBAC)						
•	Configure AWS Cognito / Azure Active Directory / Google IAM for authentication					

• Implement Role-Based Access Control (RBAC) for users and groups					
• Integrate OAuth 2.0 / OpenID Connect (OIDC) / SAML for secure authentication					
Lab Assignment 11: Encrypting Data at Rest and in Transit					
• Encrypt cloud storage (S3, Blob, Cloud Storage) using KMS (Key Management Service)					
• Set up TLS/SSL certificates for secure web traffic encryption					
• Enable database encryption (AWS RDS, Azure SQL, GCP Cloud SQL)					
Lab Assignment 12: Implementing Compliance & Governance in Cloud					
• Enable GDPR, HIPAA, ISO 27001 compliance tools in cloud platforms					
• Use AWS Config / Azure Policy / GCP Security Command Center to enforce compliance					
• Conduct security audits and generate compliance reports					
Lab Assignment 13: Implementing Cloud Monitoring & Threat Detection					
• Configure AWS CloudTrail / Azure Monitor / GCP Operations Suite for activity logging					
• Set up intrusion detection systems (IDS) & anomaly detection					
• Analyze security logs using Amazon GuardDuty / Azure Sentinel / Chronicle Security					
Lab Assignment 14: Automating Security Incident Response					
• Deploy a Serverless Lambda / Azure Logic App to automatically respond to security incidents					
• Implement automated alerts for suspicious activity					
• Test a denial-of-service (DDoS) simulation and implement mitigation strategies					
Module 4Cloud PlatformsAssignmentVirtualization9 Sessions					
Lab Assignment 15: Getting Started with Cloud Platforms					
• Create a free-tier account on AWS, Azure, or Google Cloud					
• Navigate the Cloud Console, CLI, and SDKs					
• Explore and configure dashboard, billing, and IAM settings					
Lab Assignment 16: Launching a Virtual Machine (VM) on Cloud					
• Deploy a VM instance using AWS EC2, Azure Virtual Machines, or Google Compute Engine					

Configure OS, storage, networking, and security groups
Connect to the instance using SSH (Linux) or RDP (Windows)
Lab Assignment 17: Cloud Storage and File Management
• Create Object Storage (AWS S3 / Azure Blob Storage / Google Cloud Storage) Upload, download, and set access permissions for files Implement Lifecycle Policies and Versioning
Lab Assignment 18: Cloud Database Management
• Deploy a Relational Database (AWS RDS / Azure SQL Database / Cloud SQL) Connect and query the database using MySQL/PostgreSQL clients Set up database backups and automatic scaling
Lab Assignment 19: Configuring Virtual Networks in Cloud
• Set up a Virtual Private Cloud (VPC) / Azure Virtual Network / GCP VPC Configure subnets, firewalls, and security groups Test network communication between two VMs
Lab Assignment 20: Deploying a Web Application on Cloud
Deploy a Python/Node.js/Java web app using:
AWS Elastic Beanstalk
• Azure App Service
• Google App Engine Connect the app to Cloud Database (RDS, CosmosDB, Firestore) Monitor application performance and logs
Targeted Application & Tools that can be used:
Text Book(s):
1. John Rittinghouse and James Ransome, "Cloud Computing, Implementation, Management and

Security", CRC Press.

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

Hill Education.

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

2. Anthony T Velte, Toby J Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw-Hill. Web resources: https://presiuniv.knimbus.com/user#/home



Itgalpur, Rajankunte, Yelahanka, Bengaluru – 560064

Course Code:	Course Title: Mobile A	pplication					
eourse coue.	Development Lab	PP ¹¹					
CSE2509	1		L- T-P- C	0	0	4	2
	Type of Course: Lab						
Version No.	2.0						
Course Pre- requisites	The student needs to have fundamental understanding of object-oriented programming concepts with Java/C#, XML, usage of any integrated development environment.						
Anti-requisites	NIL						
Course Description	The course provides hands-on experience in designing, developing, and deploying mobile applications for Android and iOS platforms. Students will work with native development frameworks such as Android Studio (Java/Kotlin) and Xcode (Swift), as well as explore cross-platform tools like Flutter or React Native.						
Course Objective	The objective of the course is to develop Native and Cross-Platform Mobile Applications, design Interactive and Responsive User Interfaces, integrate Backend Services and APIs, implement State Management and Performance Optimization, ensure Mobile App Security and Data Protection						
Course	On successful completion of the course the students shall be able to:						
Outcomes	1. Develop Functional Mobile Applications						
2. Design and Implement Interactive UIs							
3. Integrate Cloud Services and APIs							
	4. Integrate Backend Systems and Data Management						
	5. Deploy, Publish, and Maintain advanced Mobile Application						
Course Content:							
Module 1	Introduction and Architecture of Android	Assignment	Simulation/D Analysis	Data		1 Sess	0 sions

1.a. Design an app to read user inputs using edit text and display the result of arithmetic operations using toast message.

1.b. Create an android app to calculate the current age of yourself, select your DOB using date picker.

2. Design an app to input your personal information. Use an autocomplete text view to select your place of birth.

	User Interfaces, Intent	Term	Simulation/Data	a 15	
Module 2	and Fragments	paper/Assignme	nt Analysis	Sessions	
2 a Dasian an an					
5. a. Design an ap	p to select elective cour	se using spinner vie	w and on click of the di	splay button,	
toast your ID and	selected elective course				
3. b. Design a res	taurant menu app to prir	t the total amount o	of orders.		
	Components of	Term	Simulation/Data	a 15	
Module 3	Android	paper/Assignme	nt Analysis	Sessions	
			1 · ·		
4. Develop an and	froid app that uses inten	t to maintain the fol	lowing scenario.		
Check the eligibil	lity criteria for voting Ir	mut the Aadhar no	Name & age in the first	activity If the	
age is above 18. d	lisplay the voter's detail	in the second activi	ty. Else, display, "You at	re not eligible to	
vote" in the secon	nd Activity.				
	2				
5. Demonstrate th	e use of fragment with l	ist of buttons repres	senting various colors, an	nd on click of	
these buttons, the	appropriate color is fille	ed in the next fragm	ent. Create an Android a	pplication to input	
the vitals of a per-	son (temperature, BP). I	f the vitals are abno	rmal, give proper notific	ation to the user.	
6 Create an andraid ann to far mayia ticket hacking. Save the year name of the system any in a shared					
o. Create an anurous app to for movie ticket booking. Save the user name of the customer using shared preferences. After completion of booking, retrieve the username from the shared preferences and print					
the ticket details					
Module 4	Notifications and Term	1	Simulation/Data	15 Sessions	
	Data Persistence pape	r/Assignment	Analysis		
		C	5		
7. Create an android application to manage the details of students' database using SQLite.Use necessary					
UI components, v	which perform the operat	tions such as inserti	on, modification, remov	al and	
view Presidency I	Iniversity needs on ADE	for Admission alig	ibility checking for stud	ents for that you	
need to take the following information from the Student: registration ID, physics, chemistry and					

PCM (Total marks %) Fee concession

mathematics marks (PCM), fees is allotted as below criteria.

90 above 80 %

70 to 89 60 %

Below 69 % no concession

On click on the button "Registration" details should be stored in the database using SQLite. Create button DISPLAY ALL (full students list) on click on the button it should display the students list per the fee

concession.

8. A company need to design an app that plays soft music automatically in the background. Create an app to achieve this functionality.

9. Create an android application such that your view object in the Activity can be Animated with fadein effect. Create an appropriate XML file named fade-in and write the application to perform the property animation.

Module 5	Advance App	Term paper/Assignment	Simulation/Data	15 Sessions
	Development		Analysis	

10. Demonstrate how to send SMS and email.

11. Create an android application to transfer a file using WiFi. Create an android application "Where am I" with an Activity that uses the GPS Location provider to find the device's last known location.

Targeted Application & Tools that can be used:

Applications:

- Native Android Applications (Java/Kotlin)
- Android Mobile Apps built for Android smartphones and tablets using Java or Kotlin programming languages.
- Target audience: Android users.
- Native iOS Applications (Swift)
- iOS Mobile Apps designed for iPhone and iPad using Swift.
- Target audience: iOS users (Apple ecosystem).
- Cross-Platform Mobile Apps (Flutter, React Native)

• Cross-platform apps designed to run on both Android and iOS from a single codebase using frameworks like Flutter or React Native.

- Target audience: Users on both Android and iOS platforms.
- Mobile Web Applications (Progressive Web Apps PWA)

• Mobile-optimized web applications using HTML5, CSS3, and JavaScript that run in a browser with native-like functionality (offline support, push notifications).

• Target audience: Users accessing apps via mobile browsers.

Development Tools and Frameworks

• Integrated Development Environments (IDEs)

• Android Studio (for Android): The official IDE for Android development, supporting Java, Kotlin, and Android SDK.

• Xcode (for iOS): The official IDE for iOS development with Swift and Objective-C, providing a comprehensive suite of development tools for iPhone/iPad applications.

• Visual Studio Code (VS Code): Lightweight IDE for working with Flutter, React Native, and web development projects.

• Cross-Platform Development Frameworks

• Flutter: Open-source UI framework by Google for building natively compiled applications for mobile, web, and desktop from a single codebase.

• React Native: Open-source framework developed by Facebook for building cross-platform apps with JavaScript and React.

• Backend & Cloud Tools

• Firebase: Google's backend-as-a-service (BaaS) platform offering authentication, real-time databases, cloud storage, and push notifications for mobile apps.

• AWS Amplify: Cloud platform for backend services (API, storage, authentication) and mobile deployment.

• SQLite / Realm: Local storage solutions for mobile apps to manage data storage and retrieval on-device.

• Mobile App Testing and Debugging Tools

• Android Emulator (for Android): A virtual device to run and test Android apps without needing physical devices.

• Xcode Simulator (for iOS): A tool to simulate different iOS devices and test apps during development.

• Appium: Open-source tool for automated testing across native, hybrid, and mobile web applications.

• Version Control and Collaboration

• Git: Version control system for managing code changes and collaborating with teams.

• GitHub / GitLab / Bitbucket: Online platforms for hosting Git repositories, collaboration, and version control management.

• Mobile App Deployment Tools

• Google Play Console: For managing Android app publishing, distribution, and monitoring.

• Apple App Store Connect: For managing iOS app submissions, reviews, and releases on the Apple App Store.

• UI/UX Design Tools

• Figma / Adobe XD: Tools for UI/UX design and wireframing to create the visual elements of mobile applications before development.

• Sketch: Vector-based design tool for iOS UI design and prototyping

Text Book(s):

- T1. Pradeep kothari "Android Application Development Black Book", dreamtechpress
- T2. Barry Burd (Author), "Android Application Development" ALL IN ONE FOR Dummies
- T3. Jeff Mcherter (Author), Scott Gowell (Author), "Professional mobile Application

Development" paperback, Wrox - Wiley India Private Limited

T4. Wei-Meng Lee (Author) "Beginning Android Application Development" Wrox – Wiley

India Private Limited

Reference(s):

1. Bill Phillips, Chris Stewart, and Kristin Marsicano (Author) "Android Programming" 3rd edition,

2017. The Big Nerd Ranch Guide, Big Nerd Ranch LLC, 5. The Big Nerd Ranch Guide, by"

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

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

4. J F DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition, Wiley India Pvt

Ltd, 2016. ISBN-13: 978-8126565580

5. Anubhav Pradhan, Anil V Deshpande, "Composing Mobile Apps" using Android, Wiley 2014,

ISBN: 978-81-265-4660-2

6. Reto Meier "Professional Android Application Development"

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

Course Code: PPS	Course Title: Preparedness for I	nterview				
3018	Skills					
	Type of Course: Practical Only C	Course	L- P- C	0	2	1
Version No.	1.0		1	1		1
Course Pre-	Students are proficie	ent in English.				
requisites	• Students should have attitude to learn and excel in their field.					
Anti-requisites	NIL					
Description	corporate ready. The modules are set to improve self-confidence, Communicate effectively and Prepare for the Interview to assist in employability. It helps the students to get a glimpse of the acceptable corporate readiness and equip them with the fundamental necessities of being able to confidently deal with the highly competitive corporate environment and helps in making impactful Portfolio and resumes, prepare for lively, meaningful and productive group discussions and crack interviews.					
Course Objective	The objective of the course is to " <mark>Preparedness for Interview</mark> " a PARTICIPATIVE LEARNING techr	o familiarize th nd attain SKILI niques.	ne learners L DEVELOP	with the MENT th	e concept prough	s of
Course Out Comes	CO1: Prepare professional Resumes. CO2: Present Resume and oneself effectively CO3: Apply skills and knowledge learnt for active and effective Group Discussions. CO4: Show Interview Readiness					
Course Content:						
Module 1	RESUME WRITING/ VIDEO RESUMES/PORTFOLIO	Significance of Resume	f Portfolio a	and	10 Hours	

Topics: Content, Order, Font, Layout, use of templates, Display skills and experiences, achievements. Preparing Portfolio, presenting their work, sharing formats of resumes, keywords to be discussed, tips on making smart video resumes. Creating impressions through resumes, Customization, list of common mistakes, Cover letter.

	,		
	Vocab Building		Every Class
Dedicate 5-10min	utes towards vocabulary building	g in every session	
Module 2	Group Discussion	Mock G D	10 Hours
Group discussion a parties. Do & Don	as a placement process, GD techr 't of GD, Case-lets and topics for	niques like Keyword. SPELT & PO GD, practice session and evalua	V of affected tion
Module 3	Personal Interview	Grooming checks + Evaluation + Mock Interview+ Role Play	10 Hours
meet the job's re desired answers, Interviews, guess Telephonic Intervi	quirements. Different interview instilling through Role Play ir timation. Do's and Don'ts'. Gro iew and Virtual Interview, Mind (rounds, HR interviews, Intervie n interviews and constructive oming as an integral part. Calming Interview Techniques.	ew questions and feedback, Stress
Targeted Applicat1.TED Talks2.You Tube3.Activities4.LMSProject work/Assignment	ion & Tools that can be used: Links gnment: Mention the Type of Pro	oject /Assignment proposed for t	this course
1) Re 2) GI 3) PI	esume Writing D		
Text Book			
1. Bibliography o	f Group Discussion– Lyman Spice	er Judson, Ellen MacKechnie Juds	son
2. Priyadarshi Pa India; Second edit	atnaik, "Group Discussion and In ion (1 September 2015)	terview Skills", Cambridge Unive	rsity Press

Dinesh Mathur, "MASTERING INTERVIEWS AND GROUP DISCUSSIONS", CBS Publishers &				
3	Jack Canfield "The Success Principles" 8th Edition HarperCollins Publishers India 2015			
л. Л	Shiv Khora "You Can Win" 2d Edition Bloomsbury India 2014			
4. _				
5.	Stephen R Covey, "7 Habits of Highly Effective People", Simon & Schuster, (2018)			
6.	Resume Writing: Craft a Resume That Will Knock Their Socks Off! By Alexander Burton			
7.	HBR's 10 Must Reads on Emotional Intelligence (with featured article "What Makes			
Leader?"	by Daniel Goleman)			
8.	The presentation secrets of Steve Jobs by Carmine Gallo			
9.	Talk like Ted by Carmine Gallo			
10.	Business Etiquette made easy- The essential guide to professional success- Myka Meier			
11.	Leaders eat last- Simon Sinek			
12.	Ted talk			
links <u>https:</u> /	//www.ted.com/talks/larry smith why you will fail to have a great career			
?language	=en			
13.				
https://ww	vw.ted.com/talks/simon sinek how great leaders inspire action?referrer=pl aylist-			
<u>the_10_m</u>	ost_popular_tedx_talks&autoplay=true			
14.	https://www.ted.com/talks/aimee mullins my 12 pairs of legs?language=en			
Movie Ref	erences			
15.	The intern			
16.	The Pursuit of Happiness			
The Topics	related to Skill Development:			
Art Of Pres through as	sentation and Group Discussion for Skill Development through Participative Learning Techniques. This is attainec sessment Component mentioned in course handout.			
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Course Code:CSE 7100	Course Title: Mini Project Type of Course:	L- T-P- C	0	0	0	4				
Version No.	1.0									
Course Pre-requisites	Knowledge and Skills related to all the courses	s studied in p	orevio	ous se	mester	'S.				
Anti-requisites	NIL									
Course Description	Students observe science and technology in action, develop an awareness of the method of scientific experimentation, and often get an opportunity to see, study and operate sophisticated and costly equipment. They also learn about the implementation of the principles of management they have learnt in class, when they observe multidisciplinary teams of experts from engineering, science, economics, operations research, and management deal with techno-economic problems at the micro and macro levels. Finally, it enables them to develop and refine their language, communication and inter-personal skills, both by its very nature, and by the various evaluation components, such as seminar, group discussion, project report preparation, etc. The broad-based core education, strong in mathematics and science and rich in analytical tools, provides the foundation necessary for the student to understand properly the nature of real-life problems. The students have options to pursue this course as either Project Work and Dissertation at the university, or Project Work in an Industry/Company/ Research Laboratory, or Internship Program in an Industry/Company.									
Course Objectives	The objective of the course is to familiarize the lea Practice and attain Employability Skills through	rners with the Experientia	conc al Lea	epts o arnin	of Profe g techr	ssional iques.				
Course Outcomes	 On successful completion of this course the students shall be able to: 1. Identify the engineering problems related to local, regional, national or global needs. (Understand) 2. Apply appropriate techniques or modern tools for solving the intended problem. (Apply) 3. Design the experiments as per the standards and specifications. (Analyze) 									
	5. Appraise project findings and commu publications. (Create)	 Interpret the events and results for meaningful conclusions. (Evaluate) Appraise project findings and communicate effectively through scholarly publications. (Create) 								

Course Code:CSE 7300	Course Title: Capstone Project Type of Course:	L- T-P- C	0	0	0	10			
Version No.	1.0	L							
Course Pre-requisites	Knowledge and Skills related to all the courses	s studied in p	orevio	ous se	mester	:s.			
Anti-requisites	NIL								
Course Description	of science and technology in action, develop an awareness of the method of scientific experimentation, and often get an opportunity to see, study and operate sophisticated and costly equipment. They also learn about the implementation of the principles of management they have learnt in class, when they observe multidisciplinary teams of experts from engineering, science, economics, operations research, and management deal with techno-economic problems at the micro and macro levels. Finally, it enables them to develop and refine their language, communication and inter-personal skills, both by its very nature, and by the various evaluation components, such as seminar, group discussion, project report preparation, etc. The broad-based core education, strong in mathematics and science and rich in analytical tools, provides the foundation necessary for the student to understand properly the nature of real-life problems. The students have options to pursue this course as either Project Work and Dissertation at the university, or Project Work in an Industry/ Company/ Research Laboratory, or Internship Program in an Industry/Company.								
Course Objectives	The objective of the course is to familiarize the lea Practice and attain Employability Skills through	rners with the Experienti	conc al Lea	epts o arnin	f Profe g techr	ssional 1iques.			
Course Outcomes	 On successful completion of this course the students shall be able to: 1. Identify problems based on societal /research needs. (Understand) 2. Apply Knowledge and skill to solve societal problems in a group. (Apply) 3. Develop interpersonal skills to work as member of a group or leader. (Apply) 4. Analyze the inferences from available results through theoretical / Experimental / Simulations. (Analyze) 5. Analyze the impact of solutions in societal and environmental context for sustainable development. (Analyze) 6. Improve in written and oral communication. (Create) 7. Demonstrate capabilities of self-learning in a group, which leads to lifelor learning. (Understand) 								

					1						
Course Code:	Course	litle: Intelligen	it Systems with Machin	е							
CSE3400	Learning	g				_					
					L- T-P-	2	0	2	3		
	Type of	Course: 1] Pro	ogram Core		С						
		2] Lal	boratory integrated								
Version No.		1.0									
Course Pre-		CSE1700 – E	Essentials of Al								
requisites											
Anti-requisites		NIL									
Course Description		Machine Lear Apple's Siri, G core machine Ensemble lear learning from lectures cover the various leas students in de	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 problems.								
Course Objectives		This course is designed to improve the learners ' <u>EMPLOYABILITY SKILLS</u> ' by using <u>EXPERIENTIAL LEARNING</u> techniques. The supervised hands-on laboratory exercises, assessments and the group projects facilitate this learning process.									
Course Out Comes On successful completion of the course the students shall be able to: 1] Apply advanced supervised machine learning methods for predictive modelin [Application] 2] Produce machine learning models with better predictive performance using learning algorithms [Application] 3] Create predictive models using Perceptron learning algorithms[Application] 4] Employ advanced unsupervised learning algorithms for clustering, competiti learning and outlier detection[Application] 5] Implement machine learning based intelligent models using Python libraries [Application]						ling. g meta] tive s.					
Course Content:											
Module 1	Supervis	sed Learning	Assignment		Program Keras/Sk	ming u Iearn	sing	∩ of C L−7	lo. lasses P – 12		
Topics: An overview of Machine Learning(ML); ML workflow; types of ML; Types o					pes of f	eatures,	Feature				
Engineering -Data Imputation Methods; Regression – introduction; simple li				inear r	egressic	n, loss fu	nctions;				
Polynomia	I Regress	sion; Logistic	Regression; Softmax	Regre	ession v	vith c	ross e	ntropy a	as cost		
function;	Bayesian	Learning – Bayes Theorem, estimating conditional probabilities for categorical and									
continuous	s features	, Naïve Bayes	for supervised learnin	ng; Bay	esian Bel	ief net	works;	Support	t Vector		
Machines -	- soft ma	rgin and kernel	tricks.	. ,			,				
Module 2	Ensemb	le Learning	Assignment		Program	ming u	sing	N	lo.		

					Keras/Sklearn	of Classes					
То	nics: Ense	mble Learning - using	uhset of instances – Ba	gging P	asting using subset of fea	L-3 P-4					
pat	tches and	random subspaces me	thod: Voting Classifier.	Randor	n Forest: Boosting – AdaB	oost. Gradient					
Во	osting, Ex	tremely Randomized Ti	ees, Stacking.			,					
Module 3		Perceptron Learning	Assignment /Quiz		Programming using Keras/Sklearn	No. of Classes L-7 P -2					
To Un sof Gra	pics: Per its, logica ftmax, co adient De	ceptron Learning – f al computations with mmon loss functions, scent.	rom biological to arti Perceptrons, common multi-layer Perceptrc	ficial n activati ons and	eurons, Perceptrons, Lin on functions – sigmoid, the Backpropagation al	ear Threshold tanh, relu and gorithm using					
Module 4		Unsupervised Learning	Assignment		Programming using Keras/Sklearn	No. of Classes L-6 P -6					
To inc of Spa De alg	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)										
Exj Lev it u Lev	periment vel 1: Give using Sciki vel 2: Imp	N0 1: Methods for han en a data set from UCI r t-learn library of Pytho lement one of these m	dling missing values epository, implement t n ethods using a custom o	he diffe defined	rent ways of handling mis function in Python.	sing values in					
Exj Lev Plo Lev	periment vel 1 Perf ot using M vel 2 Crea	No. 2: Data Visualization form Exploratory Data A atplotlib and Seaborn ate Heat Maps, WordCl	on Analysis for a given data oud	set by o	creating Scatter Plot, Pair	Plot, Count					
Exj Lev est Lev Lin	 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. 										
Exj Lev Lev cla											
Exj Lev alg	periment vel 1 Give ;orithm	No.5: Bayesian Learnir n a data set from UCI r	ig epository, implement a	classifi	cation model using the Ba	yesian					
Exj	periment vel 1 Give	No.6: Support Vector I n data sets from UCI re	Machine(SVM) pository, implement a l	inear SV	/M and a non-linear SVM	based					

classification model.
Experiment No. 7: Ensemble Learning Level 1 : Implement Ensemble Learning algorithms such as Bagging, Pasting and Out-of Bag Evaluation Level 2 : Random Patches and Random Subspace Method
Experiment No. 8: Ensemble Learning Level 1 : AdaBoost and Gradient Boosting, Stacking
Experiment No. 9: Perceptron Learning Level 1 : Implement the Perceptron Classifier Level 2 : – An Image Classifier Using the Sequential API of Keras
 Experiment No. 10: Unsupervised Learning Level 1 : K-means – simple and mini-batch. Finding the optimal number of clusters using Elbow method and Silhoutte Coefficient . Compare the inertia of both as k increases. Tuning the hyperparameter 'k' using GridSearchCV. Level 2 : - Using clustering for Image segmentation and Preprocessing. Kmeans++ Experiment No. 11: Density Based Clustering Level 1 Implement DBSCAN – clustering using the local density estimation. Perform hard and soft clustering for new instances. Experiment No. 12: Outlier Detection Level 1 Outlier Detection using Isolation Forest and Local Outlier Factor
Targeted Application & Tools that can be used : 1. Execution of the ML algorithms will be done using the Google's cloud service namely "Colab", available at https://colab.research.google.com/ or Jupyter Notebook. 2. The data sets will be from the bench marking repositories such as UCI machine learning repository available at : https://archive.ics.uci.edu/ml/index.php 3. Laboratory tasks will be implemented using the libraries available in Python such as Scikit learn, matplotlib, seaborn, perceptron and the deep learning framework namely Keras.
Project work/Assignment: Mention the Type of Project /Assignment proposed for this course
Students can be assigned a mini project to develop a machine learning application for real-life problems in various domains such as health care, business intelligence, environmental modeling, etc.
 Text Book There are a number of useful textbooks for the course, but each cover only a part of the course syllabus. Following is an indicative list of textbooks. 1. Aurélien Géron, "Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow", Oreilly, Second Edition, 2019. 2. Andreas C Muller, Sarah Guido, "Introduction to Machine Learning with Python :A Guide for Data Scientists", Oreilly, First Edition, 2018 3. Giuseppe Bonaccorso, "Machine Learning Algorithms: A reference guide to popular algorithms from data science and machine learning", Packt Publishing, 2017.
References In references apart from the books and web links, mention a few standards &Hand books relevant to the Laboratory tasks used by the professionals. 1. Tan P. N., Steinbach M & Kumar V. "Introduction to Data Mining", Pearson Education, 2016. https://towardsdatascience.com/machine-learning/home

3.	MITopencourseware: https://ocw.mit.edu/courses/6-0002-introduction-to-computational-
thinking	and-data-science-fall-2016/resources/lecture-11-introduction-to-machine-learning/
4.	https://onlinecourses.nptel.ac.in/noc21_cs85/preview_

Course Code: CSE3401	Course Title: Advance Techniques	ed Deep Learning								
	Type of Course: Theo	ory & Integrated Lab	oratory	L- T-P- C	3	0	0	3		
Version No.	1.0			I	1	1				
Course Pre- requisites	CSE1700 – Essent	ials of AI								
Anti-requisites	NIL									
Course Description	This course introduces students to the concepts of deep neural networks and state of the art approaches to develop deep learning models. In this course students will be given an exposure to the details of neural networks as well as deep learning architectures and to develop end- to-end models for such tasks. It will help to design and develop an application-specific deep learning models and also provide the practical knowledge handling and analyzing end user realistic applications. Topics include Fundamental concepts of deep neural networks, Convolutional Neural Networks, Recurrent Network structures, Deep Unsupervised Learning, Generative Adversarial Networks and applications in various problem domains.									
Course Objective	This course is designe using <u>EXPERIENTIAL L</u>	ed to improve the lea <u>EARNING</u> technique	arners <u>EM</u> s.	<u>PLOYABILITY SKI</u>	<u>LLS</u> b	У				
Course	On successful comple	etion of this course t	he studen	ts shall be able t	o:					
Outcomes	 Learn the Fu Identify the (Apply). To understa Apply deep l 	Indamental Principle Deep Learning Algor and and apply deep g earning architecture	s of Deep rithms for generative es to image	Learning. (Reme learning tasks in models. (Under e and audio data	embe n vari stanc a. (Ap	r). ous r d). plv)	elated do	omains		
Course Content:		0			<u> </u>	<u>r 77</u>				
Module 1	Introduction to Deep Learning and Neural Networks	Assignment					13[7 Sess	L+6P] ions		
Topics: Fundamentals of Functions, Loss Fu Feedforward Neur Dropouts, Batch N Vanishing and Exp	Topics: Fundamentals of Deep Learning, Perceptron, Multilayer Perceptron, Optimizing Perceptions using Activation Functions, Loss Functions, Gradient Descent. Feedforward Neural Network, Training Neural Network with Back-propagation, Hyper parameters, Regularization, Dropouts, Batch Normalization, Practical Issues in Neural Network Training -The Problem of Overfitting, The Vanishing and Exploding Gradient Problems									
Module 2	Common Deep Learning	Assignment					18[8L Sess	+10P] ions		

	Architectures:							
Topics:								
Convolutional Neu	aral Network, Transfer	learning Techniques	s, Va	riants of CNN: DenseNet, ResNet				
Converse Modelli	ing. Decument Neural	Notwork and its .		ata Jawa Chaut Taura Managur				
Recurrent Unit (G	ng: Recurrent Neural	Network and its v	aria	nts - Long Short-Term Memory	(LSTM), Gated			
Madula 2	Deep Generative	Assistant			16[8L+8P]			
Module 3	Models	Assignment			Sessions			
Topics:								
Generative Advers	Sarial Networks, Kohon	en Networks, Autoe	enco	ders, Boltzmann Machine, Restrie	cted Boltzmann			
Machine, Deep Be	liet Network							
	Advanced Deep				13[7] +6P]			
Module-4	Learning	Assignment			Sessions			
	Architectures	-			565510115			
Topics:								
Hopfield Network	, Probabilistic Neural	Network, Deep R	einfo	prcement Learning - The Basic	Framework of			
Reinforcement Lea	arning							
Deep Learning app	plications: Image segme	entation. Obiect det	ecti	on.Speech Recognition. Video An	alvtics			
Project work/Assi	gnment:							
3. Assignme	ent 1 on (Module 1 and	d Module 2)						
4. Assignme	ent 2 on (Module 3 and	d Module 4)						
List of Laboratory	Tasks:							
-								
Lab 1: Working wi	th Deep Learning Fran	neworks						
Objective: Explore	various Deep Learning	Frameworks		· · · · · · · · · · · · · · · · · · ·				
Activity: Practice y	ep learning frameworks	s (Keras, Tensorflow		itplotilb, etc)				
Activity. I factice v	with various methous a							
Lab 2: Build a Basi	ic Artificial Neural Net	work						
Objective: Create	a ANN with DL framew	orks.						
Task: Identify suita	able ANN Layers using I	Keras and Tensorflo	w.					
Activity: Design a	basic Artificial Neural I	Networks using Kera	as wi	th TensorFlow (pima-indians-dia	betes)			
Lab 3 and Lab 4: B	uild a MultiLayer Perc	eptron						
Objective: Create	a MLP for classification	task.						
Task: Identify suita	able model for house p	rice prediction.						
Activity: Design a	IVILP for implementing	classification and fi	ne-t	uning using House price.csv				
Lab 5: Build a Con	volutional Neural Net	work						
Objective: Create	a CNN model.							
Task: Build CNN a	Task: Build CNN architecture for Dog-Cat classification problem.							
Activity: Implement a Convolution Neural Network (CNN) for dog/cat classification problem using keras								
lab 6 and Lah 7. B	uild a Time-Series Mo	del						
Objective: Create	a RNN and LSTM Mode							
Task: Build RNN/L	STM Model for predict	ing time series data	ı.					
Activity Train a ser	ntiment analysis model	on IMDB dataset, u	ise F	NN layers with LSTM/GRU notes				

Lab 8: Build a Gated Recurrent Unit architecture.

Objective: Create a Time Series Model.

Task: Build GRU Architecture for predicting time series data.

Activity: Implement a GRU architecture for language translations.

Lab 9 and Lab 10: Build a Transfer Learning Model.

Objective: Create a Seq2Seq Model

Task: Create Hugging-face API using Transfer learning model.

Activity: Implement Transfer Learning models for classification problems Exploring Hugging-face API

Lab 11: Build an Auto-Encoder model

Objective: Create an Unsupervised Deep Learning Model. Task: Create AutoEncoder network Output Translations. Activity: implement an Encoder-Decoder Recurrent neural network model for Neural Machine Translation.

Lab 12: Build Generative Adversarial Networks.

Objective: Create an Unsupervised Deep Learning Model. Task: Design GAN Architecture for Image generations. Activity: Design a Age Prediction model by Applying Generative Adversarial

REFERENCE MATERIALS:

TEXTBOOKS

- 5. François Chollet, "Deep Learning with Python", 2nd Edition, Manning Publications, 2022
- 6. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2017.

REFERENCES

7. Amlan Chakrabarti Amit Kumar Das, Saptarsi Goswami, Pabitra Mitra , "Deep Learning", Pearson Publication, 2021.

- 8. David Foster, "Generative Deep Learning" O'Reilly Publishers, 2020.
- 9. John D Kellehar, "Deep Learning", MIT Press, 2020.

JOURNALS/MAGAZINES

1. IEEE Transactions on Neural Networks and Learning Systems

https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=5962385

2. IEEE Transactions on Pattern Analysis and Machine Intelligence

https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=34http://ijaerd.com/papers/special_papers/IT032.p df

3. International Journal of Intelligent Systems https://onlinelibrary.wiley.com/journal/1098111x

SWAYAM/NPTEL/MOOCs:

- 4. Swayam Nptel Deep Learning IIT Ropar https://onlinecourses.nptel.ac.in/noc21_cs35/preview
- 5. Coursera Neural Networks and Deep Learning Andrew Ng
- 6. Coursera Neural Networks for Machine Learning by Geoffrey Hinton in Coursera

Course Code:CSE34	Cours Syste 02 Type	e Title: Computational O ms of Course: Discipline Electiv	ptimization for Intelligent e	L-T P- C	3	0	0000	3				
Version No.		1.0										
Course I requisites	Pre-	CSE1700 – Essentials of AI										
Anti-requisi	tes	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 Objective		The objective of the course is to familiarize the learners with the concepts of Optimization Techniques for Machine Learning and attain Skill Development through Participative Learning techniques.										
Course Outcomes		 On successful completion of this course the students shall be able to: Demonstrate simple examples to illustrate how Machine Learning is applied in real world scenarios. [Understand]. Implement Machine Learning models (e.g., decision trees, linear regression, neura networks) using tools or programming languages. [Apply]. Determine the suitability of convex optimization in solving problems like portfolic optimization, machine learning, or network design. [Apply]. Solve convex optimization problems with real or simulated data, such as minimizing 										
Course Content:												
Module 1	: Fund	amentals of Machine	Quiz	ŀ	(nowled	dge base	ed	10				
Topi Guar	cs: Mach antees, Intr	ine Learning Paradigm, Em oduction of VC-Dimension, I	pirical Risk Minimization, S Dimensionality Reduction Tec	tructura chniques	I Risk M	Minimiz	∣ э € ation, L	earning				
Module 2:	Mach	ine learning models	Quiz	Comprehension 12 based Quiz Sessio				12 essions				
Topi Rank	cs: Logistic Matrix Fact	c Regression, Support Vecto corization, Sparse PCA, Multi	r Machines, Sparse Regressi ple Kernel Learning, Loss Fur	on, Low nctions, I	Dimens Entropy	sional E , Cross-	mbeddii Entropy	ng, Low Loss				
Module 3	Conv	ex optimization models	Assignment	E	Batch-w	rise	64	13				
Торі	cs: Linear	Optimization, Convex Quadr	ratic Optimization, Second O	rder Cor	ne Optii	mizatior	n, Semi-	definite				

	Optimization, Convex Composite Optimization.									
Modu	lle 4:	Methods optimization	for	convex	Assignment Presentation	and		Batch-wise Assignment and Presentations	10 Sessions	
	Topics: g gradient i	radient descent methods, coordi	t, Newtor nate desc	n method, cent, cuttir	interior point ng plances, stoch	methods, a astic gradie	active s ent.	set, prox methods,	accelerated	
	Targeted Application & Tools that can be used: Use of Google Colab									
	Project work/Assignment:									
	Survey on Methods for convex optimization									
	Survey on Machine learning models related to optimization									
	Text Book T1. Charu C. Aggarwal, <i>"Linear Algebra and Optimization for Machine Learning"</i> , Springer, 2020. T2. Sra Suvrit, Nowozin Sebastian, and Wright Stephen J, <i>"Optimization for Machine Learning"</i> , The MIT Press 2012									
	References R1.Guanghui Lan, "First-order and Stochastic Optimization Methods for Machine Learning", Springer Cham, 2020. Web References W1. https://sm-nitk.vlabs.ac.in/ W2. https://nptel.ac.in/courses/									
	Topics re optimizat assessme	levant to SKILL ion for Skill D nt component i	DEVELOF evelopmo mentione	PMENT: Co ent throu d in course	oncepts of Conv gh Problem So e handout.	ex optimiz Iving metl	ation m hodoloį	nodels and Methods gies. This is attain	for convex ed through	

Course Code: CSE3403	Course	Title: Reinforcement Learning for AI Systems									
	Type of Course: Theory Only			2	0	2	3				
Version No.		1.0									
Course Pre- requisites	•	CSE1700 – Essentials of AI									
Anti-requisites		NIL									
Course Description		The goal of this class is to provide an introc active research sub-field of machine learning. building programs that learn how to predict a on past experience. Applications of reinforced problems, such as power plant optimization playing, inventory control, and many other fi also produced very compelling models of a course, we will study theoretical properties a	e goal of this class is to provide an introduction to reinforcement learning, a ver- tive research sub-field of machine learning. Reinforcement learning is concerned with ilding programs that learn how to predict and act in a stochastic environment, base past experience. Applications of reinforcement learning range from classical contro- oblems, such as power plant optimization or dynamical system control, to gam aying, inventory control, and many other fields. Notably, reinforcement learning having the produced very compelling models of animal and human learning. During the purse, we will study theoretical properties and practical applications of reinforcement								

			learning. We will fo (available online for and other materials	ning. We will follow the second edition of the classic textbook by Sutton & Barto alable online for free, or from MIT Press), and supplement it as needed with papers other materials.							
Course	Objective		The objective of t Reinforcement Lea	the c arnin	ourse is to familia g and attain Skill	arize th Develo	ne learners with th opment through Pr	e concepts of oblem Solving			
Course	Course Out Comes On successful completion of the course the students shall be able to: 1. Knowledge of basic and advanced reinforcement learning techniques. 2. Identification of suitable learning tasks to which these learning techniques can be applied. 3. Appreciation of some of the current limitations of reinforcement learning techniques. 4. Formulation of decision problems, set up and run computational experiments, evaluation of results from experiments. Course Content: Main Content:										
Course			41		A : +		D	No. of			
wodule	1 	introduc			Assignment		Programming	Classes:10			
Module	other rela Brush up o Expectation Correlation 2 Topics: Introductio	ited fiel f Probabi a. Concep and inde Markov	ds and with di lity concepts - Axio ots of joint and mult ependence. Decision Process terminology. Mar	fferer ms o iple r	nt branches of f probability, conce andom variables, jo Assignment property, Markov	machin pts of r int, cor chains	e learning. Proba random variables, PN nditional and margina Programming . Markov reward r	Ibility Primer /F, PDFs, CDFs, al distributions. No. of Classes:10 process (MRP).			
	Introductio Bellman ec functions, I equations.	n to and quations Bellman	in MRP. Introduct	equa ion t	tions for MRPs alo o Markov decision optimality of value f	ng with proce functio	n proof of existence ess (MDP), state an ns and policies, Belli	of solution to d action value man optimality			
Module	3	Predictio Dynamio	on and Control by C Programing		Assignment		Programming	No. of Classes:10			
Topics: Overview of dynamic programing for MDP, definition and formulation of planning in MDPs, princip optimality, iterative policy evaluation, policy iteration, value iteration, Banach fixed point theorem, policy evaluation mapping property of Bellman expectation and optimality operators, proof of convergen policy evaluation and value iteration algorithms, DP extensions Monte Carlo Methods for Model Free Prediction and Control Overview of Monte Carlo methods for model free RL, First visit and every visit Monte Carlo, Mon								Ps, principle of theorem, proof convergence of Monte Carlo No. of Classes:10			
	Topics: Incrementa estimators, and their va Getting sta variance in function, ad	I Monte unified ariants. rted with Reinforc	Carlo Methods for view of DP, MC and policy gradient me ement Learning, Re c methods.	⁻ Moo I TD e ethoo educin	del Free Prediction, evaluation methods ds, Log-derivative tr ng variance in policy	l , Overv , TD Co rick, Na y gradie	iew TD(0), TD(1) an introl methods - SAR ive REINFORCE algo ent estimates, baseli	Liasses:10 d TD(λ), k-step SA, Q-Learning rithm, bias and nes, advantage			

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	Targeted Application & Tools that can be used: While Convolution Neural Network (CNN) and Recurrent Neural Network (RNN) are becoming mor important for businesses due to their applications in Computer Vision (CV) and Natural Language Processin (NLP), Reinforcement Learning (RL) as a framework for computational neuroscience to model decisio making process seems to be undervalued. Besides, there seems to be very little resources detailing how F is applied in different industries. Despite the criticisms about RL's weaknesses, RL should never be neglected in the space of corporate research given its huge potentials in assisting decision making. Tools: Torch, Google Colaboratory, Spider, Jupiter Notebook
	Project work/Assignment:
	This part is written for general readers. At the same time, it will be of greater value for readers with som knowledge about RL.
	 <u>Resources management in computer clusters</u> Designing algorithms to allocate limited resources to different tasks is challenging and requires humar generated heuristics. The paper "Resource Management with Deep Reinforcement Learning" [2] showe how to use RL to automatically learn to allocate and schedule computer resources to waiting jobs, with th objective to minimize the average job slowdown. State space was formulated as the current resources allocation and the resources profile of jobs. For actio 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 REINFORC algorithm and baseline value to calculate the policy gradients and find the best policy parameters that giv the probability distribution of actions to minimize the objective.
	Researchers tried to design a traffic light controller to solve the congestion problem. Tested only o simulated environment though, their methods showed superior results than traditional methods and she 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 t 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 phas 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.
	 <u>Robotics</u> There are tremendous works on applying RL in Robotics. Readers are referred to for a survey of RL i Robotics. In particular, trained a robot to learn policies to map raw video images to robot's actions. Th RGB images were fed to a CNN and outputs were the motor torques. The RL component was the guide policy search to generate training data that came from its own state distribution.
	There are more than 100 configurable parameters in a web system and the process of tuning th parameters requires a skilled operator and numerous trail-and-error tests. The paper "A Reinforcemer Learning Approach to Online Web System Auto-configuration" showed the first attempt in the domain o how to do autonomic reconfiguration of parameters in multi-tier web systems in VM-based dynam environments
	The reconfiguration process can be formulated as a finite MDP. The state space was the syster configuration, action space was {increase, decrease, keep} for each parameter, and reward was defined a the difference between the given targeted response time and measured response time. The authors use the model-free Q-learning algorithm to do the task.
Ĩ	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, Albert Leon-Garcia
L	3. "Machine Learning: A Probabilistic Perspective", Kevin P. Murphy
	References

1.	Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", Second Edition,
MI	IT 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
op	otimization 12 (2012):
E-F	Resources
NP	PTEL course – https://onlinecourses.nptel.ac.in/noc19_cs55/preview
	https://archive.nptel.ac.in/courses/106/106/106106143/
	https://www.digimat.in/nptel/courses/video/106106143/L35.html
То	pics relevant to "SKILL DEVELOPMENT": Real time Data Analysis using Reinforcement learning for Skill
De	evelopment through Problem Solving techniques. This is attained through assessment component
me	entioned in course handout.

Course Code:	Course Title: Computational Linguistics and		3	0	0	3	
CSE3404	Natural Language Processing	L- T-P- C					
	Type of Course: Theory Only Course						
Version No.	1.0						
Course Pre- requisites	CSE1700 – Essentials of AI	CSE1700 – Essentials of Al					
Anti-requisites	NIL						
Course Description	The purpose of this course is to introduce processing (NLP). NLP is the science of ext is basically how we can teach machines meaning from text. In addition to regular 1. Programming Assignments 2. Regular Quiz Tests (once a week and or	The purpose of this course is to introduce students to the science of natural language processing (NLP). NLP is the science of extracting information from unstructured text. I is basically how we can teach machines to understand human languages and extrac meaning from text. In addition to regular theory, the course also involves: 1. Programming Assignments 2. Regular Quiz Tests (once a week and once after every module)					
Course Objective	The objective of the course is to fam Fundamentals of Natural language F through Participative Learning technique	niliarize the le Processing an es.	arners datta	with in Sk	the con I I Deve	cepts of copment	

	On successful completion of the course the students shall be able to:				
[Knowledge]					
Course Out Comes	[Kilowieuge]	ornora and train mo	odels for di	fforent NI R tasks [Annli	cation
course out comes	NUD Application [Appli	cation			
	• Use wo	ta embeddings for	solving an	NLP Application. [Applic modeling as used in me	duonj shina translation
	Unders [Application]	tand sequence to s	sequence r	nodeling as used in ma	chine translation.
Course Content:					
Module 1	Introduction	Quizzes			7 Sessions
Topics:					
Introductio	n. History. Text Analy	rtics. Various task	ks in NLF	P. Sentence boundary	Detection. Edit
	Word and Text			(6) parsing, machine eran	
Module 2	Representations	Quizzes		Assignments	8 Sessions
Neural Lan processing	guage Models. Text repre (CNN and LSTM).	esentations and clas	ssification.	Deep learning architect	ures for sequence
Module 3	and Parsing	ng Quizzes		Assignments	12 Sessions
Part-of-Spe Markov Me Constituen	eech Tagging – using NLTI odel. Named Entity Recog cy Parsing.	K and spacy. Buildin nition. Relationship	g a PoS Tag between	gger using existing data a NER tagging and PoS tag	and Hidden gging.
Module 4	NLP Applications	Quizzes			9 Sessions
Topics:					
Lexical Res	source Creation. Sentim	ent Analysis. Mach	nine Trans	ation. Word Sense Dis	ambiguation and
Targeted A	oplication & Tools that o	an be used:			
1. Pv	thon Libraries (Eg. NLTK	. Spacy. etc.)			
2. Ja	va (Stanford CoreNLP)				
3. G	oogle Colab				
		Project work/A	ssignment	t:	
Assignmen	t:		-		
Students w	ill have to do group assig	nments for Module	es 2 & 3. As	a part of their assignme	ents, they will
have to im	plement the solution to p	articular problems.			-
Text Book					
T1 Daniel	Jurafsky, and James Mar	tin."Speech and Lan	nguage Pro	cessing" (3rd edition dra	aft, 2022)
References	5				
R1 Chris Ma	anning and HinrichSchutz	e, "Foundations of S	Statistical I	Natural Language Proces	ssing", 1st
Edition, MI	T Press. 1999.				
R2 PawanG	oyal, "Natural Language	Processing". NPTEL	• - •		
E-Book Lin	k for R2: <u>https://drive.go</u>	ogle.com/file/d/1	<u>OnbwAJd-c</u>	dv6htOOZVBgAvLd1Wsc	lORqC/view
Web resou	rces: <u>https://web.stanfo</u>	rd.edu/~jurafsky/s	<u>1p3/</u> 2		
NPTEL Cou	rse: <u>nttps://onlinecours</u>	es.nptel.ac.in/noc2	<u>z_cs98/co</u>	urse	
Topics rel	evant to "SKILL DEVEL	OPMENT": Assign	ment imp	ementations in softw	are, batch wise

presentations for developing Skill Development through Participative Learning techniques.	This is a	attained
through assessment component mentioned in course handout.		

Course Co	ode:	Course Ti	itle: Syne	rgistic Neural Fuzzy (Computing					
CSE3405		Type of C	ourse: Di: יד	scipline Elective in A	I & ML Basket	L-T-P-C	2	0	2	2
			11	leory Course			Z	0	2	5
Version N	No.		1.0							4
Course Pi	re-		CSE170	0 – Essentials of A	AI					
requisite	s									
Anti-requ	uisites		NIL							
Course			This cour	se aims to introduce	the basic conc	epts of N	eural N	letwork	s and Fuz	zy Logic.
Description	on		Neural r	networks reflect the	e behavior of	the hun	nan bi	rain, al	llowing co	omputer
			program	s to recognize patte	erns and solve	commor	n prob	lems in	the field	is of Al,
			machine	learning, and deep	learning. Fuzz	zy Logic i	s a m	ethod tatos tk	of reason	ing that
			making i	n humans that involv	/es all interme	diate nos	sihilitie	s hetw	ie way oi c ieen digita	al values
			YES and	NO. This course intr	oduces fundan	nental co	ncepts	in Neu	iral Netwo	orks and
			Fuzzy Lo	gic Theory.						
Course O	bjective		The obje	ctive of the course is	to familiarize t	he learne	rs with	n the co	ncepts of	Neural
			Network	and Fuzzy Logic an	d attain Skill D	evelopm	ent th	rough	Participat	ive
			Learning	techniques.						
Course O	utcomes		On succe	ssful completion of t	this course the	students	shall	be able	to:	
			1.	Define the concept o	f Neural Netwo	orks. [Kno	wledg	ej		
			2. Notwork	Define the ideas ben	ind most comn	non learn	ing alg	orithms	s in Neura	i
			2	.[KIIUWIEUge]	of Fuzzy Sets a	and Relati	ons [(omnre	hension 1	
			3. 4.	Demonstrate the Fuz	zv logic concer	ots and its	applic	ations.	[Applicati	ion 1
Course Co	ontent:				-7 -8				<u> </u>	
	I	Introduct	tion to	0		Cin ala La				
iviodule 1	L	Neural N	etwork	Quiz		Single La	yer Pe	rceptro	n 90	asses
	Topics:									
	Introduct	ion to NN	: History,	Artificial and biolog	gical neural ne	tworks, A	rtificia	l intelli	gence and	d neural
	networks									
	Neurons	and Neura	al Networ	ks: Biological neuror	is, Models of s	single neu	irons,	Differei	nt neural	network
	models. Singlo Lav	or Porcon	tropular	st moon square algeri	ithm Loarning	curvos L	orning	ratos	Porcontro	'n
	Single Lay	Multilave					anni	grates,	Perceptio	<u>.</u>
Module 2	2	Perceptro	on	Quiz		Multilaye	er Perc	eptron	10	Classes
	Topics:	<u>,</u>								
	Multilaye	r Perceptr	on: The X	OR problem, Back-pr	ropagation alg	orithm, H	euristi	c for im	proving t	he back-
	propagati	ion algorit	hm, Some	e examples.						
	Radial-Ba	sis Functic	on Netwo	rks: Interpolation, Re	gularization, Le	earning st	rategie	s.		
	Kohonen	Self-Orgar	nising Ma	ps: Self-organizing ma	ap, The SOM al	lgorithm,	Learni	ng vect	or quantiz	ation.
Module 3	3	Fuzzy Set	s,	Quiz		Fuzzy Op	eratio	ns	10	Classes

Operations and Relations				
Topics: Fuzzy Sets: Crisp Sets - an Representations of Fuzzy So Fuzzy Operations: Operati Combinations of Operation Fuzzy Relations: Binary Fuz	Overview, Fuzzy Sets - Defi ets, Extension Principles of Fu- ons on Fuzzy Sets - Fuzzy C s, Aggregation Operations. ey relations, Fuzzy Equivalence	nition and uzzy Sets. Complemer ce Relation	Examples, α - Cuts an nts, Fuzzy Intersections is, Fuzzy Compatibility F	d its Properties, 5, Fuzzy Unions, Relations.
Fuzzy Logic Module 4 Fuzzy Controller	and .ogicAssignment	De [.] Coi	veloping Fuzzy Logic ntroller	10Classes
Fuzzy Logic: Classical Logic Inference from Conditiona Propositions. Fuzzy Controllers: An Ov Defuzzification Module, An	. Multivalued Logic, Fuzzy P I Fuzzy Propositions, Condit erview, Fuzzification Modu Example.	ropositions ional and Ile, Fuzzy	s, Fuzzy Quantifiers, Lir Qualified Propositions Rule Base, Fuzzy Inf	nguistic Hedges, and Quantified erence Engine,
Targeted Application & To 1. Python Libraries a 2. Matlab (Neural Neural Neu	o ls that can be used: nd Software (Eg.,Tensorflow, twork Toolbox, Fuzzy Logic T	Scikit-Leai oolbox)	rn etc.)	
Students will have to do gr	oup assignments for Module	es 2 & 4. A	s a part of their assign	ments, they will
Textbook(s): 1. Haykin, Simon. "A https://www.pearson.com, 3rd-Edition/P20000000327 2. George J. Klir and of India, 2015. https://www.worldcat.org/	eural networks and learning 'en-us/subject-catalog/p/Ha 8/9780133002553 Bo Yuan, "Fuzzy Sets and Fu title/fuzzy-sets-and-fuzzy-log	y machines ykin-Neura zzy Logic- gic-theory-	", 3/E. Pearson Educat I-Networks-and-Learnin Theory and Application and-applications/oclc/5	ion India, 2011. ng-Machines- s", Prentice Hall
References:1.Shivanandam, Dee2018.https://www.wileying2.Timothy J. Ross, "Ihttps://onlinelibrary.wiley.3.Kumar S., "Neural2017.https://www.worldca4.Fakhreddine O. Kadesign: theory, tools, and aWeblinkshttps://www.pearson.com,Design-Theory-Tools-and-A	pa S, "Principles of Soft com lia.com/principles-of-soft-co fuzzy Logic with Engineering com/doi/book/10.1002/978: Networks - A Classroom App t.org/title/neural-networks- rray, and Clarence W. De Silv oplications". Pearson Educat (en-gb/search.html?q=Karray pplications	outing", N mputing-34 Application 111999437 roach", Tat a-classroor va. "Soft co ion, 2009. 1%20Soft-0	Wiley India, 3rd Edition ed.html ns", Third Edition, Wiley 4 ta McGraw Hill, 2nd Edi m-approach/oclc/56955 mputing and intelligent Computing-and-Intellige	, tion 342 systems ent-Systems-
Topics relevant to "Skil presentationsare usedforS through assessment compo	Development": Assignment will Development through Pa nent mentioned in course h	ent implei articipative andout.	mentations in softwa e Learning techniques.	re, batch wise This is attained

Course Code:	Course Title: Introductio	on to Bioinformatic	s	L- T- P-	3 0	0	3
CSE3406	Type of Course: General CSE Basket, Theory based C						
Version No.	2.0						
Course Pre-	NIL						
requisites							
Anti-requisites	NIL						
Course Description	This course is designed	to provide the kno	wledge of the o	concepts i	elated to	bioinfc	rmatics.
	The course is aimed at ι	understanding the I	DNA and Protei	n sequenc	es and da	tabase	s. It also
	deals with Pairwise con	nparison and calcu	ulating the scor	ing matri	x. Further	, it foc	cuses on
	Sequence Alignment techniques, discovering the Motifs in the sequence. Students will						will also
Course Objective	The objective of the court	learn the overview of Structural Bioinformatics and Genome sequencing.					
course objective	Bioinformatics and atta	in Fmnlovahility th	rough Particina	tive Learr	ing techni	inues	
			iougii i ui ticipu			9405.	
Course Outcomes	C.O.1: Understand the D	NA Protein sequen	ce and structure	es. (Bloom	ı's Level: K	nowled	dge)
	C.O.2: Explain the file for	ormats and sequer	ice alignments	of DNA S	equence. (BIOOM	's Level:
	C.O.3: Apply the techni	aues of the motify	s discovery for	the analy	sis of Pro	tein Se	auence.
	(Bloom's Level: Applicat	ion)		the unury			queneei
<u> </u>							
Course Content:	Fundamentale		Comprohen	ion hacas		<u> </u>	
Module 1	of Bioinformatics	Quiz	comprehens	ants	l Quizzes	9 Cl	asses
Tonics:	of bioinformatics			ents,		<u> </u>	
principles of structu sequences,Genomic determination meth	ral/functional analysis of DNA,Mitochondrial DNA, ods, Finding Reverse com	biological molecule ,DNA Sequencing to plement of a seque	es, Biological Dat pols, Protein se ence.	a Acquisi quencing	ion, Types and struct	of DN ure	A
	Genome databases ar	d Quizzes and	Comprehens	sion based	Quizzes		
Module 2	Sequence Similarity	assignments	and assignm	ents		8	Classes
Topics:							
Types and classificat	ion of genome databases	s, DNA sequence re	etrieval system,	various D	NA and pro	otein s	equence
file formats, Comm	on sequence file format	ts; Files for multip	le sequence ali	gnment;	Files for s	tructu	ral data,
Frequent words and	d k-mers in Text, String	Reconstruction p	roblem, Sequen	ce Simila	rity search	ning, S	equence
Similarity searching	toois, NCBI BLAST, PSI BL	LAST, Significance c	or sequence alig	nments, A	lignment	scores	and gap
penanties.	DNA sequence analys	is Ouizzes and	Comprehens	sion based	Quizzes	<u> </u>	
Module 3	and applications	assignments	and assignm	ents	Quizzes	10	Classes
Sequence similarity	searches and alignmer	nt tools, Finding a	alignment using	g Needler	nan-Wuns	ch and	d Smith-
Waterman algorithn	n, Heuristic Methods of se	equence alignment,	, Pair-wise and r	nultiple s	equence al	ignmei	nts, DNA
sequence analysis, N	Aotif in protein sequence	,Motif discovery u	sing Gibbs samp	ling,Moti	f finding, G	iene Pr	rediction
models: Hidden Mar	kov model(HMM), Gene	ralized Hidden Mar	kov model(GHN	1M), Baye	sian metho	od.	
Targeted Applicatio	n & Tools that can be use	ed:					
DLAST, FastA, Clu	SIGIVV, IVIEGA						
Ficject work/Assign	nte (colf colocted batch m	ator - up to 1 in a	batch) will be all	ocated ca	so studios	laccian	monte
Each baich of Studer	its (sen-selected batch m	iates – up to 4 m a l	uaterij will be al		se studies,	rassign	ments

Textbook(s):

1. Bioinformatics: Sequence and Genome Analysis, David W. Mount, Cold Spring Harbor Laboratory Press, 2004. 2. Introduction to Bioinformatics, Arthur Lesk, Fifth Edition, Oxford University Press, 2019

References

1. Bioinformatics Methods and Applications, S. C. Rastogi, N.Mendiratta, P.Rastogi, Fourth Edition, Prentice Hall India.

2.Bioinformatics Algorithms- An Active Learning Approach, Phillip Compeau & Pavel Pevzner, 2nd Edition, Vol. I & II, Active Learning Publishers, 2015

E-References

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

Topics related to development of "Employability skills": Batch wise presentations on selected topics

- 1. String Reconstruction problem
- 2. Sequence Similarity searching
- 3. Alignment scores and gap penalties
- 4. Protein sequencing
- 5. Gene Prediction models: Hidden Markov model(HMM)
- 6. Finding similarities by performing pairwise and multiple sequence alignment,
- 7. Evaluating phylogenetic trees.

fordeveloping **Employability Skills** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.

Course Code: CSE3407	Cour Com Type Theo	rse Title: Algorithms in putational Biology e of Course: Program Core ory & Lab Integrated	L- T- P-C	2	0	2	3
Version No.		1.0					
Course Pre- requisites	•	CSE3406 - Introduction to Bioinformatics					
Anti- requisites		NIL	NIL				
Course Description		This course introduces core algorit to solve biological problems effici dynamic programming, genome techniques. Students will learn ho biological datasets and evaluate the	hms us ently. assen w to a perfor	sed i It co nbly, pply man	n com overs and algoi ce of a	nputational sequence a string n rithmic thin solutions.	biology analysis, natching nking to
Course Object		The objective of the course is to famil Algorithams in Computational Biology Experiential Learning techniques.	iarize t and at	he le tain	arners Skill	with the co Development	ncepts of t through

Come	Course Out On successful completion of the course the students shall be able to the course of the course the students shall be able to the course of the co					shall be able to:
Comes		bioinformatics. (Rei	nember)	iputat	ional biology	and
CO2: Explain the significance of algorithms					ithms in anal	yzing biological
		data. (Understand)	0	0		
		CO3: Apply basic	c algorithmic st	rategi	es to solve si	mple biological
		problems. (Apply)	C	U		1 0
		CO4: Explore dif	ferent types of	biolog	gical data and	d their
		computational need	s. (Apply)			
Course						
Content	t:					
			T	,		
Module	1	Introduction	Assignment			5L+6P Sessions
	- •					
<u> </u> <u>'</u>]	l opics:					
	T • 4	1 1	T C I	•.1		· 1
1	History a	nd principles of algorithms	, Types of algoi	rithms	s, Developme	ent and
C	computat	ional complexity				
· ·		A1 1 T 1				
Module	2	Algorithms Issues and	Assignment			8L+8P Sessions
	P •	Problems	Ũ			
<u> </u>	<u>l opics:</u>					
					Dalamana!	
Asymptotic analysis of algorithms, NP-complete problems, Polynomial reducibi			al wa day a h : 1:4-y			
	Asympto	tic analysis of algorithms, N	NP-complete pro	oblell	Droblom (CI	al reducibility,
	Asympto Fraveling	tic analysis of algorithms, N g Salesman Problem (TSP),	NP-complete pr Consecutive In	iteger	Problem (CI	al reducibility, P), Sorting
F	Asympto Fraveling problems	tic analysis of algorithms, N g Salesman Problem (TSP), and Fibonacci problem	NP-complete pr Consecutive In	iteger	Problem (CI	al reducibility, P), Sorting
P P	Asympto Fraveling problems	tic analysis of algorithms, N g Salesman Problem (TSP), and Fibonacci problem	NP-complete pr Consecutive In	iteger	Problem (CI	al reducibility, P), Sorting
A T F Module	Asympto Fraveling problems	tic analysis of algorithms, N g Salesman Problem (TSP), and Fibonacci problem Algorithmic Approaches	NP-complete pr Consecutive In Assignment	iteger	Problem (CI	al reducibility, P), Sorting 10L+8PSessions
Module	Asympto Fraveling problems 3 Fopics:	tic analysis of algorithms, N g Salesman Problem (TSP), and Fibonacci problem Algorithmic Approaches	NP-complete pr Consecutive In Assignment	iteger	Problem (CI	al reducibility, P), Sorting 10L+8PSessions
Module	Asympto Fraveling problems 2 3 Fopics:	tic analysis of algorithms, N g Salesman Problem (TSP), and Fibonacci problem Algorithmic Approaches	NP-complete pr Consecutive In Assignment	iteger	Problem (CI	al reducibility, P), Sorting 10L+8PSessions
Module	Asympto Fraveling problems 2 3 Fopics:	tic analysis of algorithms, N g Salesman Problem (TSP), and Fibonacci problem Algorithmic Approaches	VP-complete pr Consecutive In Assignment	conque	er, Expectatio	al reducibility, P), Sorting 10L+8PSessions n and Maximization
Module	Asympto Fraveling problems 3 Fopics: Linear, ex EM), Fo	tic analysis of algorithms, N g Salesman Problem (TSP), and Fibonacci problem Algorithmic Approaches haustive search, branch and bo rward and backward algorithere (string matching). Graph	VP-complete pr Consecutive In Assignment	conque	er, Expectation earning, Knut	al reducibility, P), Sorting 10L+8PSessions n and Maximization th-Morris-Pratt and
Module	Asympto Fraveling problems 2 3 Fopics: Linear, ex EM), Fo Boyer-Mc	tic analysis of algorithms, N g Salesman Problem (TSP), and Fibonacci problem Algorithmic Approaches haustive search, branch and be rward and backward algorith bore (string matching), Graph	VP-complete pr Consecutive In Assignment ound, divide and o hms, Discrimina algorithms and n	conque tive la naxim	er, Expectation earning, Knut um likelihood	al reducibility, P), Sorting 10L+8PSessions n and Maximization th-Morris-Pratt and algorithms
Module	Asympto Fraveling problems 2 3 Fopics: Linear, ex EM), Fo Boyer-Mo	tic analysis of algorithms, N g Salesman Problem (TSP), and Fibonacci problem Algorithmic Approaches haustive search, branch and be rward and backward algorit pore (string matching), Graph	VP-complete pr Consecutive In Assignment ound, divide and o hms, Discrimina algorithms and n	conque tive le	er, Expectation earning, Knut um likelihood	al reducibility, P), Sorting 10L+8PSessions n and Maximization th-Morris-Pratt and algorithms
Module	Asympto Fraveling problems 2 3 Fopics: Linear, ex EM), Fo Boyer-Mo	tic analysis of algorithms, N g Salesman Problem (TSP), and Fibonacci problem Algorithmic Approaches haustive search, branch and be rward and backward algorith bore (string matching), Graph Dynamic Programming	VP-complete pro- Consecutive In Assignment	conque tive 1	er, Expectatio earning, Knut um likelihood	al reducibility, P), Sorting 10L+8PSessions n and Maximization th-Morris-Pratt and algorithms 7L+8P Sessions
Module Module	Asympto Fraveling problems 2 3 Fopics: Linear, ex EM), Fo Boyer-Mo 2 4	tic analysis of algorithms, N g Salesman Problem (TSP), and Fibonacci problem Algorithmic Approaches haustive search, branch and be rward and backward algorither ore (string matching), Graph Dynamic Programming & Methods	VP-complete pr Consecutive In Assignment ound, divide and o hms, Discrimina algorithms and n Assignment	conque tive le	er, Expectation earning, Knut um likelihood	al reducibility, P), Sorting 10L+8PSessions n and Maximization th-Morris-Pratt and algorithms 7L+8P Sessions
Module	Asympto Fraveling problems 2 3 Fopics: Linear, ex EM), Fo Boyer-Mc 2 4	tic analysis of algorithms, N g Salesman Problem (TSP), and Fibonacci problem Algorithmic Approaches haustive search, branch and be rward and backward algorither bore (string matching), Graph Dynamic Programming & Methods	VP-complete pr Consecutive In Assignment ound, divide and o hms, Discrimina algorithms and n Assignment	conque tive le maximu	er, Expectationearning, Knut	al reducibility, P), Sorting 10L+8PSessions n and Maximization th-Morris-Pratt and algorithms 7L+8P Sessions
Module Module I Module	Asympto Fraveling problems 2 3 Fopics: 2 4 Fopics: Principles Principles	tic analysis of algorithms, N g Salesman Problem (TSP), and Fibonacci problem Algorithmic Approaches haustive search, branch and be rward and backward algorith bore (string matching), Graph Dynamic Programming & Methods	P-complete pr Consecutive In Assignment ound, divide and o hms, Discrimina algorithms and n Assignment	conque tive le naximu (B	er, Expectation earning, Knut um likelihood	al reducibility, P), Sorting 10L+8PSessions n and Maximization th-Morris-Pratt and algorithms 7L+8P Sessions STA, ClustalW), rithma Partial and
Module Module	Asympto Fraveling problems 2 3 Fopics: EM), Fo Boyer-Mo 2 4 Principles Probabilis Houble diagonal	tic analysis of algorithms, N g Salesman Problem (TSP), and Fibonacci problem Algorithmic Approaches haustive search, branch and be rward and backward algorither ore (string matching), Graph Dynamic Programming & Methods and applications, He tic/statistical methods, Mooret problems Graph algorither	VP-complete pr Consecutive In Assignment ound, divide and o hms, Discrimina algorithms and n Assignment euristics tools lels of evolution	conque tive le naximu (B n and	er, Expectation earning, Knut um likelihood LAST, FAi relevant algo	al reducibility, P), Sorting 10L+8PSessions n and Maximization th-Morris-Pratt and algorithms 7L+8P Sessions STA, ClustalW), rithms, Partial and SP3 Phrap Phrad

	Project work/Assignment:
5.	6. Assignment 1 on (Module 1 and Module 2)
	7. Assignment 2 on (Module 3 and Module 4)
	Text Book
	 Phillip Compeau & Pavel Pevzner, Bioinformatics Algorithms: An Active Learning Approach, Vol. 1, 2nd Ed., 2019. Michael T. Goodrich & Roberto Tamassia, Algorithm Design and Applications, Wiley, 2015. Jason Kinser, Computational Biology: A Hypertextbook, 2nd Ed., Jones & Bartlett Learning, 2021 Gautam B. Singh, Fundamentals of Bioinformatics and Computational Biology, Springer, 2015.
	References
	1. Zhumur Ghosh & Bibekanand Mallick, <i>Bioinformatics: Principles and Applications</i> , Oxford University Press, 2014.
	2. Steven Skiena, The Algorithm Design Manual, Springer, 2nd Ed., 2008
	 Pavel Pevzner, Computational Molecular Biology: An Algorithmic Approach, MIT Press, 2000. T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein, <i>Introduction to Algorithms</i>, 3rd Ed., MIT Press, 2009.
	5. Arthur Lesk, Introduction to Bioinformatics, 5th Ed., Oxford University Press, 2019
	Web Resources W1. https://onlinecourses.nptel.ac.in/noc25_cs06/preview W2. https://ocw.mit.edu/courses/6-096-algorithms-for-computational-biology-spring-2005/pages/lecture-notes/
	Module I: Introduction to Algorithms
	Experiment 1: Implement Sorting and Searching Algorithms
	• Implement Bubble, Merge Sort, Linear and Binary Search
	• Compare time complexity using real biological data (e.g., gene lengths)
	Experiment 2: Time Complexity and Recursion using Fibonacci Series
	Compare recursive and dynamic programming approaches
	• Visualize time/memory usage with time and memory_profiler modules
	Module II: Algorithmic Problem Solving

Experiment 3: Solve the Travelling Salesman Problem (TSP)
• Use brute force or greedy algorithms
• Simulate sequencing fragment reassembly as a path problem
Experiment 4: Knapsack Problem in Bioinformatics
• Apply knapsack logic to protein interaction weighting or resource allocation
Module III: String Matching and Sequence Analysis
Experiment 5: Naive Pattern Matching Algorithm on DNA Sequence
Identify motifs like start/stop codons
Experiment 6: KMP and Boyer-Moore Algorithms
Compare performance on large FASTA datasets
Experiment 7: Regular Expression Matching in Genomic Data
Search for specific motifs
Module IV: Dynamic Programming
Experiment 8: BLAST Query using Biopython (Online)
Submit a BLAST query and parse top hits
Experiment 9: DNA Read Assembly Simulation
Topics relevant to development of "Employability": Proficiency in bioinformatics algorithms, data analysis
Topics relevant to "PROFESSIONAL ETHICS": Maintaining professional integrity in computational biology.

Course Code: CSE3408	Course Title: Statistical Methods for BioInformatics Type of Course: Program Core Theory & Lab Integrated	L- T- P-C	2	0	2	3
Version No.	1.0					

Course Pre- requisites	• 0	CSE3406 – Introduc	tion to Bioinfo	ormat	ics	
Anti-	N	NIL				
requisites						
Course Description	T c b c d s N v c	This course provides an introduction to the statistical methods commonly used in bioinformatics and biological research. The course briefly reviews basic probability and statistics including events, conditional probabilities, Bayes theorem, random variables, probability distributions, and hypothesis testing and then proceeds to topics more specific to bioinformatics research, including Markov chains, hidden Markov models, Bayesian statistics, and Bayesian networks. Students will learn the principles behind these statistical methods and how they can be applied to analyze biological sequences and data				
Course Object	T N L	The objective of the cour Aethods for BioInform Learning techniques.	se is to familiarize atics and attain a	the le Skill	arners with the c Development the t	oncepts of Statistical hrough Experiential
Course Out Comes		On successful completion of the course the students shall be able to: CO1: Understand the basic concepts of bioinformatics including databases. Understand) CO2: Evaluate methods to characterize and manage the different types of biological sequence data. (Apply) CO3: Apply basic concepts in biostatistics exemplifying sampling methods, (Apply) CO4: Evaluate hypothesis testing using statistical methods(Apply)				
Course Content:						
Module 1	Bioinfo Fundan Databas	ormatics nentals and se Systems	Assignment			6L+6P Sessions
Topics:	1			<u> </u>		
Bioinformatics definition, history, scope and applications, Bioinformatics web portals: NCBI, EBI, ExPASy, Biological databases: Classification of databases - primary (Genbank), secondary (PIR) and tertiary or composite (KEGG) databases, Sequence databases - DNA sequence databases (ENA,DDBJ), Protein sequence databases (Swissprot, PROSITE).						
Module 2	Sequen	ce Alignment	Assignment			7L+8P Sessions

	Topics:					
	Basics of Types of alignmen Pairwise	sequence alignment - matc f sequence alignment - pa at, Dot matrix comparison of sequence similarity search	h, mismatch, ga airwise and mu Sequences, Sco by BLAST and	ps, g ultiple oring FAS	ap penalties, s e alignment, matrices - PA TA	scoring alignment, local and global M and BLOSUM,
Modu	ıle 3	Basic Concepts In Biostatistics	Assignment			10L+8PSessions
	Topics: Introducti continuou sample siz graphical frequency median, n standard	on to Biostatistics, kinds of da is, categorical-ordinal and non ze, sampling methods and sam methods– stem and leaf plot, r curves; diagrammatic metho node; merits and demerits, Me error and coefficient of varia	ta and variables - ninal) - based of pling errors, Data line diagram, bar od- pie diagram, asures of dispers ation; merits and	- base n sour a tabu grap Mea ion- ra 1 dem	d on nature (nurce (primary at lation and repr hs, histogram, sures of centr ange, variance, herits, Correlat	imerical discrete and nd secondary data), esentation methods: frequency polygon, al tendency- mean, standard deviation, tion and regression
Modu	analysis a	nd their applications to biolog Biostatistics- Applications	Assignment			7L+8P Sessions
8.	Topics:IntroductHypotheshypothessamples-student'sgoodness, AnalysiProject v9.10.	tion to Probability- definiti sis testing- steps in testin is, level of significance- typ Z-test for means and pro- t-test(one sample and tw of fit (not based s of variance (One-way AN vork/Assignment: Assignment 1 on (Module 1 Assignment 2 on (Module 3	on; Normal dis ong for statistica ope-1 and type-2 oportions, Test to samples), C on distrib (OVA) and thei and Module 2 and Module 4	stribu al hy error of si hi-squ butior r app)	tion: definition pothesis, null s, Test of significance for uare test and n), test o lications to bi	on and properties, Il and alternative nificance for large or small samples- l its applications- f independence iology.
	Text Boo 5) A 6) W Sciences, W 7) G 2015.	ok .rthur Lesk, Introduction to Bio Vayne W. Daniel & Chad L. C Viley, 11th Edition, 2019. Sautam B. Singh, Fundamental	informatics, Oxfor ross, Biostatistics s of Bioinformatics	rd Un : A Fo : and C	iversity Press, undation for Ar Computational E	5th Edition, 2019. alysis in the Health Biology, Springer,
	Reference 1. Zhur Oxford U	ces mur Ghosh & Bibekanand I Jniversity Press, 2014.	Mallick, Bioinfo	rmatio	cs: Principles a	and Applications,

2. Dat 2nd E	vid W. Mount, <i>Bioinformatics: Sequence and Genome Analysis</i> , Cold Spring Harbor, dition, 2004.
3. Ma Editio	arcello Pagano & Kimberlee Gauvreau, <i>Principles of Biostatistics</i> , CRC Press, 2nd n, 2018.
4. S. C	C. Gupta & V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand
Web I	Resources
W3.	https://www.ncbi.nlm.nih.gov
W4.	https://archive.nptel.ac.in/courses/102/101/102101056/
W5.	https://onlinecourses.nptel.ac.in/noc25_bt06/preview
W6.	https://www.ebi.ac.uk
W7.	https://www.expasy.org
Modu	le I: Bioinformatics & Biological Databases
1. Ex	periment 1: Introduction to NCBI – Searching for DNA & protein sequences
2. Ex	periment 2: Exploring the EBI and ExPASy portals
3. Ex	periment 3: Retrieving gene information from GenBank and ENA
4. Exj	periment 4: Identifying protein domains using PROSITE and SwissProt
Modu	ale II: Sequence Alignment
5. Ex	periment 5: Pairwise sequence alignment using EMBOSS Needle
6. Ex	periment 6: Local sequence alignment using BLAST
7. Ex	periment 7: Global sequence alignment using Clustal Omega
8. Ex	periment 8: Constructing phylogenetic trees using MEGA or Phylogeny.fr
Modu	le III: Basic Biostatistics
9. Ex	periment 9: Data collection and classification of variables
10. Exp Pytho	periment 10: Creating bar charts, pie charts, histograms using MS Excel or n (matplotlib/seaborn)
11. Exj statist	periment 11: Calculating mean, median, mode, standard deviation using ical software (R/SPSS/Excel)
Modu	le IV: Statistical Analysis

 12. Experiment 12: Performing correlation and regression analysis in R 13. Experiment 13: Hypothesis testing using t-test and Z-test in SPSS/R 14. Experiment 14: Conducting chi-square test for independence 15. Experiment 15: One-way ANOVA application on biological data s
Topics relevant to development of "Employability": Training in bioinformatics tools, biological databases, sequence analysis
Topics relevant to "PROFESSIONAL ETHICS": Data privacy in genomic research, ethical use of biological databases

Course Code:	Course Title:					
CSE3409	Emerging Technologies in Big Data	L-T- P- C	2 -0	2	3	
Version No	10				<u> </u>	
	1.0					
Course Pre-	CSE3156-Database Management System,					
requisites						
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 solution provider for applications that involve huge volume of data.					

r							
Course	The objective of the course is to familiarize the learners with the concepts of						
Objectives	Big Data Technologies and attain SKILL DEVELOPMENT through						
objectives	EXPERIENTIAL LEARNING techniques.						
Course	On successful comp	On successful completion of the course the students shall be able to:					
Outcomes	Apply Map-Reduce	programming on the	given datasets to extra	act required			
	insights. (Applicatio	n).					
	Employ appropriate	Hadoon Ecosystem t	ools such as scoon. Hh	hase Hive to			
	perform data analyt	ics for a given proble	m. (Application).	, use, inve, to			
	Use Spark tool to an	alvze the given datas	set for a given problem	1.			
	(Application).						
	, , , , ,						
Course							
Content:							
NA shuls 1	Introduction to	Programming	Data Collection and	10 Classes			
Module 1	Hadoop	Assignment	Analysis	10 Classes			
Introduction to D		annos Docios of Distri	hutad Filo Sustam, Fou	r Va Drivara			
for Big data Big d	lata annlications Stru	ance. Basics of Distri	semi-structured and	nuasi			
structured data	Big data Challenges-	Fraditional versus high	data annroach. The Bi	ig Data			
Technology Lands	scape: No-SOI			Butu			
Teennology Luna							
The Hadoop: Hist	ory of Hadoop-Hadoo	op use cases, The De	sign of HDFS, Blocks a	nd replication			
management, Ra	ck awareness, HDFS a	rchitecture, HDFS Fe	deration, Name node a	and data			
node, Anatomy o	f File write. Anatomy	of File read, Hadoo	o Map Reduce paradig	m, Map and			
reduce tasks, Jol	b Tracker and task tra	cker, Map reduce ex	ecution pipeline, Key	value pair,			
Shuffle and sort,	Combiner and Partiti	oner, APIs used to W	/rite/Read files into/fro	om Hadoop,			
Need for Flume a	nd Sqoop.						
Anatomy of a YAF	RN: Hadoon 2 0 Featu	res Name Node High	Availability YARN Arr	hitecture			
Introduction to Se	chedulers, YARN sche	duler policies, FIFO, F	air And Capacity sche	duler.			
Module 2	Hadoop	Programming	Data Collection and	8 Classes			
	Ecosystem Tools	Assignment	Analysis				

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 o	f tables.				
Module 3	Spark	Programming Assignment	Data analysis 8 Class		
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 ins	tall the Hadoop in pse	eudo cluster mode.			
Level 1: HDFS S	hell Commands – File	es and Folders.			
Level 2: HDFS	Shell Commands – Ma	anagement.			
2. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.					
Level 1: Find th	e number of occurrer	nce of each word app	earing 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 m	atrix multiplication us	sing map reduce			
5. Level 1: Installa	ation of Hive, working	on basic hive comm	ands. (Create, Alter an	d 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.

8. Level 1: Installing Ecosystem tools such as Scoop, Hbase.

Level 2: Scoop – Move Data into Hadoop.

9. Level 1: Working on basic Hbase commands (General commands, DDL Commands) Level 2: Apply Hbase commands on Insurance database/employee dataset.

10. 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. Big Data and Analytics. 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: Statistical Techniques for Data						
CSE3410	Science	L-T-					
		P-C	2	0	3		
	Type of Course: Theory			2			
Version No.	1.0						
Course Pre-	NIL						
requisites							
Anti-requisites	NIL	۹IL					
Course Description	This course provides an in-depth introduction to learning theory, methods, and algorithms for include multiple regression, kernel learning generalized linear models, supervised and unsup learning, covariance learning, factor models, analysis, and more. The course emphasizes limitations of these methods using mathematic world data sets.	statistic data so g, spars pervised princip the app cal statis	es and cience se re learn al co blicab stics	ma e. T gre ing omp ility and	achine Topics Ssion, , deep ponent y and l real-		
Course Objective	The objective of the course is to familiarize the learners with the concepts of Statistical Foundations for Data Science and attain Employability through Participative Learning techniques						
Course Out	On successful completion of the course the stud	ents sha	ll be a	able	e to:		
Comes	 Understand the rise and significance of fields such as Biological Sciences, Health Sci Information Sciences, Economics and Finance, Evaluation, Earth Sciences, and Astronomy. Develop a strong foundation in multiple the Gauss-Markov theorem. Apply linear regression with random de regression. Apply the power method and learn about structured covariance learning 	f Big D iences, (Busines e linear sign and out facto	ata in Comp s and regress d part or mo	n va pute Pro sssio ial	arious er and ogram on and linear ls and		

Course Content:				
Module 1	Introduction	Assignment	Programming	No. of Class es:10

Topics:

Introduction to bigdata, Rise of Big Data and Dimensionality in -Biological Sciences ,Health Sciences, Computer and Information Sciences, Economics and Finance, Business and Program Evaluation, Earth Sciences and Astronomy - Impact of Big Data - Impact of Dimensionality, Computation of Noise Accumulation, Spurious Correlation , Statistical theory - Aim of High-dimensional Statistical Learning.

Module 2	Multiple Linear Regression	Assignment	Programming	No. of Class es:12
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Topics:

Multiple Linear Regression, The Gauss-Markov Theorem , Statistical Tests - Weighted Least-Squares , Box-Cox Transformation , Model Building and Basis Expansions, Polynomial Regression - Spline Regression , Multiple Covariates , Ridge Regression -Bias-Variance Tradeoff - Penalized Least Squares - Bayesian Interpretation - Ridge Regression Solution Path - Kernel Ridge Regression , Exponential family 231 5.1.2 Elements of generalized linear models , Maximum likelihood , Computing MLE: Iteratively reweighed least squares , Deviance and Analysis of Deviance, Regularization parameters, Refitted Cross-validation, Extensions to Nonparametric Modeling.

Module 3	Inference in linear regression	Assignment	Programming	No. of Class es:14

Topics:

Inference in linear regression - Debias of regularized regression estimators, Choices of weights, Inference for the noise level, Inference in generalized linear models, Desparsified Lasso, Decorrelated score estimator - Test of linear hypotheses, Numerical comparison - Asymptotic efficiency 345 7.3.1 Statistical efficiency and Fisher information, Linear regression with random design, Partial linear regression, Gaussian graphical models - Inference via penalized least squares, Sample size in regression and

graphical models , General solutions , Local semi-LD decomposition , Data swap , Gradient approximation

Module 4	Principal Component Analysis	Assignment	Programming	No. of Class es:9
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Topics:

Principal Component Analysis -Introduction to PCA, Power Method, Factor Models and Structured Covariance Learning, Factor model and high-dimensional PCA-Cluster Analysis - K-means clustering, Hierarchical clustering, Model-based clustering, Spectral clustering, Data-driven choices of the number of clusters, Variable Selection in Clustering, Sparse K-means clustering, Sparse model-based clustering, Sparse Mixture of Experts Model, Correlation Screening, Generalized and Rank Correlation Screening, Nonparametric Screening, Sure Screening and False Selection.

Targeted Application & Tools that can be used: Tools: Torch, Google Colaboratory, Spider, Jupiter Notebook Project work/Assignment:

Project work/Assignme

Text Book

TextBook(s):

T1 Fan, J., Li, R., Zhang, C.-H., and Zou, H. (2020). Statistical Foundations of Data Science. CRC Press.

T2 Wainwright, M. J. (2019). *High-dimensional statistics: A non-asymptotic viewpoint*. Cambridge University Press.

References

R1. James, G., Witten, D., Hastie, T.J., Tibshirani, R. and Friedman, J. (2013). An *Introduction to Statistical Learning with Applications in R*. Springer, New York.
R2. Hastie, T.J., Tibshirani, R. and Friedman, J. (2009). *The elements of Statistical Learning: Data Mining, Inference, and Prediction* (2nd ed). Springer, New York.
R3. Buehlmann, P. and van de Geer, S. (2011). *Statistics for High-Dimensional Data: Methods, Theory and Applications*. Springer, New York.

Book link

<u>R1</u>: Fan, J., Li, R., Zhang, C.-H., and Zou, Statistical Foundations of Data Science. CRC Press.

E book link

R2: W. N. Venables, D. M. Smith and the R Core Team, <u>https://cran.r-</u>roject.org/doc/manuals/R-intro.pdf, October,2022

Web resources:

W1.

https://www.youtube.com/playlist?list=PLOU2XLYxmsIK9qQfztXeybpHvru-

<u>TrqAP</u> <u>https://presiuniv.knimbus.com/user#/</u>

Topics relevant to "EMPLOYABILITY SKILLS": - Asymptotic efficiency 345 7.3.1 Statistical efficiency and Fisher information, Linear regression with random design, Partial linear regression **for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout..**

Course Code: CSE341 1	Course Title:Predictive Analytics and Applications Type of Course:L- Program Core2023								
Version No.	1								
Course Pre- requisite s	MATXXXX – Probability and Statistics								
Anti- requisite s	NIL								
Course Descripti on	Predictive Analytics subject is conceptual in nature. The students will be benefited in this course to know about modern data analytic concepts and develop the skills for analyzing and synthesizing data sets for decision making in the firms.								
Course Objective	The objective of the course is skill development of student by using Learning techniques								
	On successful completion of the course the students shall be able to:								
Course Out Comes	 CO 1: Define the nature of analytics and its applications. (Remember) CO 2: Summarize the concepts of predictive analytics and data mining.(Understand) CO 3: Construct the analytical tools in business scenarios to achieve competitive advantage.(Apply) CO 4: Build the real-world insights in decision trees and time series analysis 								

	methods in dynamic business environment.(Apply)					
Course Content:						
Module 1	Introduction to Predictive Analytics	Self- Learni ng	Applications of analytics	7 Sessions		
Topics: Analytics- Definition, importance, Analytics in decision making, Applications, Challenges, Experts perception on analytics; Popularity in Analytics; Predictive analytics in business Scenarios- case studies						
Module 2	Principles and Techniques	Case analysi s		8 Sessions		
Topics: Predictive modeling: Propensity models, cluster models, collaborative filtering, applications and limitations - Statistical analysis: Univariate Statistical analysis, Multivariate Statistical analysis						
Module 3	Model Selection	Partici pative Learni ng & Case Analys is		7 Sessions		
Preparing to model the data: supervised versus unsupervised methods, statistical and data mining methodology, cross-validation, overfitting, bias-variance trade-off, balancing the training dataset, establishing baseline performance. Measuring Performance in Regression Models - Linear Regression and Its Cousins - Non- Linear Regression Models - Regression Trees and Rule-Based Models Measuring Performance in Classification Models - Discriminant Analysis and Other Linear Classification Models - Non-Linear Classification Models						
Module 4	Time Series Analysis	Discus sion & Present ation		8 Sessions		
Time series Model: ARMA, ARIMA, ARFIMA - Temporal mining - Box Jenkinson method, temporal reasoning, temporal constraint networks						
Text Book

1.Jeffrey Strickland, Predictive analytics using R, Simulation educators, Colorado Springs, 2015

2.Max Kuhn and Kjell Johnson, Applied Predictive Modeling, 1st edition Springer, 2013. References

R1 Dinesh Kumar, U. (2021). Business Analytics: The Science of data-Driven Decision Making.

R2 Business Analytics - Data Analysis & Decision Making", S. Christian Albright and Wayne L. Winston, Cengage Publication, 5th Edition, 2012

E book link R1: Raman, R., Bhattacharya, S., & Pramod, D. (2018). Predict employee attrition by using predictive analytics. Benchmarking: An International Journal. <u>https://www-emerald-com-presiuniv.knimbus.com/insight/content/doi/10.1108/BIJ-03-2018-</u>0083/full/html 2. **E book link R2:** Jing, Z., Luo, Y., Li, X., & Xu, X. (2022). A multi-dimensional city data embedding model for improving predictive analytics and urban operations. Industrial

Management & Data Systems, (ahead-of-print). <u>https://www-emerald-com-</u> presiuniv.knimbus.com/insight/content/doi/10.1108/IMDS-01-2022- 0020/full/html

3. <u>E book link R3:</u> Singh, R., Sharma, P., Foropon, C., & Belal, H. M. (2022). The role of big data and predictive analytics in the employee retention: a resource-based view. International Journal of Manpower. <u>https://www-emerald-com-</u>

presiuniv.knimbus.com/insight/content/doi/10.1108/IJM-03-2021- 0197/full/html

4. <u>E book link R4:</u> Mishra, D., Luo, Z., Hazen, B., Hassini, E., & Foropon, C. (2018). Organizational capabilities that enable big data and predictive analytics diffusion and organizational performance: A resource-based perspective. Management Decision. <u>https://www-emerald-com-presiuniv.knimbus.com/insight/content/doi/10.1108/MD-03-2018-</u>0324/full/html

Web resources:

W1.https://www.sas.com/en_in/insights/analytics/predictive-analytics.html

W2. https://www.techtarget.com/searchbusinessanalytics/definition/predictive-analytics

W3. <u>https://www.cio.com/article/228901/what-is-predictive-analytics-transforming-data-</u>intofuture-insights.html

W4. https://www.simplilearn.com/what-is-predictive-analytics-article

W5. https://www.northeastern.edu/graduate/blog/predictive-analytics/

W6.https://www.marketingevolution.com/knowledge-center/the-role-of-predictive-analyticsin-data-driven-marketing

Swayam & NPTEL Video Lecture Sessions on Predictive Analytics

1. https://onlinecourses.swayam2.ac.in/imb20_mg19/preview

2. https://onlinecourses.nptel.ac.in/noc19_mg42/preview

Case References

- 1. Predictive Analytics Industry Use cases.
- 2. <u>https://www.rapidinsight.com/blog/11-examples-ofpredictive-analytics/</u>
- 3. Srinivasan Maheswaran (2017). Predictive Analytics Employee Attrition Case center.

Topics relevant to development of "Skill Development": ": Application of Business Analytics to enhances customer satisfaction and firms' success **Topics relevant to development of "Environment and sustainability:** Focus on Predictive

analytics to minimize the errors in decision making

Course Code: CSE3412	Course Title Type of Cou Course	e: Data Mining urse: Discipline Elec	tive/ Theory Only		L- T-P- C	3	0	0	3	
Version No.		2.0								
Course Pre- requisites		MAT1003 – App	lied Statistics							
Anti-requisites		NIL								
Course Description		Introduction, Appli mining tasks, asso approaches for cl mining.	lications, issues in data mining, data pre-processing techniques, data ociation rules, advanced association rules, classification, different classification, clustering, outlier detection. Recent trends in data							
CourseThe objective of the course is to familiarize the learners with the conceptsObjectiveMining and attain Employability through Problem Solving Methodologies										
Course Out Comes On successful completion of the course the students shall be able to: Apply the various pre-processing techniques needed for a data m Understand the functionality of the various data mining algorithm Appreciate the strengths and limitations of various data mining n Understand the advances in data mining for real life applications 									ning task. s. odels.	
Module 1	Introductio	on to Data Mining	Assignment		Data Collection			5 Sessions		
Topics Introdu Technic	uction to Da ques– Merit	ata mining – Data s and Demerits.	Mining Goals– Sta	ges	of the [Data N	1inin	g Process–E	Data Mining	
Module 2	Data prepr	ocessing	Quiz		Prob	lem Sc	lving	5	9 Sessions	
Topics : Types o measu	Topics: Types of data – Pre Processing steps – Data Preprocessing Techniques – Similarity and Dissimilarity measures.									
Module 3	Data Minin Patterns	g – Frequent	Assignment		Prob	lem Sc	lving	g .	7 Sessions	
Topics Market FPGrov	Basket Ana vth.	lysis, item sets – Ge	nerating frequent ite	em se	ets and r	ules ef	ficier	ntly – Apriori	Algorithm–	

Module 4	Classification and clusterin	ng Assignment		Problem Solving	11 Sessions
Classifi	cation and Clustering Dec	ision tree Induction –	Bay	esian classificationCla	ssification by Back
Propag	ation - Lazy learners – M	odern evaluation and	sele	ction techniques to imp	prove classification
accura	cy. Clustering Analysis – por	rtioning method – Hiera	rchio	cal methods – Density ba	sed method
Module 5	Outlier detection & Data mining trends	Assignment		Problem Solving	5 Sessions
Anoma	ly detection preliminaries	- Different Outlier de	tect	ion techniques-Web mi	ning- Text mining-
Demor	istration of Weka tool.	Droject work / Acci		onti	
Assign	ments	Project work/Assi	31111	ent.	
1.	From the dataset given. f	ind the Entropy. Gain va	alue	of the attributes and also	o draw the decision
tree us	ing entropy for the given da	ataset.			
2.	Transactional Data Base,	D given below which c	onta	ains set of items find the	frequent item set
using t	he Apriori Algorithm and ge	enerate the Association	Rule	es. Minimum Support cou	int is 2%. Minimum
connue					
	T _{id} Items				
	10 1, 3, 4				
	20 2, 3, 5				
	30 1, 2, 3, 5				
	40 2, 5				
	DOK 1 Tan P. N. Steinhach M.&	Kumar V "Introduction	tоГ)ata Mining" Pearson Ed	ucation 2016
	1. Tull I . N., Stellisdell W &	Rumar V. maroduction			
Refere R1 R2 (R3 Hill	nces Han J & Kamber M, "Data G K Gupta, "Introduction to 3 Alex Berson and Stephen	Mining: Concepts and 1 Data Mining with Case S J. Smith, "Data Wareho	⁻ echi Studi Stusin	niques", Elsevier, Second ies", PHI, Third Edition, 2 g, Data Mining and OLAF	Edition, 2006 014. ¤″, Tata McGraw –
Additio	onal web-based resources				
W1. <u>h</u>	ttps://onlinecourses.swaya	m2.ac.in/cec20_cs12/pr	evie	wText book of Data Mini	ng: Concepts and
Techni	ques, Jiawei Han, Micheline	Kamber and Jian Pei, N	lorg	an Kaufmann Publishe	ers, 2012.
W2.htt	ps://puniversity.informatic	sglobal.com:2284/ehos	t/de	tail/detail?vid=7&sid=e2	d7362a-
td3049	a98t0393e963521dbd%40r	edis&bdata=JnNpdGU9	ZWh	1vc3QtbGl2ZQ%3d%3d#A	N=377411
ansa a	IEDK https://pptel.ac.in/cours	sec/105105157			
J. Tonics		IITY SKIIIS". Data M	/inin	a Techniques FP Grow	th for developing
Employ compo	yability Skills through Parti nent mentioned in the court	cipative Learning techr rse handout.	nique	es. This is attained throu	igh the assessment

Course Code:	Course Title: No SQL Data Management		2	0	2	3
CSE3413	Type of Course: Program Core	L-T-P-C				

Version No.		1.0									
Course Pre- requisites		CSE3156 –	Database Manage	ement Sy	vstem						
Anti-requisites		NIL									
Course Description		The NoSQL E non-relationa flexible altern models, incl exploring the the challenge oriented moc as sharding a trade-offs. Ac guides stude limitations of scalable data	he NoSQL Data Management course provides a comprehensive understanding of on-relational database systems, emphasizing their emergence as scalable and exible alternatives to traditional relational databases. It covers various NoSQL dat nodels, including key-value, document, column-family, and graph databases xploring their structure, use cases, and design principles. Students will learn about ne challenges of data persistence, concurrency, and integration, and how aggregate riented models address these issues. The course delves into distribution models succ s sharding and replication, the implications of the CAP theorem, and consistence rade-offs. Additionally, it introduces Map-Reduce for large-scale data processing an uides students in modeling data for access efficiency. Practical applications an mitations of each NoSQL type are discussed, preparing students to design robust calable data solutions for real-world applications.								
Course Objectives		The objective practical app knowledge a traditional r document, co availability, a	e objective of the course is to introduce students to the principles, models, and ctical applications of NoSQL databases. It aims to equip students with the weldge and skills necessary to understand the advantages of NoSQL over ditional relational databases, comprehend various data models (key-value, ument, column-family, and graph), explore distribution models for scalability and ilability, and apply Map-Reduce and other techniques for data processing.								
Course Out Comes		 Inderstand the limitations of relational databases and explain the motivation behind the emergence of NoSQL databases. Differentiate between various NoSQL data models such as key-value, document, column-family, and graph databases based on structure, use cases, and performance. Analyze and apply appropriate distribution strategies including sharding, replication, and consistency models in distributed NoSQL systems. Design and implement data access patterns using aggregate-oriented modeling and schema-less approaches for scalable NoSQL applications. Utilize Map-Reduce and other data processing techniques to handle large-scale 									
Course Content:		<u></u>									
Module 1	Introduct NoSQL an Aggregato Data Moo	ion to d e-Oriented lels	Quiz	K	nowledge based quiz	No. of sessions:8					
Why NoSC (Mostly) S Clusters, Aggregate Family Sto Graph Dat	QL? The Va standard M The Emer s, Conseq pres, Sumr abases, So	alue of Relation Model, Impeci gence of No- uences of Ag uences of Ag narizing Aggro chema less Da	onal Databases, Getti lance Mismatch, App SQL, Aggregate Data gregate Orientation, egateOriented Datab atabases, Materialized	ng at Pers lication a Models; Key-Valu ases. Mor I Views, M	sistent Data, Concurrence nd Integration Database Aggregates, Example c e and Document Data N e Details on Data Mode odelling for Data Access	y, Integration, A es, Attack of the of Relations and Models, Column- ls; Relationships,					
Module 2 Distributic	Distribute Systems a Consisten on Models	ed Data and acy Models ; Single Serve	Assignment r, Sharding, Master-S	ave Replic	Data Visualization	No. of sessions:10 lication,					
Combining	g Sharding	and Replicati	ion Consistency, Upda	ate Consis	tency, Read Consistency,	Relaxing					

	Consisten	Consistency, The CAP Theorem, Relaxing Durability, Quorums. Version Stamps, Business and System											
	Transactic	ons, Versior	n Stamps on	Multiple	Nodes								
Module	3	Key-Value Map-Redu Framewor	Stores and ice k	Design a using Ex	n algorithm ample		Random Forest	No. of sessions:10					
	Map-Redu	uce, Basic N	/lap-Reduce,	Partition	ing and Con	bining,	Composing Map-Reduc	e Calculations, A					
	Two Stage	Map-Redu	uce Example	, Increme	ntal Map-Re	educe Ke	y-Value Databases, Wh	at Is a Key-Value					
	Store, Key	-Value Stor	re Features,	Consister	ncy, Transact	tions, Qu	iery Features, Structure	e of Data, Scaling,					
	Suitable U	lse Cases, S	toring Sessio	on Inform	ation, User	Profiles,	Preference, Shopping (Cart Data, When					
	Not to Use	e, Relations	ships among	Data, Mu	ulti operatio	n Transa	ctions, Query by Data, (Operations by Sets.					
		Document	t-Oriented	Case Stu	dy		Conduct a case study of	on No. of					
		Databases	and Use				how data sets can be	sessions:10					
Module	Module 4						gathered and						
							implemented in real ti	ime					
							application.						
	Document	t Databases	s, What Is a l	Documen	t Database?	, Feature	es, Consistency, Transad	ctions, Availability,					
	Query Fea	itures, Scali	ing, Suitable	Use Case	es, Event Log	ging, Co	ntent Management Sys	tems, Blogging					
	Platforms,	, Web Anal	ytics or Real	-Time An	alytics, E- Co	mmerce	Applications, When No	ot to Use, Complex					
	Transactic	ons Spannir	ng Different	Operatio	ns, Queries a	igainst V	arying Aggregate Struc	ture					
Module	Graph Dat	tabases	Case Study					No. of					
5	and Connected Data					s	essions:10						
5	Solutions												
	Graph Dat Features,	abases, Wl Scaling, Sui	hat Is a Grap itable Use Ca	h Databa ases, Con	se?, Feature nected Data	s, Consis , Routing	stency, Transactions, Av g, Dispatch, and Locatio	vailability, Query on-Based Services,					
	Recomme	ndation En	gines, wher	I NOT TO L	ise.								
	TEXTBOO	KS:											
	1. Sadalag	e, P. & Fow	vler, NoSQL	Distilled:	A Brief Guid	e to the	Emerging World of Poly	glot Persistence,					
	Pearson A	ddision We	esley, 2012										
	REFERENC	E BOOKS:											
	1. Dan Sul	livan, "NoS	QL For Mere	e Mortals	", 1st Editior	n, Pearso	n Education India, 201	5. (ISBN- 13: 978-					
	93325573	38)											
	2. Dan Mo	Creary and	l Ann Kelly, "	'Making S	ense of NoS	QL: A gu	ide for Managers and t	he Rest of us", 1st					
	Edition, M	lanning Pul	olication/Dre	eamtech I	Press, 2013.	(ISBN-13	3: 978-9351192022)						
	3. Kristina	a Chodorov	v, "Mongodk	o: The De	finitive Guid	e- Powe	rful and Scalable Data S	storage", 2nd					
	Edition, O VIDEO LIN	'Reilly Publ KS:	ications, 201	13. (ISBN-	13: 978-935	1102694	1)						
	1. https://	/www.geek	sforgeeks.or	rg/introd	uction-to-no	sql/ (an	d related links in the pa	ige)					
	2. https://	/www.yout	ube.com/wa	atch?v=0k	uKQHokLK8	(How d	do NoSQL databases work? Simply						
	evolained) ,				-							

Course Code: CSE3414	Course Ti Type of	tle: Applied Data Intelligence Course: Program Core	P-C	2	0	2	2	3	
Version No.		1.0							
Course Pre- requisites		Nil							
Anti-requisites		NIL							

Course D	escription		and techniques. Learning python is a crucial skill for many data science roles, and th course helps to understand and develop feature engineering. With a blended learnir approach, Python for data science along with concepts like data wranglin mathematical computing, and more can be learnt. The objective of the course is to familiarize the learners with the concepts of Applie									
Course O	bjectives		The objective Data Science	e of the course is to fa and attain Employa	miliarize t bility thro	he learners with the conc ugh E xperiential Learnin	epts of Applied g techniques.					
Course O	ut Comes		On successfu 1. Uno 2. Ana [Comprehen: 3. Den like decision [Application] 4. App grouping the	 Dn successful completion of this course the students shall be able to: Understand Numpy and Matrix Operations [Knowledge] Analyze the need for data preprocessing and visualization techniques. [Comprehensive] Demonstrate the performance of different supervised learning algorithms ike decision Tree, Random Forest, Linear Regression, Logistic Regression etc. [Application] Apply unsupervised learning algorithms like K-Means, K-Medoids etc for grouping the given data. [Application] 								
Course Co	ontent:											
Introduc Science, Module 1 Structur Numpy		Introduct Science, F Structure Numpy Pa	ion to Data Python Data s, Python ackage	Quiz	K	nowledge based quiz	No. of sessions:8					
	Data Scien data types Matrix and	ice - Need, , control s d its opera	, Applications tructures, Op tions	, Difference between perators, Simple opera	data anal ations, Ari	ysis and data analytics. Py ay and its operations, Nu	ython- Variables, mpy operations,					
Module 2	Matrix and i Di pr Module 2 Ex An		paration and ssing using ataframe, ory Data Data tion	Assignment		Data Visualization	No. of sessions:10					
	Dealing m	issing valu	es, Normaliza	ation, statistical descr	iption abo	ut the data, Accessing th	ie data,					
	Summary	of the dat	a, Relationsh	ip between the data,	Data Visu	alization using matplotlib						
Module 3	;	Supervise	ed Learning	Design an algorithm	R	andom Forest	No. of					
	Decision T Regressior	ree Algori n – Case st	is thm, ID3 Clas :udy	sifier, Random Forest	, Classifie	r Accuracy, Linear Predict	tion, Logistic					
Module 4		Unsupervised Learning Algorithms		Case Study	C h g ii a	onduct a case study on ow data sets can be athered and nplemented in real time pplication.	No. of sessions:10					
	Various di Medoids (stance Fur	nction, Dissim	nilarity between the m	nixed type	es of data, K-Means Algor	ithm, K-					
	List of Lak 1. Ir 2. B 3. K 4. A	ooratory T ntroductio asic Statis -means Cl ssociation	asks: n to R tool fo tics and Visua ustering Rules	r data analytics sciend alization in R	ce							

5. Linear Regression
6. Logistic Regression
7. Naive Bayesian Classifier
8. Decision Trees
9. Simulate Principal component analysis
10. Simulate Singular Value Decomposition
Targeted Application & Tools that can be used:
IBM SPSS
 Julia and Jupyter Notebook
Matplotlib
Project work/Assignment:
 Design forest fire and wildfire prediction system.
2. Driver Drowsiness Detection System with OpenCV & Keras
3. Credit Card Fraud Detection using Python.
Textbook(s):
1. Applied Data Science with Python and Jupyter-Alex Galea, Packt Publishing, October 2018
2. Data Visualization in Python with Pandas and Matplotlib Paperback –DavidLandup, June 16,
2021
References:
1.Data Science with Python and Dask- Jesse Daniel,1st Edition,July30,2019
Weblinks:
 Udemy: https://www.udemy.com/course/applied-data-science-with-python-specialization-
mhm/
 NPTEL online course : <u>https://nptel.ac.in/courses/106106179</u>
 <u>https://presiuniv.knimbus.com/user#/home</u>
Topics relevant to "EMPLOYABILITY SKILLS": Data Science, Decision Tree Algorithm for developing
Employability Skills through Experiential Learning techniques. This is attained through assessment
component mentioned in course handout.

Course Code: CSE3415	Course Title: Could Data Engineering Type of Course : Theory	L-T- P- C	2	0	2	3					
Version No.	1.0										
Course Pre- requisites	CSE2506 – Cloud Computing										
Anti-requisites	nil										
Course Description	Course Description Course Description Course Description Course Description Course Description Course Course is the course is to familiarize the learners with the concents of cloud computing and the course is to familiarize the learners with the concents of cloud computing is a new computing as a new computing paradigm. Cloud Computing has emerged in recent years as a new paradigm for hosting and delivering services over the Internet. The students can explore various Cloud Computing and delivering services over the Internet. The students can explore various Cloud Computing and delivering services and applications. Course Description Course Cloud computing and a paradigm for hosting and its services available today, Introduction Architecture of cloud computing, Infrastructure, platform, software, Types of cloud Business models, cloud services, Collaborating using cloud services, Virtualization for cloud Security, Standards and Applications.										
Course Objective	The objective of the course is to familiarize th computing and Virtualization and attain Empl techniques.	ne learne loyability	ers with / throug	the co h Parti	oncepts cipative	of Could Learning					
Course Out Comes	Comes On successful completion of the course the students shall be able to: • Describe fundamentals of cloud computing, virtualization and cloud computing services. • Discuss high-throughput and data-intensive computing. • Explain security and standards in cloud computing. • Demonstrate the installation and configuration of virtual machine.										
Course Content:											
Module 1				10) Sessio	ns					
Introductio Cloud Comp Platforms Virtualizatic Architecture	n to Cloud and Virtualization outing at a Glance, Historical Developments, Building Clo and Technologies, Virtualization, Characteristics of N n Techniques, Virtualization and Cloud Computing, T e, IaaS, PaaS, SaaS, Types of Clouds, Economics of Cloud	oud Com Virtualize Fechnolo	outing E d Envir gy Exan	nvironn onmen ıples, (nents, Co ts Taxo Cloud Co	omputing nomy of omputing					
Module 2				10) Sessio	ns					
High Throu Introduction	ghput and Data Intensive Computing: Task computing, M n to DIC, Technologies for DIC, Aneka Map Reduce Program	IPI applic mming	ations, T	ask bas	ed prog	ramming,					
Module 3				09	Sessio	ns					
Cloud Secu standards, C	rity and Standards : Cloud Security Challenges, Sof Client standards, Infrastructure and Service standards.	ftware-as	s-a-Servi	ce Seci	urity, Aj	oplication					
Module 4				09	Sessio	ns					
Cloud Platf Engine, Intr Modia Clou	orms, Advances in cloud: introduction to Amazon We oduction to Microsoft Azure.	b Servic	es: Intro	duction	n to Go	ogle App					
Media Clouds - Security Clouds - Computing Clouds - Mobile Clouds - Federated Clouds - Hybrid Cloud Text Book 1. John Rittinghouse and James Ransome, "Cloud Computing, Implementation, Management and Security", CRC Press. 2. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education.											

References 1. David E.Y. Sarna, "Implementing and Developing Cloud Applications", CRC Press. 2. Anthony T Velte, Toby J Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw-Hill. Web resources: <u>https://presiuniv.knimbus.com/user#/home</u> Topics relevant to "EMPLOYABILITY SKILLS": Aws, Azure, APIs, Aneka Cloud Platform, EC2, Installation of VM Workstation, Infrastructure Security Challenges for developing Employability Skills through Participative Learning techniques. This is attained through assessment component mentioned in course handout..

Course Code: CSE3416	Course Type of	Title: Federated L f Course: Theory C	earning Dnly Course			L- T-P- C	2	0	2	3
Version No.		1								
Course Pre- requisites		CSE2506 – Clou	d Computing							
Anti-requisites										
Course Description		Federated Learni the data across Learning and will scenarios.	ng can improve t different devices I be able to apply	he perf . In this / the re	formar s cours al-time	nce of mo se, studer e updates	dels by l nts will l of the r	everagi earn ba nodel i	ng the d asics of I n variou	iversity of ⁻ ederated s practical
Course Objective		The objective of understand the in	the course is to a mportance of priv	get exp vacy an	osure ⁻ d secu	to need fo rity in ma	or distrik chine lea	outed m arning t	nodel up echniqu	dates and es.
Course Out Come	5	On successful co Describe Apply di Apply op Construe Evaluate privacy-preservin	mpletion of the of the key concept fferent methods otimization techn ct and scale a sim e privacy and se ng techniques (Ap	course f is and a to deve iques in ople fed curity oplication	the stu rchited lop fec n Fede lerated concer on)	udents sha cture of Fe derated le rated Lea d system (rns in Fec	all be ab ederatec arning sy rning (Ap Applicat lerated	le to: I Learni vstems. oplicatio ion) Learnin	ng. (Kno (Compro on) g and i	wledge) 2hension) mplement
Course Content:										
Module 1	Introdu Federa	uction to ted Learning:	Assignment	I	Data C	ollection/	Interpre	tation	10	Sessions
Topics:IIApplicatioSecurityContrast.	ntroducti ns – Con & Privacy	ion to Federated cepts and Termin v in Federated Le	Learning – Ove ology – Federate arning – Federa	erview d Learn ted Lea	of Fec iing Ar arning	derated L chitecture vs Centra	earning: e -Machi alized Le	Definit ne Lear earning	tion, His ning Per Compa	tory, and spective - rison and
Module 2	Horizor Federa	ntal and Vertical ted Learning	Case studies / Case let		С	Case studie	es / Case	let	13	Sessions
Topics: Ho Federated Vertical Fe Secure Fe Federated Rules – Ao Weight De	orizontal I Averagii ederated derated I I Learning dvanced ecay	Federated Learnin ng (FedAvg) Algori Learning (VFL) – D Linear Regression, g with Non-IID Dat Optimization Tech	ng (HFL) -Definiti ithm – Improvem efinition and Arcl Secure Federate a – Heterogeneit nniques in Federa	on and ents or nitectur d Tree I y in Fec ated Le	Archit the Fe re of Ve Boostin lerated arning	tecture of edAvg Alg ertical Fec ng. d Learning g -Adaptiv	F Horizor orithm. lerated L g -Stratifi e Learnii	earning cation and rg Rate	erated I g – VFL A and Loca -Mome	earning – Igorithms: Il Updated ntum and
Module 3	Federa Learnin	ted Transfer ng and Security	Case studies / Case let		C	Case studie	es / Case	let	14	Sessions
Topics: Fe Encryption based FTL Security ir Data Leak	derated n in FTL – n Federat age in FL	Transfer Learning - FTL Training Proc ed Learning – Prot Advanced Securit	(FTL) – Framewo ess -FTL Predictio tecting Against Da y Issues -Dealing	rk of Fe on Proce ata Leal with By	ederate ess – S kage ir zantin	ed Transfe security Ar n FL -Priva ne Threats	er Learnin halysis of te Paran to Neur	ng – Ho f FTL – S neter Ag al Netw	momorr Secret Sh ggregatio vorks in I	nhic naring on for FL – FL.
Targeted	Applicati nd simula	on & Tools that ca	an be used: arning systems us	sing ten	isorFlo	wFederat	ed (TFF)	, PySyft	, Google	Colab /

Jupyt	er Notebook.
Simu	ating and deploying FL across nodes using Cloud Platforms (AWS, GCP, Azure)
lt car	help small, medium and large businesses in any sector keep information assets secure.
	Project work/Assignment:
Assig	nment: Practical Applications and Case Studies -Real-world Applications of Federated Learning
Text	Book
T1 AG; 1	Federated learning comprehensive overview of methods and applications Springer Nature Switzerlar st ed. 2022 edition By Heiko Ludwig (Editor), Nathalie Baracaldo
T2	Federated Learning (Synthesis Lectures on Artificial Intelligence and Machine Learning)
, by R	onald J. Brachman, Francessa Rossi, and Peter Stone, Series Editors, Released 30 December 2019.
Publi	sher(s): Morgan & Claypool Publishers.
Refei	ences
R1	Federated Learning with Python by Kiyoshi Nakayama PhD, George Jeno, O'Reilly Media, Inc. Put
R2	What-is-federated learning? By Emily Glanz, Nova Fallen, O'Reilly Media, Inc. Pub.
E bo	ok link R1: http://www.iso.org/iso/home/standards/management-standards/iso27001.html
E	book link R2: https://www.oreilly.com/library/view/what-is-federated/9781098107253/ch03.html
÷ +	
I opic	s relevant to development of "SKILL DEVELOPMENT": Security Policy Implementation, Security Roles
l opic devel asses	opment of Skill Development of "Skill DEVELOPMENT": Security Policy Implementation, Security Roles opment of Skill Development through Participative Learning Techniques. This is attained through sment component mentioned in course handout.

Course C CSE3417	ode:	Course Type of	Title: E	dge Computing e: Theory Only Course Discip	oline Elective	L-T-P-C	2	0	2	3
Version	No.		1.0							
Course F	Pre-		CSE25	06 – Cloud Computing						
requisite	es			1 0						
Anti-req	uisites		Nil							
Description Computing platform, with a special focus on using the cloud for bi course covers various topics such as the evolution of computing ind basics and edge computing. The course provides information on the compute deployments, different types of edge compute services Edge, and Multi-access Edge (MEC)). The course also educates the s vendor platforms, software services, standard bodies and ope									today's olications ud comp types of DN Edge the diff commu	cloud s. The outing f edge e, IOT ferent inities
Course C	Dbjective		availab The ob Compu	le for edge computing. Stud ojective of the course is to ting and attain Employabili	ents will also creat o familiarize the ty through Proble	e a research learners wit m Solving M	project h the ethodol	of th conce logies	eir choo epts of 5.	sing. Edge
Course (Comes	Out On successful completion of the course the students shall be able to: CO1 Understand the principles, architectures of edge computing (Knowledge) CO2 Describe IoT Architecture and Core IoT Modules (Comprehension) CO3 Summarize edge to Cloud Protocols (Comprehension) CO4 Describe Edge computing with RaspberryPi (Comprehension)									
Course C	Content:									
IoT aı Comp Defin Use C		loT and Compu Definiti Use Cas	Edge ting on and ses	Term paper/Assignment/Case Study	Programming/Sir Collection/any ot associated activit	a	9 Sessions		15	
	Topics: Introduct computir Commun	tion to E ng use c ication I	Edge Co cases, E Models	omputing Scenario's and Us dge computing hardware a - Edge, Fog and M2M.	e cases - Edge co architectures, Edg	mputing pur e platforms,	pose ar Edge v	nd de /s Fo	efinition, g Comp	Edge uting,
Module	2	loT Archite and Cor Module	cture re loT es	Term paper/Assignment/ Case Study	Programming/Sir Collection/any ot associated activit	nulation/Dat her such y	а		9 Ses	sions
	Topics: A Metcalfe Impleme Requirem	connect s and ntations nents, In	cted eco Beckstr with ex oplement	osystem,IoT versus machine rom's laws, IoT and edge camples-Example use case ar ntation, Use case retrospect	-to-machine versu e architecture, R nd deployment, Ca ive.	us, SCADA, Th Role of an use study – Te	ne value archite lemedi	e of a ct, L cine p	networ Indersta Dalliative	k and nding care,
Module	3	Raspbe	rryPi	paper/Assignment/Case Study	Programming/Sin Collection/any ot activity	mulation/Da her such asso	ta ociated		10 Ses	sions
	Topics: Ir Systems o Remote a using Pi.	ntroduct on Raspl access to	ion to F perryPi, pols, Int	RaspberryPi, About the Rasp Configuring RaspberryPi, Pro erfacing DHT Sensor with P	berryPi Board: Ha ogramming Raspbo i, Pi as Webserver	irdware Layo erryPi, Conne , Pi Camera,	ut and ecting Ra Image &	Pinou aspbe & Vid	uts, Ope erry Pi via eo Proce	rating a SSH, essing
Module	4	Edge to Cloud Protocols Term paper/Assignment/Case Study Term Programming/Simulation/Data Collection/any other such associated activity								
	Topics: Implementation of Microcomputer RaspberryPi and device Interfacing. Edge to Cloud Protocols-									

	Protocols structure	,MQTT, MQTT , MQTT data tyj	publish-subscribe, MQTT ar pes, MQTT communication f	chitecture details, MQTT state transitior ormats, MQTT 3.1.1 working example.	ns,MQTT packet					
Module	5	Edge computing with RaspberryPi	Term paper/Assignment/Case Study	Programming/Simulation/Data Collection/any other such associated activity	7 Sessions					
	Topics: E solutions	dge computing	; with RaspberryPi, Industria	al and Commercial IoT and Edge, Edge	computing and					
	 5. Application : Smart Surveillance Video Stream Processing at the Edge for Real-Time Human Objects Tracking. 6. 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 w	ork/Assignmer	nt: Mention the Type of Pro	ject /Assignment proposed for this cours	se					
	 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 IoT and Edge Computing for Architects - Second Edition, by Perry Lea, Publisher: Packt Publishing, 2020, ISBN: 9781839214806 Raspberry Pi Cookbook, 3rd Edition, by Simon Monk, Publisher: O'Reilly Media, Inc., 2019, ISBN: 978149204322 									
	Topics re Interfacir through a	elevant to "EM ag for developi assessment com	PLOYABILITY SKILLS": Impl ng Employability Skills thro ponent mentioned in cours	ementation of Microcomputer Raspber ough Problem Solving methodologies . e handout.	ryPi and device This is attained					

Course	Course	Title: Netwo	ork Security and Fire	nd Firewall								
Code:	Manag	ement			L-T- P- C	2	0	2	3			
CSE3418	Type of	Course: Int	egrated									
Version N).	1										
Course Pro	9-	CSE2503 -	- Cryptography and	d Netwo	rk Security							
requisites	5											
Anti-												
requisites	5	This course	provides an in dent	th study s	fuarious potu	ork attac	ks tosh	niques and p	acthods to			
Course Descriptio	n	defend aga including va attacks on l mechanism communica understanc	inst them. A numbe arious vulnerabilities DNS servers, TCP ses is, including intrusio ation, IPsec, virtual p I these attacks, basic	r of threa s of TCP/I ssion hija n detectio private ne cs of the T	ats and vulnera IP protocols, de cking, and so o on, firewalls, tr etwork, and PKI TCP/IP protoco	bilities of enial of se n. This co racing the . To make Is will als	the Int ervice (E ourse wi e source e it easy o be co	ernet will be DOS), attacks Il also cover of attacks, a of or student vered in the	covered, on routing, defending anonymous s to course.			
Course		The object	ive of the course is	s to fami	liarize the lear	ners wit	h the c	oncepts of I	Firewall and			
Objective		Internet se	curity and attain Ski	ill Develo	pment throug	h Probler	n Solvir	g Methodol	ogies.			
		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 att	acks.				,					
	_	• Ex	amine security incid	ent postr	mortem report	ing and o	ngoing	network sec	urity			
Course Ou	t	activities.	-			-						
Comes		• Co	onstruct code for aut	thenticati	ion algorithms.							
		 Develop a signature scheme using Digital signature standard. 										
		● De	Demonstrate the network security system using open source tools									
Course Content:												
Module 1	Introdu Firewal	ction to I	Assignment	Data	Data Collection/Interpretation			:	12 Sessions			
Intr	oduction d	of Firewall i	in computer netwo	rk,Catego	ories of firewa	ll,How fi	rewall	works, Types	of firewall,			
Fire	wall locati	on and Con	figuration, Firewall	Policies, Fi	irewall Biasing	,Network	Archite	ecture,Net n	nasks,Packet			
filte	rs,Stateful	firewalls,Re	sources									
Module 2	Compu	ter security	Case studies / Case let		Case studies	s / Case le	et	1	.2 Sessions			
Top Secu Trar	ics: Attacl urity Type osport Laye	ks on Comp s of Attack er Security, H	uters and Computers s. Transport Level S HTTPS, Secure Shell	r Security Security: (SSH)	y: Need for Sec Web Security	curity, Se Conside	curity A erations	pproaches, Secure So	Principles of ckets Layer,			
Module 3	Networ	k Security	Quiz		Case studies	s / Case le	et	1	.0 Sessions			
Тор	ics: Overv	iew of Netw	ork Security:Elemen	ts of Netv	work Security ,	Classificat	tion of N	letwork Atta	cks ,Security			
Met Pub , Se	hods ,Sym lic-Key Cry cure Hash	metric-Key (ptography :I Algorithm (S	Cryptography :Data RSA Algorithm ,Diffie GHA) , Digital Signatu	Encryptic e-Hellmar ires.	on Standard (D n Key-Exchange	ES),Advar Protoco	nced En l , Authe	cryption Star entication :Ha	ıdard (AES) , ash Function			
	Cyber	laws and										
Module 4	Complia Standar	ance ds	Quiz	Ca	ase studies / Case let 11 Session				1 Sessions			
Top	ics:			<u> </u>				I				
Kerl secu forg	oeros:Wor irity,Public ery,Cyber vidual Gov	king ,ASS,T key Infrast Stalking,Ic gernment Pro	GS,SS-Internet sec curcture,Certificates, dentify theft and operty	curity p ,certificat d Fraud	rotocols-AH,ES tes authority.C I,Cyber terro	P,Models yber Crir rism,Cybe	s-Transp me: Intr er def	oort and oduction,Ha amation,Crir	tunnel-Email cking,Digital ne against			

1.14	t of Laboratory Tasks:
	St Of Laboratory Tasks.
1.	Perform encryption, decryption using the following substitution techniques
(1)	Ceaser cipner, (ii) playlair cipner iii) Hill Cipner iv) vigenere cipner
Ζ.	Perform encryption and decryption using following transposition techniques
1)	Rail fence II) row & Column Transformation
3.	Apply DES algorithm for practical applications.
4.	Apply AES algorithm for practical applications.
5.	Implement RSA Algorithm using HTML and JavaScript
6.	Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
7.	Calculate the message digest of a text using the SHA-1 algorithm.
8.	Implement the SIGNATURE SCHEME – Digital Signature Standard.
9.	Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.
10). Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool
11	L. Defeating Malware
i)	Building Trojans ii) Rootkit Hunter
la	ingeted Application & roots that can be used
Те	ext Book
T1	: Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian
Ed	lition
	T2: James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition,
Pe	arson,2017
RE	Herences 1. Andrew S. Tananhaum, Computer Naturalia, fifth adition, Dearson Edition
к 192	Andrew S Tanenbaum, computer Networks, Intheution, Pearson Edition
112	
	Web resources:
1.	https://networklessons.com/cisco/asa-firewall
2.	https://www.udemy.com/course/cisco-asa-firewall-lab-guide
3.	https://geekflare.com/learn-network-security
• •	Topics relevant to development of "Skill Development": AES, Network Security for Skill
De	evelopment through Problem Solving methodologies. This is attained through assessment component
m	entioned in course handout.

Course Code: CSE3419Course Title:Information Security and ManageType of Course: Theory Only Course						ent	L- T-P- C	3	0	0	3
Version No.		1							1	1	1
Course Pre- requisites		CSE250	3 – Cryp	tography and N	etwork	Secu	urity				
Anti-requisites											
		The cou	rse explo	res information	security	thro	ugh some	introdu	ctory r	naterial	and helps
Course Description		gain an introduc allows a develop discussic knowlec analyze	appreciat ction to c student an appr on of a si dge and ro potential	tion of the scope ryptography, sec to begin a fascin eciation of some mple model of t ples required for career opportun	and cor curity ma ating jou e key se che infor employa ities in th	ntext anage urney ecurit matic ability his pr	of inform ement, ne into the s y concept on securit y. A stude rofession.	ation se twork a study of s. The y in ind ent will b	ecurity. nd com inform course ustry a be able	It includ aputer se ation sec conclud nd explo to deter	es a brief ecurity. It curity and es with a ores skills, rmine and
Course Objective		The obje Security techniqu	ective of t and Ma ues.	he course is to f anagement and	amiliariz attain	e the Empl	e learners I oyability	with the through	e conce n Parti	pts of In cipative	formation Learning
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	Informa Manage	ation Sec ement:	curity	Assignment	Da	ata C	Collection/Interpretation 10 Ses			Sessions	
Topics: Inf and Exposu Information	ormation ure (CVE n Securit	n Securit :), Securi :y Measu	ty Overvie ity Attack ires.	ew, Threat and A s, Fundamentals	ttack Veo	ctors rmati	, Types of ion Securi	Attacks, ty, Com	, Comm puter S	ion Vuln Security	erabilities Concerns,
Module 2	Fundam Informa Data Le	nentals o ation Sec akage	of curity and	Case studies / Case let		С	Case studies / Case let		let	13	Sessions
Topics: Ke Information Key Perforr	y Eleme n States. nance In	ents of What is ndicators	Networks Data Lea (KPI), Da ⁻	, Logical Eleme kage and Statisti tabase Security.	nts of N cs, Data	Netw Leaka	orks, Crit age Threat	ical Info ts, Reduo	ormatic cing the	on Chara Risk of	cteristics, Data Loss,
Module 3	Informa Policies Manage	ation Sec and ement	curity	Case studies / Case let		C	ase studie	es / Case	let	14	Sessions
Topics: In Implement Responsibil Responding	iformation, (ation, (lities, Ao g to Eme	on Secu Configura ccountat rgency S	urity Pol ation, Se pility, Rol Situation-	licies-Necessity-K ecurity Standarc es and Respons Risk Analysis Pro	ey Eler Is-Guidel sibilities cess.	ment lines of I	s and (and Fra nformatio	Characte ameworl n Secur	eristics, ks, Seo rity Ma	Securi curity R anageme	ty Policy oles and nt, Team
Targeted A An ISMS is a includes pe It can help	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 small, medium and large businesses in any sector keep information assets secure.										

infor	mation, intellectual property, employee details or information entrusted to you by third parties.
ISO/I mana	EC 27001 is the best-known standard in the family providing requirements for an information se agement system (ISMS).
	Project work/Assignment:
Assig	nment:
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-O
Relea	iseu April 2013. Publisher(S): MCGraw-Hill.
•	
Refe	rences
R1	Title, Cryptography & Network Security (Sie) 2E, Author, Forouzan, Publisher, McGraw-Hill
Educ	
Euuc	ation (India) Pvt Limited.
R2	ation (India) Pvt Limited. Information Systems Security, 2ed: Security Management, Metrics, Frameworks and Best Pi
R2 R2 Nina	ation (India) Pvt Limited. Information Systems Security, 2ed: Security Management, Metrics, Frameworks and Best P Godbole.
R2 Nina	ation (India) Pvt Limited. Information Systems Security, 2ed: Security Management, Metrics, Frameworks and Best Pi Godbole.
R2 Nina E bo	ation (India) Pvt Limited. Information Systems Security, 2ed: Security Management, Metrics, Frameworks and Best Pr Godbole. ok link R1: <u>http://www.iso.org/iso/home/standards/management- standards/iso27001.html</u>
R2 Nina E bo	ation (India) Pvt Limited. Information Systems Security, 2ed: Security Management, Metrics, Frameworks and Best Pr Godbole. ok link R1: <u>http://www.iso.org/iso/home/standards/management-standards/iso27001.html</u> : book link R2: <u>http://csrc.nist.gov/publications/nistpubs/800-55-Rev1/SP800-55-rev1.pdf</u>
R2 Nina E bo	ation (India) Pvt Limited. Information Systems Security, 2ed: Security Management, Metrics, Frameworks and Best Pr Godbole. ok link R1: <u>http://www.iso.org/iso/home/standards/management-standards/iso27001.html</u> : book link R2: <u>http://csrc.nist.gov/publications/nistpubs/800-55-Rev1/SP800-55-rev1.pdf</u> _INKS: pu.informatics.global , https://sm-nitk.vlabs.ac.in.
R2 Nina E bo	ation (India) Pvt Limited. Information Systems Security, 2ed: Security Management, Metrics, Frameworks and Best Pr Godbole. ok link R1: http://www.iso.org/iso/home/standards/management- standards/iso27001.html E book link R2: http://csrc.nist.gov/publications/nistpubs/800-55-Rev1/SP800-55-rev1.pdf _INKS: pu.informatics.global , https://sm-nitk.vlabs.ac.in. Is relevant to development of "SKILL DEVELOPMENT": Security Policy Implementation, Security I
R2 Nina E bo WEB Topic deve	ation (India) Pvt Limited. Information Systems Security, 2ed: Security Management, Metrics, Frameworks and Best Pr Godbole. ok link R1: <u>http://www.iso.org/iso/home/standards/management-standards/iso27001.html</u> book link R2: <u>http://csrc.nist.gov/publications/nistpubs/800-55-Rev1/SP800-55-rev1.pdf</u> LINKS: pu.informatics.global , https://sm-nitk.vlabs.ac.in. is relevant to development of "SKILL DEVELOPMENT": Security Policy Implementation, Security I opment of Skill Development through Participative Learning Techniques. This is attained

Course Code:	Course	e Title: Netw	ork Intrusio	evention				Γ			
CSE3420						L- T-P- C	3	0	3		
	Туре о	of Course:1]	Program Co	re							
		2]	Theory Only	y							
version No.		1.0									
Course Pre-		CSE2503 Cry	ptography (and Network Securit	ΣŶ						
requisites											
Anti-requisites		NIL									
Course		Objective of	f the course	e is to Understand	when, where, how, a	ind why to	арр	ly Intrus	ion		
Description		Detection to	pols and tec	chniques in order to	r to improve the security posture of an enterprise.						
		Apply know	ledge of the	e fundamentals and	history of Intrusion I	Detection i	in order to avoid				
		common pi	tfalls in the	creation and evaluate	uation of new Intrusi	on Detecti	on Sy	/stems a	and		
Course Objectives		Analyze Intr The objective	usion detect	tion alerts and logs t	the learners with the	pes from to	aise a	larms.			
Course Objectives		The objective of the course is to familiarize the learners with the concepts of Intrusion									
		Learning techniques.									
Course Out Comes		On successfi	ul completic	on of the course the students shall be able to:							
			derstand ah	out the intruders	students shan be able						
		 Define intrusion detection and prevention policies 									
		Explain the fundamental concepts of Network Protocol Analysis and demonstrate									
		the skill to c	apture and a	analyze network pag	ckets.	and yold and	acti	onstrate			
		• Use	e various pro	otocol analyzers and	Network Intrusion De	tection Sys	tems	as secu	rity		
		tools to detect network attacks and troubleshoot network problems.									
Course Content:											
Module 1	Introd	uction to	Intrusion	ssignment	Programming ⁻	Task	1	0 Sessio	ons		
	Detect	ion and F	Prevention	U							
	System	า									
Topics											
Understa	nding Ir	ntrusion Dete	ection – Intr	usion detection and	prevention basics – ID	S and IPS a	nalvs	is schem	าคร		
Attacks, D	Detectio	n approache	es – Misuse d	etection – anomaly	detection – specification	on based d	etect	on – hył	orid		
detection	n. Interr	nal and exte	rnal threats	s to data, Need an	d types of IDS, Inform	nation sou	rces,	Host bas	sed		
informati	ion sour	ces, Networl	k based info	rmation sources.	,, ,		,				
Assignme	ent: Den	nonstrating I	the skills to	capture and analyze	network packets usin	g network	packe	et analyz	er.		
				.				<u> </u>			
Module 2		Intrusion	Prevention	Assignment	Programming Task		1	0 Sessio	ns		
	2	System									
Topics:											
Intrusion	Prevent	tion Systems	, Network II	Ds protocol based ID	s, Hybrid IDs, Analysis	schemes,	thinki	ng abou	t		
intrusion.	. A mod	el for intrusi	on analysis,	techniques, Respon	ses, requirement of re	sponses, T	pes	of			
responses	s, mapp	ing response	es to policy \	/ulnerability analysi	s, credential analysis, I	non-creder	itial a	nalysis.			
Architect	ure moo	dels of IDs ar	nd IPs.								
		المنامح المغمر الم	on dotoot!	المحمد مانان محمد ما	ions						
Assignme	ent: App	liying intrusi	on detection	h in security applicat	lions.						

Module 3	Applications tools	and Assign	ment Pro tas	ogramming/Data sk	analysis	12 Sessions			
Topics: Tool Selection Security IDS – S Installing Snort Procedure to C	and Acquisition Proce Snorts Intrusion Detec , Running Snort on M Compile and Install Sno	ss – Bro Intru tion – NFR se ultiple Netwo ort Location o	ision Detection ecurity. Introdu ork Interfaces, of Snort Files, S	n – Prelude Intrusi uction to Snort, Sn Snort Command L inort Modes Snort	on Detection ort Installatio ine Options. Alert Modes	– Cisco on Scenarios, Step-By-Step			
Assignment: D Configuration F	emonstrate the worki File.	ng with Snor	t Rules, Rule H	eaders, Rule Optio	ons and The S	Snort			
Module 4	Legal issues organizations standards	andAssig	nment	Programm analysis ta	iing/Data sk	9 Session			
Law Enforceme Standardizatio Assignment: /	ent / Criminal Prosecu ns. Addressing common le	tions – Stanc gal concerns	lard of Due Ca and myths ab	re – Evidentiary Is out Intrusion Dete	sues, Organiz ection system	ations and			
Textbooks T1. Carl Endorf Hill, 2004. T2. Earl Carter,	f, Eugene Schultz and . , Jonathan Hogue, "Int	er " Intrusion D ntion Fundam	etection & Prever entals", Pearson E	ntion", 1st Ed	ition, Tata McGrav 06.				
References									
R1. Rafeeq Reh Prentice Hall , R2. Christophe Solutions", 1st R3. Paul E.	 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: <u>https://www.y</u> https://www.c	outube.com/watch?v oursera.org/lecture/d	=RYB4cG8G2 etecting-cyb	<u>xo</u> er-attacks/intr	usion-detection-s	ystems-UeDo	<u>U</u>			
Topics relevan through Partic course handou	t to "SKILL DEVELOPN ipative Learning techn t.	1ENT": Agent niques. This is	t development s attained thro	for intrusion dete	ection for Skil omponent m	l Development entioned in			

Course Code: CSE3421	Course Title: Principles and Practices of Web Secur Type of Course: Integrated					L- T-P- C	2	0	2	3
Version No.		1								1
Course Pre-		CSE2503 – Cryp	otography and network sec	curity						
requisites				•						
Anti-requisites		NII								
Course Description		The purpose of understanding critical services are growing or course covers exploitation, va	of this course this course web functionality and vario and is quickly evolving as a a year-to-year basis and fundamental concepts arious attacks on web appl	is to in ous secu platfor designi of web ications	ntroc irity v m to ing so o se , and	duce you to validations. connect all ecure web curity prin d a few basio	o the fi The wel our dev applicat ciples, c topics	eld of is our ices. We ions is web v on web	web se gateway eb vulne challen ulnerab encryp	curity by to many rabilities ging. The ility and tion.
Course Objective		The objective of attain Skill Dev	of the course is to familiari relopment through Experie	ze the l ential Le	earn earni	ers with the ng techniqu	e concej ies.	ots of V	/eb Sec	urity and
Course Out Comes On successful completion of the course the students shall be able to: Define the fundamentals of web applications and validation [Knowledge] Recognize the significance of password and authentication applications[Comprehension] Explain the importance of session management in web [Comprehension] Apply web attack techniques to find vulnerabilities in web applications [App Course Content:							ge] tion n] [Applica	ín web ation]		
Module 1	Intr	oduction	Quiz		Com web	prehension fundament	based tals	Quiz on	10 9	Sessions
Topics: Web Fu Analyzir Data, H Defense	nctio ng th andli in-D	nality, Encoding e Application B ing Client-Side E Pepth Approach	Schemes, Mapping the Ap ypassing, Client-Side Cont Data Securely - Input Valio - Attack Surface Reduction	oplicatic rols: Tra dation, I , Rules (on - E ansm Black of Th Com	numerating hitting Data klist Validat humb, Classi pprehensive	g the Co Via the ion - W ifying ar based	ntent a e Client hitelist nd Prior	nd Func , Captu Validat tizing T	tionality, ring User ion - The hreats.
Module 2	We Aut	b Application hentication	Assignment		assig	gnment on V	Web		11	Sessions
Image: Second State Sta										
Module 3	Ses Ma &W Prir	sion nagement /eb Security nciples	Quiz		Con v	nprehensio web security	n based / techni	Quiz oı ques.	ຳ 11	Sessions
Topics: Need fo Handlin Attackin Site Scri Director	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, Director: Traversels									
Module 4	We	b Application	Assignment			Comprehe assignme	nsion ba nt on w	ased eb	10	Sessions

Vulnerability			vulnerabilities								
Topics:											
Attacking data-stores and ba XPath, LDAP, Injecting OS Co Back-end HTTP Requests, I Attacking users-Cross site vulnerabilities, preventing XS	Attacking data-stores and backend components- Injecting into Interpreted Contexts, injecting into SQL, NoSQL, XPath, LDAP, Injecting OS Commands, Manipulating File Paths, Injecting into XML Interpreters, Injecting into Back-end HTTP Requests, Injecting into Mail Services, Attacking application logic-real world logic flaws, Attacking users-Cross site scripting-varieties of XSS,XSS attacks in action, finding and exploiting XSS vulnerabilities, preventing XSS attacks, Other techniques-cookie based Attacks, HTTP Header Injection										
List of Lobourtow, Tooles											
List of Laboratory Tasks:	o of known wylnorobilitios i	~ CCI	ANAD stacks DECT ADIs store sit	o corinting							
Task 01: Practical knowledg	Task 01: Practical knowledge of known vulnerabilities in CGI, LAMP stacks, REST APIs cross-site scripting										
Task 02: FITP and setting u	p stacks, the various types	OI Udla	bases Access Controls, Vumerab	mues							
Task 04. Study of web auth											
Task 04: Study of web autility	ations										
Task 06: Cross site request	forgery attack lab										
Task 07. Web tracki	ingery allack lab										
Targeted Application & Teach	s that can be used										
rargeted Application & root	s that can be used										
1 Wordpross tool con	he used for building websit	toc with	nossible vulnerabilities								
Table such as Nman	1. Wordpress tool can be used for building websites with possible vulnerabilities.										
2. Tools such as Nmap	2. Tools such as Nmap and Nessus can be used for web attack demonstration.										
	Project work/Assignment:										
Assignment:											
Group assignment to ident applications.	tify and write different v	veb ex	ploits to demonstrate vulnera	bilities in web							
Text Book											
T1 Dafydd Stuttard, Marcus P	into, "The Web Application	Hacke	r's Handbook", Willey Publishing	g Inc.							
References	, , , , , , , , , , , , , , , , , , , ,		, , ,	5							
R1 B. Sullivan, V. Liu, and M.	Howard, "Web Application :	Securit	y", A B Guide. New York: McGrav	v-HillEducation,							
2011 R2 Web Application Se	curity: Exploitation and (Counte	measure for Modern Web A	oplications, by							
AndrewHottman											
E book link R1: https://pr	resiuniv.knimbus.com/user	#/home	2								
E book link R2 : https://presi	iuniv.knimbus.com/user#/h	iome									
R3											
Web resources:	na du atian ta lafa muatian C										
NPTEL / Swayam Link: Int	roduction to information S	ecurity	i, ili Madras								
nttps://nptei.ac.in/course	25/106106129		lesia								
PO Library Link :https://p	ouniversity.informaticsgloba	al.com/	login								
Session Management 8W/oh	ADILII T SNILLS :	h Ann	ication vulnerability for Skill De	alonment							
through Experiential Learning	Security Principles and We	sod the	near of vulnerability for Skill Dev	t montioned in							
the course handout	ig rechniques. This is attair	ieu thr	ough the assessment componen	t mentioned In							
life course nandout.											

Course Code: CSE3422	Course Title: Penetration T Type of Course: Theory On	esting and Risk As ly Course	sessment	L-T- P- C	3	0	0	3
Version No.	1.0					1		
Course Pre- requisites	CSE2503 – Cryptog	raphy and Network	Security					
Anti-requisites	NIL							
Course Description	This course explore course also covers investigation, and a networks.	es the tools that can how vulnerability analysis of commo	an be used can be ca n attacks ii	to perforn rried out b n data, mol	n info by m bile a	ormati eans o applica	on gath f tools tions an	ering. This or manual Id wireless
Course Objective	The objective of the Assessment and Pe Methodologies.	e course is to famili enetration Testing	arize the le and attain	arners with Employabi	the (lity t	concep hroug	ts of Vu n Proble	Inerability em Solving
Course Out Comes	 On successful completion of the course the students shall be able to: Understand the basic principles for information gathering and detecting vulnerabilities in the system. Determine the security threats and vulnerabilities in SDN networks and web applications. Able to use the exploits in mobile applications and wireless networks Understand the metasploit and metrepreter are used to automate the attacks and penetration testing techniques. 							
Course Content:								
Module 1	Information Gathering, Host Discovery and Evading Techniques	Assignment		Theo	ry		g	Sessions
Topics: Introduction Testing Rep Approaches Function pr	n - Terminologies - Categor orts - Information Gathering , Host discovery - Scanning	ies of Penetration g Techniques - Acti g for open ports a	Testing - I ve, Passive and service	Phases of P and Source es- Types o	enet es of f Po	ration Inforn rt, Vul	Test -P nation G nerabilit	enetration iathering – ty Scanner
Module 2	Vulnerability Scanner in SDN Networks and Web application	Quiz		Theo	ry	onne	10	Sessions
Topics: Nessus Vuln SDN Data pl Harderning, vulnerability Module 3	Image:							
Topics:	analysis							
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 eavesdropping using MITM session hijacking over								
Module 4	Exploits	Quiz		Theo	ry		8 Se	essions

Topics:
Architecture and Environment- Leveraging Metasploit on Penetration Tests, Understanding - Metasplo
Channels, Metasploit Framework and Advanced Environment configurations – Understanding the So
Architecture, Configuration and Locking, Advanced payloads and add on modules Global datastore, modul
datastore, saved environment Meterpreter.
Targeted Application & Tools that can be used:
This course helps the students to understand the threats and vulnerabilities using NMAP.
Project work/Assignment:
Project Assignment:
Text Book
1. Rafay Baloch, Ethical Hacking and Penetration Testing Guide, CRC Press, 2015. ISBN : 78-1-4822-
3161-8.
2. 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.
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: https://onlinecourses.nptel.ac.in/noc19_cs68/preview - IIT Kharagpur, Prof. Indranil Se
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 th
assessment components mentioned in course handout.

Course Code:	Course Title	e: Go Programm	ning		L- T-P- C	3	0	0	3	
CSE3423	Type of Cou	Irse: Theory Or	niy Course		_		-	-	_	
Version No.	1.0	4502 0 11								
Course Pre-	CSE	1502 Problem	Solving using C							
Anti	NUL									
Anu- requisites	INIL									
Course Description	Go i clea mos type pop This Engi Stat met Con	is an open sou in, and efficien st out of multic convenience of ed, compiled la ularity and it is course will p ineering throug ics: Topics co ements; Comp chods; garbage currency – go	t. Its concurrency tore and networked f garbage collection nguage that feels continuing to gro rovide an introdu gh lecture hours v overed in this co posite Types — are collection esse routines and char	g language cre mechanisms r ed machines. G on and the pow like a dynamic ow rapidly in in uction to the vith demonstra urse are go p rays, slices, st entials – poir nnels, Package	eated by Goo make it easy to compiles o ver of run-tim ally typed, in dustries such Go program ations. rogram stru trings, runes, nters, struct s – import ar	ogle. Go i to write j quickly to terpreted n as Dropl ming esse cture; da , bytes, h s, interfa nd create	s explorogra mach on. It's langu oox, U entials ta typ ash n ices; custo	ressive, o ams that ine code s a fast, st lage. It is lber etc. s to stud pes and naps; fur error ha m packag	concise, get the yet has tatically gaining ents of control nctions; andling; ges and	
Course Objective	app The and	The objective of the course is to familiarize the learners with the concepts of GO Programming and attain Employability Skills through Problem Solving techniques.								
Course Out Comes	CO1 CO2 prog CO3 moc CO4 (Ap)	On successful completion of the course the students shall be able to: CO1: Identify primitive programming constructs in GO. (Knowledge) CO2: Discuss composite data types with concepts of modular programming. (Comprehension) CO3: Implement garbage collection using pointers, structs, interfaces and modules. (Application) CO4: Apply concurrent programming and test routines with applications. (Application)								
Content:						Γ				
Module 1	Programmir Language	n to Go ng	Assignment	Data Collectio	n/Interpreta	tion		10 Se	essions	
Topics: Feature of Structure naming, r packages, statement	f Go languag of Go progr ules, conver println, rea s.	ge, Installing a ram; Basic typ rsions, constar ding input, Co	nd Configuring th es-numbers, boo nts, multiple vari ontrol Structures	ne developmen lean, strings, iables. Introdu - if, switch,	[Kn nt environm runes. Varia uction to pa for, progran	owledge] ent- Go t bles- dec ickages, f nming ex	ools a laratio unctio ercise	and play on, zero ons from os using	ground. values, oother control	
Module 2	Composite t functions	types and	Assignment	Data Collect	ion/Interpret	tation		9 Se	essions	
Topics: Composite returning	e types - arı multiple valu	rays, slices, sl les, variadic fur	ices with overlap nctions; Progran	oping storage, nming exercise	Structs. Fu s	[Context nctions-d	ompre eclari	ehension ng, para] meters,	
Module 3	Pointers, St Interfaces a	ructs, Ind modules	Quiz	Case stu	dies / Case le	et		9 Se	essions	
Topics: Pointers: * Modules,p	*and & opera backages – im	ator, types, po nporting and cr	inters with functi eating custom pa	ons, garbage c ckages; Progra	[Ap collector – hi mming exerc	plication] story, Me cises.	thods	and Into	erfaces,	

Module 4	Concurrency and Applications	Quiz	Case studies / Case let		7 Sessions						
Topics: Concurren commanc Computat	Topics: [Application] Concurrency using Go routines, multiple go routines, channels – channel operations, Testing- writing test, Go test command, Core Packages for – strings, containers and lists, Writing Web Applications, Basic Statistical Computations, histogram plotting, encryption and decryption.										
Targeted 1. <u>k</u> ● <u>k</u>	Targeted Application & Tools that can be used: 1. https://go.dev/play/ ● https://go.dev/doc/install										
		Project work	Assignment:								
Text Bool T1 1. Jo California	Text Book T1 1. John Badner,"Learning Go: An Idiomatic Approach to Real World Go Programming", Oreilly, California,2021.										
Reference R1. 1. A India,201 R2. Tsoul machine I Web reso EBSCO da W3. GO d Online to • ()	References R1. 1. Alan A.A. Donovan and Brian W. Kernighan, "The Go Programming Language", Pearson Education, India,2016. R2. Tsoukalos M. Mastering Go: Create Golang production applications using network libraries, concurrency, machine learning, and advanced data structures. Packt Publishing Ltd; 2019 Aug 29. Web resources: https://www.golangprograms.com/go-language.html EBSCO database of Presidency University: https://www.golangprograms.com/go-language.html BSCO document: https://go.dev/doc/ Online tool for program execution: GO Play Ground - https://go.dev/doc/install • go Play Ground - https://go.dev/doc/install										
Topics re through F handout.	levant to development of Problem Solving methodol	"Employability": Go ogies. This is attaine	Programming basics for developi d through assessment componer	ing E i nt me	mployability Skills entioned in course						

						1	-			
Course Code:	Course Title:Advanced	DBMS			2	0	2	3		
CSE3424	Type of Course: Core									
	Theor	ry &Integrated Laborato	ory	L-1-F-C						
Version No.	1.0									
Course Pre-requisites	Database Managemei	nt System (CSE3156)								
Anti-roquisitos	NIII									
Course Description	The nurness of this s	ourso is to make the st	udonte re	wicit DDBM	IS tra	ncact	ions fi	et Thon		
course Description	introduce them with	Duise is to make the st Distributed Darallol an		databasa s	oncor	isaci	how inc	st. men		
	main characteristics	advantages, and disadv	antages o	f each one	of th	om l	moort	ance and		
	differences among the	am are noted. Need to t	transit fro	m RRMS to			discus	ance and and Tho		
	striking features of die	stributed narallel and N	loSOL are	considered	and	Q∟ i3 studia	alscus	seu. me		
	The associated labora	tory provides a chance t	to have h	ands-on co	ncent	s lear	ned di	ıring this		
		tory provides a chance			icept	5 1001	neu ut	aning tins		
Course Objective	This course is design	ed to improve the lear	nors' FM		IN SK		ny loar	ning the		
working on Database using MySOI										
0										
Course Outcomes	On successful complet	tion of this course the st	tudents sr	nall be able	to:					
	(1) Recall the tra	nsactions in RDIVIS								
	(2) Explain advanced f	eatures of distributed, pa	arallel, an	a Nosql da	tabas	es.				
	(3) Illustrate the featu	res in Distributed databa	ise fo opplice	tions						
	(4) Employ Parallel dal	abase concepts in real in	le applica	tions.						
Course Content:										
	Transactions in		Compret	ension base	ed					
Module 1	RDBMS	Quiz	Ouizzes a	and assignm	ients.		06Cla	asses		
Serial and Serializabl	le, Serializability-Confl	ict and View, Conflict	Serializa	bility chec	k by	Prec	edency	/ Graph,		
			Laborato	rv experime	ents					
		Programming and Mini	and Mini	Projects or	NoS	OL	_			
Module 2	NoSQL Databases	Project	Topics us	sing Mongol	DB/	~-	0	6Classes		
			Casandra).	/					
Tonics			cusunare	••						
NoSOL Introduction - 9	Scale Out, Commodity I	Hardware Brief History	Fasturas -	- Non-Relati	ional	Scho	ma Fro	o Simolo		
APL and Distributed N	Insol Architectures/Da	ta Models - Document (Columnar	Kev-Value	and (Granh	Trans	action in		
NoSOL- BASE for reli	able database transac	tions Achieving Horizo	ntal Scala	ahility with	Data	ahase	Shard	ing CAP		
theorem				ability with	Dutt	ibuse	Shara	116, 0, 1		
Case Study: MongoDB	Casandra/ AWS/ HBa									
	Distributed		Assignme	ent on main	tonic	~				
Module 3	Databases	Assignment	of Distrib	outed Datab	ases	.5	0	6Classes		
Topics:			of Bloth		4969					
Loosely Coupled. Cha	aracteristics of Distrib	uted Databases. Local	and Glob	al view of	appl	icatio	ns. Di	stributed		
Processing, Types – He	omogeneous and Hete	rogeneous. Distributed	Data Stor	age – Replie	cation	and	Fragm	entation.		
Fragmentation – Horiz	ontal and Vertical Type	, Difference between Ce	entralized	and Distrib	uted [Datab	ases.	,		
Module 4	Parallel Databases	Assignment	Assignme	ent on m	ain 06	Class	ses			
			topics	of Para	llel					
			Database	ο . ς						
Topics:	1	l								
Tightly Counled Featu	ires of parallel databas	es. Shared Memory Sha	ared Disk	Shared Not	hing '	Svstei	ms Ad	vantages		
of each of these sche	mes. Advantages and	Disadvantages of Paralle	l Databas	es. Differer	ices h) etwe	en Par	allel and		
Distributed Databases				,						
Install MONGODB										

https://www.javatpoint.com/mongodb-create-database Create any one of the following databases. Employee, Student, University, Banking, or Online Shopping Drop database Create Collection: In MongoDB db.createCollection(name,option) is used to create collection. **Drop Collection** List of Laboratory Tasks:(7 X 2= 14 Sessions) Level 1: Perform CRUD operations (Insert, Update, Delete and Query Documents) on 'Student' Database. Level 2: Do MongoDB text search on 'Employee' Database. Experiment No. 2: Try experiments on MongoDB Operators Level 1: Perform queries involving MongoDB Query and Projection Operators using 'Student' Database. Level 2: Do queries involving MongoDB update operator on 'Employee' Database. Experiment No. 3:Explore different query modifiers. Level 1: Perform different query modifiers on 'Student' Database. Level 2: Try various query modifiers on 'Employee' Database. Experiment No. 4:Explore Aggregation commands. Level 1: Implement different aggregation commands on 'Student' Database. Level2: Perform various aggregation commands on 'Employee' Database. Experiment No. 5: Explore Authentication commands. Level 1: Try authentication commands on 'Student' Database. Level 2: NA Experiment No. 6:Explore Replication Commands Level 1: Try all replication commands on 'Student' Database. Level2: Implement replication commands on 'Employee' Database. Experiment No.7: Try Sharding Commands. Level1: Explore Sharding Commands on 'Student' Database. Level 2: Implement Sharding Commands on 'Employee' Database. Targeted Application & Tools that can be used: MongoDB is to be installed and used. Project work/Assignment: Each batch of students (self-selected batch mates) will identify projects, such as, Library, Banking, and Reservation etc.,and do it. Concepts of NoSQL, like, CRUD operations, supporting ad hoc queries, indexing flexibility, assisting replication, creating capped collections, and Retrieving data from multiple documents. Sample Mini Projects: 1. Content Management System Clubbing the content assets like text and HTML into a single database helps provide a better user experience. MongoDB has an excellent toolset not only for storing and indexing but also for controlling the structure of a content management system. You can easily design a web-based CMS by using the model proposed by "Metadata and Asset Management" in MongoDB. Additionally, you can use "Storing Comments" to model user comments on blog posts. 2. Gaming Project Data is an essential part of making video games work. Some typical examples of gaming data include player profiles, matchmaking, telemetry, and leaderboards. The common thread between all games is that they all have a specific goal. And you have to achieve multiple

The common thread between all games is that they all have a specific goal. And you have to achieve multiple objectives or pay your way out to reach the end goal. This may involve steps like watering your plants, growing vegetables, serving food in a restaurant, and so on.

Textbook(s):

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, 1st Edition, 2019(Wiley Publications).

2.	Stefano Ceri, Giuseppe Pelagatti, Distributed Databases: Principles and Systems,, 2017(McGraw Hill
Educatio	on).
Poforon	

References

Elmasri R and Navathe S B, "Fundamentals of Database System",7th Edition, 2017(Pearson Publication).
 Pivert. NoSQL Data Models: Trends and Challenges, 1st edition(Wiley).

Topics related to development of "FOUNDATION":Transaction, CRUD Operations, Replication, and Sharding Topics related to development of "EMPLOYABILITY": Project implementations in software, batch wise presentations Topics related to development of "HUMAN VALUES AND PROFESSIONAL ETHICS": Team Dynamics during Mini Project Development.

			1	1	1	т т						
Course Code:	Course Title: Programming in C	C# and .NET	L-T-	1	0	4	3					
CSE3425	Type of Course. Theory Integra		P-C									
Version No.	1.0											
Course Pre- requisites	CSE 1006 : Problem Solving u	sing Java										
Anti-	NIL											
requisites												
Course	.NET is a software framework whi	ch is designed an	nd develope	d by M	icrosof	t. It is u	ised to					
Description	develop Form-based applications, variety of programming languages	Web-based appl	ications, an Net platforr	id Web n VR N	service Jet C#	etc C#	re is one					
	of the most popular languages of	.NET framewor	k. It is use	ed to b	uild ap	plicatio	ons for					
	Windows, phone, web etc. It prov	vides a lot of fur	nctionalities	and al	so supp	ports in	ndustry					
	standards. This course intends to proceed to provide the standards.	components of the .NET framework architecture. This course also provides the features of										
	C# programming language to desig	C# programming language to design and implement console, desktop-based applications and										
	web based applications.	-		•		•						
Course Objective	This course is designed to improve the working on Database using M	e the learners' <u>EN</u> ySQL.	<u>APLOYAB</u>	<u>ILITY</u>	<u>SKILL</u>	<u>.S</u> by lea	arning					
Course	On successful completion of this	course the stude	ents shall b	e able	to:							
Outcomes												
	ite components [Compact arging]											
	its components.[Comprehension]	its components.[Comprehension]										
	2. Illustrate the Object-Orio	2. Illustrate the Object-Oriented paradigm using C# Language.[Knowledge]										
	3. Develop different types	of applications	s by apply	ving th	e C# p	orogran	nming					
	concepts and database connectiv	ity.[Application]]									
	4. Demonstrate the use of event handling mechanism[Application]											
Course Content:												
	Concepts of .NET Technology,		Demo	onstrati	on	Th	+ Pr					
Module 1	Implementation of .NET,	Ouiz	of As	sembly	Ι,	4+	1(6)					
Moune 1	Components of .NET framework	Quiz	Introd IDE	duction	to							
Topics: Understand t	he motivation behind the NET platfo	orm Common I	anguage I	nfrastri	icture	(CLD)	Know					
the role of t	he Common Type System (CTS), th	e Common La	nguage Sp	ecificat	tion (C	(CLS) a	nd the					
Common La	nguage Runtime (CLR), Understand t	he assembly, m	etadata, na	mespa	ce, typ	e distir	nction,					
Contrast sing	de-file and multi-file assemblies, Kn	low the role of	the Comm	on Inte	ermedia	ate Lan	iguage					
(CIL),Introdu	iction to .NET Core		•		<u> </u>							
			Hand	S for	on							
	C# Programming constructs	Lab Based	Conc	on tor ents	the							
Module 2	OOPS concepts	Assignme	Creat	ing	а	3-	+6(15)					
		nts,	Cons	ole								
			appli	cation								
Topics: Prog	gram structures, Types and Variables, I	Expressions, Stat	tements, St	ructs, C	Class, C)bjects	Name					
Spaces - Cons	structor and Destructors, Function Ove	rloading & Inhe	ritance, Op	erator (Overlo	adıng,	Array,					
merraces, M	ounters -, working with Console inpu			ico	s , Enu	iii ,iiite	Traces					
	Event handling. Data base	Lab based	Exerc	cises u	sing	_						
Module 3	Connectivity	Assignme	Visua	al	8	3+3	(9)					
	, , , , , , , , , , , , , , , , , , ,	nts	Studi	o.NET								

Topics:

Delegates and events, Exception handling, Advantage of ADO.NET, ADO.NET Architecture, .NET Providers, Connection, Command, Data Set, Data Reader. Working with Connection Oriented and Connection less approach, Programming Window Forms Applications: The notifies - subscribers paradigm for handling

events. .NET framework for handling GUI events

Module 4ASP.NETLabbasedPracticeExercisesusingAssignmentsVisual Studio.NET2+2(6)

Topics:

Introduction to Web Forms, Basic working of WebForms, Introduction to Web Forms, Connectivity with the database , validation Controls

List of Practical Tasks:

Experiment 1:[Module 1]

Level 1: Demonstrate the .NET framework and Visual studio IDE for writing C# code.

Level 2: Demonstrate the .NET framework and inside of Assembly using ildasm tool.

Experiment 2: [Module 2]

Level 1: University wants to gift for those date of birth falls on February 29th . Create a C# program that will accept the employee's birth year. Check the leap year and issue them with surprise gift.

Level 2: A developer wants to check the given input is in Fibonacci series or not.

Experiment 3: [Module 2]

Level 1 : A teacher is asked to create mark list of her class students. The class consists of 10 students and they have 5 different subjects. Store the student's name and five subject marks also. Calculate the total of all subject marks and display them.

Level 2: A class teacher is storing the students 'name and Roll number. Write a program to help to sort out the roll number using different sorting techniques.

Experiment 4: [Module 2]

Level 1: Design a class to represent a bank account. Include the following members: Data Members: - Name of the depositor, Account Number, Type of Account, Balance amount in the account and methods : To assign initial values, To deposit an amount, To withdraw an amount after checking balance, To display name and the balance. Write a C# program to demonstrate the working of the various class members.

Level 2: Define a class 'Person' with data members name and age. Also include following: Default Constructor and parameterized constructor, Input method which takes values from user and assigns to data members, Output method to display all data. Create 5 objects of 'Person' class using array of objects and call all the methods of a class.

Experiment 5: [Module 2]

Level 1: Write a C# program to show single and multilevel inheritance.

Level 2: Create a class 'Emp' by extending Person class with additional data member empno, position with following features:

a. Default constructor

b. Parameterized constructor

c. Input method which takes values from user and assigns to data members and calls input method of Person

d. Output method to display all data and calls output method of Person

Define a class Manager by extending Emp with data member bonus. Provide necessary constructors and override input and output methods. Create objects of manager in main.

Experiment 6: [Module 2]

Level 1: Calculate the area of different shapes using method overloading.

Level 2: Class teacher created different groups in a class and store the data in that. In order to make common announcements and activities, teacher merged all data into a single group. Write a code to merge two groups into one.

Experiment 7: [Module 2]

Level 1: Class Teacher stores students marks in an array. Teacher is searching for highest and lowest marks of the class and number of students scored those marks. Write a program to help teacher to do the same.

Level 2: Create an application for currency converter.

Experiment 8: [Module 3]

Level 1: EC is updating their database of new voters. If the user's age is less than 18, application should raise the exception.

Level 2: Develop a desktop based application for displaying employees salary and leave balance.

Experiment 9: [Module 3]

Level 1: Create a login screen and prompts for the user name and Password. If the user exists in the database, show welcome message to the user when the button is clicked.

Level 2: Company wants to create a calculator application using C#.

Experiment 10: [Module 3]

Level 1: University stores the CSE students' data in the database and display the student details whenever required. Administrator allows to insert, update and modify the data. Implement this.

Level 2: University decides to conduct online quiz for CSE students. Create a windows-based application to implement this.

Experiment 11: [Module 4]

Level 1: University is organizing a cultural festival and organizing teams wants to collect registration for various events with the help of web page. Design a registration form for collecting the participant details.

Level 2: University is decided to display all information about the various departments in their website.

Design a web site to show the above mentioned.

Experiment 12: [Module 4]

Level 1: XYZ corporation wants to review their product. So company is creating a feedback form and validating the data with the help of validation controls. Design a feedback form with validation controls.

Level 2: XYZ corporation wants to review their product. So company is creating a feedback form and validating the data with the help of validation controls. Design a feedback form with validation controls and display the comparison chart of various months.

Targeted Application & Tools that can be used: Microsoft Visual studio.NET 2022, Visual Studio Code.

Project work/Assignment:

Problem Solving: Design of Algorithms and implementation of programs.

Programming: Implementation of given scenario using .NET.

Textbook(s):

1. Herbert Schildt , "C# 4.0 The Complete Reference", Fourth Edition, TMH

2. Matthew Macdonald,"ASP.NET: The Complete Reference", McGraw Hill Education

References:

2.

1. Joseph Albahari and Ben Albhari, "C# 3.0/4.0 in NUTSHELL", O'REILLY.

- 2. Andrew Troelsen, "C# and the .NET Platform" 1st edition Apress
- 3. Matthew Macdonald,"Beginning ASP.NET 4.5 in C#", Wiley India

Online References

1.<u>C# Tutorial (C Sharp) (w3schools.com)</u>

2. https://docs.microsoft.com/en-us/dotnet/csharp/tour-of-csharp/tutorials/

3.https://docs.microsoft.com/en-us/aspnet/tutorials

Topics relevant to development of "Employability": Web Application developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

		1							
Course (CSE3426	Code:	Course Develo	Title: Front-end	Full Stack	L- T-P- C	2	0	2	3
Version	No.		1.0						<u> </u>
Course I	Pre-		CSE1504 Web Te	chnologies					
requisit	es								
Anti-req	luisites		NIL						
Course I	Description		This intermediate with emphasis architectures tha completion of th development. Th course.	e course enables stu on employability s t enables the studer nis course, the stud ne students shall de	dents to perform skills. The cours it to design and in ent shall be able velop strong pro	front-en se covers mplement e to purs oblem-solv	d full key fron ue a ving s	stack d techn t-end. C career skills as	evelopment, ologies and)n successful in full-stack part of this
Course Objectives The objective of the course is to familiarize the learners with the concepts Front Stack Development and attain Employability through experiential Learning techni								ront end Full chniques.	
Course Outcomes On successful completion of the course the students shall be able to: 1] Describe the fundamentals of DevOps and Front-end full stack developmentension] 2] Illustrate a basic web design using HTML, CSS, Javascript. [Application] 3] Illustrate development of a responsive web. [Application] 4] Apply concepts of Angular.is to develop a web front-end. [Application]							evelopment.		
Course (Content:			,					
Module	1	Fundar DevOp:	nentals of s	Project	Programming				4 Sessions
	Topics: Introductic Architectur Review of (on to Ag e, Lifect GIT sour	gile Methodology ycle, Workflow & I rce control.	; Scrum Fundament Principles; DevOps To	als; Scrum Roles ools Overview – J	s, Artifact enkins, Do	s and ocker,	l Rituals Kubern	s; DevOps – etes.
Module	2	Web D Develo	esign & pment	Project	Programming			03	3 Sessions
	Topics: HTML5 – S Gradients, Assignmen	Syntax, Text, Tr t: Deve	Attributes, Events ansform; lop a website for r	5, Web Forms 2.0, V	Veb Storage, Car of a department	nvas, Web) Socl	kets; CS	S3 – Colors,
Module	3	Respor	nsive web design	Project	Programming			0	8 Sessions
	Topics: BootStrap for Responsive Web Design; JavaScript – Core syntax, HTML DOM, objects, classes, Async; Ajax and jQuery Introduction Assignment: Design and develop a website that can actively keep track of entry-exit information of a housing society.								
Module	4	Fundar Angula	nentals of r.js	Project	Programming			1	5 Sessions
Angular.js Image: Complexity Topics: Setting up Development & Build Environment: Node.js and NPM; Introduction to TypeScript; Working with OOP concepts with TypeScript; Angular Fundamentals; Angular CLI; Introduction to TypeScript; Debugging Angular applications; Components & Databinding in Depth; Angular Directives; Using Services & Dependency Injection; Angular Routing; Observables; Handling Forms in Angular Apps; Output transformation using Pipes; Making Http Requests; Authentication & Route Protection; Dynamic Components; Angular Modules & Optimizing Angular Apps; Deploying an Angular App; Angular Animations; Adding Offline Capabilities with Service Workers; Unit Testing in Angular Apps (Jasmine, Karma). Overview of React.js Assignment: Develop a software tool to do inventory management in a warehouse. Targeted Application & Tools that can be used:									
	Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used								

	by all application developers.
-	Professionally Used Software: GCC compiler.
	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, <i>"Javascript : The Definitive Guide"</i> 7th Edition. 7th ed. O'Reilly Media; 2020. R2. Alex Libby, Gaurav Gupta, and Asoj Talesra. <i>"Responsive Web Design with HTML5 and CSS3</i> <i>Essentials"</i> , Packt Publishing, 2016 R3. Duckett J Ruppert G Moore J. <i>"Javascript & Jquery : Interactive Front-End Web Development."</i> ; Wiley; 2014.
	R4. Web Reference: <u>https://www.youtube.com/watch?v=JGNTYXkVCVY&list=PLd3UqWTnYXOkTSBCBNyyhxo_jxlY_uTWA&index</u> =2 R5. Web Reference: <u>https://www.freecodecamp.org/news/frontend-web-developer-bootcamp/</u>
	https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=2233842&site=ehost -live
	https://nptel.ac.in/courses/106102064
	Topics relevant to development of "Employability": DevOps Tools Overview – Jenkins, Docker, Kubernetes for developing Employability Skills through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course C CSE3427	Code:	Course 1	Title: Java Full Stack Development				L- T-P- C	2	0	2	3	
Version	No.		1.0					1	l			
Course F	Pre-		CSE100	6 Problem Solving Using Ja	ava							
requisite	es											
Anti-rea	uisites											
	unsites											
Course [Description		This adv	vanced level course enabl	es stude	ents t	to perforn	n full s	tack de	velopme	ent using	
			Java, w	ith emphasis on employa	bility skil	lls. T	he key te	chnolo	gies us	ed for F	ull Stack	
			develop	ment is based on either Ja	ava techr	nolog	gy or .NET	techno	ology. Ir	this cou	urse, the	
			TOCUS IS	on using Java, and the rei	ated teci	nnoid	ogles/tool	s like J	ava EE, Ethic co	Java Per	sistence,	
			shall he	able to nursue a career i	in full-sta	ack d	lavelonme	nt Th	a studa	nts shall		
			strong	problem-solving skills as pa	art of this	s cou	rse.		c stude	nto shah	ucvelop	
Course (Obiectives		This co	urse is designed to imp	rove the	e lea	rners' EN	1PLOYA	BILITY	SKILLS	bv using	
	· · · , · · · · · · ·		PROBLE	M SOLVING Methodologie	es.						-,8	
				0								
Course			0.0.0.00	and a completion of the								
course	Juccomes		11 Pract	ice the use of lave for full	stack do		nmont [A	nn be a policat	ionl			
			2] Show	web applications using la	ava FF. [/	Annli	ication]	ppiicat				
			3] Solve	3 Solve simple applications using Java EE. [Application]								
			4] Appl	I] Apply concepts of Spring to develop a Full Stack application. [Application]								
			5] Emp	loy automation tools li	ke Mave	en, S	Selenium	for Fu	ull Stac	k devel	opment.	
			[Applica	ation]								
Course C	Content:											
Module	1	Introduc	tion	Project	Р	Progr	amming			Se	03 essions	
	Topics:											
	Review of J	ava; Adva	anced co	ncepts of Java; Java generi	ics; Java I	10; N	New Featu	res of J	lava. Ur	it Testin	g tools.	
	2	Java EE Web		Project Progr		Drogramming				05.0		
wodule	2	Applications				ogramming			05 3	05 Sessions		
	Topics:											
	Introductio	n to Eclip	se & Toi	mcat; JSP Fundamentals; F	Reading H	HTML	L form Dat	a with	JSP; Sta	ate Man	agement	
	with JSP; JS	P Standa	rd Tag Li	brary - Core & Function Ta	gs; Servle	et AF	Pl Fundam	entals;	Servlet	Context,	Session,	
	Cookies; Re	quest Re	direction	n Techniques; Building MV	C App wi	ith Se	ervlets & J	SP; Co	mplete	App - Int	tegrating	
	JDBC with M	VIVC APP	n an ann	lication for managing HP r	olicies of	fad	onartmont	-				
	Assignment	lava Por	sistence				epartment					
Module	3	using IP	A and	Project	Р	Progr	amming			06 5	Sessions	
		Hibernat	te			0.						
	Topics:			•								
Fundamentals of Java Persistence with Hibernate; JPA for Object/Relational Mapping, Queryi							uerying,	Caching,				
Performance and Concurrency; First & Second Level Caching, Batch Fetching, Optimistic Locking & Ve							rsioning;					
	Entity Relat	ionships,	Inherita	nce Mapping & Polymorph	nic Querie	es; O	Querying d	atabas	e using	JPQL and	ל Criteria	
	API (JPA)	_										
	Assignment	t: Design	and dev	elop a website that can act	tively kee	ep tra	ack of enti	y-exit	informa	tion of a	housing	
	society.	1		[1							
Module	4	Spring C	ore	Project	Р	Progr	amming			10 9	Sessions	
	Topics:											

	Spring Core, Spring MVC, Spring Boot REST API; Understanding Spring Framework; Using Spring MVC; Building a Database Web App with Spring and Hibernate o Spring AOP (Aspect Oriented Programming); Implementing										
	Spring Secu Assignment	rity; Developing S : Develop a softw	pring REST API; Using Spri vare tool to do inventory n	ng Boot nanage	t for Rapid Development ment in a warehouse.						
Module	5	Automation tools	Project		Programming	06 Sessions					
	Topics: Introduction to Automation Tools; Apache Maven: Maven Fundamentals, Software Setup - Commandline and Eclipse, pom.xml and Directory Structure, Multi-Module Project Creation, Scopes, Dependency Management, Profiles; Functional/BDD Testing using Selenium, Selenium Fundamentals and IDE, Selenium WebDriver, Installation and Configuration, Locating WebElements, Driver Commands, WebElement Commands Assignment: Illustrate the use of automation tools in the development of a small software project. Targeted Application & Tools that can be used: Application Area is to Design and Analyzing the efficiency of Algorithms. This fundamental course is used by all application developers. Professionally Used Software: Eclipse, NetBeans, Hibernate, Selenium, Maven, GIT.										
	Project wor	k/Assignment:									
	Problem Solving: Design of Algorithms and implementation of programs. Programming: Implementation of given scenario using Java.										
	Text Book: T1. Fender,	Young, "Front-er	<i>nd Fundamentals",</i> Leanpu	b, 2015	5						
	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 (CSE3428	Code: B	Course 1	e Title: .NET Full Stack Development L- T-P- C 2 0 2 3							3	
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Version	No.		1.0				1		1		
Course F	Pre-		CSE150	4 Web Technologies							
requisite	es										
Anti-req	uisites		CSE342	7 Java Full Stack Develo	oment						
Course [Description		This adv .NET. w	vanced level course enat ith emphasis on employ	oles stude ability ski	ents to perform ills. The key te	n full s chnolo	tack de ogies us	velopn ed for	nent using Full Stack	
			develop	evelopment is based on either Java technology or .NET technology. In this course,							
			focus is on using .NET and the related technologies/tools like C#, ASP.NET, Entity								
			Framew	ork Core, etc. On succe	ssful com	npletion of this	s cour	se, the	studer	nt shall be	
			able to	pursue a career in full-s	tack deve	elopment. The	stude	nts shal	l deve	lop strong	
Course (Thioctives		This cou	TODIETT-SOLVING SKIILS AS PART OF THIS COURSE.							
course (Djectives		PROBLE	PROBLEM SOLVING Methodologies.							
	_										
Course C	Dutcomes		On succ	essful completion of the	e course t	the students sl	1all be	able to): Highl		
			2] Show	web applications using	Fntity Fr	a siliali applica amework, [An	plicat	ionl	lionj		
			3]Solve	simple web application	s that use	e SQL and ASP.	NET [/	Applicat	tion]		
			4] Apply	concepts of ASP.NET to	o develop	a Full Stack a	pplica	tion. [A	pplica	tion]	
Course C	Content:										
		C#									
Module	1	Program	nming	Project	P	rogramming				10	
mouule	-	for Full Stack								Sessions	
	Tonics	Develop	ment								
	NET Frame	work Fu	Indamon	tals Visual Studio IDE I	Fundame	ntals (# Lang	11200	Fosturo	s W0	rking with	
	arrays and	collecti	collections. Working with variables, operators, and expressions. Decision and iteration								
	statements	, Manag	ing prog	ram flow and events,	Working	with classes a	and m	ethods,	OOP	concepts,	
	Properties,	Auto Ir	Auto Implemented, Delegates, Anonymous Methods and Anonymous Types, Extension								
	methods, S	ealed Cla	aled Classes/Methods, Partial Classes/Methods, Asynchronous programming and threadin								
	Data validat	tion and	working	with data collections inc	luding LIN	NQ, Handling e	rrors a	ind exce	eption	s, Working	
	with Files, U	Jnit Testi	ing – Nur	nit framework	a library	using C#					
	Assignmen	Entity	ip a siliai			using C#.					
Module	2	Framew Core 2.0	ork)	Project	P	rogramming			06	5 Sessions	
	Topics:								.		
	Entity Fram	ework Co	ore 2.0 C	ode First Approach; Intro	oduction ⁻	To Entity Fram	ework	and ED	M; Qu	erying the	
	EDM; Wor	king Wit	h Store	d Procedures; Advance	d Entity	Framework -	DbCo	ontext	[EF6];	Advanced	
		; Perform	nance Op	dimization; Data Access	WITH ADU 2 policies	of a departme	nt				
	Assignment		ւի ուլ սիե		(policies	or a departine					
Module	3	ASP.NET	Ē	Toject	P	rogramming			06	5 Sessions	
	Topics:	1		I	II						
	ASP.NET Co MS SQL, Wo	re, ASP.N orking W	Net Core ith Data I	3.1 MVC, ASP.NET Core N In Asp.Net, Razor View E	Middlewa ngine, Sta	are and Reques ate Manageme	t pipel nt In A	ine, Rev sp. Net	view of MVC 8	f SQL using & Layouts;	
	Assignment	t: Develo	p a web	application to mark entr	y/exit of	guests in a bui	lding.				
Module	4	ASP.NET	-	Project	P	rogramming			08	8 Sessions	
	Topics:						المراجب				

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:
Problem Solving: Design of Algorithms and implementation of programs.
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
<i>11"</i> , 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:	Course Rust Program	ming		2	0	2	3
CSE3429	Type of Course: Core	-					
	Theo	ory &Integrated Laboratory	L-1-P-C				
Version No.	1.0						
Course Pre-requisites	CSE1004 Problem So	lving using C					
Anti-requisites	NIL						
Course Description	Rust is for students a	nd those who are interested	ed in learning about	system	s cor	ncept	s. Using
	Rust, many people h	ave learned about topics lil	ke operating system	s develo	opme	ent. T	he Rust
	programming langua	age helps students write	faster, more relia	ole soft	twar	e. Hi	gh-level
	ergonomics and low-	level control are often at	odds in programmir	ig langu	lage	desig	gn; Rust
	challenges that confil	ct. Inrough balancing powe	erful technical capac	ity and a	a gre	eat de	eveloper
	without all the bassle	traditionally associated wit	th such control	IIIS SUCH	d5 11	lemo	ry usage
	The associated labor	atory provides a chance to	have hands-on con	cents le	arne	d duu	ring this
	course.				unic	u uu	
Course Objective	This course is design	ed to improve the learners	EMPLOYABILITY SK	ILLS by	lear	ning t	he Rust
	Programming langua	ge.					
Course Outcomes	Upon the successful	completion of this course s	tudents will be able	to:			
	Create a Rus	st project, including proper	Cargo configuration	າ.			
	• Translate a	design into a working Rust	program.				
	• Explain and	remedy type and lifetime e	errors encountered of	during F	Rust		
	programming.						
	• Use <u>structs</u> ,	enums and traits as intend	ed in the constructi	on of Rı	ust p	rogra	ıms.
	 Apply refere 	ences, boxes, cells and refe	rence counting in Ru	ıst prog	ram	ming.	
	 Divide a Rus 	t crate into multiple source	e files using the mod	lule sys	tem.		
	Write tests a	and documentation using t	he Rust infrastructu	re.			
Course Content:							
	Introduction to					_	
Module 1	Rust Programming	Quiz			1	U ses	sions
Topics:	0 0	1					
Introduction to Rust	Programming: Reas	ons to adopt Rust –Use c	ases – Opportuniti	es- Lan	gua	ge Fe	atures-
Advantages- Installat	tion-First Example-F	, Rust Data types- Variables	s – Constants-String	g-Oper;	ator	s- Bra	anching
and Looping		/1	·	5 1			0
		Programming and					
Module 2	Features of Rust	Mini Proiect				12 s	essions
Topics:	l	,			1		
Unique Features of	Rust: Tuple- Comm	on types (Option, Resul	t)- Arrav-Ownersh	nin – B	orro	wing	- Slices
Structures- Enums-(follections (vector	string hashman iterat	or) - Modules -	Rust (`olle	ction	s-Frror
Handling- Input Outr	out Generics- Packa	e Manager-Iterator- Clo	sure-Smart Pointer	rs – Cor	ncur	rency	v v
	Ownershin					11 s	, essions
Tonics:	Ownership	/ SSIGIIII CITC				11.5	23510115
Ownershin + movo	semantics - Borro	wing (References) - Li	fetimes - Smart	nointer	·c /⊏		Rc/Arc
Call/Rafcall) - Modul	arising projects . Do	ocumenting code - Unit to	esting - Documents	ation to	s (E	, ОЛ, п	ιις Αις,
ceny nerceny - widuui		Comenting Code - Onit le			Sull	5	
	Conorias and	Accignment		12.0			
ivioaule 4	Generics and	Assignment		12 56	essic	ns	
L	Concurrency						
lopics:							
Generics (and mond	morphization) – Tr	aits - Static vs dynamic (dispatch – Closure	s - Fur	nctio	n ty	pes (fn,

FnOnce, FnMut, Fn) – Macros - Fearless concurrency – Threads - Sync primitives (Mutex, RwLock, mpsc, etc.) - Current state and future of Rust Install Rustup https://www.rust-lang.org/tools/install Experiment No. 1 Create and run a new project using the conventions of Cargo Create a project to Covert Fahrenheit to Celsius. Experiment No. 2 Create a project to display binary equivalent of an integer, perform AND, and shift operations. Create a dollar pattern Create a guessing game program that will ask for user input, process that input, and check that the input is in the expected form. Experiment No. 3 Create a project to display the magnitude and angle of the given complex numbers. Create a project with functions to check a number is prime or not, count primes, add primes and display primes within the given range. Experiment No. 4 Create a simple programs using simple struct, associated functions and Enums Implement a Turtle builder struct to allow building a Turtle object. Perform rotation with angle, move forward and backward. Experiment No. 5 Write a program to solve the quadratic equation using command line arguments. Write a program on Word histogram on accepting a file, count the occurrences using HashMap, sort and display. Experiment No. 6 Create a program to simulate John Conway's Game of Life using array and thread sleep. Create a project to make changes to Turtle type so that it is placed in a library module and main function uses the module. Experiment No. 7 Write a program to handle error that main returns a Result type, making the necessary code changes. Create a new library project named generics to implement stack and queue operations. Targeted Application & Tools that can be used: Rust is to be installed and used. https://www.rust-lang.org Project work/Assignment: Problem Solving: Design of Algorithms and implementation of programs. Programming: Implementation of given scenario using Rust. Textbook(s): 1 Klabnik, Steve, and Carol Nichols. The Rust programming language. No Starch Press, 2023. Publisher: William Pollock References 1. Jim Blandey, Jason Orendorff and Leonora F.S. Tindall, "Programming Rust – Fast, safe system Development", 2nd Edition, 2021(O'Reilly Publication). https://rustbook.cs.brown.edu

Topics related to development of "FOUNDATION": Features of Rust

Topics related to development of "EMPLOYABILITY": Project implementations in software, batch wise presentations

Topics related to development of "HUMAN VALUES AND PROFESSIONAL ETHICS": Team Dynamics during Mini Project Development.







Itgalpur, Rajankunte, Yelahanka, Bengaluru – 560064

Course CSE343	Code: 0	Course	Title: In	troduction to Fintech									
		Type of	f Course:	Program Core		L-T-P-	2	0	2	3			
		Theory	& Lab Ir	itegrated		C							
				C									
Version	n No.		1.0										
Course	Pre-												
requisit	tes	•	NIL										
Anti-ree	quisites		NIL										
Course			This co	urse aims to familiarize st	tudents wi	th the F	inTech	n ecosy	stem a	nd the			
Descrip	tion		disrupti	ve and innovative forces	of emergi	ing techi	nology	withir	the fi	inance			
			sector. A core component of a specialized business administration prog										
			delivers	essential, leading-edge kr	nowledge	in financ	ial tec	hnolog	y, cruc	ial for			
			professi	professionals entering the banking and financial services industry.									
Course Object The objective of the course is to familiarize the learners with the concepts of Intro							Introdu	ction to					
course	object		Fintech a	ttain Skill Development through	Experienti	al Learnii	ng techi	niques.					
Course	Se Out On successful completion of the course the students shall be able							e able to):				
Comes			CO1: D	Describe the historical devel	opment of	financia	l techi	nology.	(Under	stand)			
			CO2: A	CO2: Analyze the impact of financial technology on the financial services									
			landsca	landscape. (Apply)									
			(A n n l v)	xplain the fundamental tech	nnical aspe	ects of fil	nancia	i techno	ology.				
			(Apply)	lantify and interpret key to	hnologica	1 trands	within	the fine	ncial				
			co4: 10	sector (Apply)	mologica	ii tienus	wittiiii	the ma	incial				
			Services	sector. (Appry)									
Course													
Content	t:												
		Introdu	ation to							14			
Module	e1	Introduction to		Assignment					S	ession			
		FIITEC	1							S			
	Topics	<u>.</u>											
	What is	FinTech	Industry	? Evolution of FinTech, Fir	Tech Evo	lution 1.0): Infra	astructu	re, Fin'	Tech			
	Evolutio	on 2.0: B	anking in	dustry, FinTech Evolution	3.0 & 3.5:	Startups	and E	mergin	g Mark	ets,			
	Importa	nce of Fi	inTech, G	lobal FinTech Investment,	Main Fin'l	Tech Hub	S						
			1		T								
		Finlec	n in a						1 -				
Keshaping Financial		nig ol	Assignment					15	naion				
Services		ai s	Assignment					56	551011				
Industry-I		v-I						5					
	Topics	maasa	<i>,</i> 1										
	<u>ropics</u>	•											
	FinTech	n in Pavn	nent Indus	stry-Multichannel digital w	allets. app	lications	suppo	rting wa	allets.				
onboarding and K			XYC application, FinTech in Lending Industry- Formal lending. Informal lending.										
	P2P lending, PO			S Lending, Online lending, Payday lending, Microfinance, Crowdfunding									
		0, 0			<i>U</i> ,		,		U				

Module 3	3	FinTech as disruptor empowering Financial Services Industry-II	Assignment			16 Session s
]	<u>Topics:</u>					
H r i C	FinTech responsi insuranc Quote to	in Wealth Manag ble investing, Frac e, On-Demand In o sell, policy service	gement Industry-Financial A ctional Investing, Social Inv surance, On-Demand Consu cing, Claims Management,	dvice, Automa vesting. FinTech ultation, Custon Investment link	ted investing, Social in Insurance Indust her engagement throu ed health insurance.	ly ry- P2P 1gh
Module 4	1	Technology Disruptions enabling FinTech Innovations	Assignment			15 Session s
	4G and 3 Mobile J Web 2.0 Blockch Case Stu	5G networks fuell Applications and s), Rapid Web Desi ain adies: PayTm, Aa	ing FinTech Opportunities, smart phones, embedded ser gn, JavaScript Technologie dhar	transforming cu nsors and social s, IoT, Big Data	ustomer experience u media, Cloud comp a, analytics and AI an	using uting, nd
I	Project v	work/Assignment	f•			
1. 2	2. <i>P</i> 3. <i>P</i>	Assignment 1 on (Assignment 2 on ((Module 1 and Module 2) (Module 3 and Module 4)			
1 1 2 3 4	1) I industry 2) S 3) I 4) I	Parag Y Arjunwadk CRC Press. Sanjay Phadke (2020 Pranay Gupta, T. Ma RBI(2017). Report of	ar (2018), FinTech: The Techno)), Fintech Future : The Digital andy Tham (2018). Fintech: Th working group on FinTech an	blogy Driving Dis DNA of Finance le New DNA of F nd Digital Bankir	sruption in the financia Paperback .Sage Publ Financial Services Pape	al service ications rrback
	Referen 1. Univers 2. T Apress, Web Re W1. <u>F</u> paper/ W2. <u>F</u>	ces Bitcoin for Non-I al Publishers, US he Robotics Proc Latest 1 ST Editio sources https://www.ibm.co	Mathematicians: Exploring A, Latest 1 ST Edition 2020 ess Automation, Handboo on 2020 om/industries/banking-financi brand.com/111080/evolution	g the foundatio) ok: A Guide to al-markets/resou -future-digital-ba	ons of Crypto, Slava Implementing, Top urces/omnichannelbar anking-baastransforma	nGomzin/ m Taulli/ <u>hking-</u> ation/
2 2	Fopics 1 and opp	relevant to develo portunities.	pment of "Employability"	: Real time An	alysis of FinTech ap	plications

_		-				T	r					
Cours	e Code:	Cours	e Title: Banking Technolog	gy								
C5E34	±31	Type	of Course: Program Core		L-T-P-	2	0	2	3			
		Theor	v & Lab Integrated		C		Ŭ	~	5			
			,									
Versio	on No.		1.0									
Cours requis	e Pre- sites	•	NIL									
Anti- requis	sites		NIL									
Cours	e iption		This course explores the starting from branch com channels such as ATMs, in risk management, treasury INFINET, SFMS, RTGS, practical implementation a	This course explores the evolution and application of technology in banking, starting from branch computerization to centralized banking. It covers delivery channels such as ATMs, internet/mobile banking, and UPI/BHIM. Topics include risk management, treasury, forex operations, and CRM. Students will understand INFINET, SFMS, RTGS, NEFT, and e-payment systems. Emphasis is placed on practical implementation and emerging digital banking trends.								
Cours	e Object		The objective of the course is to	The objective of the course is to familiarize the learners with the concepts of Banking Technolog								
	,		attain Skill Development through Experiential Learning techniques.									
Cours	e Out		On successful completion	of the course the stu	udents sh	all be	able to:		1			
Come	S		banking operations.(Under	stand)	chnology	and its	mpaci	. On mo	dern			
			CO2: Explain the role of d	elivery channels lik	ke ATMs,	mobil	e banki	ng, and	UPI			
			in digital banking systems.	(Apply)								
			CO3: Evaluate the effective banking operations (Apply)	veness of risk, treas	sury, and	data ce	enter ma	inageme	ent in			
			CO4: Analyze the function	oning of centralized	banking	and pa	vment s	vstems	like			
			RTGS, NEFT, and SFMS	(Apply)	U	1	5	5				
			CO5: Understand blockch	ain, cryptocurrency	concepts	, and a	nalyze	recent c	ore			
			banking software. (Unders	tand)								
Cours	e											
Conte	nt:											
		Branc	h Operation and Core						14			
Modu	Jule 1 Branking Assignment							ssions				
	Topics:	<u>pics:</u>										
	Introduct	ion on	d Evolution of Pank Ma	nagamant Analysis	of Dong	roion	Comp	nittaa D	oporta			
	- Techno	logical	Impact in Banking Ope	rations– Total Brai	nch Com	outeriz	ation -	Concer	ot of			
	Opportur	nities-	Centralized Banking – Co	oncept, Opportunitie	es, Challe	nges &	& Imple	mentati	on.			
Module 2Delivery ChannelsAssignment15							15 Sess	ions				
	Topics:	•			•							

	Overview – Interne	v of delivery channels – Automated t Banking – Mobile Banking-	Teller Machine (AUSSD, UPI, B	ATM) – HIM –	- Phone Banking – - Payment Gatev	-Call centers vays – Card
	technolog	gies – MICR electronic clearing.		1	-	-
Modu	ıle 3	Back office Operations	Assignment			16 Sessions
	Topics:					
	Bank ba Operation Knowled	ick office management –Inter bra ns – Risk Management – Data cente ge Management (MIS/DSS/EIS)	nch reconciliation er Management - – Customer Relati	– Treas – Netwo onships	ury Management- ork Management Management (CF	- Forex - RM).
Modu	ıle 4	Interbank Payment System	Assignment			15 Sessions
	Topics: INFINET Electroni Systems	F Interface with Payment system c Fund transfer – RTGSS – – Electronic Money – E Cheques.	Network– Struct Negotiated Dea	ured Fi ling Sys	nancial Messagin stems & Securitie	g system – s Settlement
Modu	ıle 5	Contemporary Issues in Banking	5			
	Techniqu Case stud	ies Block Chain and Bit-coin – Cryp ły.	oto currency Analy	sis of R	ecent Core Bankir	ng Software-
	Project w	vork/Assignment:				
11.	12. A	ssignment 1 on (Module 1 and Mo	odule 2)			
	13. A	ssignment 2 on (Module 3,4 and N	lodule 5)			
	8) Fi 9) R 10) II Theories Transition 11) K Delhi: Pea	k nancial Services Information Systems-j ajesh, R. (2020). <i>Banking Technology</i> . No BF X Taxmann's International Trade Fi ICC Rules Regulatory Frameworks as, February 2025 alakota, R., & Robinson, M. (2017). <i>E</i> - rson Education.	Jessica Keyes Auerb ew Delhi: McGraw F nance – Complete Risk Management Banking Management	ach publ Hill Educ Expert-v : Digiti	lication, October 201 cation. vetted Guide on – T isation LIBOR-AR Solutions, and Strates	19. rade IR g <i>ies.</i> New
	Reference1.Vasu2.Turban3.BankinWeb ResW8.htpaper/W9.ht	res Ideva,E-Banking, Common Wealt In Rainer Potter, Information Techn Ing Technology – Indian Institute o ources Ittps://www.ibm.com/industries/banki	h Publishers, New nology, John Wiel of Bankers Publica ng-financial-markets evolution-future-dig	7 Delhi, y& Son tion,20 s/resour gital-ban	2010 Is Inc,2012. 10. ces/omnichannelba king-baastransform	inking- ation/
	Design a Mobil Balance Payment	nd Develop the following Bankin e Banking ee Enquiry • Cheque book Reque	g Software using est • Stop Chequ	the app e • Cre	ropriate technolo dit/Debit Notific	gies: ation • Bill

• Electronic Funds Transfer • Account Management • Loan Application • Registering of new bank services • Customer Information Management
∎ATM system
• Balance Enquiry • Withdrawal • Deposit • Pin change • Mini statement
Topics relevant to development of "Employability": Real time Data Analysis for Banking Technology.
Topics relevant to "PROFESSIONAL ETHICS": Mobile, Internet Banking for Project Development.

Course Codes CSE3432	Course Type of	Title: Blockcha Course: Theor	ain Technology y	L-T- P-C	2	0	2	3	
Version No.		1.0							
Course Pre- requisites	•	NIL							
Anti- requisites		NIL							
Course Description		This course proceeds and principles of a the world of s practical experimentation of the underpinning states of the second structure of the second str	rovides a comprehe applications of bloc decentralization, un mart contracts and erience in developin dard tools. The cour s and the practical i	ensive intro ekchain teo derstand t alternative ag and dep rse emphase mplement	oduc chno he m e cry loyin sizes atior	tion to logy. S nechani ptocur ng sma both t n of blo	the fundamenta Students will exp ics of Bitcoin, do rencies, and gain rt contracts usin he theoretical ockchain solutio	l plore the elve into n g ns.	
Course Object		The objective of the course is to familiarize the learners with the concepts of Blockchain Technology attain Skill Development through Experiential Learning techniques.							
Course Out Comes		al completion of the stand blockchain a ze Bitcoin's operation of the stand of the stand of the standard stan	he course ind decent on and tra icepts and contract de	e the raliz nsac exp evelo	stude ation p tions. (lore alt	nts shall be ab principles. (Unde (Analyze) coins. (Apply) t and deploymen	le to: erstand) nt.		
Course Content:									
Fundan Module 1 Blockch Decentr		nentals of ain and alization	Assignment				14	Sessions	
	Topics: Introductio and Bitcoir using block	n to Blockchain n, distributed sy cchain, methods	n: the growth of blo rstems, blockchain, s of decentralization	ckchain te consensus	echno 5. De 5. dec	ology, central	the history of bl lization: decentr zation, blockcha	ockchain alization ain and	

	full ecosystem decentraliz	ation, pertinent te	rminolo	gy, platforms for d	ecentralization,						
Module 2	Bitcoin: The First Cryptocurrency	Assignment			15 Sessions						
	Topics: Introduction to Bitcoin: bi blockchain, mining. The E bitcoin payments, innovat and selling Bitcoin. Bitcoi further with bitcoin-cli, bi	tcoin — an overv Bitcoin Network a ion in bitcoin, adv n Clients and AP tcoin programmir	iew, cry nd Payn vanced p Is: bitco	ptographic keys, tr nents: the bitcoin n protocols, bitcoin in in client installation	ansactions, etwork, wallets, westment and buying n, experimenting						
Module 3	Beyond Bitcoin: Altcoins and Smart Contracts	Assignment			16 Sessions						
	Topics: Consensus Algorithms: introducing the consensus problem, analysis and design, classification, algorithms, choosing an algorithm. Alternative Coins: introducing altcoins, theoretical foundations, difficulty adjustment and retargeting algorithms, bitcoin limitations, extended protocols on top of bitcoin, development of altcoins, Initial Coin Offerings (ICOs). Smart Contracts: history, definition, ricardian contracts, smart contract templates, oracles, deploying smart contracts, the DAO										
Module 4	Ethereum and the Decntralized Web (Web3)	Assignment			15 Sessions						
	<u>Topics:</u> Ethereum 101: ethereum – ethereum ecosystem, Ethe development environment software, nodes and miner languages. Introducing Wa Project work/Assignment	- an overview, the reum Virtual Mac . Further Ethereu rs, APIs, tools, and eb3: contract depl t:	ethereu chine (E um: bloo d DApp oyment	Im network, compo VM), smart contrac eks and blockchain s, supporting proto , exploring Web3 v	onents of the cts, ethereum , wallets and client cols, programming with Geth						
1.	 Assignment 1 on (Assignment 2 on ((Module 1 and M (Module 3 and M	odule 2 odule 4))							
	 Assignment 2 on (Module 3 and Module 4) Text Book Banafa, A. (2024). Blockchain technology and applications. River Publishers. Ramachandran, M. (2025). Blockchain engineering: Secure, sustainable frameworks for healthcare applications. Springer. Tanwar, S. (2022). Blockchain technology: From theory to practice. Springer. Vyas, S., Shukla, V. K., Gupta, S., & Prasad, A. (Eds.). (2022). Blockchain technology: Exploring opportunities, challenges, and applications. CRC Press. 										
	1. Chuen, D. L. K. (Ed.). (2024). <i>Han</i>	dbook d	of digital currency.	: Bitcoin, innovation,						

financial instruments and big data (2nd ed.). Academic Press. 2. Idrees, S. M. & Nowostawski, M. (Eds.). (2023). Transformations through blockchain technology: The new digital revolution. Springer. Jena, A. K., Panda, S. K., & Swain, S. K. (Eds.). (2022). Blockchain technology: 3. Applications and challenges (Vol. 203). Springer. Maleh, Y., Zhang, J., & Hansali, A. (2024). Advances in emerging financial 4. technology and digital money. Routledge. Rahman, H. (Ed.). (2025). Blockchain technology applications in knowledge 5. management. IGI Global. Web Resources Blockgeeks. Retrieved from https://www.google.com/search?q=blockgeeks.com 1. 2. Bitcoin.org. Retrieved from https://bitcoin.org/ 3. CoinDesk. Retrieved from https://www.coindesk.com/ 4. Ethereum.org. Retrieved from https://ethereum.org/ 5. Investopedia. Retrieved from https://www.investopedia.com/ Medium. Retrieved from https://medium.com/ 6. Solidity Documentation. Retrieved from https://docs.soliditylang.org/ 7. Truffle Suite Documentation. Retrieved from https://trufflesuite.com/docs 8. Web3.js Documentation. Retrieved from https://web3js.readthedocs.io/ 9. 10. GitHub. Retrieved from https://github.com/

YouTube Channels:

- 1. Andreas Antonopoulos. Retrieved from <u>https://www.youtube.com/@aantonop</u>
- 2. Chainlink. Retrieved from <u>https://www.youtube.com/@chainlink</u>
- 3. Coin Bureau. Retrieved from <u>https://www.youtube.com/@CoinBureau</u>
- 4. Eat The Blocks. Retrieved from <u>https://www.youtube.com/@EatTheBlocks</u>
- 5. freeCodeCamp.org. Retrieved from <u>https://www.youtube.com/@freecodecamp</u>
- 6. MetaMask. Retrieved from <u>https://www.youtube.com/@MetaMask</u>
- 7. Patrick Collins. Retrieved from <u>https://www.youtube.com/@patrickdcollins</u>
- 8. Simply Explained. Retrieved from <u>https://www.youtube.com/@SimplyExplained</u>
- 9. The Defiant. Retrieved from <u>https://www.youtube.com/@TheDefiant</u>
- 10. Whiteboard Crypto. Retrieved from <u>https://www.youtube.com/@WhiteboardCrypto</u>

Experiment 1: Integrated Development Environments (IDEs) for Smart Contracts

• Level 1: Explore the features and interface of Remix IDE. Deploy a simple "Hello World" smart contract on the in-browser JavaScript VM. Observe the transaction details and contract interaction options.

• Level 2: Install and configure MetaMask browser extension. Connect MetaMask to the Remix IDE. Deploy the same "Hello World" contract to the Ganache private network via MetaMask. Examine the transaction process in both Remix and MetaMask.

Experiment 2: MetaMask in a Private Network

• Level 1: Set up a local Ganache private network. Add a custom network in MetaMask, configuring the RPC URL and Chain ID to connect to your Ganache instance. Create a new account in MetaMask and observe its balance.

• Level 2: Deploy a simple token contract (e.g., ERC-20 minimal) using Remix IDE and MetaMask on your private Ganache network. Transfer some tokens between the accounts you created in MetaMask and observe the balance changes.

Experiment 3: Smart Contract with Solidity - Basic Data Types and Structures

• Level 1: Write a Solidity smart contract that declares and initializes variables of different basic data types (uint, string, bool, address). Implement functions to read and modify these variables. Deploy and interact with the contract in Remix IDE.

• Level 2: Create a Solidity smart contract that utilizes structs and arrays. Implement functions to add, retrieve, and update elements within these data structures. Deploy and test the contract with various inputs in Remix IDE.

Experiment 4: Smart Contract with Solidity - Control Flow and Functions

• **Level 1:** Write a Solidity smart contract that uses if-else statements and for loops within its functions. Implement a function that performs a simple calculation based on input parameters. Deploy and test the different control flow paths in Remix.

• Level 2: Design and implement a Solidity smart contract with multiple functions, including internal and private functions. Demonstrate how these functions can be called and how visibility modifiers affect their accessibility.

Experiment 5: Contract Deployment

• Level 1: Deploy a pre-written simple smart contract (provided by the instructor) using MetaMask connected to the Ganache network. Observe the deployment transaction details (gas used, transaction hash, contract address).

• Level 2: Explore different deployment parameters in Remix IDE (e.g., setting gas limit and gas price). Deploy the same contract multiple times with varying gas settings and analyze the impact on deployment cost and confirmation time in Ganache.

Experiment 6: MetaMask and Remix IDE Interaction

• Level 1: Deploy a simple counter smart contract using Remix IDE on the Ganache network via MetaMask. Use the Remix interface to call the contract's functions (e.g., increment, decrement, get count) and observe the state changes reflected in both Remix and MetaMask (balance changes for transactions).

• Level 2: Deploy a more complex smart contract (e.g., a simple voting contract) using Remix and MetaMask. Interact with the contract through MetaMask's custom interaction interface (sending transactions to specific functions with appropriate arguments).

Experiment 7: Use of Geth - Installation and Account Management

• **Level 1:** Install the Geth Ethereum client on your local machine. Use Geth commands to create new Ethereum accounts and list the available accounts. Observe the keystore directory where private keys are stored.

• Level 2: Use Geth commands to export and import Ethereum account private keys. Understand the security implications of managing private keys. Connect the Geth console to a running private network (e.g., Ganache or a custom Geth network).

Experiment 8: Genesis Block Creation in Geth

• Level 1: Understand the structure of a Genesis Block JSON file. Modify a sample Genesis Block configuration (e.g., changing the initial coin distribution). Initialize a new Geth data directory using this modified Genesis Block.

• Level 2: Create a custom Genesis Block for a private Ethereum network with specific pre-allocated accounts, custom gas limit, and difficulty. Start a Geth node using this custom Genesis Block and connect to it using the Geth console.

Experiment 9: Interacting with a Private Geth Network

• **Level 1:** Start a Geth node using a previously initialized data directory. Use the Geth console to check the node's peer count and block number. Create a transaction to send Ether between two accounts within your private network using Geth commands.

• Level 2: Deploy a simple smart contract to your private Geth network using the Geth console and web3.js (or similar library). Interact with the deployed contract's functions using the Geth console.

Experiment 10: Exploring Ethereum Transaction Structure

• Level 1: Send a transaction (Ether transfer) using MetaMask on the Ropsten test network. Examine the transaction details on a block explorer (e.g., Etherscan for Ropsten) and identify key fields like to, from, value, gas limit, gas price, and nonce.

• Level 2: Construct and sign a raw Ethereum transaction using web3.js (or similar library) without relying on MetaMask. Broadcast this signed transaction to a test network

(e.g., Ropsten) and analyze its details on a block explorer.

Experiment 11: Working with Smart Contract Events

• **Level 1:** Write a Solidity smart contract that emits events when certain actions occur (e.g., a value is updated). Deploy the contract in Remix and trigger the actions. Observe the emitted events in the Remix console.

• Level 2: Modify the previous contract to include indexed event parameters. Write a simple web3.js script (or use the Remix event listener) to filter and listen for specific events based on the indexed parameters.

Experiment 12: Understanding Smart Contract Security - Common Vulnerabilities (Part 1)

• **Level 1:** Study a simple smart contract with a known vulnerability (e.g., integer overflow/underflow - using an older Solidity version). Deploy the contract in Remix and attempt to exploit the vulnerability through function calls.

• Level 2: Research and demonstrate another common smart contract vulnerability (e.g., reentrancy - using a simplified example). Write a vulnerable contract and a separate "attacker" contract to exploit it on a local test network.

Experiment 13: Understanding Smart Contract Security - Common Vulnerabilities (Part 2)

• Level 1: Analyze a smart contract with access control implemented using onlyOwner modifier. Deploy the contract and attempt to call restricted functions from a non-owner account.

• Level 2: Explore the concept of gas limits and denial-of-service (DoS) attacks in smart contracts. Write a contract that could be susceptible to a simple gas-based DoS attack and demonstrate how it can be exploited.

Experiment 14: Interacting with Standard ERC-20 Tokens

• Level 1: Deploy a standard ERC-20 token contract (using OpenZeppelin library in Remix or a pre-written contract) on a local test network. Interact with the token contract's functions (e.g., totalSupply, balanceOf, transfer) using Remix.

• Level 2: Write a simple Solidity smart contract that interacts with the deployed ERC-20 token contract. Implement a function in your contract that allows users to spend a certain amount of the deployed tokens (requiring approval).

Experiment 15: Introduction to Truffle Framework

• **Level 1:** Install Truffle and Node.js. Create a new Truffle project. Understand the basic directory structure of a Truffle project (contracts, migrations, test). Compile a simple Solidity contract using Truffle commands.

• Level 2: Write a simple test case for your smart contract using Truffle's testing framework (Chai and Mocha). Run the tests to ensure the contract functions as expected. Deploy your compiled contract to a local Ganache network using Truffle migrations.

Course CSE3433	Code: 3	Course Financ	e Title: e f Course	Embedded & Decentraliz	zed	L-T- P-C	2	0	2	3	
		Theory	& Lab	Integrated		10					
Version	No.		1.0								
Course	Pre-		COED 40		1						
requisit	es	•	CSE343	30 – Introduction to Finted	n						
Anti-reg	luisites		NIL								
Descript	tion		This co through fundam Studen protoco world o traditio	through Embedded Finance and DeFi. It covers APIs, open banking, blockchain fundamentals, smart contracts, and cryptocurrencies. Students learn about decentralized platforms like DEXs, DAOs, and lending protocols. It highlights legal, security, and regulatory aspects, along with real- world case studies. The course also examines the convergence of DeFi with traditional finance and Web3 applications							
Course	Object		The object	ective of the course is to famili lized Finance and attain S	arize the kill Dev	learners y elopment	with the t throu	e concej igh Ex	ots of Embeo periential I	dded and L earning	
			techniqu	<mark>es.</mark>							
Course Out Comes			On suc CO1: Decent CO2: (Apply CO3: (Apply CO4: DeFi sy CO5: solution	 CO1: Understand the principles and applications of Embedded Finance and Decentralized Finance. (Understand) CO2: Explore blockchain technologies and smart contracts enabling DeFi. (Apply) CO3: Analyze the architecture and key components of Decentralized Finance (Apply) CO4: Evaluate security risks, vulnerabilities, and legal considerations in DeFi system. (Apply) CO5: Explain APIs, embedded wallets, and DeFi tools to develop basic solutions (Understand) 						e and eFi. Finance in	
Course Content	:										
Module	1	Introdu to Emb Finance	edded	Assignment					S	5L+6P essions	
	Topics Concept Insurance	t, Scope, ce, Case	and Evo Studies:	olution, APIs, Open Banki BNPL, Embedded Invest	ing, and ment Pla	BaaS, H atforms	Embec	lded L	ending, Pa	yments,	
Module	2	Blockc Crypto y Foun	hain & currenc dations	Assignment					7L+ Sess	6P sions	
	Topics	vics:									

	Blockel Cryptod	hain Basics: Ha currencies, Walle	shing, Consens ts, and Gas Fees	sus Mech s, Public v	anisms, Si vs Private E	mart Contrac Blockchains	ts (Ether	reum focus),
		1	Γ					
Module	e 3	Decentralized Finance	Assignment					6L+6PSess ions
	Topics	<u>:</u>						
	Concept DeFi fut	t, Benefits and Ris ture trends.	ks Associated wit	th DeFi, Co	entralized vs	s Decentralized	finance,	DeFi Projects,
Module	e 4	Risk Management and Regulation	Assignment					6L+6P Sessions
	Topics: Securit AML, I	<u>:</u> y Threats in Del KYC, Regulatory	Fi: Smart Contr Perspectives (In	act Bugs, ndia, US,	Flash Loa EU), Notal	ans, Legal and ble DeFi Hack	d Compl as & Case	iance Issues: Studies
Module	e 5	Future of Em and Decen Finance	bedded tralized				6L+6P	
	DeFi 2. Curren	0, Interoperabilit cies (CBDCs), W	y, Layer-2 Scalir eb3 Integration	ng, Real-W and Emb	/orld Asset edded Wal	Tokenization lets	, Central	Bank Digital
	Project	work/Assignme	nt:					
1.	2. 3.	Assignment 1 or Assignment 2 or	n (Module 1 and n (Module 3,4 ar	d Module nd Modu	2) le 5)			
	Text Bo	ook						
	1) 2) 3)	Scarlett Sieber and Campbell R. Harv Imran Bashir , "Ma	l Sophie Guibaud ey, "DeFi and the astering Blockcha	, "The Em Future of in", Packt,	bedded Fina Finance", W 2022.	ance Handbook 7iley, 2021.	s", Wiley	, 2023.
	Refere	nces						
	1. A1 2 Turb	ntony Lewis, "Th an Rainer Potter	e Basics of Bito	coins and	Blockchai	ns", Mango P ielv& Sons In	ublishin	g, 2021
	3		, momuton i	cennoiog	y, joint vu		<i>C,2012</i> .	
	Web R	esources https://medium.c	om/search?a-de	contralizor	l+evchange			
	W2.	https://thefinanci	albrand.com/111	080/evolu	tion-future-	digital-banking	-baastran	sformation/
	Lab Ex	periments						
	Experin	ment 1: Exploring	g Blockchain Ba	asics				
	Object	ive: Simulate a b	lockchain trans	action an	d analyze	block structu	re.	
	Experin	ment 2: Create a	Smart Contract	for Toke	n Transfer	(ERC-20)		
	Obiect	ive: Deploy a bas	sic ERC-20 toke	n on a loo	al blockch	ain using Re	mix.	

Experiment 3: Build an Embedded Payment Flow using Stripe API						
Objective: Integrate an embedded payment gateway using Stripe's API.						
Experiment 4: Create and Test a Decentralized Lending Contract						
Objective: Build a simple DeFi lending smart contract with collateral logic.						
Experiment 5: Use a Decentralized Exchange (DEX)						
Objective: Swap tokens using Uniswap on testnet or via a demo platform.						
Experiment 6: Wallet Integration and Transaction Monitoring						
Objective: Build a Web3 app that connects MetaMask and shows wallet balance.						
Experiment 7: Implement a DAO Voting Mechanism						
Objective: Build and deploy a basic voting contract simulating DAO governance.						
Experiment 8: Explore Decentralized Insurance Use Case						
Objective: Create a smart contract for crop/weather-based insurance.						
Experiment 10: Analyze a Real DeFi Protocol						
Objective: Study the architecture and working of Aave/Compound/Sushiswap.						
Topics relevant to development of "Employability": Real-world usage of APIs in FinTech, Building financial products with embedded APIs						
Topics relevant to "PROFESSIONAL ETHICS": Ethical handling of user data in embedded finance platform						

Course Code: CSE3434	Cours Type Theor	e Title: Financial and Capital Markets of Course: Program Core ry & Lab Integrated	L-T-P- C	2	0	2	3	
Version No.		1.0						
Course Pre- requisites	•	CSE3430 – Introduction to Fintech						
Anti- requisites		NIL						
Course Description		This course provides a comprehensive overvie classes, and investment instruments. It cover various markets including money, equity commodities. Students will learn about the ro mechanisms, corporate actions, and market is funds, and structured products. The course also trade life cycles, and global fund structures incl	w of glo rs the str , debt, les of dif instruments o delves luding op	bal fin ucture deriv ferent its suc into e en-enc	ancial 1 e and for vatives, particip ch as b equity ca led and	narkets inctioni forex, pants, ti onds, n apital ra closed-	, asset ing of , and rading nutual aising, ended	

	investment vehicles. Emphasis is placed on both theoretical concepts and practical knowledge of global financial systems							
		kilowiedze of global finalielal systems.						
Cours	a Object		The objective	of the course is	to familiarize the lea	rners wi	th the concepts of	Embedded and
Cours	eObject		Decentralized	Finance and attair	Skill Development	hrough E	Experiential Learnin	g techniques.
Cours	e Out		On successf	ul completion	of the course the s	tudents	shall be able to:	
Come	Comes CO1: Understand the evolution of banking technology and its impact on modern banking operations (Understand)						on modern	
			CO2: Expla	in the role of d	elivery channels li	ke ATN	As, mobile bankin	g, and UPI
			in digital ba	unking systems.	(Apply) veness of risk, trea	sury, ar	nd data center mar	nagement in
			banking ope	erations.(Apply)			
			RTGS, NEF	Tyze the function FT, and SFMS ((Apply)	i dankii	ng and payment sy	stems like
			CO5: Under banking sof	rstand blockch	ain, cryptocurrency	y conce	pts, and analyze re	ecent core
			ballking sor	tware. (Unders	tand)			
Cours	0							
Conte	nt:							
		Overv	iew of Financ	cial Markets				10
Modu	le 1	And A	Assets Classes		Assignment			Sessions
	<u>Topics:</u>							
	Cash and	Money	Markets, Bo	ond markets, Fc	oreign Exchange M	larkets,	Equities Markets,	Indices and
	Stocks, L and Inves	Derivativ stment I	ves Markets, Products, Mut	Products and S tual Fund and c	Settlement, Commuter of the co	odities 1 roducts	Markets and Prod	ucts, Saving
Modu	le 2	Globa	1 Equities	Markets and	Assignment			19 Sacriana
	Topics:	Instru	ments					Sessions
	Tu tu a dan at	•	E	- 4 Taylor day - 4' - 10				Detaine
	Equity T	hrough	IPO, Raisin	g Equity Thro	ugh Private Source	es, Equ	uity buybacks, de	e-listing and
	reversion	to a	'private' com	npany. Equity	Instruments & th	neir cha	aracteristics-Stock	Prices and
	Equity St	ructure	d Products. Pa	articipants in th	e Equity Markets-	Introduc	ction and Role of the	he Buy Side,
	Buy Side Market N	Partici Jakers	pants, Introdu Types of Fai	iction and Role	of Sell Side. Serv	vices and	d Participants in the Equity Markets	he Sell Side, Indices and
	their role	s, Unde	rstand the dif	ference betwee	n exchange and O	TC mar	kets, Types of wei	ghted index,
	other indices and global indices, Electronic and Hybrid Markets and Order and Quote Driven Markets, Global Equity Markets, Trading of Equity Instruments, Equity Investments, and its benefits and risks							ven Markets, its and risks
	Stock Quotations, Delivery or cash trading, Long and short positions, Leverage and Margin, Investing,							n, Investing,
	trading an Offline T	nd hedg rading	ing, Placing (, Introduction	Orders-limit or to Trade Life (ders, stop loss ord Cycle, Clearing an	ers and d Settle	GTD/GTC orders	, Online and
Modu	le 3	Globa	l Foreign Exc	hange Markets	Assignment			16 Sessions
	Topics:		.5u unients		_			365510115
	Introduct	ion to I	Forex Markat	What is foreig	m exchange mark	et Fund	ptions and nurness	es of the FV
	market, 1	Introduc	tion to types	s of Foreign E	xchange Market.	Particip	ants in the foreig	gn exchange

	market-C Banks, G Purchasin Quotation economic deals, Re Forward	onsumers & Tra overnment & C og power parity, o conventions, Di statistics, Deliv lation between discounts and pre	velers, Bu entral Ban Nominal rect and in rery and co spot & fo emiums, Fo	usinesses, nks. Theo v/s real e ndirect pr operations orward m orward fo	Investors & pries governing exchange rates, ices, Cross rates Forward For arkets, Quotin grward transact	specula g foreig etc. Sp es, Valu rex Ma g forwa ions	tors gn e pot ie o rke ard	s, Commer exchange-I Market-M f a pip, Int t-Outright rates, Qu	rcial & interest arket o erpretin forward oting sy	Investment rate parity, rganization, ng news and d and swap wap points,
Modu	le 4	Global Fixed Markets and Ins	Income	(Bond)	Assignment					8 Sessions
	Topics:				L					I
	Overview equity and Bond-An character Eurobond	of Debt Capital d debt products, 7 Introduction- E istics, Zero Cou market.	Markets-C The differe Sond defin Opon Bon	Characteri ences betw nition, Bo d, Price/	stics of Debt C ween loans and ond Issuer & yield relations	apital M bonds, Bond ship, G	Mar Hy Inv love	kets, The c brid securi estor, Typ ernment b	lifferend ties, Sed es of t ond ma	ces between curitization. oond, Bond arkets, The
Modu	le 5	Global Funds							7 Sess	ions
	ntroducti active and open-end for Collec Ended In Meaning companie Global fir	on -Potential adv d passive manag ed fund / mutua ctive Investment vestment Compa of the discount es , How closed- nancial centers	vantages a ement .Op l fund: • U in Transfe nies-Char s and pre ended inv	ind disad pen-Endeo JS • Euro erable Sec acteristics miums in estment o	vantages of co d/Mutual Fun- pe, Purpose ar urities (UCITS s of closed-end n relation to the companies' sha	llective ds-Chan d princ) direct ed inve he pric ures are	inv ract ipa ive estn ing tra	vestment, I teristics and l features of in Europea nent compa of closed ided. Off si	Differer d differ of the Ur an mark anies, sk -ended hore an	nce between ent types of ndertakings kets .Closed nare classes, investment .d On-shore
	Project w	ork/Assignment	•							
14.	15. A	ssignment 1 on (Module 1	and Mod	dule 2)					
	16. A	ssignment 2 on (Module 3	,4 and M	odule 5)					
	Text Boo 12) Fi Edition, M 13) M Education	k nancial Markets ar IcGraw Hill Educa ishkin, F. S., & Eak	ud Institutio tion, 2024. .ins, S. G. (2	ons 7th Ed 2018) <i>" Fini</i>	ition By Anthon ancial Markets an	y Saund d Institu	lers	and Marcia s″ (9th Edit	Cornett ion). Pea	, Ninth Irson
	Referenc	<mark>es</mark> 1on, E. & Natara	jan, K. (20)22) Finar	ıcial Markets d	and Sera	vice	es (Latest E	Edition)	. Himalaya
	Publishin 2.Bhole,L. Edition). N	ng House. M.&Mahakud,J.(20 AcGraw Hill Educat)17) Financ ion .	ial Institut	tions and Marke	ts: Struc	ctur	e, Growth,	, and Inno	ovations (5th
	W10. <u>ht</u>	tps://www.ibm.co	m/industri	<u>es/bankin</u>	g-financial-mark	<u>ets/reso</u>	ouro	ces/omnicha	annelba	nking-
	<u>paper/</u> W11. <u>ht</u>	tps://thefinancialb	orand.com/	<u>/111080/e</u>	volution-future-	digital-k	banl	king-baastra	ansform	ation/
	Design a ■ Mobile • Balanc	nd Develop the f e Banking e Enquiry • Ch	following eque boo	Banking k Reque	Software usir st • Stop Che	ng the a que • (pp Cre	ropriate te dit/Debit	chnolog Notifica	gies: ation • Bill

Payment
■ Internet Banking
• Electronic Funds Transfer • Account Management • Loan Application • Registering of new bank services • Customer Information Management
■ATM system
• Balance Enquiry • Withdrawal • Deposit • Pin change • Mini statement
Topics relevant to development of "Employability": Real time Data Analysis for Banking Technology.
Topics relevant to "PROFESSIONAL ETHICS": Mobile, Internet Banking for Project Development.

Course Code: CSE3435	Cours Progra Type Theor	e Title: Blockchain D amming of Course: Program Cor ry & Lab Integrated	evelopment and	L-T- P-C	2	0	2	3
Version No.		1.0						
Course Pre- requisites	•	CSE3432 - Blockchain	Technology					
Anti- requisites		NIL						
Course Description		This course provides a comprehensive introduction to the fundamental concepts and applications of blockchain technology. Students will explore the principles of decentralization, understand the mechanics of Bitcoin, delve into the world of smart contracts and alternative cryptocurrencies, and gain practical experience in developing and deploying smart contracts using industry-standard tools. The course emphasizes both the theoretical underpinnings and the practical implementation of blockchain solutions.						
Course Object		The objective of the cour Development and Programs techniques.	se is to familiarize ming and attain Skill	the learn Develog	ners wit p ment tl	h the c rough l	oncepts of B E xperiential	lockchain <mark>Learning</mark>
Course Out Comes		On successful completion of the course the students shall be able to: CO1: Understand blockchain and decentralization principles. (Understand) CO2: Analyze Bitcoin's operation and transactions. (Apply) CO3: Apply smart contract concepts and explore altcoins. (Apply) CO4: Utilize Truffle for smart contract development and deployment. (Apply)						
Course Content:								
Module 1	Funda Block	amentals of chain and	Assignment				6L+6P S	Sessions

		Decentralization						
	Introduct Bitcoin	ion to Blockchain: the growth o listributed systems blockchain	f blockchain tech	nolog ntraliz	y, the history of ation: decentrali	blockchain and		
	blockchain, methods of decentralization, routes to decentralization, blockchain and full							
	ecosystem decentralization, pertinent terminology, platforms for decentralization, innovative							
	trends.							
Modu	le 2	Bitcoin: The First Cryptocurrency	Assignment			7L+8P Sessions		
	<u>Topics:</u>							
	Introduction to Bitcoin: bitcoin — an overview, cryptographic keys, transactions, blockchain, mining. The Bitcoin Network and Payments: the bitcoin network, wallets, bitcoin payments, innovation in bitcoin, advanced protocols, bitcoin investment and buying and selling Bitcoin. Bitcoin Clients and APIs: bitcoin client installation, experimenting further with bitcoin-cli, bitcoin programming							
Modu	le 3	Beyond Bitcoin: Altcoins and Smart Contracts	Assignment			10L+8PSessions		
	Topics:							
	Consensus Algorithms: introducing the consensus problem, analysis and design, classification, algorithms, choosing an algorithm. Alternative Coins: introducing altcoins, theoretical foundations, difficulty adjustment and retargeting algorithms, bitcoin limitations, extended protocols on top of bitcoin, development of altcoins, Initial Coin Offerings (ICOs). Smart Contracts: history, definition, ricardian contracts, smart contract templates, oracles, deploying smart contracts, the DAO.							
Modu	le 4	Ethereum and the Decentralized Web (Web3)	Assignment			7L+8P Sessions		
	Topics:							
	Ethereum 101: ethereum – an overview, the ethereum network, components of the ethereum ecosystem, Ethereum Virtual Machine (EVM), smart contracts, ethereum development environment. Further Ethereum: blocks and blockchain, wallets and client software, nodes and miners, APIs, tools, and DApps, supporting protocols, programming languages. Introducing Web3: contract deployment, exploring Web3 with Geth							
	Project w	ork/Assignment:						
17.	18. A	ssignment 1 on (Module 1 and	Module 2)					
	19. A	ssignment 2 on (Module 3 and	Module 4)					
	Text Boo	ks						
	 Text Books Banafa, A. (2024). Blockchain technology and applications. River Publishers. Ramachandran, M. (2025). Blockchain engineering: Secure, sustainable frameworks for healthcare applications. Springer. Tanwar, S. (2022). Blockchain technology: From theory to practice. Springer. Vyas, S., Shukla, V. K., Gupta, S., & Prasad, A. (Eds.). (2022). Blockchain technology: 							

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3. Jena, A. K., Panda, S. K., & Swain, S. K. (Eds.). (2022). *Blockchain technology: Applications and challenges* (Vol. 203). Springer.

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W2. Bitcoin.org. Retrieved from https://bitcoin.org/

W3. CoinDesk. Retrieved from https://www.coindesk.com/

W4. Ethereum.org. Retrieved from https://ethereum.org/

W5. Investopedia. Retrieved from https://www.investopedia.com/

W6. Medium. Retrieved from <u>https://medium.com/</u>

W7. Solidity Documentation. Retrieved from https://docs.soliditylang.org/

W8. Truffle Suite Documentation. Retrieved from https://trufflesuite.com/docs

W9. Web3.js Documentation. Retrieved from https://web3js.readthedocs.io/

W10. GitHub. Retrieved from https://github.com/

Experiment 1: Integrated Development Environments (IDEs) for Smart Contracts

• **Level 1:** Explore the features and interface of Remix IDE. Deploy a simple "Hello World" smart contract on the in-browser JavaScript VM. Observe the transaction details and contract interaction options.

• Level 2: Install and configure MetaMask browser extension. Connect MetaMask to the Remix IDE. Deploy the same "Hello World" contract to the Ganache private network via MetaMask. Examine the transaction process in both Remix and MetaMask.

Experiment 2: MetaMask in a Private Network

• Level 1: Set up a local Ganache private network. Add a custom network in MetaMask, configuring the RPC URL and Chain ID to connect to your Ganache instance. Create a new account in MetaMask and observe its balance.

• Level 2: Deploy a simple token contract (e.g., ERC-20 minimal) using Remix IDE and MetaMask on your private Ganache network. Transfer some tokens between the accounts you created in MetaMask and observe the balance changes.

Experiment 3: Smart Contract with Solidity - Basic Data Types and Structures

• Level 1: Write a Solidity smart contract that declares and initializes variables of different basic data types (uint, string, bool, address). Implement functions to read and modify these variables. Deploy and interact with the contract in Remix IDE.

• Level 2: Create a Solidity smart contract that utilizes structs and arrays. Implement functions to add, retrieve, and update elements within these data structures. Deploy and test the contract with various inputs in Remix IDE.

Experiment 4: Smart Contract with Solidity - Control Flow and Functions

• Level 1: Write a Solidity smart contract that uses *if-else* statements and *for* loops within its functions. Implement a function that performs a simple calculation based on input parameters. Deploy and test the different control flow paths in Remix.

• Level 2: Design and implement a Solidity smart contract with multiple functions, including internal and private functions. Demonstrate how these functions can be called and how visibility modifiers affect their accessibility.

Experiment 5: Contract Deployment

• Level 1: Deploy a pre-written simple smart contract (provided by the instructor) using MetaMask connected to the Ganache network. Observe the deployment transaction details (gas used, transaction hash, contract address).

• Level 2: Explore different deployment parameters in Remix IDE (e.g., setting gas limit and gas price). Deploy the same contract multiple times with varying gas settings and analyze the impact on deployment cost and confirmation time in Ganache.

Experiment 6: MetaMask and Remix IDE Interaction

• Level 1: Deploy a simple counter smart contract using Remix IDE on the Ganache network via MetaMask. Use the Remix interface to call the contract's functions (e.g., increment, decrement, get count) and observe the state changes reflected in both Remix and MetaMask (balance changes for transactions).

• Level 2: Deploy a more complex smart contract (e.g., a simple voting contract) using Remix and MetaMask. Interact with the contract through MetaMask's custom interaction interface (sending transactions to specific functions with appropriate arguments).

Experiment 7: Use of Geth - Installation and Account Management

• Level 1: Install the Geth Ethereum client on your local machine. Use Geth commands to create new Ethereum accounts and list the available accounts. Observe the keystore directory where private keys are stored.

• Level 2: Use Geth commands to export and import Ethereum account private keys. Understand the security implications of managing private keys. Connect the Geth console to a running private network (e.g., Ganache or a custom Geth network).

Experiment 8: Genesis Block Creation in Geth

• Level 1: Understand the structure of a Genesis Block JSON file. Modify a sample Genesis Block configuration (e.g., changing the initial coin distribution). Initialize a new Geth data directory using this modified Genesis Block.

• Level 2: Create a custom Genesis Block for a private Ethereum network with specific preallocated accounts, custom gas limit, and difficulty. Start a Geth node using this custom Genesis Block and connect to it using the Geth console.

Experiment 9: Interacting with a Private Geth Network

• Level 1: Start a Geth node using a previously initialized data directory. Use the Geth console to check the node's peer count and block number. Create a transaction to send Ether between two accounts within your private network using Geth commands.

• Level 2: Deploy a simple smart contract to your private Geth network using the Geth console and web3.js (or similar library). Interact with the deployed contract's functions using the Geth console.

Experiment 10: Exploring Ethereum Transaction Structure

• Level 1: Send a transaction (Ether transfer) using MetaMask on the Ropsten test network. Examine the transaction details on a block explorer (e.g., Etherscan for Ropsten) and identify key fields like to, from, value, gas limit, gas price, and nonce.

• Level 2: Construct and sign a raw Ethereum transaction using web3.js (or similar library) without relying on MetaMask. Broadcast this signed transaction to a test network (e.g., Ropsten) and analyze its details on a block explorer.

Experiment 11: Working with Smart Contract Events

• Level 1: Write a Solidity smart contract that emits events when certain actions occur (e.g., a value is updated). Deploy the contract in Remix and trigger the actions. Observe the emitted events in the Remix console.

• Level 2: Modify the previous contract to include indexed event parameters. Write a simple web3.js script (or use the Remix event listener) to filter and listen for specific events based on the indexed parameters.

Experiment 12: Understanding Smart Contract Security - Common Vulnerabilities (Part 1)

• Level 1: Study a simple smart contract with a known vulnerability (e.g., integer overflow/underflow - using an older Solidity version). Deploy the contract in Remix and attempt to exploit the vulnerability through function calls.

• Level 2: Research and demonstrate another common smart contract vulnerability (e.g., reentrancy - using a simplified example). Write a vulnerable contract and a separate "attacker" contract to exploit it on a local test network.

Experiment 13: Understanding Smart Contract Security - Common Vulnerabilities (Part 2)

• Level 1: Analyze a smart contract with access control implemented using onlyOwner modifier. Deploy the contract and attempt to call restricted functions from a non-owner account.

• Level 2: Explore the concept of gas limits and denial-of-service (DoS) attacks in smart contracts. Write a contract that could be susceptible to a simple gas-based DoS attack and demonstrate how it can be exploited.

Experiment 14: Interacting with Standard ERC-20 Tokens

• Level 1: Deploy a standard ERC-20 token contract (using OpenZeppelin library in Remix or a pre-written contract) on a local test network. Interact with the token contract's functions (e.g., totalSupply, balanceOf, transfer) using Remix.

• Level 2: Write a simple Solidity smart contract that interacts with the deployed ERC-20 token contract. Implement a function in your contract that allows users to spend a certain amount of the deployed tokens (requiring approval).

Experiment 15: Introduction to Truffle Framework

• **Level 1:** Install Truffle and Node.js. Create a new Truffle project. Understand the basic directory structure of a Truffle project (contracts, migrations, test). Compile a simple Solidity contract using Truffle commands.

• Level 2: Write a simple test case for your smart contract using Truffle's testing framework (Chai and Mocha). Run the tests to ensure the contract functions as expected. Deploy your compiled contract to a local Ganache network using Truffle migrations.

Topics relevant to development of "Employability": Hands-on experience with blockchain platforms, smart contract development, and decentralized applications

Topics relevant to "PROFESSIONAL ETHICS": Understanding ethical considerations in blockchain use, such as data privacy, transparency, and responsible innovation, promotes integrity in decentralized systems

					1	r			
Course CSE34	e Code: 136	Cours for Fin Type	e Title: Statistics an nance of Course: Program Cor	ıd Data Analysis re	L-T- P-C	2	0	2	3
		Theor	y & Lab Integrated						
			1						
Versio	on No.		1.0						
Course requis	e Pre- sites	•	CSE3430 - Introducti	on to Fintech					
Anti- requis	sites		NIL						
Course Descri	e iption		This course provides a comprehensive understanding of the theory and practice of data analysis in the Accounting and wider business domains. Students who complete this course should develop the skills to apply and interpret data-based initiatives that address real-world problems across many financial activities such as financial accounting, management accounting, taxation, auditing and corporate finance.						
Course	Course Object The objective of the course is to familiarize the learners with the concepts of Statistics and Data Analysis for Finance and attain Skill Development through Experiential Learning techniques.								
Course	e Out s	 On successful completion of the course the students shall be able to: CO1: Understand the strategic processes, benefits and challenges. (Understand) CO2: Apply preprocessing techniques to business datasets (Apply) CO3: Apply statistical techniques to the datasets . (Apply) CO4: Analyse data protection, data privacy and other ethical issues. (Apply) 							
Course Conte	e nt:								
Modu	le 1	Strat Man Fina	egic Data agement in in nce	Assignment				6L+6P S	Sessions
	Topics:			·					
	Challenges in Human Decision Making, Data Analytics Processes - Introduction to Process								
Models, Financial Big Data for Competitive Advantage, Strategic Data Management in Finance, Management Challenges in Data Driven Environments, Developing a Data Driven Culture									
Moder	Madula 2 Employateurs Data Analysia Assistant anti-								
widuu	Topics:	L ZPIO	natory Data Analysis	Assignment				11-01 5	C3510115
	Explorate	ory Data	a Analysis, Data Prepara	ation – Normalizat	ion, <u>B</u> in	ning,	Sampl	ing Descrip	tive

	Statistics	, Data Quality Issues - Missing	Values, Outliers,	Visua	lizing Relationsl	nips Between		
	Features	, Measuring Covariance and Cor	rrelation, Data	Distri	butions and Cont	fidence Intervals,		
	• S	imple Linear Regression, Corre	lation Coefficien	t, Calc	ulation of Regre	ssion parameters		
Modu	ı le 3	Statistics for Big data	Assignment			10L+8PSessions		
	Topics:							
	-							
	Effect size	ze, Statistical power and sample	size, Effect of Va	ariation	n, Hypothesis tes	ting		
	Interpret	outputs from statistical softwa	are to analyse pa	tterns	in accounting d	ata for signalling		
	unexpected fluctuations e.g. Fraud Analysis, detecting anomaly transactions etc., Time Series							
	basics, E	Decomposition of Time Series, S	easonality, Linea	r Tren	d models, Smoo	othing models,		
	Interpret	outputs from statistical software	e to support predi	ction (of accounting da	ta.		
		Dimension Reduction &						
Modu	ı le 4	Data Ethics	Assignment			7L+8P Sessions		
	-							
	Topics:							
	Factor Ar	alysis, Principal Component Analy	ysis (PCA), Interpr	et outp	uts from statistica	al software to		
	analyse r	easons behind fluctuations in acco	unting data e.g. de	fining	cost drivers in Act	ivity Based		
	Costing e	etc, Data Ethics in Finance, Data Le	egislation GDPR, D	ata and	l Statistical reporti	ng		
	Project v	vork/Assignment:						
20.	21. A	ssignment 1 on (Module 1 and	l Module 2)					
	22. A	ssignment 2 on (Module 3 and	l Module 4)					
		<u> </u>	,					
	Text Boo	aks						
	ICA DOC							
	5 F	oster Provost, Tom Fawcett, Da	ta Science for Br	isiness	O'Reilly Media	1, 2023		
	6 V	Ves McKinney, Python for Data	Analysis, O'Reil	llv Me	, o Ronf Mean dia (2nd Ed.), 20)22		
	7. P	eter J. Brockwell, Richard A., I	ntroduction to Ti	me ser	ies and Forecasti	ing. Springer.		
	2023.							
	8. V	V. Gregory Voss, Hélène J. Lefe	bvre, Data Ethics	s in the	e Digital Age, Sp	oringer, 2023.		
			,			U ,		
	Referen	700						
	Reference							
	6.	Mark J. Bennett, Dirk L. Hugen,	Financial Analyt	ics wit	h R: Building a I	Laptop Laboratory		
	for Data	Science, Cambridge University	Press, 2021.		0	1 1 5		
	7. T	homas H. Davenport, Analytics	at Work: Smarte	r Deci	sions, Better Res	sults, Harvard		
	Business	Press, 2022.						
	8. P	eter Bruce, Andrew Bruce, Pete	r Gedeck, Practic	al Sta	tistics for Data S	cientists,		
	O'Reilly	Media (2nd Ed., 2023.						
	9. S	atish Kumar, Principles and Pra	ctice of Multi-din	nensic	onal Data Analys	is, Wiley, 2022.		
	Web Res	sources						
	W1. http	os://link.springer.com/book/10.100	07%2F978-3-030-01	279-3				
	W2. <u>http</u>	os://link.springer.com/book/10.10	07%2F978-1-4939	-2122-5	5			
	W3. <u>http</u>	s://link.springer.com/book/10.1007%	2F978-3-319-55444	<u>-0</u>				
	G							
	Strategic D Identif	ata Management in Finance y and discuss the challenges in Human De	cision Making particu	larly rele	ating to large datasets			
	Discus	s the benefits and challenges of utilising Pr	cocess Models to manage	ge Finan	ce Data Analysis proje	ects		
	• Identif	y and discuss the strategic benefits to be d	erived from Financial I	Big Data				
	Idont: free	d discuss the management shallonger in t	ovoraging the herefits	of Dia D	ata for stratosia como	actitivo advantago		
			everaging the periefits	ט צום וט		entive auvantage		
1	Exploratory	Data Analysis						

 Discuss the process of data cleaning and preparation – e.g. Normalization, Binning, Sampling Apply and Evaluate key descriptive statistics, including Covariance and Correlation, in a data set for large business datasets Discuss solutions to overcome data quality issues in Data Analysis projects - missing values, outliers etc.
Apply and Evaluate methods for visualizing relationships between features
 Statistics for Big data Explain relationships between sample size, effect size, statistical power Describe and Evaluate measures of variation for large datasets Describe hypothesis testing and evaluate outputs from hypothesis tests performed using software such as Excel, R and Python etc.
Interpret outputs from statistical software to analyse patterns in accounting data for signaling unexpected fluctuations - fraud analysis, detection of anomaly transactions etc.
 Dimension reduction Explain PCA and factor analysis and discuss its uses in the analysis of large financial datasets
Interpret outputs from statistical software to analyse reasons behind fluctuations in accounting data e.g. defining cost drivers in Activity Based Costing etc.
 Data Ethics & Legal Considerations Identify and discuss the ethical issues surrounding the use of data analytics in finance Demonstrate an understanding of Data Legislation GDPR and its impact on data analytics
Discuss the societal impacts of the increasing use of Data Analysis techniques in Finance and Business
Topics relevant to development of "Employability": Hands-on experience with PCA, Hypothesis test.
Topics relevant to "PROFESSIONAL ETHICS": Understanding ethical considerations and legal considerations

Course Code: CSE3437	Course Title: Financial Regulations and Compliances Type of Course: Theory	L- T- P- C	3	0	0	3
Version	1.0					
No.						
Course						
Pre-						
requisites						
Anti-	NIL					
requisites						

Course Description	This course provides a comprehensive understanding of the evolving landscape of financial technology (FinTech) regulations and the growing importance of Regulatory Technology (RegTech). It examines the historical development of FinTech regulation, analyzes the specific regulatory framework governing FinTech innovations in India, and explores the application of regulatory sandboxes. Furthermore, the course evaluates the challenges associated with the adoption and implementation of RegTech solutions in the financial services industry. By the end of this course, students will gain a strong foundation in the key regulatory considerations shaping the FinTech ecosystem and the role of technology in						
Course Objective	navigating this complex environment. The objective of this course is to equip learners with a practical understanding of FinTech regulations and RegTech, and to develop their analytical and problem- solving skills through active participation in learning activities, thereby enhancing their employability in the evolving financial technology sector.						
Course Outcomes	On successful completion of the course the students shall be able to: CO1: Understand the evolution of FinTech regulation and the emergence of RegTech. CO2: Explain the regulations governing FinTech within the Indian context. CO3: Describe the purpose and function of regulatory sandboxes. CO4: Analyze the challenges in adopting RegTech solutions.						
Course Contont:		C					
Module 1	Introduction to FinTech regulation and RegTech	Assignment	RegTech Ecosyst	em	10 Sessions		
FinTech Regu Financial inst	ulation, Evolution of R itutions, start-ups, and	egTech- RegTech regulators. The fu	1.0, RegTech 2.0, nuture of Regtech an	RegTech 3.0, Reg d the technologies	Tech ecosystem- impacting it		
Module 2	Regulations governing FinTech in India	Assignment	Regulations		10 Sessions		
Regulation of regulatory im Issuance and direction-NB banks, Anti m	mobile money, Regular plications of cryptocur operation of prepaid p FC, Guidelines regulat noney-laundering regu	ation of smart cont rencies, Payment ayments instrume ing P2P lending pl lations, Data priva	racts, Regulation o and Settlements Sy nts. NPCI guideline atforms, payment a cy and protection.	f Robo-Advisory s estem Act 2007, M es governing UPI p aggregators/interme	ervices, legal and aster direction on payments, Master ediaries, payment		
Module 3	Regulatory Sandboxes	Assignment	Regulatory Sandl	ooxes	9 Sessions		
Introduction, what is regulatory sandbox-Covered FinTech products and eligible participants, parameters, regulatory safe harbour, Post sandbox engagement. Benefits-Participant-regulator dialogue, reduced time and cost of market penetration, stronger appeal to stakeholders, market signalling. Shortcoming-Multi-tiered regimes, Pre-judging innovative value, scalability, race to the bottom. Regulatory sandbox in India, China, USA, Europe and other countries.							
Module 4	Challen ges, Future Assignme and Use Case	ent Complainc	e	9 Ses	sions		

Risks and challenges of RegTech adoption-Procurement and approval process, Preference for large and established players, Fragmented markets, Regulatory uncertainty, Concentration risk, Data protection security and cyber threats. Future Trends in RegTech-Quantitative Regulation, Machine readable regulation, Agile Regulation, Regulatory Sandboxes, International regulation. Compliance, Identity management and control, risk management, Regulatory reporting, Transaction monitoring, Trading in markets

Targeted Application & Tools that can be used:

Text Book(s):

- 1. Madir, J. (Ed.). (2024). *FinTech: Law and Regulation* (3rd ed.). Edward Elgar Publishing.
- 2. Securities and Exchange Board of India. (2014). *Consultation paper on crowdfunding in India*. https://www.sebi.gov.in/sebi_data/attachdocs/1403005615257.pdf
- 3. Reserve Bank of India. (2025, April 9). *Enabling Framework for Regulatory Sandbox* <u>https://www.rbi.org.in/Scripts/PublicationReportDetails.aspx?UrlPage=&ID=938</u>

Reference(s):

- 1.Ren, D. (2018). Tightening regulations make FinTechs easy takeover targets for banks stepping up
digitalisationdrive.SCMP.Retrievedfromhttps://www.scmp.com/business/companies/article/2159718/tightening-regulations-make-fintechs-easy-
takeover-targets-banksfromfrom
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- 3. Magnuson, W. J. (2017). *Regulating Fintech* (Texas A&M University School of Law Legal Studies Research Paper No. 17-55). Retrieved from <u>https://ssrn.com/abstract=3027525</u>
- 4. Sethi, V. (n.d.). *Fintech & Regtech your definitive guide on the convergence of finance, technology and regulation* (p. 3) [Kindle Edition]. Max Krish Publishers.
- 5. Lui, A., & Ryder, N. (Eds.). (2023). *FinTech, Artificial Intelligence and the Law: Regulation and Crime Prevention*. Routledge.
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- 7. McGurk, B. KC., & Reichenbach, S. (2024). Financial Services Law and Distributed Ledger Technology: Regulating Cryptoassets and Decentralised Finance. Edward Elgar Publishing.
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- 10. El Dimachki, M. (2024). Fintech Regulation In Practice. Kogan Page.
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- 12. McGurk, B. KC., & Reichenbach, S. (2024). Financial Services Law and Distributed Ledger Technology: Regulating Cryptoassets and Decentralised Finance. Edward Elgar Publishing.
- 13. Risk Books. (2025). Regtech, Suptech and Beyond: Innovation in Financial Services.
- 14. Gupta, S., et al. (Eds.). (2024). Integrating RegTech Solutions for Industry 4.0. IGI Global.

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2. Securities and Exchange Board of India. (n.d.). *Homepage*. Retrieved from <u>https://www.sebi.gov.in/</u>

- 3. **Reserve Bank of India.** (n.d.). *Homepage*. Retrieved from <u>https://www.rbi.org.in/</u>
- 4. **Financial Industry Regulatory Authority.** (n.d.). *FinTech.* Retrieved from <u>https://www.finra.org/rules-guidance/key-topics/fintech</u>
- 5. International Financial Services Centres Authority. (n.d.). FinTech Hub. Retrieved from

https:/	//ifsca.gov.	in/FinTe	chHub2023/ifs	ca.gov.ir	I/Pages/Co	ontents/Finr	nTechHub.html		
6.	Federal	Trade	Commission.	(n.d.).	Fintech.	Retrieved	from <u>https://</u>	www.ftc.gov/bu	isiness-
guida	nce/credit-f	<u>finance/f</u>	<u>intech</u>						
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https:/	//www.delo	<u>oitte.com</u>	/lu/en/Industrie	<u>es/techno</u>	<u>logy/anal</u>	<u>ysis/regtech</u>	<u>i-companies-co</u>	<u>mpliance.html</u>	
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https:/	//www.apia	ax.com/re	esources/guide	s/regtech	<u>-guide/</u>				
9.	Ascent F	tegTech.	. (n.d.). Homep	age. Retr	ieved fror	n <u>https://wy</u>	ww.ascentregte	<u>ch.com/</u>	
10.	CUBE G	Hobal. (r	ı.d.). Homepag	e. Retriev	ved from]	<u>nttps://cube</u>	<u>.global/</u>		
11.	ACA	Group.	(n.d.).	Compliar	ıceAlpha	RegTecl	h Solutions.	Retrieved	from
https:/	https://www.acaglobal.com/our-solutions/compliancealpha								
12.	FinTech	F	utures.	(n.d.).	RegT	ech I	Archives.	Retrieved	from
https:/	//www.fint	<u>echfutur</u>	es.com/categor	<u>y/regtech</u>	<u>ı/</u>				







Itgalpur, Rajankunte, Yelahanka, Bengaluru – 560064

Course Code: CAI3427	Course Title: Lang Mining Type of Course: D & Integrated Labora	guage Models for iscipline Elective - T torv	Text Theory	L-T-P-C	2	0	0	2			
Version No.	1.0	j			l	1					
Course Pre- requisites	CSE3001 – Artificial Intelligence and Machine Learning										
Anti- requisites	NIL										
Course Description	This course introduces the basics of Text Mining and Natural Language Processing. The course will teach students different concepts such as text mining, NLP, Sequence Labeling, etc. Topics: Text Mining, NLP, Tokenization, Lemmatization, Stemming, One-hot encoding, Language modelling, Bag-of-words, Term-document Matrix, Cosine similarity, Viterbi Algorithm, etc.										
Course Objectives	The objective of the course is EMPLOYBILITY of student by using EXPERIENTIAL LEARNING techniques.										
Course Out Comes	 On successful completion of this course the students shall be able to: 5. Process text data to derive information from text. [Apply] 6. Apply insights from textual information to real-world business. [Apply] 7. Develop solutions for a particular NLP problem using different machine learning and deep learning techniques. [Apply] 										
Course Content:											
Module 1	Text Mining	Adversarial Quiz Tests	Modu	le Tests		Ses	sion	No. of s: 09			
Introduction to 7	Гext Mining. Text Mini	ng vs. NLP. Text Mir	ning Alg	gorithms. S	Steps in	n Te	xt M	ining -			
Extraction, Prepr	ocessing, Analysis and	Evaluation. Lexical Re	esource	Creation (NEW).	Data	a coll	ection.			
String Manipulat	tion to Clean Data. N	latural Language Pro	ocessing	g. Researc	h Para	ndigr	ns ii	n NLP.			
Sequential Data.	Sequence Labeling (NE	W). <mark>Viterbi Algorithm</mark>	(NEW)	. Corpus. <mark>B</mark>	uilding	g a H	MM [·]	<mark>using a</mark>			
Corpus (NEW). U	nknown word handling	<mark>g (NEW)</mark> .									
Module 2	Text Preprocessing	Adversarial Quiz Tests	Modu	le Tests		SI	nizze	No. of			
Introduction to P	reprocessing. Tokeniza	tion. Stop Words Rem	noval. Le	emmatizat	ion and	l Ste	mmi	ng. PoS			
Tagging. Integer	Tagging. Integer Encoding. Padding. One-Hot Encoding.										
	Text	Adversarial Ouiz		1				No. of			
Module 3	Representations	Tests	Modu	le Tests		ses	sion	s: 08			
Language Modeli	ing. N-Gram Language	Model. Bag-of-Word	s Mode	l. Term-Do	ocumer	nt M	atrix	. Term			
Frequency. Inverse Document Frequency. TF-IDF. Cosine Similarity. Naive Bayes Classifier using Bag-											
of-Words. Topic	of-Words. Topic Modeling. Latent Semantic Analysis. Singular Value Decomposition. Truncated SVD										
and Topic Vector	. LDA Algorithm.		1								
Module 4	Natural Language Processing with Keras	Adversarial Quiz Tests	Modu	le Tests		Se	essio	No. of ons: 06			

Word Embeddings vs. One-Hot Encoding. Contextual Bag of Words (CBOW). Skipgram. Deep Learning for Document Classification.

List of Laboratory Tasks:

Experiment No. 1: File Handling

Level 1: Read text files using Python and extract meaningful content.

Level 2: Parse text files using Python to preprocess the data for NLP tasks.

Experiment No. 2: Introduction to NLP Tools

Level 1: Install and use NLTK for basic text processing.

Level 2: Install and use SpaCy for tokenization, PoS tagging, and Named Entity Recognition.

Experiment No. 3: Corpus Cleaning Techniques

Level 1: Use NLTK for corpus cleaning techniques such as tokenization, stopword removal, and stemming.

Level 2: Prepare cleaned text data for downstream NLP tasks like classification or translation.

Experiment No. 4: Word Vector Usage

Level 1: Download and use pre-trained word vectors (e.g., Word2Vec, GloVe, or FastText). Level 2: Compute similarity between two words, find the most similar word, and complete word analogies (e.g., king - man + woman = queen).

Experiment No. 5 & 6: Language Identification

Level 1: Build a simple language identifier using Bag-of-Words (BoW) features. Level 2: Predict the language of a given text using the trained model.

Experiment No. 7 & 8: Lexical Simplification

Level 1: Implement a lexical simplifier to replace complex words with simpler alternatives. Level 2: Generate a simplified version of a given word or sentence while preserving meaning.

Experiment No. 9 & 10: Sentiment Analysis

Level 1: Implement a basic sentiment classifier using a lexicon-based or machine learning approach. Level 2: Compare the performance of an existing sentiment classifier (e.g., VADER, TextBlob, or a pretrained Transformer model).

Experiment No. 11: Named Entity Recognition (NER)

Level 1: Extract named entities from a text using NLTK. Level 2: Extract named entities using SpaCy and compare results.

Experiment No. 12 & 13: Implement a Hidden Markov Model (HMM)

Level 1: Implement a generic HMM for sequence prediction. Level 2: Calculate the forward probability of a given sequence using HMM.

Experiment No. 14: Linguistic HMM

Level 1: Develop a Hidden Markov Model (HMM) for NLP tasks such as PoS tagging. Level 2: Evaluate the performance of the HMM on a specific NLP task (e.g., Named Entity Recognition or Chunking).

Experiment No. 15: Machine Translation

Level 1: Implement Machine Translation (MT) using a pre-trained model from Hugging Face Transformers.

Level 2: Evaluate the quality of MT output via Round-Trip Translation (translate text to another language and back to check accuracy).

Targeted Application & Tools that can be used:

- 3. Google Colab
- 4. Python IDEs like PyCharm

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

1. Group project on some NLP Task like text classification (Creating a Simple Text Classifier: Use Scikit-learn to classify positive vs. negative reviews from a dataset), sentiment analysis, etc.

Textbook(s):

1. Daniel Jurafsky, James H. Martin. "Speech and Language Processing: An Introduction to Natural Language Processing", Computational Linguistics and Speech, Pearson Publication, 2025 (3rd Edition Draft).

2. Aditya Joshi, Pushpak Bhattacharyya. "Natural Language Processing", Wiley Publication, 2023 (1st Edition).

References:

R1. Chris Manning and Hinrich Schutze, "Foundations of Statistical Natural Language Processing", 1st Edition, MIT Press. 1999.

R2. Pawan Goyal. "Natural Language Processing". 1st Edition, 2016.

Weblinks

W1. E-Book link or R2: <u>https://drive.google.com/file/d/10nbwAJd-dv6htOOZVBgAvLd1Wscl0RqC/view</u>
W2. Web Resource for T1: <u>https://web.stanford.edu/~jurafsky/slp3/</u> - VERY VERY IMPORTANT!!!
W3. NPTEL Courses: <u>https://nptel.ac.in/courses/106106211</u> CMI), <u>https://nptel.ac.in/courses/106105158</u>
(IIT Kgp), <u>https://nptel.ac.in/courses/106101007</u> (IITB), <u>https://nptel.ac.in/courses/106105572</u> (IIT Kgp - NEW)

Course Code: CAI3428	Course Title: Pract TensorFlow Type of Course: Di & Integrated Labora	ical Deep Learni scipline Elective atory	ng with - Theory	L- T-P- C	2	0	2	3
Version No.	1.0				1			<u>I</u>
Course Pre- requisites	CSE 3001-Artificial Intelligence and Machine Learning							
Anti-requisites	NIL							
Course Description	This course introduces students to the concepts of deep neural networks and state of the art approaches to develop deep learning models. In this course students will be given an exposure to the details of neural networks as well as deep learning architectures and to develop end-to-end models for such tasks. It will help to design and develop an application-specific deep learning models and also provide the practical knowledge handling and analyzing end user realistic applications.							
Objective	using <u>EXPERIENTIAL LEARNING</u> techniques.							
Course Outcomes	CourseOn successful completion of this course the students shall be able to:Outcomes6. Implement backpropagation and gradient descent techniques to train in networks effectively. (Apply)7. Build and train deep learning models using Python libraries such as Tensor and Keras for real-world applications. (Apply)8. Utilize deep learning techniques for image classification, object dete sentiment analysis, and language modeling. (Apply)						neural orFlow ection,	
Course Content:								
Module 1	Basics of Neural Networks	Assignment					18[8L Sess	+10P] ions

Topics:

Understanding Perceptron with Excel, Understanding Multilayer Perceptron with Excel, From Multilayer Perceptron to Deep Learning, Error Backpropagation and Gradient Descent to reduce errors, Activation Functions, Deep Learning, Problems with Deep Learning with solutions.

Module 2	TensorFlow Basics	Assignment	14[7L+7P]
Wiodule 2		rissignment	Sessions

Topics:

Introduction to TensorFlow, TensorFlow dataset, Machine Learning with TensorFlow

Module 3	Deep Learning methods with Tensor Flow and Keras	Assignment		14[6L+8P] Sessions
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Topics:

Main Features of TensorFlow, Keras basics, AI with Keras.

Project work/Assignment:

23. Assignment 1 on (Module 1 and Module 2)

24. Assignment 2 on (Module 3)

List of Laboratory Tasks:

Lab 1: Working with Deep Learning Frameworks

Objective: Explore various Deep Learning Frameworks Tasks: Identify deep learning frameworks (Keras, Tensorflow, Matplotlib, etc) Activity: Practice with various methods available in DL Frameworks to develop a Model.

Lab 2: Build a Basic Artificial Neural Network

Objective: Create a ANN with DL frameworks.

Task: Identify suitable ANN Layers using Keras and Tensorflow.

Activity: Design a basic Artificial Neural Networks using Keras with TensorFlow (pima-indians-diabetes)

Lab 3: Build a MultiLayer Perceptron

Objective: Create a MLP for classification task.

Task: Identify suitable model for house price prediction.

Activity: Design a MLP for implementing classification and fine-tuning using House price.csv

Lab 4: Create a Tensor in TensorFlow using List or Numpy array.

Objective: To understand how to create a tensor in TensorFlow using a Python list or NumPy array Task: Create a simple tensor using both a Python list and a NumPy array in TensorFlow. Activity: Create a tensor using a Python list and Numpy array

Lab 5: Apply math operations on tensor using various mathematical functions.

Objective: To learn how to apply mathematical operations on tensors using various TensorFlow mathematical functions.

Task: Perform basic mathematical operations (addition, subtraction, multiplication, division) and advanced functions (square, square root, exponential) on tensors.

Activity: Perform basic math operations: Add, Subtract, Multiply, Divide and Apply advanced math functions: Square, Square root, Exponential.

Lab 6: Connecting two tensors in dataset.

Objective: Combine two tensors using concatenation and stacking operations in TensorFlow. Task: Combine two tensors using concatenation and stacking operations in TensorFlow Activity: Concatenate them along a specific axis and Stack them along a new axis.

Lab 7: Building dataset from a file stored in a local drive

Objective: To learn how to build a dataset in TensorFlow from a file stored in a local drive. Task: Load a dataset from a CSV file stored on the local drive and process it using TensorFlow Activity: Load the file using TensorFlow's tf.data API and Process the dataset (e.g., convert it into tensors)

Lab 8: Loading Dataset from TensorFlow.dataset Library

Objective: To learn how to load a dataset from the tensorflow_datasets library and use it in machine learning models.

Task: Load a dataset from TensorFlow Datasets (tfds), preprocess it, and display sample data Activity: Load a dataset (e.g., MNIST, CIFAR-10, IMDB Reviews) and Split the dataset into training and testing sets.

Lab 9: Build a Convolutional Neural Network

Objective: Create a CNN model. Task: Build CNN architecture for Dog-Cat classification problem. Activity: Implement a Convolution Neural Network (CNN) for dog/cat classification problem using keras.

Lab 10: Build a Time-Series Model

Objective: Create a RNN and LSTM Model

Task: Build RNN/LSTM Model for predicting time series data.

Activity Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU notes. REFERENCE MATERIALS:

TEXTBOOKS

7. François Chollet, "Deep Learning with Python", 2nd Edition, Manning Publications, 2022

8. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2017.

REFERENCES

10. Amlan Chakrabarti Amit Kumar Das, Saptarsi Goswami, Pabitra Mitra , "Deep Learning", Pearson Publication, 2021.

- 11. David Foster, "Generative Deep Learning" O'Reilly Publishers, 2020.
- 12. John D Kellehar, "Deep Learning", MIT Press, 2020.

JOURNALS/MAGAZINES

1. IEEE Transactions on Neural Networks and Learning Systems

https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=5962385

2. IEEE Transactions on Pattern Analysis and Machine Intelligence

https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=34http://ijaerd.com/papers/special_papers/IT032.pdf

3. International Journal of Intelligent Systems https://onlinelibrary.wiley.com/journal/1098111x

SWAYAM/NPTEL/MOOCs:

- 4. Swayam Nptel Deep Learning IIT Ropar https://onlinecourses.nptel.ac.in/noc21_cs35/preview
- 5. Coursera Neural Networks and Deep Learning Andrew Ng
- 6. Coursera Neural Networks for Machine Learning by Geoffrey Hinton in Coursera

Course Code: UG COURSE: CAI3429	Course Title: Deep I Vision Type of Course: Discipl Integrated Laboratory	earning for Compute	er & L-T- P- C	2	0	2	3			
Version No.	1.0									
Course Pre- requisites	MAT1003 Applied Statistics, Knowledge of Python, Machine Learning, and Digital image processing									
Anti~ requisites	NIL									
Course Description	This course covers the fundamentals and advanced concepts of deep learning for computer vision applications. Students will explore convolutional neural networks (CNNs), object detection, image segmentation, and generative models. Hands-on lab experiments will reinforce theoretical concepts using frameworks like TensorFlow and PvTorch.									
	On successful completion	of the course the students	s shall be abl	e to:						
	1. Understand the F	undamentals of Deep L	earning for V	Visio	n					
	Explain the core concepts of neural networks and deep learning architectures for image processing.									
	Implement and optimize convolutional neural networks (CNNs) for classification tasks.									
	2. Apply Object Detection and Image Segmentation Techniques									
Course Out Comes	Implement and analyze state-of-the-art object detection algorithms such as YOLO, Faster R-CNN, and SSD.									
	Develop and evaluate image segmentation models like U-Net and Mask R-CNN.									
	3. Explore Advanced Deep Learning Techniques for Vision									
	Utilize Vision Transformers (ViTs) and attention mechanisms for image classification.									
	Generate and manipulate images using Generative Adversarial Networks (GANs).									
	4. Deploy and Optimize Deep Learning Models for Real-World Applications									
Course Content:										
Module 1	Fundamentals of Deep Learning for Vision	Assignment Pr	ractical			No Clas	o. of sses:8			
Introduction to D	eep Learning & Neural Netw	orks, Convolutional Neur	al Networks ((CNN	's) Ar	chitectu	re			
backpropagation	Object Detection &	ansier Learning & Fretrall	icu models.							
Module 2	Image Segmentation	Assignment Pr	ractical			No Clas	o. of ses:14			
Introduction to (Object Detection (R~CNN, SSI	D, YOLO), Region Proposa	l Networks (I	aster	$R \sim C$	NN)				
Semantic & I	istance Segmentatic	on (U-Net, N	Mask R~CNN), Real-	time Object Detection Ap	plications					
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Module 3	Advanced ' Vision	Topics ir	1 Assignment	Practical	No. of Classes:8					
Attention Mechanisms & Vision Transformers (ViTs), Generative Adversarial Networks (GANs) for Image										
Generation, Self-supervised Learning for Vision, Multi-modal Learning (CLIP, DALL·E)										
Module 4	Applications	8	k Assignment	Practical	No. of					
	Deployment	·			Classes:8					
Edge AI & Mobile Deployment (TensorFlow Lite, ONNX), Adversarial Attacks & Robustness in										
Vision Models, Explainability & Interpretability of Vision Models, Case Studies & Industry										
Applications										
Late Experiments are to be can ducted on the following tension										
Lad Experiments are to be conducted on the following topics.~										
Lab Sheet 1:										
Keras Sequential API model										
1. Read in the data and explore										
2. Define a Sequential API model										
3. Defi	3. Define the hyperparameters and optimizer									
4. Train the model and visualize the history										
5. Testing										
Keras Functional API model:										
1. Define a Functional API model										
2. Train the model and visualize the history										
Lab Sheet 2:										
Softmax regression with Keras										
1. Read	in the data and pre	pare								
2. Defi	Define a Sequential API model									
3. Defi	Define the hyperparameters and optimizer									
4. Train	Train the model and visualize the history									
5. Testi	1g									
Lab Sheet 3:										
Convolutional Neural Network with Keras (grayscale images)										
I. Keac	in the data:									
2. V1su	alize the data:									
3. Prep	Prepare the data:									
4. Defi	Define a CNN model:									
5. Defi	Define the hyperparameters and optimizer:									
6. Trai	. Train the model and visualize the history:									
7. Testing:										
Lab Sheet 4:										
Convolutional Neural Network with Keras (color images):										
1. Read	in the data:									
2. Visu	alize the data:									
3. Prep	are the data:									
4. Defi	ne a CNN model:									
5. Defi	Define the hyperparameters and optimizer:									
6. Trai	<u>the model</u> and vi	isualize the	e history:							

7. Testing:

Lab Sheet 5:

Time series and prediction:

- 1. Read in the data and explore:
- 2. Apply the exponential smoothing method and predict

Recurrent neural network (RNN):

- 1. Pre-processing:
- 2. Do the necessary definitions: (Hyper parameters, Model,
- 3. Train the model:
- 4. Predict the future:

Lab Sheet 6:

Document classification with LSTM network:

- 1. Read in the data:
- 2. Explore the data:
- 3. Data preprocessing:
- 4. Define the model:
- 5. Define the optimizer and compile:
- 6. Train the model and visualize the history:
- 7. Testing:

Lab Sheet 7:

Document classification with LSTM network (Binary):

- 1. Read in the data:
- 2. Explore the data:
- 3. Data preprocessing:
- 4. Define the model:
- 5. Define the optimizer and compile:
- 6. Train the model and visualize the history:
- 7. Testing:

Lab Sheet 8:

Document classification with LSTM + CNN network (Binary):

- 1. Read in the data:
- 2. Explore the data:
- 3. Data preprocessing:
- 4. Define the model:
- 5. Define the optimizer and compile:
- 6. Train the model and visualize the history:
- 7. Testing:

Lab Sheet 9:

Softmax regression to recognize the handswritten digits:

- 1. Download the MNIST data:
- 2. Take a look at the dataset:
- 3. Do the necessary definitions:
- 4. Training and Testing:
- Multi-layer neural network to recognize the handswritten digits:
- 1. Download the MNIST data:
- 2. Take a look at the dataset:
- 3. Do the necessary definitions:

Training and Testing:

Lab Sheet 10: Object Detection using YOLOv5 Lab Sheet 11:

Image Segmentation using U-Net

Custom Object Detection using Faster R-CNN Lab Sheet 12:

Implementing Vision Transformers for Image Classification Generating Images using GANs (DCGAN, StyleGAN)

(Group Project)

- 8. Object Detection and Recognition:
- a. Haar cascade object detection (e.g., face detection or object detection using pre-trained classifiers).

b. Feature-based object detection using techniques like Speeded-Up Robust Features (SURF) or Scale-Invariant Feature Transform (SIFT).

c. Deep learning-based object detection using Convolutional Neural Networks (CNNs) or You Only Look Once (YOLO) algorithm.

- 9. Optical Character Recognition (OCR):
- a. Preprocessing of text images (e.g., binarization, noise removal, or skew correction).

b. Text localization using techniques like connected component analysis or Stroke Width Transform (SWT).

c. Character recognition using machine learning algorithms like Support Vector Machines (SVM) or Convolutional Neural Networks (CNNs).

- 10. Gesture Recognition:
- a. Hand segmentation using techniques like background subtraction or skin color detection.
- b. Feature extraction from hand regions (e.g., finger counting, hand shape descriptors).

c. Classification of gestures using machine learning algorithms (e.g., k-Nearest Neighbors or Support Vector Machines).

Tools/Software Required :

- 1. OpenCV 4
- 2. Python 3.7
- 3. MATLAB

Text Books

1. "Deep Learning for Computer Vision Image Classification, Object Detection and Face Recognition in Python" Jason Brownlee (2019)

2. "Deep Learning for Computer Vision with python" Adrian Rosebrock (2017)

References

3. **Goodfellow, I., Bengio, Y., & Courville, A. (2016).** *Deep Learning.* MIT Press.

A foundational book covering deep learning principles, including CNNs, optimization, and generative models.
Raschka, S., & Mirjalili, V. (2022). *Machine Learning with PyTorch and Scikit-Learn.* Packt Publishing.

Covers practical deep learning techniques using PyTorch, including CNNs and transfer learning.

5. **Geron, A. (2022).** *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow (3rd Edition).* O'Reilly Media.

Provides hands-on implementations of deep learning for computer vision using TensorFlow and Keras. **Zhang, A., Lipton, Z. C., Li, M., & Smola, A. J. (2021).** *Dive into Deep Learning.* Available online

(https://d2l.ai).

Open-access book covering CNNs, object detection, and advanced vision techniques with PyTorch and TensorFlow.

7. **Chollet, F. (2021).** *Deep Learning with Python (2nd Edition)*. Manning Publications.

Explains deep learning fundamentals and applications with Keras, including image classification and segmentation.

8. **Ballé, J., Laparra, V., & Simoncelli, E. P. (2017).** *Deep Learning for Computer Vision: A Brief Introduction.*

A concise introduction to CNNs, object detection, and generative models.

Ittagalpura, Rajanukunte, Yelahanka, Bengaluru 560 119