PRESIDENCY UNIVERSITY

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PROGRAMME REGULATIONS & CURRICULUM

2025-29

PRESIDENCY SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

BACHELOR OF TECHNOLOGY (B.TECH.) IN COMPUTER SCIENCE AND ENGINEERING BLOCK CHAIN (CBC)

PRESIDENCY UNIVERSITY

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REACH GREATER HEIGHTS

50 YEARS

PRESIDENCY SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

Program Regulations and Curriculum

2025-2029

BACHELOR OF TECHNOLOGY (B.Tech.) in

COMPUTER SCIENCE AND ENGINEERING

BLOCK CHAIN (CBC)

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

PRESIDENCY UNIVERSITY

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PRESIDENCY UNIVERSITY

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50 YEARS

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 Presidency School of Computer Science and Engineering, committed to developing globally competent engineers, dedicated to developing cutting-edge technology to enhance the quality of life.

1.4 Mission of Presidency School of Computer Science and Engineering

- Cultivate a practice-driven environment with computing-based pedagogy, integrating theory and practice.
- Attract and nurture world-class faculty to excel in teaching and research in the realm of computing sciences.
- Establish state-of-the-art computing facilities for effective teaching and learning experiences.
- Promote interdisciplinary studies to nurture talent for global impact.
- Instill entrepreneurial and leadership skills to address social, environmental and community needs.

2. Preamble to the Program Regulations and Curriculum

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

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

In exercise of the powers conferred by and in discharge of duties assigned under the relevant provision(s) of the Act, Statutes and Academic Regulations, 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 2025-2029.
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 2025-2029 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;*
l. *"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, 2025-2029;*

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*

ll. *"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 2025-2029 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 2025-2029 offered by the Presidency School of Computer Science and Engineering (PSCS):

1 B.Tech. Computer Science and Engineering

2. B. Tech. Computer Science and Technology (Big Data)
3. B. Tech. Computer Science and Engineering (Block Chain)
4. B. Tech. Computer Science and Technology (DevOps)
5. B. Tech. Computer Science and Engineering (Cyber Security)
6. B. Tech. Computer Science and Engineering (Internet of Things)
7. B. Tech. Computer Science and Engineering (Data Science)
8. B. Tech. Computer Science and Technology [Artificial Intelligence and Machine Learning]
9. B. Tech. Information Science and Technology [Artificial Intelligence and Data Science]
10. B. Tech. Computer Science and Information Technology
11. B. Tech. Computer Science and Engineering (Networks)
12. B. Tech. Computer Engineering
13. B. Tech. Information Science and Engineering [Artificial Intelligence and Robotics]
14. B. Tech. Computer Science and Engineering (Artificial Intelligence and Machine Learning)
15. B.Tech. - Artificial Intelligence and Data Science
16. B.Tech. - Robotics and Artificial Intelligence

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

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

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

6. Minimum and Maximum Duration

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

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

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

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

6.5 The enrolment of the student who fails to complete the mandatory requirements for the award of the concerned Degree (refer Section 19. of Academic Regulations) in the prescribed maximum duration (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 able to:

PEO1. Demonstrate success as Mechanical Engineer with innovative skills and moral and ethical values.

PEO2. Engage in lifelong learning through research and professional development,

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

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

8.1 Programme Outcomes (PO)

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

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

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

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

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

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

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

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

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

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

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

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

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

8.2 Program Specific Outcomes (PSOs):

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

PSO 01: Problem Analysis: Identify, formulate, and analyze complex engineering problems related to Cyber Security principles and practices, Programming, and Computing technologies. Utilize research literature and apply first principles of mathematics, natural sciences, and engineering sciences to draw substantiated conclusions.

PSO 02: Design/Development of Solutions: Design innovative solutions for complex engineering challenges in Cyber Security principles and practices, Programming, and Computing technologies. Develop system components or processes that address specified needs while considering public health and safety, cultural, societal, and environmental factors.

PSO 03: Modern Tool Usage: Select, create, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to tackle complex engineering problems related to Cyber Security principles and practices, Programming in Cyber Security, and Computing & Analytics, with an understanding of their limitations.

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./B.E./B.S 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, 2025-2029, 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-Block Chain) 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-Block Chain) 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:

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

10.2.2 The student shall submit the Application for Transfer along with a non-refundable Application Fee (as prescribed by the University from time to time) to the University no later than July 10 of the concerned year for admission to the 2nd Year (3rd Semester) B.Tech. Program commencing on August 1 on the year concerned.

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

10.2.4 The transfer may be provided on the condition that the Courses and Credits completed by the concerned student in the 1st Year of the B.Tech. Four Degree Program from the concerned University, are declared equivalent and acceptable by the Equivalence Committee constituted by the Vice Chancellor for this purpose. Further, the Equivalence Committee may also prescribe the Courses and Credits the concerned students shall have to mandatorily complete, if admitted to the 2nd Year of the B.Tech. Program of the University.

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

11 Change of Branch / Discipline / Specialization

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

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

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

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

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

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

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

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

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

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

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

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

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

12.4 Grading is the process of rewarding the students for their overall performance in each Course. The University follows the system of Relative Grading with statistical approach

to classify the students based on the relative performance of the students registered in the concerned Course except in the following cases:

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

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

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

12.5 Assessment Components and Weightage

	Credit Structure [L-T-P-C]	Percentage/ Marks	CA		Mid-Term		End-term		Project	Total	Exam Conducted by
			Theory	Practical	Theory	Practical	Theory	Practical			
1	3-0-0-3	Percentage	25%	-	25%	-	50%	-	-	100 %	Mid-Term & End Term by CoE
		Marks	50	-	50	-	100	-	-	200	
2	2-0-2-3	Percentage	12.50 %	12.50 %	12.50 %	12.50 %	25%	25%	-	100 %	Mid-Term & End Term by CoE * Except for full stack courses
		Marks	25	25	25	25	50	50	-	200	
3	1-0-4-3	Percentage	-	25%	10%	40%	5%	20%	-	100 %	Mid-Term & End Term by School
		Marks	-	25	10	40	5	20	-	100	
4	2-0-4-4	Percentage	12.50 %	12.50 %	10%	15%	20%	30%	-	100 %	*Mid-Term & End Term by CoE
		Marks	25	25	20	30	40	60	-	200	
5	0-0-4-2	Percentage	-	50%	-	-	-	-	50%	100 %	Project evaluated by IC at School level
		Marks	-	50	-	-	-	-	50	100	
6	0-0-2-1	Percentage	-	100%	-	-	-	-	-	100 %	Only CA at School Level
		Marks	-	100	-	-	-	-	-	100	
7	3-0-2-4	Percentage	12.50 %	12.50 %	15%	10%	30%	20%	-	100 %	Mid-Term & End Term by CoE
		Marks	25	25	30	20	60	40	-	200	
8	2-0-0-2	Percentage	25%	-	25%	-	50%	-	-	100 %	Mid-Term & End Term by CoE
		Marks	50	-	50	-	100	-	-	200	

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

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

2.1 Minimum Performance Criteria:

2.1.1 Theory only Course and Lab/Practice Embedded Theory Course

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

a. A student must obtain a minimum of 30% of the total marks/weightage assigned to the End Term Examinations in the concerned Course.

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

2.1.2 Lab/Practice only Course and Project Based Courses

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

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

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

3.1 The transfer of credits shall be examined and recommended by the Equivalence Committee (Refer ANNEXURE B of academic regulations) and approved by the Dean - Academics.

3.2 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.

3.3 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:

3.3.1 A student may complete SWAYAM/NPTEL/other approved MOOCs as mentioned in Clause 17.3 (as per academic regulations) and transfer equivalent credits to partially or fully complete the mandatory credit requirements of Discipline Elective Courses and/or the mandatory credit requirements of Open Elective Courses as prescribed in the concerned Curriculum Structure. However, it is the sole responsibility of the student to complete the mandatory credit requirements of the Discipline Elective Courses and the Open Elective Courses as prescribed by the Curriculum Structure of the concerned Program.

3.3.2 SWAYAM/NPTEL/ other approved MOOCs as mentioned in Clause 17.3 (as per academic regulations) shall be approved by the concerned Board of Studies and placed (as Annexures) in the concerned PRC.

3.3.3 Parent Departments may release a list of SWAYAM/NPTEL/other approved MOOCs for Pre-Registration as per schedule in the Academic Calendar or through University Notification to this effect.

3.3.4 Students may Pre-Register for the SWAYAM/NPTEL/other approved MOOCs in the respective Departments and register for the same Courses as per the schedule announced by respective Online Course Offering body/institute/ university.

3.3.5 A student shall request for transfer of credits only from such approved Courses as mentioned in Sub-Clause 3.3.2 above.

3.3.6 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.

3.3.7 A student who has successfully completed the approved SWAYAM/NPTEL/ other approved MOOCs and wants to avail the provision of transfer of equivalent credits, must submit the original Certificate of Completion, or such similar authorized documents to the HOD concerned, with a written request for the transfer of the equivalent credits. On verification of the Certificates/Documents and approval by the HOD concerned, the Course(s) and equivalent Credits shall forwarded to the COE for processing of results of the concerned Academic Term.

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

marks received by the Absolute Grading Table 8.11 in the academic regulations.

Table 2: Durations and Credit Equivalence for Transfer of Credits from SWAYAM-NPTEL/ other approved MOOC Courses		
Sl. No.	**Course Duration**	**Credit Equivalence**
1	4 Weeks	1 Credit
2	8 Weeks	2 Credits
3	12 Weeks	3 Credits

3.3.9 The maximum permissible number of credits that a student may request for credit transfer from MOOCs shall not exceed 20% of the mandatory minimum credit requirements specified by the concerned Program Regulations and Curriculum for the award of the concerned Degree.

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

3.4 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) 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-Block Chain) Program Structure (2025-2029) totalling 160 credits. Table 3.0 summarizes the type of baskets, number of courses under each basket and the associated credits that are mandatorily required for the completion of the Degree.

Table 3: B.Tech. (Computer Science and Engineering Block Chain) 2025-2029: Summary of Mandatory Courses and Minimum Credit Contribution from various Baskets		
Sl. No.	**Baskets**	**Credit Contribution**
1	Humanities and Social Sciences including Management Courses (HSMC)	10
2	Basic Science Courses (BSC)	24
3	Engineering Science Courses (ESC)	22
4	Professional Core Courses (PCC)	64

Table 3: B.Tech. (Computer Science and Engineering Block Chain) 2025-2029: Summary of Mandatory Courses and Minimum Credit Contribution from various Baskets		
Sl. No.	**Baskets**	**Credit Contribution**
5	Professional Elective Courses (PEC)	18
6	Open Elective Courses (OEC)	06
7	Project Work (PRW)	16
8	Mandatory Courses (MAC)	0
	Total Credits	**160 (Minimum)**

In the entire Program, the practical and skill based course component contribute to an extent of approximately 57% out of the total credits of 160 for B.Tech. (Computer Science and Engineering Block Chain) 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.

PART C – CURRICULUM STRUCTURE

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 a of Academic Regulations**;**

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

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

17. Curriculum Structure – Basket Wise Course List (not Semester Wise)
List of Courses Tabled – aligned to the Program Structure
(Course Code, Course Name, Credit Structure (LTPC), Contact Hours, Course Basket, Type of Skills etc., as applicable).

Table 3.1 : List of Humanities and Social Sciences including Management Courses (HSMC)									
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Contact Hours**	**Type of skill**	**Pre Requisite**
1	ENG1002	Technical English	1	0	2	2	3	S	
2	PPS1001	Introduction to soft skills	0	0	2	1	2	S	
3	DES1146	Introduction to Design Thinking	1	0	0	1	1	F	
4	ENG2001/ FRLXXXX	Advanced English / Foreign Language courses	1	0	2	2	3	S	ENG1002
5	PPS1012	Enhancing Personality Through Soft Skills	0	0	2	1	2	S	
6	BBA1055	Managerial Economics and Financial Analysis	3	0	0	3	3	S	
		Total No. of Credits				**10**			

Table 3.2 : List of Basic Science Courses (BSC)									
S.No	Course Code	Course Name	L	T	P	C	Conact Hours	Type of Skill	Pre-requisite
1	MAT2301	Calculus and Differential Equations	3	1	0	4	4	F	-
2	PHY2501	Optoelectronics and Quantum Physics	3	0	0	3	3	F	-
3	PHY2504	Optoelectronics and Quantum Physics Lab	0	0	2	1	2	F	-
4	MAT2402	Probability and Statistics	3	1	0	4	4	F	-
5	CHE2501	Chemistry of Smart Materials	3	0	0	3	3	S	-
6	CHE2502	Chemistry of Smart Materials Lab	0	0	2	1	2	S	-
7	MAT2303	Linear Algebra and Vector Calculus	3	1	0	4	4	EM	-
8	MAT2404	Discrete Mathematics	3	1	0	4	4	F	-
		Total No. of Credits				24			

	Table 3.3 : List of Engineering Science Courses (ESC)								
S.No	Course Code	Course Name	L	T	P	C	Contact Hours	Type of Skill	Pre-requisite
1	MEC1006	Engineering Graphics	2	0	0	2	2	S	-
2	CSE1500	Computational Thinking using Python	2	0	2	3	4	S	-
3	ECE2022	Digital Design	2	0	0	2	2	F/S	-
4	ECE2052	Digital Design Lab	0	0	2	1	2	F/S	-
5	CIV1200	Foundations of Integrated Engineering	2	0	0	2	2	S	-
6	EEE1200	Basics of Electrical and Electronics Engineering	3	0	0	3	3	F/S	-
7	EEE1250	Basics of Electrical and	0	0	2	1	2	F/S	-

		Electronics Engineering Lab							
8	**ECE1511**	**Design Workshop**	**1**	**0**	**2**	**2**	**3**	**S/EM**	-
9	**CSE2264**	**Essentials of AI**	**3**	**0**	**0**	**3**	**3**	**S/EM**	-
10	**CSE2265**	**Essentials of AI Lab**	**0**	**0**	**2**	**1**	**2**	**S/EM**	-
11	**CSE2274**	**Competitive Programming and Problem Solving**	**0**	**0**	**4**	**2**	**4**	**S/EM**	-
						Total No. of Credits	**22**		

Table 3.4 : List of Professional Core Courses (PCC)

S.No	Course Code	Course Name	L	T	P	C	Contact Hours	Type of Skill	Pre-requisite
1	**CSE2200**	**Problem Solving using C**	**2**	**0**	**0**	**2**	**2**	**S**	-
2	**CSE2201**	**Problem Solving using C Lab**	**0**	**0**	**4**	**2**	**4**	**S**	-
3	**CSE2251**	**Data Communication and Computer Networks**	**3**	**0**	**0**	**3**	**3**	**S**	-
4	**CSE2252**	**Data Communication and Computer Networks Lab**	**0**	**0**	**2**	**1**	**2**	**S**	-
5	**CSE2253**	**Data Structures**	**3**	**0**	**0**	**3**	**3**	**S**	-
6	**CSE2254**	**Data Structures Lab**	**0**	**0**	**2**	**1**	**2**	**S**	-
7	**CSE2255**	**Object Oriented Programming Using Java**	**3**	**0**	**0**	**3**	**3**	**S/EM**	-
8	**CSE2256**	**Object Oriented Programming Using Java Lab**	**0**	**0**	**2**	**1**	**2**	**S/EM**	-
9	**CSE2257**	**Computer Organization and Architecture**	**3**	**0**	**0**	**3**	**3**	**S**	-
10	CBC2000	Foundations of Blockchain Technology	**3**	**0**	**0**	**3**	**3**	**S/EM**	-
11	**CSE2271**	**Software Design and Development**	**3**	**0**	**0**	**3**	**3**	**S**	-
12	**CSE2258**	**Web Technologies**	**3**	**0**	**0**	**3**	**3**	**S/EM**	-
13	**CSE2259**	**Web Technologies Lab**	**0**	**0**	**2**	**1**	**2**	**S/EM**	-

14	**CSE2260**	**Database Management Systems**	**3**	**0**	**0**	**3**	**3**	**S**	**-**
15	**CSE2261**	**Database Management Systems Lab**	**0**	**0**	**2**	**1**	**2**	**S**	**-**
16	**CSE2262**	**Analysis of Algorithms**	**3**	**1**	**0**	**4**	**4**	**S**	**-**
17	**CSE2263**	**Analysis of Algorithms Lab**	**0**	**0**	**2**	**1**	**2**	**S**	**-**
18	**CSE2266**	**Theory of Computation**	**3**	**0**	**0**	**3**	**3**	**S**	**-**
19	CSE2502	Cryptography and Network Security	3	0	0	3	**3**	S	CSE2051
20	**CSE2269**	**Operating Systems**	**3**	**0**	**0**	**3**	**3**	**S**	**Nil**
21	**CSE2270**	**Operating Systems Lab**	**0**	**0**	**2**	**1**	**2**	**S/EM**	**Nil**
22	CBC2500	Smart Contract and Solidity	3	0	0	3	**3**	**S/EM**	**CBC2000**
23	CBC2501	Smart Contract and Solidity Lab	0	0	2	1	**2**	**S/EM**	**CBC2000**
24	CBC2502	Distributed Ledger Technology	3	0	0	3	**3**	**S/EM**	**CBC2000**
25	CBC2503	Distributed Ledger Technology Lab	0	0	2	1	**2**	**S/EM**	**CBC2000**
26	CBC2504	Blockchain Security and Performance	3	0	0	3	3	**S/EM**	**CBC2000**
27	CBC2505	Blockchain Security and Performance Lab	0	0	4	2	4	**S/EM**	**CBC2000**
28	CBC2506	Blockchain Architecture Design	3	0	0	3	3	**S/EM**	**CBC2000**
		Total No. of Credits				**64**			

Table 3.5 : List of course in Project Work basket (PRW)					
S.No	Course Name	L	T	P	C
1	Capstone Project	0	0	0	10
2	Internship	0	0	0	2
3	Mini Project	0	0	0	4
				Total No. 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 Regulations, are simply assigned the number of Credits based on the quantum of work / effort required to fulfill the learning objectives and outcomes prescribed for the concerned Courses. Such courses are referred to as Non-Teaching Credit Courses (NTCC). These Courses are designed to provide students with hands-on experience and skills essential for their professional development. These courses aim to equip students with abilities in problem identification, root cause analysis, problem-solving, innovation, and design thinking through industry exposure and project-based learning. The expected outcomes are first level proficiency in problem solving and design thinking skills to better equip B.Tech. graduates for their professional careers. The method of evaluation and grading for the Practical / Skill based Courses shall be prescribed and approved by the concerned Departmental Academic Committee (refer Annexure A of the Academic Regulations). The same shall be prescribed in the Course Handout.

18.1 Internship

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

18.1.1 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 18.1.2 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 Mini Project

A student may opt to do a Mini Project for a period of 6-8 weeks in an Industry / Company or academic / research institution or the University Department(s) 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 Mini Project shall be approved by the concerned HOD and be carried out under the guidance of a faculty member.

18.2.2 The student may do the project work in an Industry / Company or academic / research institution of her / his choice subject to the above mentioned condition (Sub-Clause 18.2.1). 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 7th / 8th Semester as applicable, subject to the following conditions:

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

18.3.2 The selection criteria (minimum CGPA, pass in all Courses as on date, and any other qualifying criteria) as applicable / stipulated by the concerned Industry / Company or academic / research institution for award of the Capstone Project to a student;

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

18.3.4 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 Capstone Project Policy of the University.

18.3.1.5 A student selected for a Capstone Project in an industry / company or academic / research institution shall adhere to all the rules and guidelines prescribed in the Capstone Project Policy of the University.

18.4 Research Project / Dissertation

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

18.4.1 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 12 credits is to be earned by the student in a particular track and overall 18 credits.

Track -1 Block Chain with Cryptocurrency											
Sl.No		**Semester**	**New Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Type of Skill**	**Prerequisite**	**Type of course**
1	PEC-I	Sem V	CBC3400	Cryptography and Security in Blockchain	3	0	0	3	S/ EM	Nil	PEC
2	PEC-II	Sem VI	CSE3426	Front End Full Stack Development	2	0	2	3	S/ EM	CSE1504	PEC
3	PEC-III	Sem VI	CSE3427	Java Full Stack Development	2	0	2	3	S/ EM	CSE1514	PEC
	PEC-III	Sem VI	CSE3428	.Net Full Stack Development	2	0	2	3	S/ EM	CSE1504	PEC
4	PEC-IV	Sem VII	CBC3401	Crypto Trading Strategies & Risk Management	3	0	0	3	S/EM	Nil	PEC
	PEC-IV	Sem VII	CBC3402	Bitcoin and Ethereum Protocols	3	0	0	3	S/EM	Nil	PEC
	PEC-IV	Sem VII	CAI3427	Language Models for Text Mining	2	0	2	3	S/ EM	CSE2064	PEC
5	PEC-V	Sem VII	CBC3403	Blockchain for Digital Identity Management	3	0	0	3	S	Nil	PEC

	PEC-V	Sem VII	CBC3404	Cryptocurrency Wallet Development	3	0	0	3	S	Nil	PEC
	PEC-V	Sem VII	CAI3428	Practical Deep Learning with TensorFlow	2	0	2	3	S/ EM	CSE2064	PEC
6	PEC-VI	Sem VII	CBC3405	Blockchain Security & Ethical Hacking	3	0	0	3	S/EM	Nil	PEC
	PEC-VI	Sem VII	CAI3429	Deep Learning for Computer Vision	2	0	2	3	S/ EM	MAT2402	PEC
Track -2 Block Chain with AI											
Sl.No			**New Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Type of Skill**	**Prerequisite**	**Type of course**
1	PEC-I	Sem V	CBC3406	Introduction to Artificial Intelligence in Block Chain	3	0	0	3	S/ EM	Nil	PEC
2	PEC-II	Sem VI	CSE3426	Front End Full Stack Development	2	0	2	3	S/ EM	CSE1504	PEC
3	PEC-III	Sem VI	CSE3427	Java Full Stack Development	2	0	2	3	S/ EM	CSE1514	PEC
	PEC-III	Sem VI	CSE3428	.Net Full Stack Development	2	0	2	3	S/ EM	CSE1504	PEC
4	PEC-IV	Sem VII	CBC3407	Machine Learning for Cyber Threat Detection	3	0	0	3	S/EM	Nil	PEC
	PEC-IV	Sem VII	CBC3408	AI-Powered Fraud Detection in Blockchain	3	0	0	3	S/EM	Nil	PEC
	PEC-IV	Sem VII	CAI3427	Language Models for Text Mining	2	0	2	3	S/ EM	CSE2064	PEC
5	PEC-V	Sem VII	CBC3409	Optimizing Blockchain Networks with AI	3	0	0	3	S	Nil	PEC
	PEC-V	Sem VII	CBC3410	Generative AI for Blockchain Applications	3	0	0	3	S	Nil	PEC
	PEC-V	Sem VII	CAI3428	Practical Deep Learning with TensorFlow	2	0	2	3	S/ EM	CSE2064	PEC
6	PEC-VI	Sem VII	CBC3411	Quantum Computing & Blockchain-AI Security	3	0	0	3	S/EM	Nil	PEC
	PEC-VI	Sem VII	CAI3429	Deep Learning for Computer Vision	2	0	2	3	S/ EM	MAT2402	PEC
Track 3 - Decentralized Finance (DeFi) for Block Chain											

Sl.No			New Course Code	Course Name	L	T	P	C	Type of Skill	Prerequisite	Type of course
1	PEC-I	Sem V	CBC3412	Introduction to Decentralized Finance (DeFi)	3	0	0	3	S/EM	Nil	PEC
2	PEC-II	Sem VI	CSE3426	Front End Full Stack Development	2	0	2	3	S/EM	CSE1504	PEC
3	PEC-III	Sem VI	CSE3427	Java Full Stack Development	2	0	2	3	S/EM	CSE1514	PEC
	PEC-III	Sem VI	CSE3428	.Net Full Stack Development	2	0	2	3	S/EM	CSE1504	PEC
4	PEC-IV	Sem VII	CBC3413	Blockchain in Financial Services	3	0	0	3	S/EM	Nil	PEC
	PEC-IV	Sem VII	CBC3414	Building Decentralized Applications (DApps) for Finance	3	0	0	3	S/EM	Nil	PEC
	PEC-IV	Sem VII	CAI3427	Language Models for Text Mining	2	0	2	3	S/EM	CSE2064	PEC
5	PEC-V	Sem VII	CBC3415	Smart Contracts for Financial Products	3	0	0	3	S	Nil	PEC
	PEC-V	Sem VII	CBC3416	Decentralized Autonomous Organizations and Risk Management in Finance	3	0	0	3	S	Nil	PEC
	PEC-V	Sem VII	CAI3428	Practical Deep Learning with TensorFlow	2	0	2	3	S/EM	CSE2064	PEC
6	PEC-VI	Sem VII	CBC3417	Regulatory and Compliance Challenges in DeFi	3	0	0	3	S/EM	Nil	PEC
	PEC-VI	Sem VII	CAI3429	Deep Learning for Computer Vision	2	0	2	3	S/EM	MAT2402	PEC

Track -4 Mandatory Non Credited Course (Offered for Lateral Entry students in higher semester whereever applicable in MOOC mode)**

Sl.No			Course Code	Course Name	L	T	P	C	Type of Skill	Prerequisite
1			LAW1007	Indian Constitution and Professional Ethics for Engineers	1	0	0	0	F	-

2			CHE7601	Environmental Studies **	0	0	0	0	F	-
3			XXXXXXX	Universal Human Values **	0	0	0	0	F	-

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 12												
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Type of Skill/ Focus**	**Course Caters to**	**Prerequisites/ Corequisites**	**Antirequisites**	**Future Courses that need this as a Prerequisite**
Chemistry Basket											
1	CHE1003	Fundamentals of Sensors	3	0	0	3	S	ES	-	-	-
2	CHE1004	Smart materials for IOT	3	0	0	3	S	ES	-	-	-
3	CHE1005	Computational Chemistry	2	0	0	2	S	ES	-	-	-
4	CHE1006	Introduction to Nano technology	3	0	0	3	S	ES	-	-	-
5	CHE1007	Biodegradable electronics	2	0	0	2	S	ES	-	-	-
6	CHE1008	Energy and Sustainability	2	0	0	2	S	ES	-	-	-
7	CHE1009	3D printing with Polymers	2	0	0	2	S	ES	-	-	-
8	CHE1010	Bioinformatics and Healthcare IT	2	0	0	2	S	ES	-	-	-
9	CHE1011	Chemical and Petrochemical catalysts	3	0	0	3	S	ES	-	-	-
10	CHE1012	Introduction to Composite materials	2	0	0	2	S	ES	-	-	-
11	CHE1013	Chemistry for Engineers	3	0	0	3	S	ES	-	-	-
12	CHE1014	Surface and Coatings technology	3	0	0	3	S	ES	-	-	-
13	CHE1015	Waste to Fuels	2	0	0	2	S	ES	-	-	-
14	CHE1016	Forensic Science	3	0	0	3	S	ES	-	-	-
Civil Engineering Basket											
1	CIV1001	Disaster mitigation and management	3	0	0	3	S	-	-	-	-
2	CIV1002	Environment Science and Disaster Management	3	0	0	3	FC	-	-	-	-
3	CIV2001	Sustainability Concepts in Engineering	3	0	0	3	S	-	-	-	-
4	CIV2002	Occupational Health and Safety	3	0	0	3	S	-	-	-	-
5	CIV2003	Sustainable Materials and Green Buildings	3	0	0	3	EM	-	-	-	-
6	CIV2004	Integrated Project Management	3	0	0	3	EN	-	-	-	-
7	CIV2005	Environmental Impact Assessment	3	0	0	3	EN	-	-	-	-
8	CIV2006	Infrastructure Systems for Smart Cities	3	0	0	3	EN	-	-	-	-
9	CIV2044	Geospatial Applications for Engineers	2	0	2	3	EM	-	-	-	-
10	CIV2045	Environmental Meteorology	3	0	0	3	S	-	-	-	-
11	CIV3046	Project Problem Based Learning	3	0	0	3	S	-	-	-	-
12	CIV3059	Sustainability for Professional Practice	3	0	0	3	EN	-	-	-	-
Commerce Basket											
1	COM2001	Introduction to Human Resource Management	2	0	0	2	F	HP/GS	-	-	-
2	COM2002	Finance for Non Finance	2	0	0	2	S	-	-	-	-
3	COM2003	Contemporary Management	2	0	0	2	F	-	-	-	-
4	COM2004	Introduction to Banking	2	0	0	2	F	-	-	-	-
5	COM2005	Introduction to Insurance	2	0	0	2	F	-	-	-	-
6	COM2006	Fundamentals of Management	2	0	0	2	F	-	-	-	-
7	COM2007	Basics of Accounting	3	0	0	3	F	-	-	-	-
Computer Science Basket											

1	CSE2002	Programming in Java	2	0	2	3	S/EM	-	-	-	-
2	CSE2003	Social Network Analytics	3	0	0	3	S	GS	-	-	-
3	CSE2004	Python Application Programming	2	0	2	3	S/ EM	-	-	-	-
4	CSE2005	Web design fundamentals	2	0	2	3	S/ EM/EN	-	-	-	-
5	CSE3111	Artificial Intelligence : Search Methods For Problem Solving	3	0	0	3	S/ EM/EN	-	-	-	-
6	CSE3112	Privacy And Security In Online Social Media	3	0	0	3	S/ EM/EN	-	-	-	-
7	CSE3113	Computational Complexity	3	0	0	3	S/ EM/EN	-	-	-	-
8	CSE3114	Deep Learning for Computer Vision	3	0	0	3	S/ EM/EN	-	-	-	-
9	CSE3115	Learning Analytics Tools	3	0	0	3	S/ EM/EN	-	-	-	-
Design Basket											
1	DES1001	Sketching and Painting	0	0	2	1	S	-	-	-	-
2	DES1002	Innovation and Creativity	2	0	0	2	F	-	-	-	-
3	DES1121	Introduction to UX design	1	0	2	2	S	-	-	-	-
4	DES1122	Introduction to Jewellery Making	1	0	2	2	S	-	-	-	-
5	DES1124	Spatial Stories	1	0	2	2	S	-	-	-	-
6	DES1125	Polymer Clay	1	0	2	2	S	-	-	-	-
7	DES2001	Design Thinking	3	0	0	3	S	-	-	-	-
8	DES1003	Servicability of Fashion Products	1	0	2	2	F	ES	-	-	-
9	DES1004	Choices in Virtual Fashion	1	0	2	2	F	ES, GS, HP	-	-	-
10	DES1005	Fashion Lifestyle and Product Diversity	1	0	2	2	F	ES, GS, HP	-	-	-
11	DES1006	Colour in Everyday Life	1	0	2	2	F	ES	-	-	-
12	DES2080	Art of Design Language	3	0	0	3	S	-	-	-	-
13	DES2081	Brand Building in Design	3	0	0	3	S	-	-	-	-
14	DES2085	Web Design Techniques	3	0	0	3	S	-	-	-	-
15	DES2089	3D Modeling for Professionals	1	0	4	3	S	-	-	-	-
16	DES2090	Creative Thinking for Professionals	3	0	0	3	S	-	-	-	-
17	DES2091	Idea Formulation	3	0	0	3	S	-	-	-	-
Electrical and Electronics Basket											
1	EEE1002	IoT based Smart Building Technology	3	0	0	3	S	-	-	-	-
2	EEE1003	Basic Circuit Analysis	3	0	0	3	S	-	-	-	-
3	EEE1004	Fundamentals of Industrial Automation	3	0	0	3	S	-	-	-	-
4	EEE1005	Electric Vehicles & Battery Technology	3	0	0	3	S	-	-	-	-
5	EEE1006	Smart Sensors for Engineering Applications	3	0	0	3	S	-	-	-	-
Electronics and Communication Basket											
1	ECE1003	Fundamentals of Electronics	3	0	0	3	F	-	-	-	-
2	ECE1004	Microprocessor based systems	3	0	0	3	F	-	-	-	-
3	ECE3089	Artificial Neural Networks	3	0	0	3	S	-	-	-	-
4	ECE3097	Smart Electronics in Agriculture	3	0	0	3	F/EM	-	-	-	-
5	ECE3098	Environment Monitoring Systems	3	0	0	3	F/EM	-	-	-	-
6	ECE3102	Consumer Electronics	3	0	0	3	F/EM	-	-	-	-
7	ECE3103	Product Design of Electronic Equipment	3	0	0	3	S/F/ EM / EN	-	-	-	-
8	ECE3106	Introduction to Data Analytics	3	0	0	3	F/EM	-	-	-	-
9	ECE3107	Machine Vision for Robotics	3	0	0	3	F/EM	-	-	-	-
English Basket											

1	ENG1008	Indian Literature	2	0	0	2	-	GS/ HP	-	-	-
2	ENG1009	Reading Advertisement	3	0	0	3	S	-	-	-	-
3	ENG1010	Verbal Aptitude for Placement	2	0	2	3	S	-	-	-	-
4	ENG1011	English for Career Development	3	0	0	3	S	-	-	-	-
5	ENG1012	Gender and Society in India	2	0	0	2	-	GS/ HP	-	-	-
6	ENG1013	Indian English Drama	3	0	0	3	-	-	-	-	-
7	ENG1014	Logic and Art of Negotiation	2	0	2	3	-	-	-	-	-
8	ENG1015	Professional Communication Skills for Engineers	1	0	0	1	-	-	-	-	-
DSA Basket											
1	DSA2001	Spirituality for Health	2	0	0	2	F	HP	-	-	-
2	DSA2002	Yoga for Health	2	0	0	2	S	HP	-	-	-
3	DSA2003	Stress Management and Well Being	2	0	0	2	F	-	-	-	-
Kannada Basket											
1	KAN1001	Kali Kannada	1	0	0	1	S	-	-	-	-
2	KAN1003	Kannada Kaipidi	3	0	0	3	S	-	-	-	-
3	KAN2001	Thili Kannada	1	0	0	1	S	-	-	-	-
4	KAN2003	Pradharshana Kale	1	0	2	2	S	-	-	-	-
5	KAN2004	Sahithya Vimarshe	2	0	0	2	S	-	-	-	-
6	KAN2005	Anuvadha Kala Sahithya	3	0	0	3	S	-	-	-	-
7	KAN2006	Vichara Manthana	3	0	0	3	S	-	-	-	-
8	KAN2007	Katha Sahithya Sampada	3	0	0	3	S	-	-	-	-
9	KAN2008	Ranga Pradarshana Kala	3	0	0	3	S	-	-	-	-
Foreign Language Basket											
1	FRL1004	Introduction of French Language	2	0	0	2	S	S	-	-	-
2	FRL1005	Fundamentals of French	2	0	0	2	S	S	-	-	-
3	FRL1009	Mandarin Chinese for Beginners	3	0	0	3	S	S	-	-	-
Law Basket											
1	LAW1001	Introduction to Sociology	2	0	0	0	2	F	HP	-	-
2	LAW2001	Indian Heritage and Culture	2	0	0	0	2	F	HP/GS	-	-
3	LAW2002	Introdcution to Law of Succession	2	0	0	0	2	F	HP/GS	-	-
4	LAW2003	Introduction to Company Law	2	0	0	0	2	F	HP	-	-
5	LAW2004	Introduction to Contracts	2	0	0	2	F	HP	-	-	-
6	LAW2005	Introduction to Copy Rights Law	2	0	0	2	F	HP	-	-	-
7	LAW2006	Introduction to Criminal Law	2	0	0	2	F	HP	-	-	-
8	LAW2007	Introduction to Insurance Law	2	0	0	2	F	HP	-	-	-
9	LAW2008	Introduction to Labour Law	2	0	0	2	F	HP	-	-	-
10	LAW2009	Introduction to Law of Marriages	2	0	0	2	F	HP/GS	-	-	-
11	LAW2010	Introduction to Patent Law	2	0	0	2	F	HP	-	-	-
12	LAW2011	Introduction to Personal Income Tax	2	0	0	2	F	HP	-	-	-
13	LAW2012	Introduction to Real Estate Law	2	0	0	2	F	HP	-	-	-
14	LAW2013	Introduction to Trademark Law	2	0	0	2	F	HP	-	-	-
15	LAW2014	Introduction to Competition Law	3	0	0	3	F	HP	-	-	-
16	LAW2015	Cyber Law	3	0	0	3	F	HP	-	-	-
17	LAW2016	Law on Sexual Harrassment	2	0	0	2	F	HP/GS	-	-	-
18	LAW2017	Media Laws and Ethics	2	0	0	2	F	HP/GS	-	-	-
Mathematics Basket											
1	MAT2008	Mathematical Reasoning	3	0	0	3	S	-	-	-	-
2	MAT2014	Advanced Business Mathematics	3	0	0	3	S	-	-	-	-
3	MAT2041	Functions of Complex Variables	3	0	0	3	S	-	-	-	-
4	MAT2042	Probability and Random Processes	3	0	0	3	S	-	-	-	-
5	MAT2043	Elements of Number Theory	3	0	0	3	S	-	-	-	-
6	MAT2044	Mathematical Modelling and Applications	3	0	0	3	S	-	-	-	-

Mechanical Basket (not to be offered for Mechanical Department students)											
1	MEC1001	Fundamentals of Automobile Engineering	3	0	0	3	F	-	-	-	-
2	MEC1002	Introduction to Matlab and Simulink	3	0	0	3	S/EM	-	-	-	-
3	MEC1003	Engineering Drawing	1	0	4	3	S	-	-	-	-
4	MEC2001	Renewable Energy Systems	3	0	0	3	F	ES	-	-	-
5	MEC2002	Operations Research & Management	3	0	0	3	F	-	-	-	-
6	MEC2003	Supply Chain Management	3	0	0	3	S/ EM/ EN	-	-	-	-
7	MEC2004	Six Sigma for Professionals	3	0	0	3	S/EM	-	-	MEC 2008	-
8	MEC2005	Fundamentals of Aerospace Engineering	3	0	0	3	F	-	-	-	-
9	MEC2006	Safety Engineering	3	0	0	3	S/EM	ES	-	-	-
10	MEC2007	Additive Manufacturing	3	0	0	3	F/EM	-	-	-	-
11	MEC3069	Engineering Optimisation	3	0	0	3	S/EM	-	-	-	-
12	MEC3070	Electronics Waste Management	3	0	0	3	F/S	ES	-	-	-
13	MEC3071	Hybrid Electric Vehicle Design	3	0	0	3	S/EM	ES	-	-	-
14	MEC3072	Thermal Management of Electronic Appliances	3	0	0	3	S/EM	-	-	-	-
15	MEC3200	Sustainable Technologies and Practices	3	0	0	3	S/EM	-	-	-	-
16	MEC3201	Industry 4.0	3	0	0	3	S/EM	-	-	-	-
Petroleum Basket											
1	PET1011	Energy Industry Dynamics	3	0	0	3	FC	ES	-	NIL	-
2	PET1012	Energy Sustainability Practices	3	0	0	3	FC	ES	-	NIL	-
Physics Basket											
1	PHY1003	Mechanics and Physics of Materials	3	0	0	3	FC / SD				
2	PHY1004	Astronomy	3	0	0	3	FC				
3	PHY1005	Game Physics	2	0	2	3	FC / SD				
4	PHY1006	Statistical Mechanics	2	0	0	2	FC				
5	PHY1007	Physics of Nanomaterials	3	0	0	3	FC				
6	PHY1008	Adventures in nanoworld	2	0	0	2	FC				
7	PHY2001	Medical Physics	2	0	0	2	FC	ES			
8	PHY2002	Sensor Physics	1	0	2	2	FC / SD				
9	PHY2003	Computational Physics	1	0	2	2	FC				
10	PHY2004	Laser Physics	3	0	0	3	FC	ES			
11	PHY2005	Science and Technology of Energy	3	0	0	3	FC	ES			
12	PHY2009	Essentials of Physics	2	0	0	2	FC				
Management Basket- I											
1	MGT2007	Digital Entrepreneurship	3	0	0	3	S/EM/EN	-	-	-	-
2	MGT2015	Engineering Economics	3	0	0	3	S	-	-	-	-
3	MGT2023	People Management	3	0	0	3	S/EM/ EN	HP	-	-	-
Management Basket- II											
1	MGT1001	Introduction to Psychology	3	0	0	3	F	HP	-	-	-
2	MGT1002	Business Intelligence	3	0	0	3	EN	-	-	-	-
3	MGT1003	NGO Management	3	0	0	3	S	-	-	-	-
4	MGT1004	Essentials of Leadership	3	0	0	3	EM/ EN	GS/ HP	-	-	-
5	MGT1005	Cross Cultural Communication	3	0	0	3	S/EM/ EN	HP	-	-	-
6	MGT2001	Business Analytics	3	0	0	3	S/ EM/EN	-	-	-	-
7	MGT2002	Organizational Behaviour	3	0	0	3	F	HP	-	-	-

8	MGT2003	Competitive Intelligence	3	0	0	3	S	-	-	-	-
9	MGT2004	Development of Enterprises	3	0	0	3	S/EM/EN	-	-	-	-
10	MGT2005	Economics and Cost Estimation	3	0	0	3	S/EM	-	-	-	-
11	MGT2006	Decision Making Under Uncertainty	3	0	0	3	S	-	-	-	-
12	MGT2008	Econometrics for Managers	3	0	0	3	S	-	-	-	-
13	MGT2009	Management Consulting	3	0	0	3	S/EM/EN	-	-	-	-
14	MGT2010	Managing People and Performance	3	0	0	3	S/EM/EN	HP/GS	-	-	-
15	MGT2011	Personal Finance	3	0	0	3	F	-	-	-	-
16	MGT2012	E Business for Management	3	0	0	3	S/EM	-	-	-	-
17	MGT2013	Project Management	3	0	0	3	EN / EM	GS/HP/ES	-	-	-
18	MGT2014	Project Finance	3	0	0	3	EN / EM	HP	-	-	-
19	MGT2016	Business of Entertainment	3	0	0	3	EM/ EN	-	-	-	-
20	MGT2017	Principles of Management	3	0	0	3	S/EM/ EN	-	-	-	-
21	MGT2018	Professional and Business Ethics	3	0	0	3	S/EM/ EN	HP	-	-	-
22	MGT2019	Sales Techniques	3	0	0	3	S/EM/ EN	HP	-	-	-
23	MGT2020	Marketing for Engineers	3	0	0	3	S/EM/ EN	HP	-	-	-
24	MGT2021	Finance for Engineers	3	0	0	3	S/EM/ EN	HP	-	-	-
25	MGT2022	Customer Relationship Management	3	0	0	3	S/EM/ EN	HP	-	-	-
Media Studies Basket											
1	BAJ3050	Corporate Filmmaking and Film Business	0	0	4	2	EM	HP	-	-	-
2	BAJ3051	Digital Photography	2	0	2	3	EM	HP	-	-	-
3	BAJ3055	Introduction to News Anchoring and News Management	0	0	2	1	EM	-	-	-	-

Table 3.8 : List of Mandatory Courses (MAC)

S.No	Course Code	Course Name	L	T	P	C
1	CHE7601	Environmental Studies	-	-	-	0
2	LAW7601	Indian Constitution	-	-	-	0
3	CIV7601	Universal Human Values and Ethics	-	-	-	0
4	PPS1025	Industry Readiness Program - I	0	0	2	0
5	PPS1026	Industry Readiness Program - II	0	0	2	0
6	APT4002	Introduction to Aptitude	0	0	2	0
7	APT4004	Aptitude Training - Intermediate	0	0	2	0
8	APT4006	Logical and Critical Thinking	0	0	2	0
					Total No. of Credits	**0**

21.List of MOOC Courses

21.1 Presidency University students are given the opportunity to study abroad in International Universities through a selection process coordinated by the Office of International Affairs (OIA). Such

selected students need to complete their credits for the semester that they are abroad in the following way:

21.1.1 The student needs to study and complete School Core and Program Core Courses in offline mode only.

21.1.2 Massive Open Online Course (MOOC) courses maybe given for Open Elective and Discipline Elective Courses. These courses need to be approved by the concerned BOS and Academic Council from time to time.

21.1.3 SWAYAM/NPTEL/ other approved MOOCs shall be approved by the concerned Board of Studies and placed in the concerned PRC.

21.1.4 Student shall register for these courses in the ERP of Presidency University.

21.1.5 For these MOOC courses faculty coordinators are identified. These faculty should have undergone similar MOOC courses and therefore should be familiar with the mode of class conduction, types of assessments and evaluation procedures.

21.1.6 Study materials shall be provided to the students as video lectures shared by the MOOCs Coordinator(s), or the students may access the approved MOOCs Portal directly. The mode of class conduction is determined by the MOOCs coordinator(s) as detailed in the Course Catalogue and Course Plan.

21.1.7 The question paper shall be prepared by the MOOCs coordinator(s).

21.1.8 Students write the exams in online mode. These exams are scheduled and conducted by the School.

21.1.9 Results are evaluated by School and given to the Office of the Controller of Examinations (CoE).

21.1.10 The details of the duration, credits and evaluation are given below:

Sl#	Duration	Credits	Evaluation
1.	12 weeks	3	Continuous Assessment –50 Marks Mid Term –50 Marks End Term-100 Marks
2.	8 weeks	2	Mid Term-50 Marks End Term-100 Marks
3	4 weeks	1	End Term-100 Marks

21.2 MOOC - Discipline Elective Courses for B. Tech. Computer Science and Engineering Block Chain

Table 3.9: MOOC Discipline Elective Courses

Sl.No	Course Code	Course Name	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	CSE3196	Foundations of Cyber Physical Systems	3	3-0-0-3
16	CSE3197	Getting Started with Competitive Programming	3	3-0-0-3
17	CSE3198	GPU Architectures and Programming	3	3-0-0-3
18	CSE3199	Artificial Intelligence: Knowledge Representation and Reasoning	3	3-0-0-3
19	CSE3200	Programming in Modern C++	3	3-0-0-3

20	CSE3201	Circuit Complexity Theory	3	3-0-0-3
21	CSE3202	Basics of Computational Complexity	3	3-0-0-3
22	CSE3212	Introduction to Computer and Network Performance Analysis using Queuing	1	1-0-0-1
23	CSE3213	C Programming and Assembly Language	1	1-0-0-1
24	CSE3214	Python for Data Science	1	1-0-0-1
25	CSE3215	Software Conceptual Design	1	1-0-0-1
26	CSE3117	Industrial Digital Transformation	3	3-0-0-3
27	CSE3118	Blockchain for Decision Makers	3	3-0-0-3
28	CSE3349	Technology for Lawyers	3	3-0-0-3
29	CSE3430	Deep Learning for Natural Language Processing	3	3-0-0-3
30	CSE3431	Machine Learning for Engineering and Science Applications	3	3-0-0-3
31	CSE3432	Algorithms in Computational Biology and Sequence Analysis	3	3-0-0-3
32	CSE3433	Introduction to Large Language Models (LLMs)	3	3-0-0-3
33	CSE3434	Quantum Algorithms and Cryptography	3	3-0-0-3

21.3 MOOC - Open Elective Courses for B. Tech. Computer Science and Engineering Block Chain

Table 3.10: MOOC Open Elective Courses

Open Elective Courses Duration is 12 weeks

Sl. No.	Course ID	Course Name	Total Credits	L-T-P-C
1	BBA2022	Supply Chain digitization	3	3-0-0-3
2	BBA2021	E Business	3	3-0-0-3

3	BBB2016	Business Analytics for Management Decisions	3	3-0-0-3
4	BBB2015	Artificial Intelligence for Investments	3	3-0-0-3

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

First Year Cycle 1

Sl. No.	Course Code	Course Name	L	T	P	C	Contact Hours	Type of Skill	Pre-requisite	Basket
Semester I - PHYSICS Cycle (CSE-Allied (29 Sec))			**15**	**1**	**8**	**19**	**24**			
1	MAT2301	Calculus and Differential Equations	3	1	0	4	4	F	Nil	BSC
2	ENG1900	English for Technical Communication	2	0	0	2	2	S	Nil	HSMC
3	PHY2501	Optoelectronics and Quantum Physics	3	0	0	3	3	F	Nil	BSC
4	PHY2504	Optoelectronics and Quantum Physics Lab	0	0	2	1	2	F	Nil	BSC
5	MEC1006	Engineering Graphics	2	0	0	2	2	S	Nil	ESC
6	ECE2022	Digital Design	2	0	0	2	2	F/S	Nil	ESC
7	ECE2052	Digital Design Lab	0	0	2	1	2	F/S	Nil	ESC
8	DES1146	Introduction to Design Thinking	1	0	0	1	1	F	Nil	HSMC
9	CSE1500	Computational Thinking using Python	2	0	2	3	4	S	Nil	ESC
10	PPS1025	Industry Readiness Program – I	0	0	2	0	2	SS	Nil	MAC
Semester I - CHEMISTRY Cycle (CSE (21 Sec + Engg 10 Sec))			**16**	**1**	**8**	**19**	**25**			
1	MAT2301	Calculus and Differential Equations	3	1	0	4	4	F	Nil	BSC
2	ENG1900	English for Technical Communication	2	0	0	2	2	S	Nil	HSMC
3	CHE2501	Chemistry of Smart Materials	3	0	0	3	3	S	Nil	BSC
4	CHE2502	Chemistry of Smart Materials Lab	0	0	2	1	2	S	Nil	BSC
5	CIV1200	Foundations of Integrated Engineering	2	0	0	2	2	S	Nil	ESC

6	EEE1200	Basics of Electrical and Electronics Engineering	3	0	0	3	3	F/S	Nil	ESC
7	EEE1250	Basics of Electrical and Electronics Engineering Lab	0	0	2	1	2	F/S	Nil	ESC
8	LAW7601	Indian Constitution	1	0	0	0	1	F	Nil	MAC
9	CSE1500	Computational Thinking using Python	2	0	2	3	4	S	Nil	ESC
10	PPS1025	Industry Readiness Program – I	0	0	2	0	2	SS	Nil	MAC

First Year Cycle 2

Semester II - CHEMISTRY Cycle (CSE-Allied (29 Sec))			**16**	**1**	**10**	**22**	**27**			
1	MAT2402	Probability and Statistics	3	1	0	4	4	F	Nil	BSC
2	ENG2501	Advanced English	2	0	0	2	2	S	Nil	HSMC
3	CHE2501	Chemistry of Smart Materials	3	0	0	3	3	S	Nil	BSC
4	CHE2502	Chemistry of Smart Materials Lab	0	0	2	1	2	S	Nil	BSC
5	CIV1200	Foundations of Integrated Engineering	2	0	0	2	2	S	Nil	ESC
6	EEE1200	Basics of Electrical and Electronics Engineering	3	0	0	3	3	F/S	Nil	ESC
7	EEE1250	Basics of Electrical and Electronics Engineering Lab	0	0	2	1	2	F/S	Nil	ESC
8	LAW7601	Indian Constitution	1	0	0	0	1	F	Nil	MAC
9	CSE2000	Problem Solving using C	2	0	0	2	2	S	Nil	PCC
10	CSE2001	Problem Solving using C Lab	0	0	4	2	4	S	Nil	PCC
11	PPS1026	Industry Readiness Program – II	0	0	2	0	2	SS	Nil	MAC
12	ECE1511	Design Workshop	1	0	2	2	3	S/EM	Nil	ESC
13	CHE7601	Environmental Studies	0	0	0	0	0	F	Nil	MAC
Semester II - PHYSICS Cycle (CSE (21 Sec + Engg 10 Sec))			**15**	**1**	**10**	**22**	**26**			
1	MAT240	Probability and Statistics	3	1	0	4	4	F	Nil	BSC
2	ENG2501	Advanced English	2	0	0	2	2	S	Nil	HSMC
3	PHY2501	Optoelectronics and Quantum Physics	3	0	0	3	3	F	Nil	BSC
4	PHY2504	Optoelectronics and Quantum Physics Lab	0	0	2	1	2	F	Nil	BSC
5	MEC1006	Engineering Graphics	2	0	0	2	2	S	Nil	ESC

6	ECE2022	Digital Design	2	0	0	2	2	F/S	Nil	ESC
7	ECE2052	Digital Design Lab	0	0	2	1	2	F/S	Nil	ESC
8	DES1146	Introduction to Design Thinking	1	0	0	1	1	F	Nil	HSMC
9	CSE2000	Problem Solving using C	2	0	0	2	2	S	Nil	PCC
10	CSE2001	Problem Solving using C Lab	0	0	4	2	4	S	Nil	PCC
11	PPS1026	Industry Readiness Program – II	0	0	2	0	2	SS	Nil	MAC
12	ECE1511	Design Workshop	1	0	2	2	3	S/EM	Nil	ESC
13	CHE7601	Environmental Studies	0	0	0	0	0	F	Nil	MAC

Semester 3			**57**	**5**	**22**	**25**	**30**		
1	**MAT2303**	**Linear Algebra and Vector Calculus**	**3**	**1**	**0**	**4**	**4**	**EM**	
2	**CSE2251**	**Data Communication and Computer Networks**	**3**	**0**	**0**	**3**	**3**	**S**	
3	**CSE2252**	**Data Communication and Computer Networks Lab**	**0**	**0**	**2**	**1**	**2**	**S**	
4	**CSE2253**	**Data Structures**	**3**	**0**	**0**	**3**	**3**	**S**	
5	**CSE2254**	**Data Structures Lab**	**0**	**0**	**2**	**1**	**2**	**S**	
6	**CSE2255**	**Object Oriented Programming Using Java**	**3**	**0**	**0**	**3**	**3**	**S/EM**	
7	**CSE2256**	**Object Oriented Programming Using Java Lab**	**0**	**0**	**2**	**1**	**2**	**S/EM**	
8	**CSE2257**	**Computer Organization and Architecture**	**3**	**0**	**0**	**3**	**3**	**S**	
9	CBC2000	Foundations of Blockchain Technology	**3**	**0**	**0**	**3**	**3**	**S/EM**	
10	**CSE2271**	**Software Design and Development**	**3**	**0**	**0**	**3**	**3**	**S**	
11	**CIV7601**	**Universal Human Values and Ethics**	**0**	**0**	**0**	**0**	**0**	**S**	**Nil**
12	APT4002	Introduction to Aptitude	0	0	2	0	2	AT	Nil
Semester 4			**18**	**2**	**8**	**24**	**28**		
1	**MAT2404**	**Discrete Mathematics**	**3**	**1**	**0**	**4**	**4**	**F**	
2	**CSE2258**	**Web Technologies**	**3**	**0**	**0**	**3**	**3**	**S/EM**	
3	**CSE2259**	**Web Technologies Lab**	**0**	**0**	**2**	**1**	**2**	**S/EM**	
4	**CSE2260**	**Database Management Systems**	**3**	**0**	**0**	**3**	**3**	**S**	
5	**CSE2261**	**Database Management Systems Lab**	**0**	**0**	**2**	**1**	**2**	**S**	
6	**CSE2262**	**Analysis of Algorithms**	**3**	**1**	**0**	**4**	**4**	**S**	
7	**CSE2263**	**Analysis of Algorithms Lab**	**0**	**0**	**2**	**1**	**2**	**S**	
8	**CSE2264**	**Essentials of AI**	**3**	**0**	**0**	**3**	**3**	**S/EM**	**Nil**
9	**CSE2265**	**Essentials of AI Lab**	**0**	**0**	**2**	**1**	**2**	**S/EM**	**Nil**
10	**FIN1002**	**Essentials of Finance**	**3**	**0**	**0**	**3**	**3**	**S**	**Nil**
11	APT4004	Aptitude Training-Intermediate	0	0	2	0	2	AT	Nil

Semester 5			**18**	**0**	**8**	**24**	**26**		
1	**CSE2266**	**Theory of Computation**	**3**	**0**	**0**	**3**	**3**	**S**	
2	CSE2502	Cryptography and Network Security	3	0	0	3	**3**	S	CSE2051
5	**CSE2269**	**Operating Systems**	**3**	**0**	**0**	**3**	**3**	**S**	**Nil**
6	**CSE2270**	**Operating Systems Lab**	**0**	**0**	**2**	**1**	**2**	**S/EM**	**Nil**
7	CBC2500	Smart Contract and Solidity	3	0	0	3	**3**	**S/EM**	**CBC2000**
8	CBC2501	Smart Contract and Solidity Lab	0	0	2	1	**2**	**S/EM**	**CBC2000**
9	CBC2502	Distributed Ledger Technology	3	0	0	3	**3**	**S/EM**	**CBC2000**
10	CBC2503	Distributed Ledger Technology Lab	0	0	2	1	**2**	**S/EM**	**CBC2000**
11	CSEXXXX	Professional Elective – I	3	0	0	3	**3**	S/EM	Nil
12	**CSE7000**	**Internship**	**0**	**0**	**0**	**2**	**0**	**S/EM**	**Nil**
13	**APT4006**	**Logical and Critical Thinking**	**0**	**0**	**2**	**1**	**2**	**S/EM**	**Nil**
Semester 6			**16**	**0**	**12**	**19**	**30**		
1	CBC2504	Blockchain Security and Performance	3	0	0	3	3	**S/EM**	**CBC2000**
2	CBC2505	Blockchain Security and Performance Lab	0	0	4	2	4	**S/EM**	**CBC2000**
3	CBC2506	Blockchain Architecture Design	3	0	0	3	3	**S/EM**	**CBC2000**
4	**CSE2274**	**Competitive Programming and Problem Solving**	**0**	**0**	**4**	**2**	**4**	**S/EM**	**Nil**
5	CSEXXXX	Professional Elective – II	3	0	0	3	3	S	Nil
6	CSEXXXX	Professional Elective – III	3	0	0	3	3	S	Nil
7	XXXXXXX	Open Elective – I	3	0	0	3	3	S	Nil
8	**APT4005**	**Aptitude for Employability**	**0**	**0**	**2**	**1**	**2**	**AT**	**Nil**
Semester 7			**12**	**0**	**0**	**16**	**12**		
1	CSEXXXX	Professional Elective – IV	3	0	0	3	3	S	Nil
2	CSEXXXX	Professional Elective – V	3	0	0	3	3	S	Nil
3	CSEXXXX	Professional Elective – VI	3	0	0	3	3	S	Nil
4	XXXXXXX	Open Elective – II	3	0	0	3	3	S	Nil
5	**CSE7100**	**Mini Project**	**0**	**0**	**0**	**4**	**0**	**S**	**Nil**
Semester 8			**0**	**0**	**0**	**10**	**0**		
1	**CSE7300**	**Capstone Project**	**0**	**0**	**0**	**10**	**0**	**S/EM**	**Nil**
			117	**5**	**54**	**160**	**176**		

22. 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.

Sample Catalogue is given below for reference:

Course Code: CSE7300	**Course Title:** Capstone Project	**L- T-P- C**	0	0	0	10
Version No.	**1.0**					
Course Pre-requisites	**Knowledge and Skills related to all the courses studied in previous semesters.**					
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 learners with the concepts of Professional Practice and attain Employability Skills through Experiential Learning techniques.					
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 lifelong learning. (Understand)					

Course Code: CSE7100	**Course Title:** Mini Project	**L- T-P- C**	0	0	0	4
Version No.	**1.0**					

Course Pre-requisites	**Knowledge and Skills related to all the courses studied in previous semesters.**
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 learners with the concepts of Professional Practice and attain Employability Skills through Experiential Learning techniques.
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) 4. Interpret the events and results for meaningful conclusions. (Evaluate) 5. Appraise project findings and communicate effectively through scholarly publications. (Create)

Course Code: CSE2274	**Course Title:** Competitive Programming and Problem Solving	L-T-P-C	0	0	4	2
Version No.	1.0					
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 algorithmic approaches to solve relevant CP problems. CO4: Creating efficient solutions of CP problems using the learnt algorithmic approaches.
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Competitive Programming and Problem Solving** and attain **Skill Development** through **Experiential Learning** techniques.

Module 1: Introduction to Competitive Programming

Overview of Efficient Coding for Problem Solving and CP: Introduction to competitive programming (CP); revisit of complexity analysis; introduction to online platforms such as codechef, codeforces etc and online submission; constraints during CP, online testing process and common errors such as TLE; use of STL

Module 2: Number Theory for Problem-Solving

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, Thomas H. Cormen (Author), Charles E. Leiserson (Author), Ronald L. Rivest , fourth edition April 2022

Web Resources

1. https://nptel.ac.in/courses/106106231

2.
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

Course Code: PPS4006	**Course Title: LOGICAL & CRITICAL THINKING** **Type of Course: HSMC**	**L- T-P- C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Students should have the basic concepts of Logical reasoning and Critical thinking, along with its applications in real life problems.					
Anti-requisites	Nil					
Course Description	This is a skill-based training program for the engineering students (Undergraduate). This course is designed to enable the students to enhance their skills in Logical reasoning and Critical thinking.					
Course Objective	The objective of the course is to familiarize the learners with concepts in in Logical reasoning and Critical thinking through problem solving techniques suitable for their career development.					
Course Outcomes	On successful completion of the course the students shall be able to:					
	CO1] **Understand** all the concepts.					
	CO2] **Apply** the concepts in problem solving (Bloom's taxonomy Level 3)					
Course Content:						
Module 1	Logical Thinking	Assignment				**16 Hours**
Topics: Syllogisms, Cubes and Dices, Mirror and Water images, Paper cutting and Folding, Embedded figures & Completion of figures, Data Interpretation, Data sufficiency						
Module 2	Critical Thinking	Assignment				**14 Hours**
Topics: Analogy, Symbol and Notations, Statement and assumption, Cause of action, Statement and conclusion, Puzzles						
Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS						
Evaluation	**Continuous Evaluation**					
	· Topic wise evaluation					
	· Mid-Term & End Term					
	Text Book					

	1. A new approach to reasoning verbal, non-verbal & analytical by BS Sijwali
	2. R S Aggarwal
	3. Kiran publications
	References
	1. www.indiabix.com
	2. www.testbook.com
	3. www.youtube.com/c/TheAptitudeGuy/videos
	Topics relevant to Skill Development Logical reasoning and Critical thinking for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.

Course Code: CSE2269	**Course Title: Operating Systems**	**L-T- P- C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Nil					
Anti-requisites	**NIL**					
Course Description	This course introduces the concepts of operating system operations, operating system structure and its design and implementation. It covers the classical operating systems internal 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 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] Describe the fundamental concepts of operating Systems and case studies. [**Knowledge**] 2] Demonstrate various CPU scheduling algorithms. .[**Application**] 3] Apply various tools to handle synchronization problems.[**Application**] 4] Demonstrate deadlock detection and recovery methods **[Application]** 5] Illustrate various memory management techniques.[**Application**]					
Course Content:						
Module 1	Introduction to Operating System	Assignment	Programming		**9 Hours**	
Topics:						

Introduction to OS , Operating-System Operations, Operating System Services, , System Calls and its types, Operating System Structure, System Program and its types, Linkers and Loaders, Overview of OS design and implementation, Open-source operating system

Module 2	Process Management	Assignment/Case Study	Programming/Simulation	**11 Hours**

Topics:

Process Concept, Operations on Processes, Inter Process Communication, Communication in client-server systems (sockets, RPC, Pipes), Introduction to threads - Multithreading Models, Thread Libraries, Threading Issues, Process Scheduling– Basic concepts, Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, SRTF, RR and Priority.

Module 3	Process Synchronization and Deadlocks	Assignment	Programming	**11 Hours**

Topics:

The Critical-Section Problem- Peterson's Solution, Synchronization hardware, Semaphores, Classic Problems of Synchronization with Semaphore Solution- Producer-Consumer Problem, Reader-Writer problems, Dining Philosopher's Problem, . Introduction to Deadlocks, Necessary conditions for deadlock, Resource allocation Graph, Methods for handling deadlock: Deadlock Prevention and Implementation, Deadlock Avoidance and Implementation, Deadlock detection & Recovery from Deadlock.

Module 4	Memory Management	Assignment	Programming/Simulation	**10 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, "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

Course Code: CSE2270	**Course Title: Operating Systems Lab**	**L-T- P- C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Nil					
Anti-requisites	**NIL**					
Course Description	This laboratory course provides hands-on experience with the core concepts of 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 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.

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

Course Code: CSE2266	**Course Title:** **Theory** of Computation		**L- T-P- C**	3	**0**	0	**3**
Version No.	2.0						
Course Pre-requisites	nil						
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 on Strings and Language operations	**6 classes**			
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 on DFA, NFA's	13 Sessions

Topics:

Basic concepts of Finite automata, DFA- definitions of DFA, Deterministic Accepters Transition Graphs and Languages

and DFA's, Regular Languages, NFA- Definition of a Nondeterministic Accepter, Languages and NFA's Why Non- determinism? Equivalence of Deterministic and Nondeterministic Finite Accepters, Reduction of the Number of States in Finite Automata.

Module 3	Regular Expressions & Context Free Grammar	Assignment	Problems on RE, CFG, PT, PL and Ambiguity	12 Sessions

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	Push down Automata	Assignment	Problems on pushdown Automaton	08 Sessions

Topics:

Definition of a Pushdown Automaton, Language Accepted by a Pushdown Automaton, Acceptance by Final State, Acceptance by Empty Stack, From Empty Stack to Final State, From Final State to Empty Stack Equivalence of PDA's and CFG's: From Grammars to Pushdown Automata.

Module 5	Turing Machine	Assignment	Problems on Turning Machine	07 Sessions

Topics:

Definition of a 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://onlinecourses.nptel.ac.in/noc21_cs83/preview

Course Code: CSE2264	**Course Title:** Essentials of AI **Type of Course:** Program Core Course - Theory	**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					

Course Code: CSE2265	**Course Title:** Essentials of AI Lab	**L-T-P-C**	0	0	2	1

Type of Course:	Program Core Course **Lab**
Version No.	1.0
Course Description	This course introduces 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 learn about uncertainty in AI, as well as approaches to solve such challenges such as Naïve Bayes Classifier and Hidden Markov Models.
Course Pre-requisites	NIL
Anti-requisites	NIL
Course Objectives	Topics: Uninformed search, Heuristic search, Local search, Adversarial search, Constraint satisfaction, logic, First Order Resolution, Probability, Naïve Bayes Classifier, and Hidden Markov Model (HMM). The objective of the course is to EMPLOYABILITY of student by using EXPERIENTIAL LEARNING techniques.
Course Out Comes	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:

Module 1	**Search Methods for Problem-Solving**	**Problem-Solving Tests**	**NPTEL Assignments**	**No. of Sessions: 13**

Introduction – History of AI, Agents and Environment, Types of AI and Learning, State Space Search; General Formulation of Search Problems; Data Structures used in Searching. **Uninformed Search Algorithms** – Breadth-First Search, Depth-First Search, Uniform Cost Search, Generalized Uniform Cost Search (a.k.a Dijkstra's Single-Source Shortest Path), Iterative Deepening Depth-First Search, Time and Space Complexity Analysis of Uninformed Search Algorithms. **Heuristic Search Algorithms** – Heuristics and Admissibility, Greedy Best-First Search, A* Search and weighted A* Search.

Experiment No. 1: File Handling

Level 1: Read text files using Python

Level 2: Parse text files using Python

Module 2	**Advanced Search Methods**	**Problem-Solving Tests**	**NPTEL Assignments**	**No. of Sessions: 12**

Local Search – Local Search, Hill Climbing, Genetic Algorithms, Gradient Descent. **Adversarial Search** – Minimax Search, Alpha-Beta Pruning, Ideal Ordering. **Constraint Satisfaction** – Constraint Satisfaction Problems: Definitions and Examples – Map Colouring, N Queens, Cryptarithmetic, Generalized CSP; Back-tracking Heuristics; Arc Consistency and Path Consistency.

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

Module 3	**Knowledge Based Logic Representation**	**Automated Theorem Proving using FOL Resolution**	**NPTEL Assignments**	**No. of Sessions: 10**

Propositional Logic – Syntax and Semantics of Propositional Logic. Logical connectives. Inference Rules. Conjunctive and Disjunctive Normal Forms. **First Order Logic** – Syntax and Semantics of Propositional Logic. Logical connectives. Inference Rules. Conjunctive and Disjunctive Normal Forms. **Resolution** – Resolution Principle. Propositional and First Order Resolution. Applications for solving story problems using Resolution

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

Module 4	**Uncertainty in AI**	**Representing problems as HMM**	**NPTEL Assignments**	**No. of Sessions: 06**

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

Level 1: Implement a CSP solver to solve a cryptarithmetic problem

Probability – Probability – Definitions, Conditional Probability, Bayes Theorem. Naïve Bayes Classifier. Using Naïve Bayes Classifier for Supervised Learning. **Hidden Markov Models** –

Level 2: Implement HMM as a sequence labeler using Viterbi Algorithm.

Experiment No. 11: Implement a Family Tree Parser

Level 1: Perform logic programming using loggy

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:

3. Google Colab
4. 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.
2. 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. Mukesh Chandra Trivedi. *A Classical Approach to Artificial Intelligence*. 2nd Edition. Khanna Publishers. 2018.

Weblinks

1. NPTEL Courses: Mausam (IIT Delhi), "An Introduction to Artificial Intelligence" Link: https://nptel.ac.in/courses/106102220.
2. Shyamanta M. Hazarika (IIT Guwahati), "Fundamentals of Artificial Intelligence". Link: https://nptel.ac.in/courses/112103280. Useful for the full course.
3. Deepak Khemani (IIT Madras), "Artificial Intelligence: Search Methods for Problem-Solving". Link: https://nptel.ac.in/courses/106106126. Useful for Module 2.
4. Deepak Khemani (IIT Madras), "Artificial Intelligence: Knowledge Representation and Reasoning". Link: https://nptel.ac.in/courses/106106140. Useful for Module 3.
5. Deepak Khemani (IIT Madras), "AI: Constraint Satisfaction". Link: https://nptel.ac.in/courses/106106158. Useful for Module 2.

Course Code: **CSE2262**	**Course Title:** **Analysis of Algorithms** **Type of Course:** **Theory PCC**	**L- T-P- C**	3	1	0	4
Version No.	1.0					
Course Pre-requisites						

Anti-requisites	Nil			
Course Description	This course introduces techniques for the design and analysis of efficient algorithms and methods of applications. This course discusses the classic approaches for algorithm design such as Divide and 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 various complexity classes is covered in the end.			
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Analysis of Algorithms** and attain **Skill Development** through **Problem Solving** Methodologies.			
Course Out Comes	On successful completion of the course the students shall be able to: 1. Compute efficiency of a given algorithm.[Apply] 2. Apply divide and conquer technique for searching and sorting Problems.[Apply] 3. Apply the Dynamic Programming technique for a given problem. [Apply] 4. Apply greedy technique for solving a Problem.[Apply] 5. Demonstrate Back tracking technique and limitations of Algorithms.[Apply]			
Course Content:				
Module 1	**Introduction**	Assignment	Simulation/Data Analysis	**10 Sessions**
Introduction, Asymptotic Notations and its properties, Best case, worst case and average case- Sequential search, Sorting; Mathematical analysis for Recursive and Non-recursive algorithms: Substitution method and Master's Theorem.				
Module 2	**Divide-and-conquer**	Assignment	Simulation/Data Analysis	**08 Sessions**
Introduction. Insertion Sort; Merge sort, Quick sort, Binary search.				
Module 3	**Dynamic programming**	Term paper/Assignment	Simulation/Data Analysis	**10 Sessions**
Introduction with examples, Principles of Memoization, 0-1 Knapsack Problem, Bellman-Ford algorithm, Floyd-Warshall's Algorithms. Chain Matrix Multiplication.				
Module 4	**Greedy technique**	Term paper/Assignment	Simulation/Data Analysis	**09 Sessions**
Introduction, Fractional Knapsack Problem, Minimal Spanning Tree: Prim's Algorithm and Kruskal's Algorithm, Single-source Shortest Path: Dijkstra's Algorithm				
Module 5	**Complexity Classes**	Term paper/Assignment	Simulation/Data Analysis	**08 Sessions**
Complexity Classes- P,NP- NP Hard and NP Complete - Boolean Satisfiability Problem (SAT). Branch and Bound: Knapsack problem; Backtracking, - N-Queens problem.				
Text Book				

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

Course Code: CSE2263	**Course Title: Analysis of Algorithms Lab** **Type of Course: Lab - PCC**	**L- T-P-C**	0	0	2	1
Version No.	1					
Course Pre-requisites	**Nil**					
Anti-requisites	NIL					
Course Description	This course introduces techniques for the design and analysis of efficient algorithms and methods of applications. This course discusses the classic approaches for algorithm design such as Divide and 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 various complexity classes is covered in the end.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Analysis of Algorithms** and attain **Skill Development** through **Experiential Learning** Methodologies.					

Course Out Comes	**On successful completion of the course the students shall be able to:** 1. Compute efficiency of a given algorithm. [Applying] 2. Apply divide and conquer technique for searching and sorting Problems.[Applying] 3. Apply the Dynamic Programming technique for a given problem. [Applying] 4. Apply greedy technique for solving a Problem.[Applying] 5. Demonstrate Back tracking technique and limitations of Algorithms.[Applying]	
Course Content		
Module 1	**Introduction**	**3 Sessions**
Measuring running time of an algorithm, Compare running time of algorithms, Implement sorting algorithms such as bubble sort, selection sort		
Module 2	**Divide-and-conquer**	**3 Sessions**
Compare searching algorithms: Linear Search, Binary Search; Compare Sorting algorithms: Insertion Sort, Merge Sort, QuickSort.		
Module 3	**Dynamic programming**	**3 Sessions**
Introduction and memorization: Factorial; Coin Change Problem ; Floyd-Warshall's Algorithm.		
Module 4	**Greedy technique**	**3 Sessions**
Fractional Knapsack Problem; Minimal Spanning Tree Algorithms-Prim's Algorithm, Kruskal's algorithm		
Module 5	**Complexity Classes**	**3 Sessions**
Branch and Bound: Knapsack problem; Backtracking, - N-Queens problem.		
	List of Laboratory Tasks: **1. Measuring running time of an algorithm** **Objective: To experimentally determine the running time of basic algorithms for input size n=10, 100, 1000, etc. by taking difference of starting time and ending time.** **2. Compare running time of algorithms** **Objective: To execute two algorithms to solve the same problem, and to comparatively evaluate the better algorithm for large values of N.** **3. Implement sorting algorithms such as bubble sort, selection sort** **Objective: To implement comparison based sorting strategies.** **4. Compare searching algorithms**	

	Objective: To implement two searching strategies and compare their performance. **5. Compare Sorting algorithms** **Objective: To implement searching strategies that follow top down design approach(Insertion sort, merge 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 1. 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 1and 3 Pearson. Web Based Resources and E-books: W1. NPTEL: https://onlinecourses.nptel.ac.in/noc19_cs47/preview W2. Coursera: Analysis of Algorithms by Princeton University W3. Algorithms Specialization in Coursera by Stanford University(Group of 4 courses). 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

Course Code: CSE2260	**Course Title: Database Management Systems** **Type of Course: Theory only - PCC**	**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Foundational understanding of data types, data structures, basic programming knowledge, familiarity with operating systems and file management. Basic knowledge of set theory, logic, and discrete mathematics to understand relational algebra and query formulation.					

Anti-requisites	NIL
Course Description	This course introduces the foundational principles of database management systems, including data models, schemas, and architectures. This course provides a solid foundation on the relational model of data and the use of relational algebra. It develops skills in SQL for data definition, manipulation, and control, enabling students to construct and execute complex queries. The course also introduces the concept of object oriented and object relational databases and modern database technologies like **NoSQL.** The also course allows the students to gain insights into data storage structures and indexing strategies for optimizing query performance.
Course Objective	The objective of the course is to familiarize the learners with the concepts of Database Management Systems and attain **Employability** through **Problem Solving** Methodologies.
Course Out Comes	On successful completion of the course the students shall be able to: 1. Describe the fundamental elements of relational database management systems. [Understand] 2. Examine databases using SQL query processing and Optimization. [Apply] 3. Design simple database systems applying the normalization constraints and demonstrate the database transaction processing, recovery, and security. [Apply] 4. Interpret the concept of advanced databases and its applications. [Apply]

Course Content:

Module 1	**Introduction to Database Modelling and Relational Algebra (Understand)**	Assignment	**Problem Solving**	**10 Sessions**

Topics:

Introduction to Database: Schema, Instance, 3-shema architecture, physical and logical data independence, Data isolation problem in traditional file system, advantages of database over traditional file systems. Entity Relationship (ER) Model, ER Model to Relational Model, Examples on ER model.

Relational Algebra with selection, projection, rename, set operations, Cartesian product, joins (inner and outer joins), and division operator. Examples on Relational Algebra Operations.

Module 2	**Fundamentals of SQL and Query Optimization (Apply)**	Assignment	**Programming**	**11 Sessions**

Topics:

SQL Database Querying, DDL, DML, Constraints, Operators, Set Operators, Aggregate Functions, Joins, Views, Procedures, Functions and Triggers.

Database programming issues and techniques: Embedded SQL, Dynamic SQL; SQL / PSM and NoSQL.

Query Optimization: Purpose, transformation of relational expressions, estimating cost and statistics of expression, choosing evaluation plans, linear and bushy plans, dynamic programming algorithms.

Module 3	**Relational Database Design & Transaction Management (Apply)**	Assignment	**Problem Solving**	**12 Sessions**

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, NativeXML 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.

1. Problem Solving: Constructing ER-Diagrams for a given real time requirements, Normalizing the databases, querying the databases using relational algebra.
2. Programming: Implementation of any given scenario using 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 designusing ER- Relational mapping, Implementation of given database scenario using MYSQLDB.
Topics relevant to development of Employability: Develop, test and implement computer databases, creatingsophisticated, interactive and secure database applications
Topics relevant to “HUMAN VALUES &PROFESSIONAL ETHICS”: Nil

Course Code: CSE2261	Course Title: Database Management Systems Lab Type of Course: 1) Laboratory - PCC	L-T-P-C	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Foundational understanding of data types, basic programming knowledge, operating systems and file management.					
Anti-requisites	NIL					
Course Description	The Database Management Systems (DBMS) Laboratory is designed to provide students with hands-on experience in database design, implementation, and management using SQL and database management tools such as MySQL. The lab complements theoretical concepts learned in database courses by allowing students to practice database creation, querying, and optimization techniques. The DBMS Lab enables students to develop industry-relevant skills in database					

	management, preparing them for careers in **software development, data engineering, and database administration**.
Course Objective	The objective of the course is to familiarize the learners with the concepts of Database Management Systems and attain **Employability** through **Problem Solving** Methodologies.
Course Out Comes	On successful completion of the course the students shall be able to: 5. Demonstrate the database concepts, practice, and SQL queries. [Apply] 6. Design and implement database schemas while applying normalization techniques to optimize structure. [Apply]] 7. Develop and implement stored procedures, triggers, and views for automation and efficiency. [Apply] 8. To Design and build database applications for real world problems. [Apply]

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]
8. 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.

Course Code: CSE2258	**Course Title: Web Technologies**	**L-T- P- C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	**NIL**					

Course Description		This course highlights the comprehensive introduction to scripting languages that are used for creating web-based applications. The associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills.
Course Objective		**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 Outcomes		**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)**
Course Content:		

Module 1	**Introduction to XHTML**	Quizzes and Assignments	Quizzes on various features of XHTML, simple applications		**20 Sessions**
	Basics: Web, WWW, Web browsers, Web servers, Internet. **XHTML:** Origins and Evolution of HTML and XHTML: Basic Syntax, Standard XHTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, Frames, Syntactic Differences between HTML and XHTML, Demonstration of applications using XHTML for Responsive web pages.				
Module 2	**Advanced CSS**	Quizzes and assignments	Comprehension based Quizzes and assignments; Application of CSS in designing webpages		**20 Sessions**
	Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks				
XML: Basics, Demonstration of applications using XML with XSLT.					
Module 3	**PHP – Application Level**	Quizzes and assignments	Application of PHP in web designing		**20 Sessions**
PHP: Introduction to server-side Development with PHP, Arrays, Superglobal Arrays, $GET and $ POST, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object Oriented Design, Working with Databases, SQL, Database APIs, Managing a MySQL Database. Accessing MySQL in PHP, Applications.					

Project work/Assignment:

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

Textbook(s):

1] Robert. W. Sebesta, "*Programming the World Wide Web"*, Pearson Education, 9th Edition, 2016.

2]Paul Deitel, Harvey Deitel, Abbey Deital,"Internet & World Wide Web How to Program", Fifth Edition, Pearson Education, 2021.

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

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

Reference Book(s):

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

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

Additional web-based resources

W1. W3schools.com

W2. Developer.mozilla.org/en-US/docs/Learn

W3. docs.microsoft.com

W4. informit.com/articles/ The Relationship Between Web 2.0 and Social Networking

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: CSE2259	**Course Title: Web Technologies Lab**	**L-T- P-C**	0	0	2	1
Version No.		1.0				
Course Pre-						

requisites		
Anti-requisites		**NIL**
Course Description		This course highlights the comprehensive introduction to scripting languages that are used for creating web-based applications. The associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills.
Course Objective		**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 Outcomes		**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)**
Course Content:		

Module 1	**Introduction to XHTML Features**	Quizzes and Assignments	Quizzes on various features of XHTML, simple applications		**8 Sessions**
	Standard XHTML Document Structure, Basic Text Markup such as headings, paragraphs, lists, tables, forms, and semantic tags.				
Module 2	**CSS Styling**	Quizzes and assignments	Comprehension based Quizzes and assignments; Application of CSS in designing webpages		**10 Sessions**
	Apply CSS3 to style HTML elements, including layout techniques, color schemes, typography, and responsive design principles.				
XML: Basics, Demonstration of applications using XML with XSLT.					
Module 3	**PHP – Application Level**	Quizzes and assignments	Application of PHP in web designing		**12 Sessions**

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

List of Laboratory Tasks:

Experiment No. 1: Demonstration of XHTML features

Level 1: Demonstration of various XHTML Tags (Level 1)
Level 2: Design and develop static web pages for an online Book store (Level 2).

Experiment No. 2: Application of CSS in web designing

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

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

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

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

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

Experiment No. 4: Building a website.

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

Targeted Application & Tools that can be used: **Xampp web server to be used to demonstrate PHP.**

Project work/Assignment:

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

Textbook(s):

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

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

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

Reference Book(s):

R1. Randy Connolly, Ricardo Hoar,"Fundamentals of Web Development", Pearson Education India,

1st. Edition.2016.

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

Edition,2016.

Additional web-based resources

W1. W3schools.com

W2. Developer.mozilla.org/en-US/docs/Learn

W3. docs.microsoft.com

W4. informit.com/articles/ The Relationship Between Web 2.0 and Social Networking

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.

Course Code: MAT2404	Course Title: Discrete Mathematics Type of Course: Theory - ESC	L-T- P- C	3	1	0	4
Version No.	1.0					
Course Pre-requisites	MAT2302					
Anti-requisites	**NIL**					
Course Description	The course explores the study of mathematical structures that are fundamentally discrete (not continuous), focusing on concepts like set theory, logic, graph theory, 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, functions, counting 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 particular set of mathematical facts and how to apply them. It teaches students how to think logically and mathematically through five important themes: mathematical					

	reasoning, combinatorial analysis, discrete structures, algorithmic thinking, and applications and modeling. A successful discrete mathematics course should carefully blend and balance all five themes.		
Course Outcomes	On successful completion of the course the students shall be able to: CO1 - Explain logical sentences through predicates, quantifiers and logical connectives. CO2 - Deploy the counting techniques to tackle combinatorial problems CO3 - Comprehend the basic principles of set theory and different types of relations. CO4 - Apply different types of structures of trees for developing programming skills		
Course Content:			
Module 1	**Fundamentals of Logic**		**(10 Classes)**
Basic Connectives and Truth Tables, Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.			
Module 2	**Principle of Counting**	**Assignment**	**(15 Classes)**
The Well Ordering Principle – Mathematical Induction 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 Principle, Derangements – Nothing is in its Right Place, Rook Polynomials.			
Module 3	**Relations and Functions**		**(10 Classes)**
Cartesian Products and Relations, Functions, One-to-One, Onto Functions. The Pigeon-hole Principle, Function Composition and Inverse Functions. Relations, Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders, Lattice, Hasse Diagrams, Equivalence Relations and Partitions.			
Module 4	**Recurrence Relations and Generating Functions**		**(10 Classes)**
Homogeneous and inhomogeneous recurrences and their solutions - solving recurrences using generating functions - Repertoire method - Perturbation method - Convolutions - simple manipulations and tricks.			
Module 5	**Graph Theory & Algorithms on Networks**	**Assignment**	**(15 Classes)**
Definitions and basic results - Representation of a graph by a matrix and adjacency list - Trees - Cycles - Properties - Paths and connectedness - Sub graphs - Graph Isomorphism - Operations on graphs - Vertex and edge cuts - Vertex and edge connectivity, Euler and Hamilton Paths, Shortest-Paths. Tree - Definitions, Properties, and Examples, Routed Trees, Binary search tree, Decision tree, spanning tree: BFS, DFS.			

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:

Assignment 1: Logic Equivalences and Predicate calculus.

Assignment 2: Equivalence Relations and Lattices

Assignment 3: Recurrence Relations

Text Book

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", McGraw-Hill,s 8th 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:

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&que_id=EBSCO95_30102024_54588

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&que_id=EBSCO95_30102024_375

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

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

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: **CSE2271**	Course Title: **Software Design and Development**	**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 course is to provide the fundamentals concepts of Software Engineering process and principles. The course covers software requirement engineering processes, system analysis, design, implementation and testing aspects of software system development. The course covers software quality, configuration management and maintenance.			
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Software Engineering and attain Skill Development through Participative Learning techniques.			
Course Out Comes	On successful completion of this course the students shall be able to: 1] Describe the Software Engineering principles, ethics and process models(Knowledge) 2] Identify the requirements, analysis and appropriate design models for a given application(Comprehension) 3] Understand the Agile Principles(Knowledge) 4] Apply an appropriate planning, scheduling, evaluation and maintenance principles involved in software(Application)			
Module 1	**Introduction to Software Engineering and Process Models** **(Knowledge level)**	Quiz		**10 Hours**
Introduction: Need for Software Engineering, Professional Software Development, Software Engineering Ethics, Software Engineering Practice-Essence of Practice, General Principles Software Development Life Cycle **Models:** Waterfall Model – Classical Waterfall Model, Iterative Waterfall Model, Evolutionary model-Spiral, Prototype.				
Module 2	**Software Requirements, Analysis and Design** **(Comprehension level)**	Assignment	Development of SRS documents for a given scenario	**12 Hours**
Requirements Engineering: Eliciting requirements, Functional and non- Functional requirements, Software Requirements Specification (SRS), Requirement Analysis and validation. Requirements				

modelling- Introduction to Use Cases, Activity diagram and Swim lane diagram. CASE support in Software Life Cycle, Characteristics of CASE Tools, Architecture of a CASE Environment.

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

Module 3	**Agile Principles & Devops** **(Knowledge level)**	Quiz		**10 Hours**

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

Devops: Introduction, definition, history, tools.

Module 4	**Software Testing and Maintenance** **(Application Level)**	Assignment	Apply the testing concepts using Programing	**13 Hours**

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

R1. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, VII Edition, McGraw-Hill, 2] B2. Bob Hughes, Mike Cotterell, Rajib Mall, “Software Project Management”, VI Edition, McGraw- 201

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

Course Code: **CSE2255**	**Course Title:** Object Oriented Programming Using Java **Type of Course:** **Theory - PCC**	**L-T- P- C**	3	0	0	3

Version No.	2.0			
Course Pre-requisites	Nil			
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 Objective	The objective of the course is to familiarize the learners with the concepts of Problem-Solving using JAVA and attain **SKILL DEVELOPMENT** through **EXPERIENTIAL LEARNING** techniques			
Course Out Comes	**On successful completion of the course the students shall be able to:** **CO1:** Describe the basic programming concepts. [Understand] **CO2:** Apply the concept of classes, objects and methods to solve problems. [Application] **CO3:** Apply the concept of arrays and strings. [Appy] **CO4:** Implement inheritance and polymorphism building secure applications. [Apply] **CO5:** Apply the concepts of interface and error handling mechanism. [Apply]			
Course Content:				
Module 1	**Basic Concepts of Programming and Java**	Assignment	Problem Solving	**9 Sessions**
Topics: Introduction to Principles of Programming: Process of Problem Solving, Java program structure, Download Eclipse IDE to run Java programs, Sample program, Data types, Identifiers, Variables, Constants in java, Operators, Assignments and Expression, Basic Input/ Output functions, Control Statements: Branching and Looping.				
Module 2	**Classes, objects, methods and Constructors**	Assignment	Problem Solving	**10 Sessions**
Topics: Classes, Objects and Methods: Introduction to object Oriented Principles, defining a class, adding data members and methods to the class, access specifiers, instantiating objects, reference variable, accessing class members and methods. Static Polymorphism: Method overloading, constructors, constructor overloading, this keyword, static keyword, Nested classes, Accessing members in nested classes.				
Module 3	**Arrays, String and String buffer**	Assignment	Problem Solving	**8 Sessions**

Topics: Arrays: Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array, Array of objects. String: Creation & Operation. String builder class, methods in String Buffer.

Module 4	**Inheritance and Polymorphism**	Assignment	Problem Solving	**10 Sessions**

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

Module 5	**Input & Output Operation in Java**	Assignment	Problem Solving	**8 Sessions**

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

Text Book

T1 Herbert Schildt, "The Complete Reference Java 2", Tata McGraw Hill Education, 11th Edition,2019.

References

R1. Cay S Horstmann and Cary Gornell, "CORE JAVA volume I-Fundamentals", Tenth Edition, Pearson 2015.

R2: James W. Cooper, "Java TM Design Patterns – A Tutorial", Addison-Wesley Publishers.4th Edition, 2000.

R3. E. Balagurusamy, "Programming with Java", Tata McGraw Hill Education, 6th Edition, 2019.

E book link R1: http://rmi.yaht.net/bookz/core.java/9780134177373-Vol-1.pdf

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

Web **resources**

https://youtube.com/playlist?list=PLu0W_9lII9agS67Uits0UnJyrYiXhDS6q

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

Topics relevant to development of "Skill Development":

1. Static Polymorphism
2. Method overloading, constructors
3. constructor overloading

4. this keyword
5. static keyword and Inner classes
6. Inheritance and Polymorphism.

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

Course Code: CSE2254	**Course Title:** Data Structures Lab **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 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 Objective	The objective of the course is SKILL DEVELOPMENT of student by using EXPERIENTIAL LEARNING 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:						
Module 1	**Introduction to Data Structure and Linear Data Structure - Stacks and Queues**	Assignment	Program activity		**9 Hours**	

Course Code: CSE2253	Course Title: Data Structures Type of Course: Theory	L-T-P-C	3	0	0	3
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	NIL					
Course Description	This course 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 Objective	The objective of the course is SKILL DEVELOPMENT of student by using EXPERIENTIAL LEARNING 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 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 Hours

Introduction -Introduction to Data Structures, Types and concept of Arrays .

Stack -Concepts and representation, Stack operations, stack implementation using array and Applications of Stack.

Queues- Representation of queue, Queue Operations, Queue implementation using array, Types of Queue and Applications of Queue.

Recursion- Recu

Module 2	Linear Data Structure - Linked List	Assignment	Program activity	12 Hours

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

Module 3	Non-linear Data Structures - Trees	Assignment	Program activity	12 Hours

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 Search 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.

Hashing: Introduction, Static Hashing, Dynamic Hashing

Introduction -Introduction to Data Structures, Types and concept of Arrays .

Stack -Concepts and representation, Stack operations, stack implementation using array and Applications of Stack.

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:

Queues - Representation of queue, Queue Operations, Queue implementation using array, Types of Queue and Applications of Queue.

Module 2	**Linear Data Structure - Linked List**	Assignment	Program activity	**12 Hours**

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 activity	**12 Hours**

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 Concepts 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: Programming Exercises on Stack and its operations

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

Lab sheet -2

Level 1: Programming on Stack application infix to postfix Conversion

Level 2: -

Lab sheet -3

Level 1: Programming on Stack application Evaluation of postfix

Level 2: -

Lab sheet -4

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

Level 2: -

Lab sheet -5

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

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

Lab sheet -6

Level 1: 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 -7

Level 1: Programming Exercises on Doubly Linked list and its operations with various positions

Level 2: Programming Exercises on Graphs ADT

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: Prompt the user, read input and print messages.Programs using class, methods and objects

Lab sheet -11

Level 2: Programming Exercises on fundamental Data structure - Arrays based on Scenario.

Lab sheet -2

Level 1: Programming Exercises on Stack and its operations

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

Lab sheet -3

Level 1: Programming on Stack application infix to postfix Conversion

Level 2: -

Lab sheet -4

Level 1: Programming 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 post-order(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

Level 1: Program to Implement and Estimate the Time complexity of 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

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:

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

Topics relevant to development of "Skill Development":

Level 1: Program to Implement and Estimate the Time complexity of Selection Sort

Linked list and stacks

Level 2: Program to Implement and Estimate the Time complexity of Insertion Sort

Topics relevant to development of "Environment and sustainability": Queues

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:

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

Topics relevant to development of "Skill Development": Linked list and stacks **Topics relevant to development of "Environment and sustainability: Queues**

Course Code: CSE2252	**Course Title:** Data Communications and Computer Networks Lab **Type of Course: Lab / PCC**	**L- T-P- C**	0	**0**	2	**1**
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	**NIL**					
Course Description	This lab-based course provides hands-on experience in the principles and practices of data communications and computer networking. It is designed to complement theoretical concepts covered in the associated lecture course. Through a series of structured experiments and practical exercises, students will gain proficiency in configuring, analyzing, and troubleshooting computer networks. Key topics include network topology design, IP addressing and subnetting, Ethernet and LAN technologies, routing and switching, TCP/IP protocol suite, and basic network security measures. Students will work with industry-standard tools and equipment, including routers, switches, protocol analyzers, and network simulation software such as Cisco Packet Tracer or Wireshark.					
Course Objective	The objective of this lab course is to provide students with practical, hands-on experience in the configuration, operation, and troubleshooting of data communication systems and computer networks. Through guided experiments and real-world scenarios, students will reinforce theoretical knowledge, develop essential technical skills, and gain a deeper understanding of networking concepts, protocols, and devices used in modern communication systems.					
Course Outcomes	On successful completion of the course, the students shall be able to: 1. Design and configure basic network topologies using routers, switches, and end devices to meet specified requirements. 2. Analyze and troubleshoot network connectivity and performance issues using tools such as Wireshark and network simulators. 3. Demonstrate understanding of key networking protocols (e.g., TCP/IP, ARP, ICMP, DHCP) through practical implementation and observation. 4. Apply IP addressing and subnetting techniques to efficiently allocate and manage network resources in various networking scenarios.					
Course Content:						
Module 1,2,3,4	Physical Layer, Network Layer, Transport Laye	Lab Assignment	Problem Solving	**24 Sessions**		

List of Laboratory Tasks:
Lab sheet -1, M-1, 3 [2 Hours]
Experiment No 1:
Level 1: Study of basic network commands and network configuration commands.

Lab sheet -2, M-1[2 Hours]
Experiment No 1:
Level 1: Identify and explore Network devices, models and cables. Introduction to Cisco packet tracer.
Experiment No. 2:
Level 2 – Create various network topologies using a cisco packet tracer.

Lab sheet -3, M-2,3 [2 Hours]
Experiment No. 1:
Level 2 - Basic Configuration of switch/router using Cisco packet tracer.
Experiment No. 2:
Level 2 -Configure the privilege level password and user authentication in the switch/router.

Lab sheet – 4, M-3 [2 Hours]
Experiment No. 1:
Level 2 - Configure the DHCP server and wireless router and check the connectivity

Lab sheet – 5, M-3 [2 Hours]
Experiment No. 1:
Level 2 - Configure the static routing in the Cisco packet tracer.
Experiment No. 2:
Level 2 - Configure the dynamic routing protocol in the Cisco packet tracer.

Lab sheet – 6, M-4 [2 Hours]
Experiment No. 1: Configuration of DNS Server with Recursive & Integrative approach in Cisco packet tracer.
Lab sheet – 7, M-4 [2 Hours]
Experiment No. 1:
Configure the telnet protocol in the router using the Cisco packet tracer.
Lab sheet – 8, M-4[2 Hours]
Experiment No. 1:
Level1- Introduction to NS2 and basic TCL program.
Lab sheet – 9, M-4 [2 Hours]
Experiment No. 1:
Level 1: Simulate three node Point to point network using UDP in NS2.
Experiment No. 2:
Simulate transmission of Ping message using NS2.
Lab sheet – 10, M-4[2 Hours]
Experiment No. 1:
Simulate Ethernet LAN using N-node in NS2.
Experiment No. 2:
Simulate Ethernet LAN using N-node using multiple traffic in NS2
Lab sheet –11, M-3,4 [2 Hours]
Experiment No. 1:
Level 1- Introduction to Wire Shark.
Experiment No. 2:
Level 2- Demonstration of packet analysis using wire shark.

Lab sheet –12, M-1,2,3 [2 Hours] Experiment No. 1: Level 2- Demonstration of switch and router configuration using real devices
Targeted Application & Tools that can be used: Cisco Packet Tracer, Wireshark, and NS2. Case Study/Assignment: Choose and analyze a network from any organization/Assignment proposed for this course in CO1-CO4 Problem Solving: Choose and appropriate devices and implement various network concepts. Programming: Simulation of any network using NS2.
Text Book(s): 1. Behrouz A. Forouzan, "Data Communications and Networking 5E", 5 th Edition, Tata McGraw-Hill, 2017. 2. Andrew S Tanenbaum, Nick Feamster & David J Wetherall, "Computer Networks" Sixth Edition, Pearson Publication, 2022
Reference(s): 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

Course Code: **MAT2303**	**Course Title: Linear Algebra & Vector Calculus** **Type of Course:BSC**	**L-T- P- C**	**3**	**1**	**0**	**4**

Version No.		1.0
Course Pre-requisites		Basic Concepts of Limits, Differentiation, Integration, Matrices (PU Level)
Anti-requisites		**NIL**
Course Description		This course explores the fundamental concepts of vectors, matrices, and their operations within the context of calculus, including vector differentiation and integration, while applying these tools to solve problems related to linear systems, transformations, and geometric interpretations in higher dimensions, often with applications in fields like physics, engineering, and computer graphics; key topics include vector algebra, matrix operations, determinants, eigenvalues, eigenvectors,

		gradients, divergence, curl, line integrals, surface integrals, and the fundamental theorems of vector calculus like Green's Theorem, Stokes' Theorem, and the Divergence Theorem.
Course Objective		The course is intended to develop computational proficiency involving procedures in Matrices, Linear Algebra and Vector Calculus which are useful to all engineering disciplines. This course is to equip students with the ability to understand and manipulate vectors in multidimensional space, apply matrix operations to solve systems of linear equations, and utilize concepts like gradients, divergence, and curl to analyze physical phenomena, all while developing a strong foundation for applying these tools in various scientific and engineering fields like physics, mechanics, and computer graphics.
Course Out Comes		On successful completion of the course the students shall be able to: CO1 - Use matrix methods and certain techniques to solve the system of linear equations and to find eigen values, eigen vectors of a matrix to check whether it is diagonalizable. CO2 - Understand the abstract notions of vector space and dimensionality of it. CO3 - find the matrix representation of a linear transformation given bases of the relevant vector spaces. CO4 - Learn different notions of vector and scalar fields with their properties. Understanding the major theorems (Green's, Stokes', Gauss') and some applications of these theorems.
Course Content:		

Module 1	**Systems of Linear Equations**		6. ***Classes)***
Systems of Linear Equations, Matrices and Elementary Row Operations, Echelon forms, Matrix operations, invertible matrices, Determinants and their properties, Cramer's Rule, LU-decomposition, Applications of Systems of Linear Equations.			
Module 2	**Vector Space**	**Assignment**	***(9Classes)***
Linear Combinations and Linear Independence, Vectors in n R^n, Linear Combinations, Linear Independence Vector Spaces, Definition of a Vector Space, Subspaces, Basis and Dimension, Coordinates and Change of Basis, Orthogonal bases and orthogonal projections.			
Module 3	**Linear Transformations**		***(15 lectures)***
Linear Transformations, Algebra of transformations, The Null Space and Range, Isomorphisms, Matrix Representation of Linear Transformations, Similarity Eigenvalues and Eigenvectors, Eigen values and Eigen vectors, Diagonalization. Inner Product Spaces, The Dot Product on R^n and Inner Product Spaces, Orthonormal Bases, Orthogonal Complements, Application: Least Squares Approximation, Diagonalization of Symmetric Matrices, Application: Quadratic Forms. Singular Value Decomposition: Singular values, computing singular value decomposition, and Introduction to principal component analysis.			
Module 4	**Vector Calculus**	**Assignment**	***(15 lectures)***

Vector & Scalar Functions and Fields, Derivatives, Curve, Arc length, Curvature & Torsion, Gradient of Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field, Physical interpretation, solenoidal and irrotational vector fields. Problems.

Line Integrals, Path Independence of Line Integrals, Green`s Theorem in the plane, Surface Integrals, Divergence Theorem of Gauss, Stokes`s Theorem.

Targeted Application & Tools that can be used:

- Solve systems of linear equations using various methods including Gaussian and Gauss Jordan elimination and inverse matrices.
- Perform matrix algebra, invertibility, and the transpose and understand vector algebra in R^n.
- Determine relationship between coefficient matrix invertibility and solutions to a system of linear equations and the inverse matrices.
- Find eigenvalues and eigenvectors and use them in applications.
- Find the dimension of spaces such as those associated with matrices and linear transformations.
- Understand real vector spaces and subspaces and apply their properties.
- Compute inner products in a real vector space and compute angle and orthogonality in inner product spaces.
- Create orthogonal and orthonormal bases: Gram-Schmidt process and use bases and orthonormal bases to solve application problems.
- Prove basic results in linear algebra using appropriate proof-writing techniques such as linear independence of vectors; properties of subspaces; linearity, injectivity and subjectivity of functions; and properties of eigenvectors and eigenvalues.

Assignment:

Preparation of power-point slides, which include videos, animations, pictures, graphics for better erstanding the applications of Linear Algebra and Vector Calculus to engineering applications – The ulty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus of Linear ebra and Vector Calculus is covered.

Text Book

1. Gilbert Strang, Linear Algebra and its applications, Wellesley-Cambridge Press,U.S.; 6th edition.

2. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.

References:

1. Introduction to Linear Algebra with Application, Jim Defranza, Daniel Gagliardi, Tata McGraw-Hill

2. Elementary Linear Algebra, Applications version, Anton and Rorres, Wiley India Edition.

3. Advanced Engineering Mathematics, Erwin Kreysig, Wiley Publication.

4. Elementary Linear Algebra, Ron Larson, Cengage Learning .

5. Linear Algebra and its Applications, David C. Lay, Pearson Education.

E-resources/ Web links:

1. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_9607

2. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_143156

3. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=CUSTOM_PACKAGE_EBSCO_29052023_270975

4. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_94555

5. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_243864

6. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_224531

7. NPTEL Video Lectures Matrices and Linear Algebra:

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

9. NPTEL Video Lectures Differential Equations:

10. https://nptel.ac.in/courses/111106100/

11. NPTEL Vector Calculus:

12. https://nptel.ac.in/courses/111/105/111105122/

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

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

Topics relevant to SKILL DEVELOPMENT: The course focuses on the concepts of Vector calculus and Linear Algebra 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 the course handout.

Course Code: **ECE1511**	**Course Title: Design Workshop** **Course Type : ESC**	**L- T-P- C**	1	0	2	2
Version No.	1.0					
Course Pre-requisites	NIL					

Anti-requisites	NIL			
Course Description	This course is designed to provide an in-depth understanding of Arduino, microcontrollers Raspberry pi and their application in various real time projects involving sensors. Throughout the course, students will learn the fundamentals of Arduino and Raspberry Pi programming and gain hands-on experience with a wide range of sensors. Students will explore how to connect and interface sensors with Arduino and Raspberry Pi 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, Raspberry Pi and sensors.			
Course Objective	The objective of the course is **Employability Skills** of student by using **PARTICIPATIVE LEARNING** techniques.			
Course Outcomes	**On successful completion of the course the students shall be able to** 1. Explain the main features of the Arduino & the Raspberry Pi prototype board. 2. Demonstrate the hardware interfacing of the peripherals to Arduino and Raspberry Pi system. 3. Understand the types of sensors and its functions 4. Demonstrate the functioning of live projects carried out using Arduino and Raspberry Pi system**.**			
Course Content:				
Module 1	**Basic concepts of Microcontrollers**	Hands-on	Interfacing Task and Analysis	**3 Sessions**
Topics: Introduction to Arduino, ESP and Node MCU Pin configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board, API's , Introduction to Embedded C and Arduino platform, Arduino Datatypes and variables, Arduino i/o Functions, Arduino Communications, Arduino IDE, Various Cloud Platforms.				
Module 2	**Sensory Devices**	Hands-on	Interfacing Task and Analysis	**3 Sessions**
Arduino Sensors: Humidity Sensor, Temperature Sensor, Water Detector / Sensor, PIR Sensor, Ultrasonic Sensor, Connecting Switches and actuators, sensor interface with Arduino. Introduction to 3D Printer: 3D Printer technology and its working Principles, Applications. Introduction to online Simulators: Working with AutoCAD/Fusion 360 Simulator.				
Module 3	**Introduction to Micro python**	Hands-on	Interfacing Task and Analysis	**4 Sessions**
Topics: Introduction to MicroPython, Comparison with other programming languages, Setting up the MicroPython development environment, Basics of MicroPython syntax and structure.				
Module 4	**Working with Raspberry-pi**	Hands-on	Interfacing Task and Analysis	**5 Sessions**
Introduction to raspberry pi boards, pin-diagram, different types of raspberry pi boards and its application, LED and switch control. Mastering Modules, Setup Raspberry - PuTTY SSH,VNC Viewer to interface with more complicated sensors and actuators. Various Libraries and its functions.				

Lab: Name of the Experiments:

1. **Introduction Lab 1:**
   Level 1: Overview on Arduino based Micro-controller, and sensors.
   Level 2: Interfacing of Arduino and ESP boards with sensors and other components.
2. **Lab 2: Smart Plant Monitoring**
   Level 1- Push button-controlled LED.
   Level 2- Automatic Irrigation and monitoring System using Arduino
3. **Lab 3: Robotics with Arduino**.
   Level 1- Servo Motor control using Arduino
   Level 2: DC Motor Control Using Arduino for Robotics.
4. **Lab 4: Environmental pollution using ESP.**
   Level 1 - IoT based air Pollution Monitoring System.
   Level 2- IoT Based water pollution system
5. **Introduction Lab for raspberry pi:**
   Level 1: Overview on Different Raspberry Pi Boards, and sensors.
   Level 2: Configuring the Raspberry Pi and Interfacing with sensors and other components.
6. **Lab 7:** Raspberry Pi based Object Detection using TensorFlow and OpenCV.
7. **Lab 8:** Speech Recognition on Raspberry Pi for Voice Controlled Home Automation.
8. **Lab 9:** Design the website using HTML and CSS, and host the website on Raspberry Pi.
9. **Introduction Lab for 3D printing:**
   Overview of 3D printing. Design of 3D structure using the CAD. Understand the steps of fabrication of simple rectangular box using 3D printer.
10. **Lab 10:** Design and print of Hollow Cylindrical structure using 3D CAD and 3D printer.
11. **Lab 11** Demonstration of Jetson nano board and its capability. **(OPTIONAL)**
12. **Lab 12:** Revision
13. **Lab 13:** Revision
14. **Lab 14:** Mini Project
15. **Lab 15:** Mini Project Evaluation.

Topics: Types of Arduino boards, Thonny Python, Python IDLE, **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, Raspberry Pi and sensors can be applied. The flexibility and affordability of Arduino, and Raspberry Pi combined with the wide range of sensors available, allow for endless possibilities in creating innovative projects.

Professionally Used Software: Students can use open SOURCE Software's Arduino IDE and Tincker CAD, Thonny Python, Python IDLE etc.

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. Presidency University Library Link .

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):

1. **Monk Simon "Programming Arduino: Getting Started with Sketches", Mc Graw Hill Publications Second Edition**
2. **Monk Simon "Raspberry Pi Cookbook: Software and Hardware Problems and Solutions", Publisher(s): O'Reilly Media, Inc. ISBN: 9781098130923 fourth 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.

3. **Charles Bell Micro Python for the Internet of Things: A Beginner's Guide to Programming with Python on Microcontrollers" by" Edition 1, 2017, ISBN 978-1-4842-3123-4**

4. Stewart Watkiss "Learn Electronics with Raspberry Pi " Apress Berkeley, CA . second edition,2020. ISBN978-1-4842-6348-8

5. Jo Prusa, "Basic of 3D printing", Prusa Research, 3rd edition.

6. Volker Ziemann, "**A Hands-On Course in Sensors Using the Arduino and Raspberry Pi (Series in Sensors)**", CRC Press, 1st Edition. 2018.

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

1. Arduino trending Projects < https://www. https://projecthub.arduino.cc/>
2. Introduction to Arduino < https://onlinecourses.swayam2.ac.in/aic20_sp04/preview>
3. Case studies on Wearable technology< https://www.hticiitm.org/wearables>
4. Raspberry-pi Projects < https://magpi.raspberrypi.com/articles/category/tutorials/>
5. Introduction to internet of things< https://nptel.ac.in/courses/106105166>

E-content:

1. Cattle Health Monitoring System Using Arduino and IOT (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.
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.
5. Basil, Eliza Sawant, S.D. "IoT based traffic light control system using Raspberry Pi " DOI 10.1109/ICECDS.2017.8389604
6. Supriya S, 2Dr. Aravinda " Green leaf disease detection and identification using Raspberry Pi https://www.irjet.net/archives/V9/i8/IRJET-V9I847.

7. Dr. E.N. Ganesh., "Health Monitoring System using Raspberry Pi and IOT" DOI : http://dx.doi.org/10.13005/ojcst12.01.03

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

Course Code: PPS1026	**Course Title: Industry Readiness Program – II (Audited Course)** **Type of Course: Practical Only Course**	L- T - P- C	0	0	2	0

Version No.	1.0
Course Pre-requisites	
Anti-requisites	NIL
Course Description	This course is designed to enable students learn styles of communication, team building and use empathy in leadership. The course will benefit learners in preparing themselves effectively through various activities and learning methodologies.
Course Objective	The objective of the course is to **familiarize the learners with the concepts of "Industry Readiness for Young Professionals" and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.**
Course Out Comes	**On successful completion of this course the students shall be able to:** CO 1 **Apply** different communication skills for success in workplace CO 2 **Practice team building skills** for career success CO3 **Demonstrate** ethical leadership skills in workplace
Course Content	

Course Code: CSE2201	**Course Title: Program Solving Using C Lab** **Type of Course: Lab - PCC**	**L- T-P-C**	0	0	4	2

Version No.	1.0
Course Pre-requisites	**NIL**
Anti-requisites	**NIL**
Course Description	The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs and applications in C. ACAlso by learning the basic programming constructs they can easily switch over to any other language in future.
Course Object	The objective of the course is to familiarize the learners with the concepts of Problem SolvingUsing C and attain Employability through Problem Solving Methodologies.

Course Code EEE1250	**Course Title:** Basics of Electrical and Electronics Engineering Laboratory **Type of Course:** Laboratory - ESC	**L-T- P- C**	0	2	1
Version No.	1.0				
Course Pre-requisites	NIL				
Anti-requisites	NIL				
Course Description	This fundamental laboratory provides an opportunity to validate the concepts taught in the basics of electrical and electronics engineering and enhances the ability to visualize 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.				
Basic skill sets required for the laboratory:					
	The students shall be able to develop: **1) An attitude of enquiry.** **2) Confidence and ability to tackle new problems.** **3) Ability to interpret events and results.** **4) Ability to work as a leader and as a member of team.** 5) Assess errors and eliminate them. **6) Observe and measure physical phenomenon.** **7) Write Reports.** **8) Select suitable equipment, instrument and materials.** 9) Locate faults in systems. 10) Manipulative skills for setting and handling equipment. **11) The ability to follow standard test procedures.** **12) An awareness of the need to observe safety precautions.** 13) To judge magnitudes without actual measurement.				
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. Apply basic laws of Electrical Engineering to compute voltage, currents, and other parameters in the circuits. 2. Demonstrate the working of electrical machines to observe performance characteristics. 3. Demonstrate the working of electronic circuits to obtain the V-I Characteristics of various semiconductor devices. 4. Sketch the characteristics and waveforms relevant to standard electrical and electronic circuits				
Course Content:					
	List of Laboratory Tasks: **Experiment No 1:** Verification of KVL and KCL for a given DC circuit. **Level 1:** Study and Verify KVL and KCL for the given electrical Circuit. **Level 2:** For the same circuit considered in level 1, perform the simulation using NI LabVIEW/Multisim/MATLAB. **Experiment No 2:** Analyse AC series circuits – RL, RC and RLC . **Level 1:** Conduct an experiment to perform and verify the impedance, current and power of Series RL and RC circuits				

	Level 2: Conduct an experiment to perform and verify the impedance and current of RLC series circuits. **Experiment No 3:** Calculation of power and power factor of the given AC Circuit. **Level 1:** Conduct an experiment to measure the power and power factor for given resistive load. **Level 2:** Conduct an experiment to measure the power and power factor for given inductive load. **Experiment No 4:** Perform the experiments on given Transformer. **Level 1:** Verify the EMF equation of a transformer and compute the voltage transformation ratio. **Level 2:** Study the effect of load on the secondary side of the transformer and verify the EMF equation under load conditions. **Experiment No 5:** Load test on DC shunt motor **Level 1:** Conduct load test on DC shunt motor and find its efficiency at different loads **Level 2:** Conduct load test on DC shunt motor and plot the performance characteristics. **Experiment 6:** Study of PN-Junction Diode Characteristics in Forward and Reverse Bias Conditions. **Level 1:** Carry out an experiment to plot VI Characteristics and hence find the cut-in voltage on forward characteristics for the Silicon P-N Junction diode. **Level 2:** Carry out an experiment to plot VI Characteristics of Zener diode and hence find the zener voltage on reverse characteristics for the Silicon P-N Junction zener diode. **Experiment No. 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: Multisim/ P Spice

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.

Course Material

1. Basics of Electrical and Electronics Engineering Laboratory Manual, Presidency University, Bengaluru.

Text Book:

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

Reference Books:

3. John Hiley, Keith Brown and Ian McKenzie Smith, "HUGHES Electrical and Electronic Technology", 10th Edition (Indian Edition published by Dorling Kindersley), Pearson,2011
4. Samarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2nd Edition, Prentice Hall India, 2007.
5. K Uma Rao, A Jaya Lakshmi, "Basic Electrical engineering" IK International publishing house Pvt. Ltd
6. R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education India 7th Edition.
7. A K. Maini, V. Agrawal, "Electronic Devices & Circuits", Wiley, 2nd Edition
8. A.S Sedra, K. C. Smith, "Microelectronic Circuits", Oxford University Press, 6th Edition

Online Learning Resources:

9. https://presidencyuniversity.linways.com
10. https://www.digimat.in/nptel/courses/video/108105112/L01 "Fundamentals of Electrical Engineering-Basic Concepts, Examples"
11. Video lectures on "Diodes", by Prof. Chitralekha Mahanta, IIT Guwahati, https://nptel.ac.in/courses/117/103/117103063/

Topics relevant to "SKILL DEVELOPMENT": All the experiments which are listed are for **Skill Development** through **Experiential Learning Techniques**. This is attained through the assessment component mentioned in course handout.

Course Outcomes	**On successful completion of this course the students shall be able to:** 1. Write algorithms and to draw flowcharts for solving problems 2. Demonstrate knowledge and develop simple applications in C programming constructs 3. Develop and implement applications using arrays and strings 4. Decompose a problem into functions and develop modular reusable code 5. Solve applications in C using structures and Union 6. Design applications using Sequential and Random Access File Processing.
Course Content:	

List of Practicals:

Lab Sheet 1: 10 Sessions

Program 1: Sum of Two Numbers
Program 2: Find the Greatest of Three Numbers
Program 3: Check Even or Odd using Conditional Operator
Program 4: Print Multiplication Table using Loop
Program 5: Count Digits in a Number using While Loop
Program 6: Demonstration of Preprocessor Directives
Program 7: Simple Calculator using Switch Case

Lab Sheet 2: 10 Sessions

Program 1: Check Whether a Number is Positive, Negative or Zero
Program 2: Find the Sum of First N Natural Numbers
Program 3: Check Whether a Number is Prime or Not
Program 4: Find Factorial of a Number
Program 5: Reverse a Number
Program 6: Simple Number Guessing Game

Lab Sheet 3: 10 Sessions

Program 1: Linear Search in a One-Dimensional Array
Program 2: Bubble Sort on an Integer Array
Program 3: Matrix Addition (2D Arrays)
Program 4: Count Vowels in a String
Program 6: Selection Sort on an Array

Lab Sheet 4: 10 Sessions

Program 1: Sum of Two Numbers Using User-Defined Function
Program 2: Factorial Using Recursion
Program 3: Swap Two Numbers Using Call by Value (No Swap)
Program 4: Swap Two Numbers Using Call by Reference (With Swap)
Program 5: Pointer Basics - Access and Modify Variable via Pointer
Program 6: Accessing Array Elements Using Pointers

Lab Sheet 5: 10 Sessions

Program 1: Basic Structure Usage
Program 2: Input and Display Array of Structures
Program 3: Array Inside Structure (Student Marks)
Program 4: Structure with Nested Structures (Date of Birth)

Program 5: Union Example and Member Access

Lab Sheet 6: 10 Sessions
Program 1: Write to a File (Text Mode)
Program 2: Read from a File (Text Mode)
Program 3: Append Data to a File
Program 4: Count Characters, Words and Lines in a File
Program 5: Write and Read Structure to/from a Binary File
Program 6: Random Access in File (Update a Record)

Text Book(s):

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

Reference Book(s):

1. **Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.**
2. **ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.**
3. **Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015**
4. **Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th Edition, 2014.**
5. **Stephen G. Kochan, "Programming in C", Addison-Wesley Professional, 4th Edition, 2014.**

Web Links and Video Lectures:

1. https://nptel.ac.in/courses/106/105/106105171/
2. https://archive.nptel.ac.in/courses/106/104/106104128/

Course Code: MAT2301	**Course Title: Calculus and Differential Equations** **Type of Course: BSC**	**L-T- P- C**	**3**	**1**	**0**	**4**
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	**NIL**					
Course Description	Calculus and differential equations are used ubiquitously throughout mathematics, statistics and operations research. In this course, students can be able to build upon the foundations of calculus established to greatly enhance their repertoire of theory and practice in these areas. The application of calculus and differential equations in the description and modelling of real-world problems will also be considered. This unit will extend the problem-solving skills, range of knowledge and use of techniques in differential and integral calculus. The course focuses on the concepts of Calculus and Differential Equations with reference to specific engineering problems. The course is of both conceptual and analytical type in nature.					
Course Objective	The goal of the course Calculus and Differential Equations is to facilitate the students with a concrete foundation of differential calculus and to solve the first					

	and higher-order ordinary differential equations enabling them to acquire the knowledge of these mathematical tools.		
Course Out Comes	On successful completion of the course the students shall be able to: 1. Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve. 2. Apply the principles of integral calculus to evaluate integrals. 3. Learn the notion of partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobian. 4. Solve first-order linear/nonlinear ordinary differential equations analytically using standard methods.		
Course Content:			
Module 1	**Differential Calculus**		**(10 Classes)**
Polar Coordinates, polar curves, angle between radius vector and the tangent, angle between two curves, pedal equations, curvature and radius of curvature. Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.			
Module 2	**Integral Calculus**	**Assignment**	**(10 Classes)**
Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.			
Module 3	**Multivariable Calculus**		**(10 lectures)**
Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.			
Module 4	**Differential Equations**	**Assignment**	**(15 lectures)**
Definition, types of Differential Equations, Applications, Variable Separable, Homogeneous, Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. Linear differential equations of second and higher order with constant coefficients - Non-Homogeneous term of the type $Q(x) = e^{ax}$, Sin ax, Cosax, $e^{ax}v(x)$, $x^n v(x)$ - Method of variation of parameters.			
Targeted Application & Tools that can be used: Differential calculus is used extensively in science and engineering. It can solve problems related to motion, velocity, acceleration, angles of incline or curve on a surface, etc. Differential Equations are used to model the behavior of electromagnetic fields, including in the design of antennas, microwave ovens, and other devices. Biology: PDEs are used to model biological processes, such as the spread of diseases and the development of biological tissues. Tools Used: Python.			

Assignment:
1. 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. 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 3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002. 4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008. **E-resources/ Web links:** 1. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_103205 2. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_106839 3. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_61605 4. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_134719 5. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html 6. https://www.scu.edu.au/study-at-scu/units/math1005/2022/
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: **PHY2501**	**Course Title:** Optoelectronics and Quantum Physics **Type of Course:** **BSC**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	**NIL**					

Course Code: MAT1001	Course Title: Calculus and Linear Algebra Type of Course: Basic Sciences Theory	L-T- P- C	3	0	2	4
Version No.	3.0						
Course Pre-requisites	Basic Concepts of Limits, Differentiation, Integration						
Anti-requisites	NIL						
Course Description	The course focuses on the concepts of calculus and linear algebra with reference to specific engineering problems. The course is of both conceptual and analytical type in nature. The lab sessions associated with the course are concerned with acquiring an ability to use the MATLAB software.						
Course Objective	The objective of the course is Skill Development of student by using Problem Solving Techniques.						
Course Out Comes	On successful completion of the course the students shall be able to: 1) Comprehend the knowledge of applications of matrix principles. 2) Understand the concept of partial derivatives and their applications. 3) Apply the principles of integral calculus to evaluate integrals. 4) Adopt the various analytical methods to solve differential equations. 5) Demonstrate the use of MATLAB software to deal with a variety of mathematical problems.						
Module 1	Linear Algebra						10 Sessions

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

Linear Algebra:

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

Engineering Applications of Linear Algebra.

Module 2	Partial Derivatives			10 Sessions

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.

Module 3	Advanced Integral calculus			12 Sessions

Review: Integral calculus for single integrals.

Advanced Integral calculus:

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

Engineering applications of partial derivatives.

Module 4	Ordinary Differential Equations	Assignment	Programming	12 Sessions

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 eax, sinax, cosax, eaxf(x), xnf(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:

List at least 3 sets of Matrix Applications concerning the respective branch of Engineering and obtain the solution using MATLAB.

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 Sankara Rao, Introduction to Partial differential equations, Prentice Hall of India, edition, 2011 B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.
References: Victor Henner, Tatyana Belozerova, Mickhail Khenner, Ordinary and Partial Differential Equations, CRC Press, Edition, 2013. Walter Ledermann, Multiple integrals, Springer, 1st edition Lay, Linear Algebra ansd its applications, 3rd Ed., 2002, Pearson Education India. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition 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.

Course Code: PHY1002	Course Title: Optoelectronics and Device Physics Type of Course: Engineering Sciences Theory	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 shall be able to: CO1: Describe the concepts of semiconductors, magnetic materials and superconductors. CO2: Apply the concept of materials in the working of optoelectronic and magnetic devices. CO3: Discuss the quantum concepts used in advanced microscopy and quantum computers. CO4: Explain the applications of lasers and optical fibers in various technological fields. CO5: Interpret the results of various experiments to verify the concepts used in optoelectronics and advanced devices. [Lab oriented].			
Course Objective	The objective of the course is to familiarize the learners with the concepts of "Optoelectronics and device physics "and attain Skill Development through Experiential Learning techniques			
Course Content:				
Module 1	Fundamentals of Materials.	Assignment	Plotting of magnetization (M) v/s Magnetic field (H) for diamagnetic, paramagnetic and ferromagnetic materials using excel/ origin software.	7 Sessions
Topics: Concept of energy bands, charge carriers, carrier concentration, concept of Fermi level, Hall effect, Magnetic materials, Superconductors:				

Module 2	Advanced Devices and applications	Assignment	Data collection on efficiency of solar cells.	8 Sessions
Topics: p-n junctions, Zener diode, transistor characteristics, Optoelectronic devices:, Solar cells, I-V characteristics, and LEDs				
Module 3	Quantum concepts and Applications	Term paper	Seminar on quantum computers.	8 Sessions
Topics: Planck's quantum theory, applications of Quantum theory: de-Broglie hypothesis, matter waves, properties. de-Broglie wavelength associated with an electron. Heisenberg's uncertainty principle. Schrodinger time independent wave equation. Particle in a box				
Module 4	Lasers and Optical fibers	Term paper	Case study on medical applications of Lasers.	7 Sessions

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.

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 software, electronic devices using transistors and diodes, memory devices, endoscopy, SQUIDS in MRI, Advanced material characterizations using SEM and STM.

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 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 Griffiths, Cambridge University Press, 2019
E-Resourses: https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=553045&site=ehost-live https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=833068&site=ehost-live https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=323988&site=ehost-live https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1530910&site=ehost-live https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=486032&site=ehost-live
Topics relevant to “SKILL DEVELOPMENT”: Fundamentals of materials, Lasers and optical fibers. for Skill Development through Participative Learning Techniques. This is attained through the Assignment/ Presentation as mentioned in the assessment component in course handout.

Course Code: MEC1006	Course Title: Engineering Graphics Type of Course: Engineering Science & Theory Only	L- T-P- C	2	0	0	2
Version No.	1.2					
Course Pre-requisites	NIL					
Anti-requisites	NIL					

Course Description	The course is designed with the objective of giving an overview of engineering graphics. It is introductory in nature and acquaints the students with the techniques used to create engineering drawings. The course emphasizes on projection of points, lines, planes and solids and isometric projections.
Course Objective	The objective of the course is to familiarize the learners with the concepts of "Engineering Graphics" and attain SKILL DEVELOPMENT through Problem solving methodologies.
Course Outcomes	On successful completion of this course the students shall be able to: Demonstrate competency of Engineering Graphics as per BIS conventions and standards. Comprehend the theory of projection for drawing projections of Points, Lines and Planes under different conditions. Prepare multiview orthographic projections of Solids by visualizing them in different positions. Prepare pictorial drawings using the principles of isometric projections to visualize objects in three dimensions.

Course Content:

Module 1	Introduction to Drawing	Assignment	Standard technical drawing	02 Sessions

Topics:

Introduction, drawing instruments and their uses, relevant BIS conventions and standards, Lettering, Line conventions, dimensioning, Selection of drawing sheet size and scale. [02 Hours: Comprehension Level]

Module 2	Orthographic projections of Points, Straight Lines and Plane Surfaces	Assignment	Projection methods Analysis	10 Sessions

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 in all 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
Topics: Introduction, Projection of right regular prisms, pyramids, cone, hexahedron and tetrahedron in different 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
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: K.R. Gopalakrishna, "Engineering Graphics", Subhash Publishers, Bangalore. D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, "Engineering Graphics with AutoCAD," Prentice Hall. 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: ENG1002	Course Title: Technical English Type of Course: Humanities Science / Theory		L-T-P-C	1-0-2-2
Version No.	V. 3			
Course Pre-requisites	Intermediate Level English			
Course Anti-requisites	NIL			
Course Description	Technical English course is designed to equip students with the language skills necessary for effective communication in technical and scientific contexts. The course focuses on the specialized vocabulary, writing styles, and communication techniques used in various technical fields, including engineering and information technology.			
Course Objectives	The objective of this course is to develop the learners' EMPLOYABILITY SKILLS by using EXPERIENTIAL LEARNING and PARTICIPATIVE LEARNING TECHNIQUES.			
Course Outcomes	On successful completion of the course, the students shall be able to: Develop proficiency in using technical vocabulary and terminology. Apply language skills for better speaking skills in technical fields. Write technical descriptions Demonstrate writing skills in writing technical documents such as reports, manuals, and articles.			
Course Content:				
Module 1	Fundamentals of Technical Communication	Worksheets& Quiz	Vocabulary building	9 Classes
Introduction to Technical English Differences between Technical English and General English Technical Writing Basics Technical Vocabulary				
Module 2	Technical Presentation	Presentations	Speaking Skills	12 Classes
Introduction Planning the Presentation Creating the Presentation				

Giving the Presentation				
Module 3	Technical Description	Assignment	Group Presentation	12 Classes
Product Description Process Description User Manuals Transcoding: Diagrams, charts and images				
Module 4	Technical Writing	Assignment	Writing Skills	12 Classes
Email Writing Persuasive and Descriptive Language Professional Email Etiquette Writing clear and concise technical emails Communicating technical information effectively Technical Report Writing Types of technical reports (Lab reports, research reports, etc.) Components of technical reports Writing an abstract and executive summary Structure and content organization Transcoding: diagrams, charts and images				
List of Laboratory Tasks: Module-1 Level 1: Worksheets Level 2: Worksheets Module 2 Level 1: Preparing Presentation Level 2: Giving Presentation (Individual) Module-3				

Level 1: Product Description & User Manual

Level 2: Process Description & Transcoding

Module 4

Level 1: Email Writing

Level 2: Report Writing

Targeted Applications & Tools that can be used:

Flipgrid

Quizzes

Youtube Videos

Podcast

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

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

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.

Presentation

Describing a product/process

Individual Reports

Text Books

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

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

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

Reference Book:

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

Sunder Jain. Technical Report Writing. Centrum Press, 2013.

John Bowden. “Writing a Report: How to Prepare, Write & Present Really Effective Reports?”. 9th Edition 2011

Comfort, Jeremy et. al. 1984. Business Reports in English. Cambridge University Press. Sharma, R.C. and K. Mohan. 2011. Business Correspondence and Report Writing, Fourth Edition. Tata McGraw Hill.
Web Resources: https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=JSTOR1_3307. 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 Last,Suzan, et. al. Technical Writing Essentials. University of Victoria, British Columbia, 2019 (E-Book) 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: PPS 1001	Course Title: Introduction to Soft Skills Type of Course: Practical Only Course	L- T-P-C	0	2	1
Version No.	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 “Soft Skills” and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.				

Course Out Comes	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: Apply SMART technique to achieve goals and increase productivity		
Course Content:			
Module 1	INTRODUCTION TO SOFT SKILLS	Classroom activity	04 Hours
Topics: Setting Expectations, Ice Breaker, Significance of soft skills, Formal grooming, punctuality			
Module 2	EFFECTIVE COMMUNICATION	Individual Assessment	10 Hours
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: Professional and personal ethics for success, Identity based habits, Domino effect, Habit Loop, Unlearning, standing up for what is right			
Module 4	Goal setting & Time Management	Goal sheet	8 Hours
A session where students will be introduced to Time management, setting 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			
Individual Assessment 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.			

ENG2501	**Advanced English**	**L- T- P- C**	2	0	0	2
Version No.	2.0					
Course Pre-requisites	ENG1900 - English for Technical Communication					
Anti-requisites	**NIL**					
Course Description	This course is designed to equip students to enhance their communication abilities in Listening, Speaking, Reading, and Writing. The curriculum covers interpersonal communication principles, the art of speech writing and delivery (including impromptu speaking), strategic approaches to critical reading, the identification of logical fallacies, and persuasive writing. Furthermore, the course will introduce students to the potential of AI tools and the techniques of prompt engineering to elevate their communication skills in the digital age. Upon course completion, students will be well-prepared to communicate effectively and critically in both academic and professional environments.					
Course Out Come	On successful completion of the course the students shall be able to: 1. Recognize the elements of interpersonal and cross-cultural communication to address communication challenges effectively. 2. Demonstrate the ability to deliver structured and impromptu speeches using effective speaking techniques. 3. Interpret textual and visual materials using critical reading strategies to evaluate arguments, logic, and persuasion. 4. Produce persuasive and analytical essays using effective argumentation techniques and structured writing strategies.					

Course Content:

Module 1	**Foundations of Effective Communication**	**Case Studies/ Role play**	**Cross-Cultural Competency**	**12 Classes**

Topics:

- Fundamentals of Interpersonal Communication
- Verbal, Non-verbal, and Paraverbal communication.
- Cultural dimensions theory (Hofstede's Cultural Dimensions).
- Active Listening Techniques
- Common Errors in Communication

Activities:

- Instagram/YouTube Vocabulary Activity
- Charades with a Twist/Tone and Emotion Experiment/Mixed Messages Challenge/Role Reversal Conversations/Observation Exercise

Module 2	**Mastering Speech Delivery**	**JAM**	**Public Speaking Confidence**	**12 Classes**

Topics:

- Introduction to Prompt Engineering

- Speech Preparation and Organization
- Techniques for Effective Impromptu Speaking
- Practice Speech Delivery

Activities:

- Speech Writing
- Impromptu Speech

Module 3	**Critical Reading and Logical Analysis**	**Worksheet**	**Critical Thinking and Analysis**	**12 Classes**

Topics:

- Critical Reading Strategies: Contextualizing, Figurative Language, Evaluating Logic of an Argument, Recognizing Emotional Manipulation, Analysing Visuals
- Recognizing Logical Fallacies: Slippery Slope, False Dilemma, Post Hoc, Hasty Generalization, Ad Hominem, Straw Man, Bandwagon, No True Scotsman, Red Herring, Appeal to Authority, Sunk Cost, Appeal to ignorance

Activities:

- Critical Reading Worksheet/Identifying Bias in News Articles

Module 4	**Writing Effective Arguments**	**Assignment**	**Clear and Coherent Writing**	**9 Classes**

Topics**:**

- Understanding Critical Writing
- Building Arguments (Pathos, Ethos, Logos)
- Techniques for Persuasion

Activities:

- Causes or Effects/Appeal Mash-Up/Debates on Controversial Topics
- Opinion Writing

Targeted Application & Tools that can be used: Quizziz, Chatgpt, Gemini, Youtube, Instagram, Quillbot, Grammarly, Padlet

References

1. Adler, R. B., Rodman, G., & DuPré, A. (2019). *Understanding human communication (14th ed.)*. Oxford University Press.
2. Moore, B. N., & Parker, R. (2020). *Critical thinking* (13th ed.). McGraw-Hill Education.
3. Hamilton, C. (2020). *Communicating for success* (2nd ed.). Routledge.
4. Ting-Toomey, S., & Dorjee, T. (2018). Intercultural competence: A model for teaching and assessing cross-cultural communication. *Journal of Intercultural Communication, 47*(2), 213–229. https://doi.org/10.1016/j.jicc.2018.03.004
5. https://www.ted.com/

Topics Relevant to "employability": Teamwork and Collaboration, Critical Thinking and Problem-Solving

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

Course Code: EEE1200	**Course Title: Basics of Electrical and Electronics Engineering. Type of Course: Theory - ESC**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	**2.0**					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This is a fundamental Course which is designed to know the use of basics of electrical and electronics engineering principles occurs in various fields of Engineering. The course emphasises on the characteristics and applications of electrical and electronic devices. The course also emphasizes on the working, analysis and design of electrical circuits using both active & passive components. Additionally, this course creates a foundation for the future courses such as Electrical machines, power system, power electronics Linear Integrated Circuits, Analog Communication and Digital Communication etc.					
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 Participative Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: Apply basic laws of Electrical Engineering to compute voltage, currents and other parameters in the circuits. Discuss various fundamental parameters appearing in the characteristics of semiconductor devices and their applications. Summarize the operations of different biasing configurations of BJTs and amplifiers. Discuss the performance characteristics and applications of various electrical Machines.					
Course Content:						
Module 1	Introduction to Electrical Circuits	Assignment/ Quiz	Numerical solving Task	10 Sessions		

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, Nodal 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 applications	Assignment/ Quiz	Memory Recall based Quizzes	10 Sessions
Mass Action Law, Charge densities in a semiconductor, Types of SC, Junction diodes -Ideal and practical behaviour, Modelling the Diode Forward Characteristic, and Diode applications like rectifiers, Zener diode, characteristics and its applications like voltage regulator.				
Module 3	Transistors and its Applications	Assignment/ Quiz	Memory Recall-based Quizzes	10 Sessions
Transistor characteristics, Current components, BJT Configurations (CB, CC, CE configurations) and their current gains. Operating point, Biasing, Fixed Bias, and load line analysis. Single Stage amplifier. JFET (Construction, principal of Operation and Volt –Ampere characteristics). Pinch-off voltage, Comparison of BJT and FET. MOSFET (Construction, principal of Operation and symbol), MOSFET characteristics in Enhancement and Depletion modes.				
Module 4	Fundamentals of Electrical Machines	Assignment/ Quiz	Numerical solving Task	10 Sessions
Electrical Machines: Single phase transformers: principle of operation and EMF equation, Numerical examples. DC Motor: principle of operation, Back EMF, torque equation, Numerical examples. AC Motor: Principle operation of Induction Motors and its Applications.				

Self-Learning Topics:

- Clipping and clamping circuits, Stabilization Techniques, Voltage divider bias and its stability factor, Multistage amplifier, Darlington pair.
- Special Machines: Introduction to special electrical machines and its applications.

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: Multisim/ P Spice
- 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..

Project Work/ Assignment:

1. Article review: At the end, of course 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.

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

3. Case Study: - At the end of the course students will be given a 'real-world' application based circuits like Power Amplifier, Signal/Function Generator etc. as a case study. Students will be submitting a report which will include Circuit Diagrams, Design, Working Mechanism and Results etc. in appropriate format

Text Book(s):

- Kothari D. P. & Nagrath I. J., "Basic Electrical and Electronics Engineering", Tata McGraw-Hill
- Education
- 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.
- A.P.Malvino, Electronic Principles,7thEdition, Tata McGraw Hill,2007
- J. Millman, C. C. Halkias and C. D. Parikh, "Millman's Integrated Electronics", McGraw Hill Education, 2nd Edition.
- Basics of Electrical & Electronics Laboratory Manual.

Reference Book (s):

- John Hiley, Keith Brown and Ian McKenzie Smith, "HUGHES Electrical and Electronic 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.
- K Uma Rao, A Jaya Lakshmi, "Basic Electrical engineering" IK International publishing house Pvt. Ltd
- R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education India 7th Edition.
- A K. Maini, V. Agrawal, "Electronic Devices & Circuits", Wiley, 2nd Edition
- A.S Sedra, K. C. Smith, "Microelectronic Circuits", Oxford University Press, 6th Edition
- Online Resources (e-books, notes, ppts, video lectures etc.):
- https://presidencyuniversity.linways.com
- https://www.digimat.in/nptel/courses/video/108105112/L01 "Fundamentals of Electrical Engineering-Basic Concepts, Examples"
- Seminar Topic: https://nptel.ac.in/courses/108/105/108105153/ "Electrical Measurements"
- Video lectures on "Electronic Devices" by Prof. Dr. A. N. Chandorkar, IIT Bombay http://www.satishkashyap.com/2013/03/video-lectures-on-electron-devices-by.html
- Video lectures on "Analog Electronics" by Prof. S.C. Dutta Roy, IIT Delhi https://nptel.ac.in/courses/108/102/108102095/
- Video lectures on "Diodes", by Prof. Chitralekha Mahanta, IIT Guwahati,
- https://nptel.ac.in/courses/117/103/117103063/
- E-content:
- "Introduction to Electrical Machines https://nptel.ac.in/courses/108/102/108102146/"
- M. -Y. Kao, H. Kam and C. Hu, "Deep-Learning-Assisted Physics-Driven MOSFET Current Voltage Modeling," 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
- F. Bonet, O. Aviñó-Salvadó, M. Vellvehi, X. Jordà, P. Godignon and X. Perpiñà, "Carrier
- Concentration Analysis in 1.2 kV SiC Schottky Diodes Under Current Crowding," in IEEE Electron Device Letters, vol. 43, no. 6, pp. 938-941, June 2022, doi: 10.1109/LED.2022.3171112. https://ieeexplore-ieeeorg-presiuniv.knimbus.com/document/9764749

- 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
- 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 electric circuit parameters, performance operation of machines, and operation of semiconductor devices for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course plan.

Course Code: CSE2200	Course Title: Problem Solving Using C Type of Course: School Core Lab Integrated.		L- T-P-C	1	0	4	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs and applications in C. ACAlso by learning the basic programming constructs they can easily switch over to any other language in future.					
Course Object	The objective of the course is to familiarize the learners with the concepts of Problem Solving Using C and attain Employability through Problem Solving Methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: Write algorithms and to draw flowcharts for solving problems Demonstrate knowledge and develop simple applications in C programming constructs Develop and implement applications using arrays and strings Decompose a problem into functions and develop modular reusable code Solve applications in C using structures and Union Design applications using Sequential and Random Access File Processing.					
Course Content:						
Module 1	Introduction to C Language	Quiz	Problem Solving	9 Hrs.		
Topics: Introduction to Programming – Algorithms – Pseudo Code - Flow Chart – Compilation – Execution – Preprocessor Directives (#define, #include, #undef) - Overview of C – Constants, Variables and Data types – Operators and Expressions – Managing Input and Output Operations – Decision Making and Branching - Decision Making and Looping.						
Module 2	Introduction to Arrays and Strings	Quiz	Problem Solving	9 Hrs.		
Topics: Arrays: Introduction – One Dimensional Array – Initialization of One Dimensional Arrays – Example Programs – Sorting (Bubble Sort, Selection Sort) – Searching (Linear Search) - Two Dimensional						

Arrays – Initialization of Two Dimensional Arrays. Example Programs – Matrix operations. Strings: Introduction – Declaring and Initializing String

Variables – Reading Strings from Terminal – Writing String to Screen – String Handling Functions.

Module 3	Functions and Pointers	Quiz	Problem Solving	9 Hrs.

Topics:

Functions: Introduction – Need for User-defined functions – Elements of User-Defined Functions: declaration, definition and function call–Categories of Functions – Recursion. Pointers: Introduction – Declaring Pointer Variables – Initialization of Variables – Pointer Operators – Pointer Arithmetic – Arrays and Pointers – Parameter

Passing: Pass by Value, Pass by Reference.

Module 4	Structures and Union	Quiz	Problem Solving	9 Hrs.

Topics:

Structures: Introduction – Defining a Structure – Declaring Structure Variable – Accessing Structure Members – Array of Structures – Arrays within Structures – Union: Introduction – Defining and Declaring Union – Difference Between

Union and Structure.

Module 5	File handling	Case Study	Problem Solving	9 Hrs.

Topics:

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

List of Practical Tasks Lab Sheet 1 (Module I)

Programs using IO Statements, Conditional Statements and Looping Statements

Lab Sheet 2 (Module II)

Programs using Arrays and Strings

Lab Sheet 3 (Module III)

Programs using Functions and Pointers

Lab Sheet 4 (Module IV)

Programs using Structures and Unions

Lab Sheet 5 (Module V)

Programs using Files

Text Book(s): 1. E. Balaguruswamy, “Programming in ANSI C”, 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316- 513-0.
Reference Book(s): Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016. Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2015 Schildt Herbert, “C: The Complete Reference”, Tata McGraw Hill Education, 4th Edition, 2014. Stephen G. Kochan, “Programming in C”, Addison-Wesley Professional, 4th Edition, 2014.
Web Links and Video Lectures: 1. https://nptel.ac.in/courses/106/105/106105171/ 2. https://archive.nptel.ac.in/courses/106/104/106104128/

Course Code: ECE2007	Course Title: Digital Design Type of Course: Theory &Integrated Laboratory	L- T-P- C	2	0	2	3
Version No.	2.0					
Course Pre-requisites	[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.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Digital Design and attain the SKILL DEVELOPMENT through EXPERIENTIAL LEARNING.					

<table>
<tr><td>Course Outcomes</td><td colspan="4">On successful completion of this course the students shall be able to:
Describe the concepts of number systems, Boolean algebra and logic gates.
Apply minimization techniques to simplify Boolean expressions.
Demonstrate the Combinational circuits for a given logic
Demonstrate the Sequential and programmable logic circuits
Implement various combinational and sequential logic circuits using gates.</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1</td><td>Fundamentals of Number systems- Boolean algebra and digital logic</td><td>Application Assignment</td><td>Data Analysis task</td><td>06 classes</td></tr>
<tr><td colspan="5">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.</td></tr>
<tr><td>Module 2</td><td>Boolean function simplification</td><td>Application Assignment</td><td>Data Analysis task</td><td>08 Classes</td></tr>
<tr><td colspan="5">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.</td></tr>
<tr><td>Module 3</td><td>Combinational Logic circuits:</td><td>Application Assignment</td><td>Programming Task & Data Analysis task</td><td>08 Classes</td></tr>
<tr><td colspan="5">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.</td></tr>
<tr><td colspan="5">List of Laboratory Tasks:
Experiment N0 1: Verify the Logic Gates truth table
Level 1: By using Digital Logic Trainer kit
Level 2: By using Analog devices like RPS, Volt meter, Resistors and ICs</td></tr>
</table>

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):

Mano, M. Morris and Ciletti Michael D., "Digital Design", Pearson Education, 6th edition

Thomas L. Floyd "DIGITAL LOGIC DESIGN" , Pearson Education, fourth edition.

Reference(s):

Reference Book(s):

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

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

Edition

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

(studymaterialz.in)

eBook1: Mano, M. Morris and Ciletti Michael D., "Digital Design", Pearson Education.

{[PDF] Digital Design By M. Morris Mano, Michael D Ciletti Book Free Download

}

eBook2:Floyd "DIGITAL LOGIC DESIGN" fourth edition- ePub, eBook- [PDF] DIGITAL LOGIC DESIGN FOURTH EDITION FLOYD | abri.engenderhealth.org.

NPTEL Course- NPTEL :: Electrical Engineering - NOC:Digital Electronic Circuits

Digital Logic Design PPT Slide 1 (iare.ac.in)

Lab Tutorial: Multisim Tutorial for Digital Circuits - Bing video

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:

Z. Xin-Li and W. Hong-Ying, "The Application of Digital Electronics in Networking Communication," 2016 Eighth International Conference on Measuring Technology and Mechatronics Automation (ICMTMA), 2016, pp. 684-687, doi: 10.1109/ICMTMA.2016.168.

An encoding technique for design and optimization of combinational logic circuit DipayanBhadra;Tanvir Ahmed Tarique;Sultan Uddin Ahmed;Md. Shahjahan;KazuyukiMurase2010 13th International Conference on Computer and Information Technology (ICCIT)

A. Matrosova and V. Provkin, "Applying Incompletely Specified Boolean Functions for Patch Circuit Generation," 2021 IEEE East-West Design & Test Symposium (EWDTS), 2021, pp. 1-4, doi: 10.1109/EWDTS52692.2021.9581029.

A. Matrosova, V. Provkin and E. Nikolaeva, "Masking Internal Node Faults and Trojan Circuits in Logical Circuits," 2019 IEEE East-West Design & Test Symposium (EWDTS), 2019, pp. 1-4, doi: 10.1109/EWDTS.2019.8884434.

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

Course Code: **MAT2402**	**Course Title: Probability and Statistics** **Type of Course: BSC**	**L-T- P- C**	**3**	**1**	**0**	4
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	**NIL**					
Course Description	The course introduces the concepts of probability theory and statistical analysis, covering how to collect, organize, interpret, and draw inferences from data using mathematical models to understand randomness and uncertainty, with applications across various fields like science, engineering, economics, and social sciences.					
Course Objective	The objective of the course is to equip students with the foundational knowledge of probability theory and statistical methods, enabling them to collect, analyze, interpret data, and make informed decisions based on the likelihood of events occurring in various situations, often applied across different fields like science, engineering, and business.					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Be able to compute conditional probabilities directly and using Bayes' theorem, and check for independence of events.					

	2. Be able to set up and work with discrete & continuous random variables; in particular, to understand the Bernoulli, binomial, geometric, Poisson distributions, uniform, normal, and exponential distributions. 3. Identifying different types of data relationships (linear, polynomial, exponential, logarithmic). 4. Be able to use specific significance tests, including z-test, t-test (one- and two-sample), and chi-squared test

Course Content:

Module 1	**Basic Probability**		**(6 Classes)**
Probability of an Event, multiplication rule, combinations, permutations, Addition Law, Multiplication Law, Conditional Probability, Bayes's Theorem and Problems.			
Module 2	**Random Variables and Bivariate Distributions**	**Assignment**	**(15 Classes)**
Random Variables (discrete and continuous), Probability Mass/Density Functions, Mathematical Expectations, discrete probability distributions - Binomial distribution, Poisson distribution, geometric distribution, Continuous uniform distribution - exponential distribution, normal distribution, gamma distribution. Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.			
Module 3	**Curve Fitting & Statistical Methods**		**(13 Classes)**
Curve Fitting (Straight Line ($y = a + bx$), Parabola ($y = a + bx + cx^2$), Exponential Curves ($y = ae^{bx}$, $y = ab^x$ and $y = ax^b$) Measures of Central tendency, Moments, skewness and Kurtosis, Correlation - Karl Pearson's coefficient of correlation and rank correlation (with & Without repetition, Multiple Correlation - Problems. Regression analysis - lines of regression, Multiple regression - Problems.			
Module 4	**Joint Probability Distribution and Sampling Theory**	**Assignment**	**(15 Classes)**
Joint Probability distribution for two discrete random variables, expectation and covariance. Random sampling, sampling distributions, Standard Error, Type I & Type II errors, Testing of Hypothesis, Test of significance - Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations, Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.			

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: R software (Open Source)

Assignment:

1. 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. Ronald .E. Walpole, Raymond. H. Myers, Sharon. L Myers, and Keying E. Ye, “Probability and Statistics for Engineers and Scientists”, Pearson Education, Delhi-9th edition, 2012.
2. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.

References:

1. Miller and Freund, Probability and Statistics for Engineers, Pearson Education Ltd.
2. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition.
3. Douglas C. Montgomery & George Runger, Applied Statistics and Probability for Engineers, , Wiley Publications

E-resources/ Web links:

1. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_10427
2. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_100198
3. https://nptel.ac.in/courses/109104124
4. https://nptel.ac.in/courses/111106051
5. https://nptel.ac.in/courses/111102137
6. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html
7. https://www.scu.edu.au/study-at-scu/units/math1005/2022/
8. Presidency University's Knimbus library URL is: presiuniv.knimbus.com

Topics relevant to SKILL DEVELOPMENT: The course focuses on the concepts of Vector calculus and Linear Algebra 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 the course handout.

Course Code: **CIV1200**	**Course Title: Foundations of Integrated Engineering** **Type of Course: ESC**	**L- T-P- C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					

Course Code: DES1146	Course Title: Introduction to Design Thinking	L-T-P- C	1	0	0	1

Course Description	Type of Course: Theory rse introduces first-year engineering students to foundational s across key engineering domains, emphasizing real-world problem-solving, sustainability, and ethical innovation. Students explore how civil,
Version No.	1.0 AI, and geomatics to address global challenges. Through case studies, learners gain
Course Pre-requisites	NIL systems, and securing IT solutions. Topics include bioinformatics for environmental monitoring, GIS-enabled urban planning, renewable energy integration, and cybersecurity fundamentals. The course cultivates a holistic understanding of
Anti-requisites	NIL technology-driven world.
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	1] Recall key principles of Agile, DevOps, and bioinformatics used in
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	On successful completion of the course the students shall be able to: Understand the concept and importance of Design Thinking. Differentiate between traditional problem-solving and Design Thinking. Identify the core stages of the Design Thinking process. cybersecurity threats, and blockchain applications.
Course Content:	All assignments and projects must be developed using the reference materials available from the PU e-resource database – JSTOR, EBSCO, Library OPAC, NPTEL Videos, etc.

Module 1	**Foundations of Engineering**	Visual journal, book of essays, context-specific assignment/project	signment	Case studies	**6 Sessions**
Real-world problem-solving u Innovation throu Emerging Fields Module 1	Introduction to Design Thinking		logic and practical applications, Collaboration and t, Engineering Ethics & Environmental Impact duction to bioinformatics and its application ny principles	Visual output generation, by Visual Journal and narrative development.	3 hours
Module 2	**Geomatics**		Assignment	Article Review	**6 Sessions**
Smart Infrastructure & Geom Geospatial data analysis for Sustainable Construction: 3D-printed structures, self-healing concrete, Digital twins for			mapping, LiDAR, drone surveys for urban planning, anagement.		

Topic Definition and Introduction to Design Thinking Understand the Design Thinking Process

Course Code: PHY2554	**Course Title: Optoelectronics and Quantum Physics Lab**			**L-T-P-C**	**0**	**0**	**2**	**1**
Version No.	1.0						
Course Pre-requisites	NIL						
Anti-requisites	NIL						
Course Description	The 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 Outcomes	On successful completion of the course the students shall be able to: CO1: To understand electrical and optical properties of materials. CO2: Interpret the results of various experiments to verify the concepts used in optoelectronics and advanced devices.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of " Applied Physics for Computer Science" and to attain **Skill Development** through **Experiential Learning** techniques						

List of Laboratory Tasks:

Expert Lectures

Experiment No. 1: Experimental errors and uncertainty using excel

Text Book

Level 1: Calculation of accuracy and precision of a given data

Level 2: propagation of errors in addition, subtraction, multiplication and division.

Experiment No.2: To determine the wavelength of semiconductor diode Laser and to estimate the particle size of lycopodium powder using diffraction.

Level 1: Determination of Wavelength of Laser

Level 2: Finding the particle size of lycopodium powder.

References

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 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. 8: 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. 9: 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. 10: Determination of Stefan's constant and verification of Stefan-Boltzmann Law.

Level 1: Determination of Stefan's constant

Level 2: Verification of Stefan-Boltzmann Law.

Experiment No. 11: Determination of dielectric constant of given materials.

Level 1: Determination of Stefan's constant

Level 2: compare the obtain results with other materials

Experiment No. 12: determine the wavelength of monochromatic light, such as sodium light, using Newton's rings.

Level 1: Determination of wavelength

Level 2: determine the radius of curvature of the Plano-convex lens.

Targeted Application & Tools that can be used:

3. Areas of application are optoelectronics industry, Solar panel technologies, quantum computing software, electronic devices using transistors and diodes, memory devices, endoscopy, SQUIDS in MRI, Advanced material characterizations using SEM and STM.
4. 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.

Course Code: MAT1003	Course Title: Applied Statistics Type of Course: School Core	L-T-P-C	1	0	2	2
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 Skill Development Through Problem Solving techniques.					
Expected Outcome:	At the end of this course, students will be in a position to apply the techniques of descriptive statistics effectively interpret the ideas of probability and conditional probability demonstrate the knowledge of probability distributions Compute statistical parameters, correlation and regression, probability and sampling distributions using R software.					
Module 1	Descriptive Statistics	Assignment	Coding needed	10 classes		

Introduction to Statistics, Data and statistical thinking, review of basic statistical parameters, Covariance, Correlation, Types of Measures of Correlation - Karl Pearson's Correlation Coefficient, Spearman Rank Correlation, linear regression, Multi linear regression .				
Module 2	Probability			6 classes
Introduction to Probability, Probability of an event, Addition Principle, Multiplication law, Conditional Probability, Total Probability and Baye's theorem with examples				
Module 3	Random Variables and Probability Distributions		Coding needed	14 classes
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 needed	15 classes
Introduction to Sampling Theory, Population, Statistic, Parameter, Sampling Distribution, Standard Error. Testing of Hypothesis, Types of Errors, Critical Region, level of Significance. Difference between Parametric and Non-parametric Tests, Large Sample Tests: Z-Test for Single Mean and Difference of Means (Self Study), Small Sample Tests: Student's t-Test for Single Mean and Difference of Means, F-Test, Chi-Square Test.				
Targeted Application & Tools that can be used: The objective of the course is to familiarize students with the theoretical concepts of probability and statistics and to equip them with basic statistical tools to tackle engineering and real-life problems. Tools used: R Software / MS-Excel				
Text Book Ronald E Walpole, Raymond H Myers, Sharon L Myers, and Keying E Ye, Probability and Statistics for Engineers and Scientists, Pearson Education, 2016.				

References James T. McClave, P. George Benson and Terry Sincich, Statistics for Business and Economics, 2018. David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Essentials of Modern Business Statistics with Microsoft Excel, 2020. David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Essentials of Statistics for Business and Economics, 2019. Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, John Wiley and Sons, 2018. Richard A. Johnson, Miller and Freund's Probability and Statistics for Engineers, 2018. Kishor S Trivedi, Probability and Statistics with reliability, Queuing and Computer Science Applications, John Wiley & Sons, 2008.
Topics relevant to SKILL DEVELOPMENT: The goal of this course is to provide a firm understanding of probability and statistics by means of a thorough treatment of descriptive statistics, probability and probability distributions keeping in mind the future courses having statistical, quantitative and probabilistic components. The course covers topics such as descriptive statistics, probability, rules for probability, random variables and probability distributions, standard discrete and continuous probability distributions for Skill Development through Problem Solving methodologies. This is attained through assessment component mentioned in course handout.

Course Code: CHE1018	Course Title: Environmental Science	L- T- P- C	1	0	2	0
	Type of Course: School Core- Theory and Lab	Contact hours	1	0	2	3
Version No.	2.0					
Course Pre-requisites	NIL					
Anti-	NIL					

requisites				
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. This course is designed to cater to Environment and Sustainability			
Course Objective	The objective of the course is to familiarize the learners with the concepts of "Environmental Science" and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING techniques.			
Course Outcomes	On successful completion of this course the students shall be able to: Appreciate the historical context of human interactions with the environment and the need for eco-balance. Describe basic knowledge about global climate change with particular reference to the Indian context. Understand biodiversity and its conservation Develop an understanding on types of pollution and ways to protect the environment Learn about various strategies on Global environmental management systems			
Course Content:				
Module 1	Humans and the Environment	Assignment	Data Collection	01 class
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 Development	Assignment		03 Classes

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

Topics:

Environmental Pollution: Types of Pollution- air, noise, water, soil, municipal solid waste, hazardous waste; Trans- boundary air pollution; Acid rain; Smog.

Land use and Land cover change: land degradation, deforestation, desertification, urbanization. Global change: Ozone layer depletion; Climate change

Self -learning topics: Environmental issues and scales

	Module 4	Conservation of Biodiversity and Ecosystems	Assignment		02 Classes

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

Topics:

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

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

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

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

	Module 6	Climate Change: Impacts, Adaptation and Mitigation	Assignment/case		02 Classes

Topics:

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

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

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

	Module 7	Environmental Management	Case study	Data analysis	02 Classes

Topics:

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

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

	Module 8	Environmental Treaties and Legislation	Case study	Data analysis	01 Classes

Topics:

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

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

List of laboratory tasks : Any eight experiments will be conducted

Determination of total alkalinity of a water sample (knowledge)

Estimation of water hardness by EDTA method and its removal (by zeolite/ ion exchange method) (Comprehensive)

Estimation of copper from industrial effluents by colorimetric method (Comprehensive)

Estimation of iron from industrial effluents by titrimetric method/potentiometric method (Comprehensive)

Estimation of nickel from industrial effluents by titrimetric method (Comprehensive)

Estimation of chloride in drinking water by titrimetric method (Comprehensive)

Estimation of fluoride in ground water by colorimetric method (Comprehensive)

Determination of calcium in aqueous solution (Comprehensive)

Determination of Total Dissolved Salts, conductivity and pH of a water samples (Knowledge) Determination of Chemical oxygen demand in the industrial effluent. (Comprehensive) Biological oxygen demand of waste water sample (Comprehensive) Determination of dissolved oxygen of an industrial effluent (Comprehensive) Quality monitoring analysis of a soil sample (knowledge) Flame photometric estimation of Sodium and potassium (Application) 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 G. Tyler Miller and Scott Spoolman (2020), Living in the Environment, 20th Edition, Cengage Learning, USA Krishnamurthy, K.V. (2003) Text book of Biodiversity, Science Publishers, Plymouth, UK.

Jackson, A.R. & Jackson, J.M. (2000), Environmental Science: The natural environment and human impact, Pearson Education.

Reference Books

Fisher, Michael H. (2018) An Environmental History of India- From Earliest Times to the Twenty-First Century, Cambridge University Press.

William P. Cunningham and Mary Ann Cunningham (2017), Principles of Environmental Science: Inquiry & Applications, 8th Edition, McGraw-Hill Education, USA.

Sinha N., (2020) Wild and Wilful. Harper Collins, India.

www.ipcc.org; https://www.ipcc.ch/report/sixth-assessment-report-cycle/

Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press.

Richard A. Marcantonio, Marc Lame (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press.

E-resources:

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO AB_1_06082022_18126

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO AB_1_06082022_8761

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DO AJ_1_02082022_3333

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https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=CU_STOM_PACKAGE_16012023_WORLD_BUSINESS_COUNCIL_SUSTAINABLE_488
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=CU_STOM_PACKAGE_16012023_WORLD_BUSINESS_COUNCIL_SUSTAINABLE_583
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=SP_RINGER_INDEST_1_171
https://presiuniv.knimbus.com/user#/searchresult?searchId=3R%20principle&_t=1687427221129
https://presiuniv.knimbus.com/user#/searchresult?searchId=eco%20labelling&_t=1687427279979
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=TE_XTBOOK_LIBRARY01_06082022_395&xIndex=4
https://www.ugc.gov.in/oldpdf/modelcurriculum/env.pdf

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

Course Outcomes	On successful completion of this course the students shall be able to: 1] Recognize the significance of various disciplines in Civil Engineering 2] Discuss the recent evolutions in Civil Engineering 3] Explain various energies, energy generating machineries and energy consumption machineries 4] Describe the fundamental concept and terminology associated with the Petroleum Industry 5] Distinguish between conventional and modern manufacturing techniques.			
Course Content:				
Module 1	Introduction to various fields in Civil Engineering	Assignment	Case studies on different Civil Engineering Projects	6 Sessions
Topics: Introduction to Civil Engineering: Definition, scope and branches of Civil Engineering, Role of Civil Engineer, Overview of Infrastructure.				
Module 2	Current Trends and Evolution in Civil Engineering	Assignment	Article Review	6 Sessions
Topics: Mechanization in Construction, Application of Digital Technologies in Planning, Design, execution, monitoring and maintenance of Construction. Overview of Smart Cities.				
Module 3	Power Production and Consumption Machinery	Assignment & Quiz	Data Collection	6 Sessions
Topics: Energy and its types, Engines and their applications, Pumps-Compressors and their applications.				
Module 4	Overview of Petroleum Engineering	Assignment & Quiz	Article Review	6 Sessions
Overview of the Petroleum Industry, Importance of Petroleum Engineering, lifecycle of Petroleum products, Classifications of E&P activities: Key difference between Offshore and Onshore, Onshore facilities, offshore platforms, Digitization of petroleum engineering				
Module 5	Industry 4.0	Assignment & Quiz	Data Collection	6 Sessions
Topics: Conventional manufacturing process: Metal forming, metal removal and metal joining process. 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: Collect data and prepare report on various Mega Projects in Civil Engineering

Assignment 2: Review Articles on current evolutions in Civil Engineering.

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

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

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

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

Text Book:

T1. Elements of Civil and Mechanical Engineering, L.S. Jayagopal & R Rudramoorthy, Vikas Publishers

T2. Elements of Mechanical Engineering, by VK Manglik

T3. Fundamentals of Oil & Gas Industry for Beginners by Samir Dalvi, Notion Press; 1st edition

References

K.P. Roy, S.K. Hajra Choudhury, Nirjhar Roy, “Elements of Mechanical Engineering”, Media Promoters and Publishers Pvt Ltd, Mumbai.

Nontechnical Guide to Petroleum Geology, Exploration, Drilling & Production by Norman J. Hyne, PennWell Books; 3rd Revised edition

Web-resources:

Basic Civil Engineering

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

Post-parametric Automation in Design and Construction

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

Smart Cities : Introducing Digital Innovation to Cities

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

Innovation Energy: Trends and Perspectives or Challenges of Energy Innovation

https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2323766&site=ehost-live Mechanical Engineering https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO106_REDO_1705 Additive Manufacturing: Opportunities, Challenges, Implications https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1134464&site=ehost-live Society of Petroleum Engineers (SPE) https://www.spe.org/en/ PetroWiki: A comprehensive online resource created by the Society of Petroleum Engineers that provides information on various aspects of petroleum engineering. https://petrowiki.spe.org/PetroWiki Rigzone: A resource for news and information about the oil and gas industry, including job postings and industry trends. https://www.rigzone.com/
Topics relevant to the development of SKILLS: Engines-Turbines and their applications. Mechanization in Construction. Digitization in Petroleum Industries

Course Code: CSE1006	Course Title: Problem Solving using JAVA Type of Course: Lab Integrated	L- T-P-C	1	0	4	3
Version No.	2.0					
Course Pre-requisites	CSE1004 – Problem-Solving Using C					
Anti-requisites	Nil					
Course Description	This course introduces the core concepts of object-oriented programming. This course has theory and lab component which emphasizes understanding the implementation and application of object-oriented programming paradigm. It helps the student to build real-time secure applications by applying these concepts and also for effective problem-solving. The students interpret and understand the need for object-oriented programming to build applications.					

Course Objective	The objective of the course is to familiarize the learners with the concepts of Problem-Solving using JAVA and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING techniques			
Course Out Comes	On successful completion of the course, the students shall be able to: C.O. 1: Describe the basic programming concepts. [Knowledge] C.O. 2: Apply the concept of classes, objects and methods to solve problems. [Application] C.O. 3: Apply the concept of arrays and strings. [Application] C.O. 4: Implement inheritance and polymorphism in building secure applications. [Application] C.O. 5: Apply the concepts of interface and error handling mechanism. [Application]			
Course Content:				
Module 1	Basic Concepts of Programming and Java	Assignment	Data Collection/Interpretation	12 Sessions
Topics: Introduction to Principles of Programming: Process of Problem Solving, Java program structure, Download Eclipse IDE to run Java programs, Sample program, Data types, Identifiers, Variables, Constants in java, Operators, Assignments and Expression, Basic Input/ Output functions, Control Statements: Branching and Looping.				
Module 2	Classes, objects, methods and Constructors	Case studies / Case let	Case studies / Case let	12 Sessions
Topics: Classes, Objects and Methods: Introduction to object Oriented Principles, defining a class, adding data members and methods to the class, access specifiers, instantiating objects, reference variable, accessing class members and methods. Static Polymorphism: Method overloading, constructors, constructor overloading, this keyword, static keyword, Nested classes, Accessing members in nested classes.				
Module 3	Arrays, String and String buffer	Quiz	Case studies / Case let	14 Sessions
Topics: Arrays: Defining an Array, Initializing & Accessing Array, Multi–Dimensional Array, Array of objects. String: Creation & Operation. String builder class, methods in String Buffer.				
Module 4	Inheritance and Polymorphism	Quiz	Case studies / Case let	14 Sessions
Topics: Inheritance: Defining a subclass, Types of Inheritance, super keyword. Dynamic Polymorphism: Method overriding. Final keyword: with data members, with member functions and				

with class. Abstract keyword: with data members, with member functions and with class, Exception handling.

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

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

List of Laboratory Tasks:

P1 - Problem Solving using Basic Concepts.

P2 - Problem Solving using Basic Concepts and Command Line Arguments.

P3 - Programming assignment with class, objects, methods and Constructors.

P4 - Programming assignment with method overloading.

P5 - Programming assignment with constructor overloading.

P6 - Programming assignment with Static members and static methods.

P7 - Programming assignment with Nested classes.

P8 - Programming assignment using Arrays.

P9 - Programming assignment using Strings.

P10 - Programming assignment using String Builder.

P11 - Programming assignment using Inheritance and super keyword.

P12 - Programming assignment using Method overriding and Dynamic method invocation.

P13 - Programming assignment using Final keywords.

P14 - Programming assignment using Abstract keywords.

P15 - Programming assignment using Interface.

P16 - Programming assignment using Interface.

P17 - Programming assignment CharacterStream Classes

P18 - Programming assignment Read/Write Operations with File Channel

Targeted Application & Tools that can be used : JDK /eclipse IDE/ net Beans IDE.

Text Book

T1 Herbert Schildt, “The Complete Reference Java 2”, Tata McGraw Hill Education.

References

R1: Cay S Horstmann and Cary Gornell, “CORE JAVA volume I-Fundamentals”, Pearson

R2: James W. Cooper, “Java TM Design Patterns – A Tutorial”, Addison-Wesley Publishers. E book link R1: http://rmi.yaht.net/bookz/core.java/9780134177373-Vol-1.pdf E book link R2: Java(tm) Design Patterns: A Tutorial([PDF] [7qmsenjl97t0] (vdoc.pub) Web resources https://youtube.com/playlist?list=PLu0W_9lII9agS67Uits0UnJyrYiXhDS6q https://puniversity.informaticsglobal.com:2229/login.aspx
Topics relevant to the development of “Skill Development”: Static Polymorphism Method overloading, constructors constructor overloading this keyword static keyword and Inner classes Inheritance and Polymorphism. for Skill Development through Experiential Learning techniques. This is attained through the assessment component mentioned in the course handout.

ENG2001	Advanced English	L- T- P- C	1	0	2	2
Version No.	1.3					
Course Pre-requisites	ENG1002 Technical English					
Anti-requisites	NIL					
Course Description	The course emphasizes on technical communication at advanced level by 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 Out Come	On successful completion of the course the students shall be able to: Develop a critical and informed response reflectively, analytically, discursively, and creatively to their reading. Communicate effectively, creatively, accurately and appropriately in their writing. Deliver technical presentations Design resume and create professional portfolio to find a suitable career			
Course Content: Theory				
Module 1	Critical Reasoning and Writing	Writing Essays	Critical Reading	4 Classes
Topics: A Catalog of Reading Strategies The Myth of Multitasking A Guide to Writing Essays Speculating about Causes or Effects Is Google Making Us Stupid (Self Study)				
Module 2	Technical Presentation	Presentation	Oral Skills	3 Classes
Topics: Planning the presentation Creating the presentation Giving the presentation				
Module 3	Writing Reviews	Prezi	Review Writing	4 Classes
Topics: Review Writing Short film reviews Advanced English Grammar (Self Study)				
Module 4	Starting your Career	Online Writing Lab	Writing Skills	4 Classes

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

Level 1 – Annotation

Level 2 - Assumptions

Writing Narrative Essays

Level 1 – Draft 1

Level 2 – Draft 2

Module 2	Technical Presentation	10 Classes

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

Technical Group Presentation

Module 3	Writing Reviews	Classes

Practice Worksheets

Level 1 – Eliminating the Passive Voice

Level 2 – Simple, compound and complex sentences

Writing Short Film Reviews

Module 4	Starting your Career	Classes

Collaborative Project

Job search and writing report

Writing Resume

Module 1-4	Academic Journal	2 Classes

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

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

Johnson, Richard. (2010) Technical Communication Today. Pearson, 2015

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.

The Princeton Review. (2010) MCAT Verbal Reasoning & Writing. The Princeton Review, Inc.

https://www.hitbullseye.com/Strong-and-Weak-Arguments.php Accessed on 10 Dec 2021

https://www.inc.com/guides/how-to-improve-your-presentation-skills.html Accessed on 10 Dec 2021

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

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

Course Code: PPS1012	Course Title: Enhancing Personality through Soft Skills	L- T - P- C	0	0	2	1

	Type of Course: Practical Only Course					
Version No.	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 this course the students shall be able to: CO 1 Identify the stages of team formation (Remember) CO 2 Demonstrate effective presentation skills (Apply) CO3 Prepare professional social media profile (Apply)					
Course Content:						
Module 1	Team Building	Classroom and outbound team building activities.	6 Hours			
Topics: Importance of team, stages of Team Formation, Trust and collaboration, Virtual Team. Activity: Team Building outbound activity						
Module 2	Art of Questioning	Role plays	4 Sessions			

Topics: Framing Questions, 5W1H Technique, Open-ended and Close-ended questions, Funnel technique, Probing questions, Leading questions			
Module 3	Presentation Skills	Practice and evaluation of individual / group presentation	10 Sessions
Topics: Content development, Delivery techniques, Audience Analysis, Timing and Pacing, handling questions and challenges. Activity: Individual presentations and team presentation			
Module 4	Professional Brand Building	Brand Framework Activity	4 Sessions
Topics: Personal brand definition, Crafting a compelling LinkedIn profile, Networking strategies. Activity: Create a basic online profile			
Module 5	Recap / Revision /Feedback Session		1 Session
Targeted Application & Tools that can be used: TED Talks You Tube Links Activities			
Project work/Assignment: Mention the Type of Project /Assignment proposed for this course			
Presentation Evaluation			
Targeted Application & Tools that can be used: TED Talks YouTube Links Videos by L&D Team shared on Edhitch/YouTube.com LMS			

Assignments proposed for this course

Evaluation on Presentation

Assignment on LinkedIn Post

YouTube Links: https://youtu.be/z__jxoczNWc (Steve Jobs Introducing the iPhone 4 in June 2010)

References

"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

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

"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:

https://www.wordstream.com/blog/ws/2014/11/19/how-to-improve-presentation-skills

https://www.cbs.de/en/blog/15-effective-presentation-tips-to-improve-presentation-skills/

https://hbr.org/2022/05/the-art-of-asking-great-questions

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.

Course Code: EEE1007	Course Title: Basics of Electrical and Electronics Engineering. Type of Course: Engineering Science - Theory & Integrated Laboratory	L-T-P-C	3	0	2	4
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					

Course Description	This is a fundamental Course which is designed to know the use of basics of 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: Explain basic laws of Electrical Engineering to compute voltage, currents and other parameters in the circuits. Discuss various fundamental parameters appearing in the characteristics of semiconductor devices and their applications. Summarize the operations of different biasing configurations of BJTs and amplifiers. Summarizethe performance characteristics and applications of various electrical Machines. Demonstrate the working of electrical machines to observe performance characteristics Demonstrate the working of electronic circuits to obtain the V-I Characteristics of various semiconductor devices.			
Course Content:				
Module 1	Introduction to Electrical Circuits	Assignment/ Quiz	Numerical solving Task	10 Sessions
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 applications	Assignment/ Quiz	Memory Recall based Quizzes	11 Sessions
Mass Action Law, Charge densities in a semiconductor, Types of SC, Junction 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 Electrical Machines	Assignment/ Quiz	Memory Recall-based Quizzes	12 Sessions
Electrical Machines: Single phase transformers: principle of operation and EMF equation, Numerical examples. DC Motor: principle of operation, Back EMF, torque equation, Numerical examples. AC Motor: Principle operation of Induction Motors and its Applications. Special Machines: Introduction to special electrical machines and its applications.				
Module 4	Transistors and its Applications	Assignment/ Quiz	Numerical solving Task	12 Sessions
Transistor characteristics, Current components, BJT Configurations (CB, CC, CE configurations) and their current gains. Operating point, Biasing & stabilization techniques: Fixed Bias, Voltage divider bias and its stability factor and load line analysis. Single and multistage amplifier, Darlington pair. JFET (Construction, principal of Operation and Volt –Ampere characteristics). Pinch- off voltage, Comparison of BJT and FET. MOSFET (Construction, principal of Operation and symbol), MOSFET characteristics in Enhancement and Depletion modes.				
List of Laboratory Tasks: Experiment No 1: Verification of KVL and KCL for a given DC circuit. Level 1: Study and Verify KVL and KCL for the given electrical Circuit. Level 2: For the same circuit considered in level 1, perform the simulation using NI LabVIEW/Multisim/MATLAB. Experiment No 2: Analyse AC series circuits – RL, RC and RLC . Level 1: Conduct an experiment to perform and verify the impedance, current and power of Series RL and RC circuits Level 2: Experiment No 3: Calculation of power and power factor of the given AC Circuit. Level 1: Conduct an experiment to measure the power and power factor for given resistive load.				

Level 2: Conduct an experiment to measure the power and power factor for given inductive load.

Experiment No 4: Perform the experiments on given Transformer.

Level 1: Verify the EMF equation of a transformer and compute the voltage transformation ratio.

Level 2: Study the effect of load on the secondary side of the transformer and verify the EMF equation under load conditions.

Experiment 5: Load test on DC shunt motor

Level 1: Conduct load test on DC shunt motor and find its efficiency at different loads

Level 2:Conduct load test on DC shunt motor and plot the performance characteristics.

Experiment 6: Study of PN-Junction Diode Characteristics in Forward and Reverse Bias Conditions.

Level 1:Carry out an experiment to plot VI Characteristics and hence find the cut-in voltage on forward characteristics for the Silicon P-N Junction diode.

Level 2: Carry out an experiment to plot VI Characteristics of Zener diode and hence find the zener voltage 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 Zin input impedance and Zout 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):

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

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.

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

J. Millman, C. C. Halkias and C. D. Parikh, “Millman’s Integrated Electronics”, McGraw Hill Education, 2nd Edition.

Basics of Electrical & Electronics Laboratory Manual.

Reference Book (s):

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

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

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

A K. Maini, V. Agrawal, “Electronic Devices & Circuits”, Wiley, 2nd Edition

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

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

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

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

Seminar Topic: https://nptel.ac.in/courses/108/105/108105153/ “Electrical Measurements”

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

Video lectures on “Analog Electronics” by Prof. S.C. Dutta Roy, IIT Delhi https://nptel.ac.in/courses/108/102/108102095/

Video lectures on “Diodes”, by Prof.ChitralekhaMahanta, IIT Guwahati,

https://nptel.ac.in/courses/117/103/117103063/

“Introduction to Electrical Machines https://nptel.ac.in/courses/108/102/108102146/”

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

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

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

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 Developmentthrough Experiential Learning techniques. This is attained through assessment component mentioned in course plan.

Course Code: CSE1006	Course Title: Problem Solving using JAVA Type of Course: Integrated	L- T-P- C	1	0	4	3
Version No.	2.0					
Course Pre-requisites	CSE2200 – Problem Solving Using C					
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 Objective	The objective of the course is to familiarize the learners with the concepts of Problem-Solving using JAVA and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING techniques					
Course Out Comes	On successful completion of the course the students shall be able to: C.O. 1: Describe the basic programming concepts. [Knowledge] C.O. 2: Apply the concept of classes, objects and methods to solve problems. [Application] C.O. 3: Apply the concept of arrays and strings. [Application] C.O. 4: Implement inheritance and polymorphism building secure applications. [Application] C.O. 5: Apply the concepts of interface and error handling mechanism. [Application]					
Course Content:						
Module 1	Basic Concepts of Programming and Java	Assignment	Data Collection/Interpretation	12 Sessions		

Topics: Introduction to Principles of Programming: Process of Problem Solving, Java program structure, Download Eclipse IDE to run Java programs, Sample program, Data types, Identifiers, Variables, Constants in java, Operators, Assignments and Expression, Basic Input/ Output functions, Control Statements: Branching and Looping.				
Module 2	Classes, objects, methods and Constructors	Case studies / Case let	Case studies / Case let	12 Sessions
Topics: Classes, Objects and Methods: Introduction to object Oriented Principles, defining a class, adding data members and methods to the class, access specifiers, instantiating objects, reference variable, accessing class members and methods. Static Polymorphism: Method overloading, constructors, constructor overloading, this keyword, static keyword, Nested classes, Accessing members in nested classes.				
Module 3	Arrays, String and String buffer	Quiz	Case studies / Case let	14 Sessions
Topics: Arrays: Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array, Array of objects. String: Creation & Operation. String builder class, methods in String Buffer.				
Module 4	Inheritance and Polymorphism	Quiz	Case studies / Case let	14 Sessions
Topics: Inheritance: Defining a subclass, Types of Inheritance, super keyword. Dynamic Polymorphism: Method overriding. Final keyword: with data members, with member functions and with class. Abstract keyword: with data members, with member functions and with class, Exception handling.				
Module 5	Input & Output Operation in Java	Quiz	Case studies / Case let	14 Sessions
Input/output Operation in Java(java.io Package), Streams and the new I/O Capabilities, Understanding Streams, working with File Object, File I/O Basics, Reading and Writing to Files, Buffer and Buffer Management, Read/Write Operations with File Channel, Serializing Objects, Observer and Observable Interfaces.				
List of Laboratory Tasks: P1 - Problem Solving using Basic Concepts. P2 - Problem Solving using Basic Concepts and Command Line Arguments. P3 - Programming assignment with class, objects, methods and Constructors. P4 - Programming assignment with method overloading. P5 - Programming assignment with constructor overloading.				

P6 - Programming assignment with Static members and static methods.

P7 - Programming assignment with Nested classes.

P8 - Programming assignment using Arrays.

P9 - Programming assignment using Strings.

P10 - Programming assignment using String Builder.

P11 - Programming assignment using Inheritance and super keyword.

P12 - Programming assignment using Method overriding and Dynamic method invocation.

P13 - Programming assignment using Final keywords.

P14 - Programming assignment using Abstract keywords.

P15 - Programming assignment using Interface.

P16 - Programming assignment using Interface.

P17 - Programming assignment CharacterStream Classes

P18 - Programming assignment Read/Write Operations with File Channel

Targeted Application & Tools that can be used : JDK /eclipse IDE/ net Beans IDE.

Text Book

T1 Herbert Schildt, "The Complete Reference Java 2", Tata McGraw Hill Education.

References

R1: Cay S Horstmann and Cary Gornell, "CORE JAVA volume I-Fundamentals", Pearson

R2: James W. Cooper, "Java TM Design Patterns – A Tutorial", Addison-Wesley Publishers.

E book link R1: http://rmi.yaht.net/bookz/core.java/9780134177373-Vol-1.pdf

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

Web resources

https://youtube.com/playlist?list=PLu0W_9lII9agS67Uits0UnJyrYiXhDS6q

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

Topics relevant to development of "Skill Development":

Static Polymorphism

Method overloading, constructors

constructor overloading

this keyword

static keyword and Inner classes Inheritance and Polymorphism. for Skill Development through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.

Course Code: FRL1002	Course Title: Basic French Type of Course: Open Elective		L- T-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 the learners Employability skills by using participative learning techniques to develop students' language proficiency and cross-cultural competence by active and participatory teaching methods.			
Course Outcomes	On successful completion of the course the students shall be able to: Identify the basics of French Grammar, vocabulary and Conjugation Apply the basics strategies of listening, reading, speaking and writing skills Use of French on everyday topics such as greetings, personal information, time and schedule Practice conversations in French language with peer speakers in different situations			
Course Content:	Learning of Basic French skills			
Module 1	Greetings and Introducing yourself		[Remember]	6 Periods

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 1st group

Usage of audio visual files

Module 2	Expressing likes/dislikes and introducing someone		[Apply]	6 Periods

Chapter 3. Expressing likes and dislikes

Objectives: How to expressing what you like and dislike.

Grammar: Negative form, singular and plural.

Culture: The polite way to address people in French

Assignment

Chapter 4. Introducing someone

Objectives: How to describe someone,

Grammar: Vocabulary of the family, Demonstrative adjectives,

Present tense of verbs of the 2nd and 3rd 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

Course Code: ECE2010	Course Title: Innovative Projects using Arduino	L- T-P- C	-	-	-	1
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course is designed to provide an in-depth understanding of Arduino microcontrollers and their application in various real time projects involving sensors. Throughout the course, students will learn the fundamentals of Arduino programming and gain hands-on experience with a wide range of sensors. Students will explore how to connect and 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 Objective	The objective of the course is Employability Skills of student by using PARTICIPATIVE LEARNING techniques.					
Course Outcomes	On successful completion of the course the students shall be able to Explain the main features of the Arduino prototype board Demonstrate the hardware interfacing of the peripherals to Arduino system. Understand the types of sensors and its functions 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: Introduction to Arduino, Pin configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board, API's , Introduction to Embedded C and Arduino platform, Arduino Datatypes and variables, Arduino i/o Functions, Arduino Communications, Arduino IDE, Various Cloud Platforms.						
Module 2	Sensory Devices	Hands-on	Interfacing Task and Analysis	4 Sessions		

Arduino Sensors: Humidity Sensor, Temperature Sensor, Water Detector / Sensor, PIR Sensor, Ultrasonic Sensor, Connecting Switches and actuators, sensor interface with Arduino.

Introduction to 3D Printer: 3D Printer technology and its working Principles, Applications.
Introduction to online Simulators: Working with Tinkercad Simulator.

Topics: Types of 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. Presidency University Library Link .

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.):

Arduino trending Projects < https://www. https://projecthub.arduino.cc/>

Introduction to Arduino < https://onlinecourses.swayam2.ac.in/aic20_sp04/preview>

Case studies on Wearable technology< https://www.hticiitm.org/wearables>

E-content:

Cattle Health Monitoring System Using Arduino and IOT (April 2021| IJIRT | Volume 7 Issue 11 | ISSN: 2349-6002)

M H Hemanth Kumar, Ravi Pratap Singh, Nishu Sharma, Pragya Singh” IOT BASED SMART SECURITY SYSTEM USING ARDUINO” 2021 JETIR August 2021, Volume 8, Issue 8.

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.

Yaser S Shaheen,Hussam., " Arduino Mega Based Smart Traffic Control System ," December 2021 Asian Journal of Advanced Research and Reports 15(12): 43-52, 2021(15(12): 43-52, 2021):15(12): 43-52, 2021.

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

Course Code: MAT2010	Course Title: Integral Transforms and Partial Differential Equations Type of Course:1] School Core	L-T- P- C	3	0	0	3

Version No.		1.0
Course Pre-requisites		Calculus and Differential Equations
Anti-requisites		NIL
Course Description		This course aims to introduce various transform techniques such as Laplace transform, Fourier transform and Z-transform in addition to expressing functions in terms of Fourier series. The course covers applications of Laplace transform to LCR circuits and solutions of different equations using Z-transform. The course also deals with the analytical methods for solving partial differential equations and the classical applications of partial differential equations.
Course Objective		The objective of the course is to familiarize the learners with the concepts of "Transform Techniques, Partial Differential Equations" and attain Skill Development through Problem Solving Techniques.
Course Out Comes		On successful completion of the course the students shall be able to: CO1 - Express functions in terms of uniformly convergent Fourier series. CO2 - Apply Laplace transform technique to solve differential equations. CO3 - Employ Z-transform techniques to solve difference equations. CO4 - Solve a variety of partial differential equations analytically.
Course Content:		

Module 1	Laplace Transforms		(12 Classes)
Definition and Laplace transform of elementary functions. Properties of Laplace transform, and Laplace transform of periodic function, unit-step function and Impulse function – related problems. Inverse Laplace transform of standard functions - problems, initial and final value theorem. Convolution theorem, solution of linear and simultaneous differential equations and LCR Circuit.			
Module 2	Fourier Series	Assignment	(8 Classes)
Fourier Series: Periodic functions, Dirichlet's condition. Fourier series of periodic functions period 2π and arbitrary period. Half range Fourier series. Practical harmonic analysis.			
Module 3	Fourier Transforms and Z - Transforms		(13 Classes)

Fourier Transforms: Definitions, infinite Fourier transforms, Fourier sine and cosine transforms, inverse Fourier 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	Assignment	(12 Classes)

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 q = R.

Applications of PDE: Derivation of one-dimensional wave and heat equations. Various possible solutions of these by the method of separation of variables. D'Alembert's solution of wave equation. Two-dimensional Laplace's equation – various possible solutions. Solution of all these equations with specified boundary conditions (Boundary value problems).

Targeted Application & Tools that can be used:

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

Assignment:

Newton-Raphson Methods, Gauss-Seidel Method, LU Decomposition, Trapezoidal Rule, Simpson's rule, Runge-Kutta 4th Order.

Text Book

Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition

B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.

References:

Victor Henner, Tatyana Belozerova, Mickhail Khenner, Ordinary and Partial Differential Equations, CRC Press, Edition, 2013.

Walter Ledermann, Multiple integrals, Springer, 1st edition

E-resources/ Web links:

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&uniq ue_id=EBSCO95_30102024_140238

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&uniq ue_id=EBSCO95_30102024_233298

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_204892

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_246791

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_223548

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_134719

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_32614

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

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

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: CBC2000
Course Title: Foundations of Blockchain Technology
L:T:P:C – 3:0:0:3

Course Description

This course introduces the foundational principles of blockchain technology, its architecture, components, and applications. It explores the working of distributed ledgers, cryptographic fundamentals, consensus algorithms, and the structure of cryptocurrencies and smart contracts.

Course Objectives

— Understand the fundamentals of distributed ledger technology
— Explore cryptographic primitives used in blockchain systems
— Explain consensus algorithms and their roles in decentralized networks
— Analyze the architecture and components of blockchain platforms
— Examine blockchain applications across industries

Course Outcomes

CO1 (Understand): Describe the architecture and components of blockchain technology
CO2 (Understand): Explain cryptographic techniques and consensus mechanisms in blockchain

CO3 (Apply): Demonstrate the creation and validation of transactions and blocks
CO4 (Analyze): Compare various blockchain platforms and their real-world applications

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Course Content (45 Hours Total)

Module 1: Introduction to Blockchain Technology – 10 Sessions
History of blockchain, Evolution from Bitcoin to Web3, Distributed ledger technology, Key characteristics: immutability, transparency, trust, Use cases and applications

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Module 2: Cryptography and Blockchain – 12 Sessions
Hash functions (SHA-256), Digital signatures, Merkle trees, Public and private key cryptography, Wallets and addresses, Transaction lifecycle

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Module 3: Consensus Mechanisms – 11 Sessions
Consensus overview, Proof-of-Work (PoW), Proof-of-Stake (PoS), Practical Byzantine Fault Tolerance (PBFT), Delegated Proof of Stake (DPoS), Comparison of consensus algorithms

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Module 4: Blockchain Platforms and Applications – 12 Sessions
Bitcoin overview, Ethereum overview, Permissioned vs permissionless blockchains, Hyperledger Fabric basics, Smart contracts, Blockchain in finance, healthcare, and supply chain

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Textbooks
T1: Narayanan et al., *Bitcoin and Cryptocurrency Technologies*, Princeton University Press
T2: Imran Bashir, *Mastering Blockchain*, Packt Publishing, 3rd Edition, 2020

Reference Books
R1: Antonopoulos, *Mastering Bitcoin*, O'Reilly Media
R2: Arvind Narayanan et al., *Introduction to Cryptography and Blockchain*, Princeton Press
R3: Don Tapscott & Alex Tapscott, *Blockchain Revolution*, Portfolio
R4: Josh Thompson, *Blockchain Basics*, CreateSpace

Web Resources
W1: https://blockgeeks.com
W2: https://ethereum.org
W3: https://bitcoin.org
W4: https://hyperledger.org
W5: https://web3.foundation

Course Code: CSE2502	**Course Title: Operating Systems** **Type of Course: Program Core and Theory Only**	**L-T- P- C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CSE2200- Computer Organization, Problem solving using C Students should have basic knowledge on computers, computer software & hardware, andComputer Organization. Prior programming experience in C is recommended.					
Anti-requisites	**NIL**					
Course Description	This course introduces the concepts of operating system operations, operating system structure and its design and implementation. It covers the classical operating systems internal algorithms such as process scheduling, synchronization, deadlocks detection and recovery and memory management. The course also enhances the problem solving, systemsprogramming ability and case studies.					
Course Object	The objective of the course is to familiarize the learners with the concepts of OperatingSystems and attain **Employability** through **Problem Solving** Methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: Describe the fundamental concepts of operating Systems and case studies.[**Knowledge**] 2] Demonstrate various CPU scheduling algorithms. .[**Application**] Apply various tools to handle synchronization problems.[**Application**]4] Demonstrate deadlock detection and recovery methods **[Application]** 5] Illustrate various memory management techniques.[**Application**]					
Course Content:						
Module 1	Introduction to Operating System	Assignment	Programming		**9 Hours**	
Topics: Introduction to OS , Operating-System Operations, Operating System Services, , System Calls and its types, Operating System Structure, System Program and its types, Linkers and Loaders, Overview of OS design and implementation, Open-source operating system						

Module 2	Process Management	Assignment/Case Study	Programming/Simulation	**11 Hours**

Topics:

Process Concept, Operations on Processes, Inter Process Communication, Communication in client-server systems (sockets, RPC, Pipes), Introduction to threads - Multithreading Models, Thread Libraries, Threading Issues, Process Scheduling– Basic concepts, Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, SRTF, RR and Priority.

Module 3	Process Synchronization and Deadlocks	Assignment	Programming	**11 Hours**

Topics:

The Critical-Section Problem- Peterson's Solution, Synchronization hardware, Semaphores, Classic Problems of Synchronization with Semaphore Solution- Producer-Consumer Problem, Reader-Writer problems, Dining Philosopher's Problem, . Introduction to Deadlocks, Necessary conditions for deadlock, Resource allocation Graph, Methods for handling deadlock: Deadlock Prevention and Implementation, Deadlock Avoidance and

Implementation, Deadlock detection & Recovery from Deadlock.

Module 4	Memory Management	Assignment	Programming/Simulation	**10 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:

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

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

Project work/Assignment
1. **Demonstrate process concepts in LINUX OS.** 2. **Simulation of CPU scheduling algorithms.** 3. **Develop program to demonstrate use of Semaphores in threads.** 4. **Develop program to demonstrate use of deadlock avoidance algorithms.** 5. **Develop program to demonstrate use of page replacement algorithms.** 6. **Simulation of memory allocation strategies [first fit, best fit and worst fit].**
Text Book 1. Silberschatz A, Galvin P B and Gagne G , "Silberschatz's Operating System Concepts", Paperback, Global Edition Wiley, 2019 2.
References 1. Silberschatz A, Galvin P B and Gagne G, "Operating System Concepts", 10th edition Wiley, 2018. 2. William Stallings, "Operating Systems",Ninth Edition, By Pearson Paperback ,1 March 2018. 3. Sundaram RMD, Shriram K V, Abhishek S N, B Chella Prabha, " Cracking the Operating System skills",Dreamtech, paperback, 2020 4. Remzi H. Arpaci-Dusseau Andrea C. Arpaci-dusseau , "Operating Systems: Three Easy Pieces, Amazon digital Services", September 2018. **E-resources/Weblinks** 5. https://www.os-book.com/OS9/ 6. https://pages.cs.wisc.edu/~remzi/OSTEP/ 7. https://codex.cs.yale.edu/avi/os-book/OS10/index.html

Course Code: CSE1508	**Course Title:** Data Structures **Type of Course: Theory**	**L-T- P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	NIL					
Course Description	This course 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 Objective	The objective of the course is SKILL DEVELOPMENT of student by using EXPERIENTIAL LEARNING techniques					

Course Code: CSE1506	**Course Title: Data Communications and Computer Networks** **Type of Course: Theory & Integrated Laboratory**	**L-T- P- C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	**ECE2007 - Digital Design**					
Anti-requisites	**NIL**					
Course Description	**The objective of this course is to provide knowledge in data communications and computer networks, its organization and its implementation, and gain practical experience in the installation, monitoring, and troubleshooting of LAN systems.**					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Data Communications and Computer Networks and attain **Employability** through **Problem Solving** Methodologies.					
Course Outcomes	**On successful completion of this course, the students shall be able to:** **CO1**: Illustrate The Basic Concepts Of Data Communication And Computer Networks. (Apply) **CO2:** Analyze the functionalities of the Data Link Layer. (Analyse) **CO3**: Apply the Knowledge of IP Addressing and Routing Mechanisms in Computer Networks.(Apply) **CO4:** Demonstrate the working principles of the Transport layer and Application Layer. (Apply)					
Course Content:						
Module 1	**Introduction and Physical layer-CO1**	Assignments	Problem Solving			**17 Sessions (L9 + P8)**

Introduction to Computer Networks and Data communications, Network Components – Topologies, Transmission Media –Reference Models - TCP/IP Suite, OSI Model .

Physical Layer -Analog and Digital Signals – Digital and Analog Signals – Transmission - Multiplexing and Spread Spectrum.

Module 2 **Module 5**	**Data Link Layer –CO2** **Searching &**	Assignments	Problem Solving Program activity	**20 Sessions (L12 + P08)** **6 Hours**
Data Link Layer - Error Detection and Correction– Parity, CRC, Hamming Distance Flow Control and Error Control, Stop and Wait, Multiple Access Protocols, CSMA/CD,CSMA/CA **Topic: Sorting & Searching** - Sequential and Binary Search, Sorting – Selection and Insertion sort, Quick sort, Merge Sort, Bubble sort **List of Laboratory Tasks:**				
Module 3	**Network Layer –CO3**	Assignments	Problem Solving	**21 Sessions (L13 + P8)**
Network Layer Services - Network Layer Services, Switching Techniques, IP Addressing methods- IPv4 IPV6 – Subnetting. Routing, - Distance Vector Routing, Link State Routing, RIP, OSPF, BGPV4.				
Level 2: Progr **Module 4** **Lab sheet -2**	**Transport and Application Layer - CO4**	Assignments	Problem Solving	**17 Sessions (L11 + P6)**
Transport Layers - Connection management – Flow control-Sliding Window, Go-Back N ARQ, Selective Repeat ARQ, UDP, TCP, congestion control, Congestion avoidance The Application Layer: Domain Name System (DNS), Domain Name Space, FTP, Electronic Mail (SMTP), HTTP.				

Targeted Application & Tools that can be used:

Cisco Packet Tracer, Wireshark, and NS2 Simulator.

Project work/Assignment: Choose and analyse a network from any organization/Assignment proposed for this course in CO1-CO4

Level 1: Programming on Stack application – Evaluation of postfix

Topics related to

1. Problem Solving: Choose and appropriate devices and implement various network concepts.

2. Employability: Simulation of any network using Cisco Packet Tracer/NS2.

Lab sheet -6

Textbook(s):

T1. Behrouz A. Forouzan, "Data Communications and Networking with TCP/IP Protocol Suite", 6th Edition, Tata McGraw-Hill, 2022.

T2. Andrew S Tanenbaum, Nick Feamster & David J Wetherall, "Computer Networks" Sixth Edition, Pearson Publication, 2022.

References

1. **R1. "Computer Networking: A Top-Down Approach", Eighth Edition, James F. Kurose, Keith W. Ross, Pearson publication, 2021.**

2. **R2. William Stallings, Data and Computer Communication, 8th Edition, Pearson Education, 2007.**

R3. Behrouz A. Forouzan, "Data Communications and Networking 5E", 5th Edition, Tata McGraw-Hill, 2012

E-Resources:

1. https://www.geeksforgeeks.org/what-is-spread-spectrum/
2. https://www.geeksforgeeks.org/difference-between-fdma-tdma-and-cdma/
3. https://archive.nptel.ac.in/courses/106/105/106105183/
4. http://www.nptelvideos.com/course.php?id=393
5. https://www.digimat.in/keyword/106.htmlhttps://puniversity.informaticsglobal.com/login

Level 1: Program to Construct Binary Search Tree and Graph

Level 2: Program to traverse the Binary Search Tree in three ways)in-order, pre-order and post-order(and implement BFS and DFS

Lab sheet -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

Level 1: Program to Implement and Estimate the Time complexity of 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:

5. For theory :https://onlinecourses.nptel.ac.in/noc20_cs85/preview
6. https://puniversity.informaticsglobal.com/login

Topics relevant to development of "Skill Development":

Linked list and stacks

Topics relevant to development of "Environment and sustainability: Queues

Course Code: CSE1500	**Course Title: Computational Thinking using Python** **Type of Course: Engineering Science Theory Integrated**	**L-T-P-C**	2	0	0	2

Version No.	1.0
Course Pre-requisites	•
Anti-requisites	NIL
Course Description	The course efficiently introduces fundamental ideas including conditionals, loops, functions, lists, strings, and tuples through some inspiring examples. It then discusses dynamic programming like handling exceptions and file usage. In terms of data structures, the course covers Python dictionaries, classes, and objects for constructing user-defined datatypes like linear and binary search.
Course Object	The objective of the course is to familiarize the learners with the concepts of **Computational Thinking using Python** and attain **Skill Development** through **Participative Learning** techniques.
Course Out Comes	On successful completion of the course the students shall be able to: 1) Describe algorithmic solutions for basic computing issues.. (Understand) 2) Explain data types and operators. (Understand) 3) Demonstrate control structures and Functions. (Apply) 4) Apply the data structures for the given data. (Apply) 5) Demonstrate the file operations. (Apply)
Course Content:	

Module 1	**Computational Thinking And Problem Solving**	Assignment		Programming	**6 Sessions**

Topics:

Fundamentals of Computing– Identification of Computational Problems Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi

Module 2	**Datatypes, Expressions, Statements**	Assignment		Programming	**6 Sessions**

Topics:

Python interpreter and interactive mode,debugging; values and types: int, float, boolean, string , and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

Module 3	**Control flow, Functions, Strings**	Assignment		Programming	**6 Sessions**

Topics:

Conditionals:Boolean values and operators, conditional (if), alternative (if else),chained conditional (if-elif-else);Iteration: state, while, for, break, continue, pass; Fruitful functions: return values,parameters, local and global scope, function composition, recursion; Strings: string slices,immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

Module 4	**Lists, Tuples, Dictionaries**	Assignment		Programming	**6 Sessions**

Topics:

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing- list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

Module 5	**Files**	Assignment		Programming	**6 Sessions**

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

Project work/Assignment:

2. **Assignment 1 on (Module 1 and Module 2)**
3. **Assignment 2 on (Module 3 and Module 4 & 5)**

Course Code: ECE2022	**Course Title:** Digital Design **Type of Course:** ESC	**L- T-P- C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites	[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.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Digital Design and attain the SKILL DEVELOPMENT through EXPERIENTIAL LEARNING.					
Course Outcomes	On successful completion of this course the students shall be able to: i. Describe the concepts of number systems, Boolean algebra and logic gates. ii. Apply minimization techniques to simplify Boolean expressions. iii. Demonstrate the Combinational circuits for a given logic iv. Demonstrate the Sequential and programmable logic circuits					
Course Content:	**Topics relevant to development of "Employability":** Data structures using python. **Topics relevant to "PROFESSIONAL ETHICS":** Naming and coding convention for simple programs using python.					

Module 1	Fundamentals of Number systems- Boolean algebra and digital logic	Application Assignment	Data Analysis task	06 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 Analysis task	08 Classes

Topics:

Introduction to Combinational circuits, Analysis, Design procedure, Binary Adder and Subtractor, Magnitude comparator, Parity generator and checker, Multiplexers-Demultiplexers, Decoders, Encoders and Priority Encoders, HDL Models of combinational circuits.

Module 3	Combinational Logic circuits:	Application Assignment	Programming Task & Data Analysis task	08 Classes

Topics:

Text Book

1) Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021
2) Eric Matthes, Python Crash Course,: A Hands-On, Project-Based Introduction to Programming, 3rd Edition, 2023

References

1.Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.

2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

Web Resources

W1. https://onlinecourses.nptel.ac.in/noc20_cs70/preview

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.

Targeted Application & Tools that can be used:
Digital electronics is the foundation of all modern electronic devices such as cellular phones, MP3 players, laptop computers, digital cameras, high definition televisions, Home Automation, Communication in systems in industries Professionally Used Software: HDL/VHDL/Verilog HDL/ OOPS

Text Book(s):

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

Reference(s):

Reference Book(s):

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

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

Edition

Online Resources (e-books, notes, ppts, video lectures etc.): Book Free Download (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- NPTEL :: Electrical Engineering - NOC:Digital Electronic Circuits
5. Digital Logic Design PPT Slide 1 (iare.ac.in)
6. Lab Tutorial: Multisim Tutorial for Digital Circuits - Bing video 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.

Course Code: CSE1509	**Course Title:** Data Structures Lab **Type of Course:Lab**	**L-T- P-C**	0	0	4	2
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	NIL					
Course Description	This course 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 Objective	The objective of the course is SKILL DEVELOPMENT of student by using EXPERIENTIAL LEARNING 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:						
Module 1	**Introduction to Data Structure and Linear Data Structure – Stacks and Queues**	Assignment	Program activity		**9 Hours**	

Introduction –Introduction to Data Structures, Types and concept of Arrays **.**

Stack -Concepts and representation, Stack operations, stack implementation using array and Applications of Stack**.**

Queues -Representation of queue, Queue Operations, Queue implementation using array, Types of Queue and Applications of Queue**.**

Module 2	**Linear Data Structure -Linked List**	Assignment	Program activity	**12 Hours**

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 activity	**12 Hours**

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.

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 objects

Level 2: Programming Exercises on fundamental Data structure - Arrays based on Scenario.

Lab sheet -2

Level 1: Programming Exercises on Stack and its operations

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

Lab sheet -3

Level 1: Programming on Stack application infix to postfix Conversion

Level 2: -

Lab sheet -4

Level 1: Programming 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 post-order(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

Level 1: Program to Implement and Estimate the Time complexity of 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:

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

Topics relevant to development of "Skill Development":

Linked list and stacks
Topics relevant to development of "Environment and sustainability: Queues

Course Code: CSE1501	Course Title: Computational Thinking using Python Lab	L-T-P-C				

	Type of Course: Engineering Science Laboratory Integrated		0	0	4	2

Version No.		1.0
Course Pre-requisites	•	•
Anti-requisites		NIL
Course Description		The course efficiently introduces fundamental ideas and practical knowledge including control structures, functions, and tuples through hands on sessions. It also introduces dynamic programming like handling exceptions and file operations. The course covers Python dictionaries, classes, and objects for creating user-defined datatypes, such binary search, in terms of data structures.
Course Object		The objective of the course is to familiarize the learners with the concepts of **Computational Thinking using Python Lab** and attain **Skill Development** through **Experiential Learning** techniques.
Course Out Comes		On successful completion of the course the students shall be able to: 6) Explain algorithms to solve fundamental computational problem. (Understand) 7) Illustrate the use of different data types and operators in Python. (Apply) 8) Demonstrate conditionals, loops, and functions to address problem-solving tasks. (Apply) 9) Utilize appropriate data structures to efficiently manage and process data. (Apply) 10) Perform file handling tasks such as reading, writing, and modifying files in Python.. (Apply)
Course Content:		

Module 1	**Computational Thinking And Problem Solving**	Assignment		Programming	**6 Sessions**

Lab sheet :

Introduction to Python Programming.

Demonstration of Colabs or Jupiter environment.

Demonstrate Input function.

Demonstrate int method.

Demonstrate data types

	Demonstrate operators. **Demonstrate simple programs for python environment.** **Python program that takes an integer input and calculates the sum of its digits.**

Module 2	**Datatypes, Expressions, Statements**	Assignment		Programming	**14 Sessions**

Topics:

Python program to count the number of times a given character appears in a string.

Python program to identify the data types of given variables.

A grocery store needs a billing system, write a python program that calculates the total bill amount based on the price of individual items and their quantities.

A car rental company wants to calculate the mileage (km per liter) for different vehicles based on distance traveled and fuel consumed. Write a Python program to calculate the mileage.

A company wants to calculate the net salary of an employee after deducting tax (10%) and provident fund (5%) from the gross salary. Write a Python program to calculate net salary.

In a student grading system where the final grade depends on whether the student has passed both the written and practical exams. You need to check if the student has passed based on certain conditions:

- **The student must score at least 40 in the written exam.**
- **The student must score at least 50 in the practical exam.**
- **The student must have attended at least 75% of the classes**

Write a Python program to check if a person is eligible to vote. The criteria are:

- **The person must be at least 18 years old.**
- **The person should be a citizen of the country.**

Write a Python program to classify a person into age groups:

- **Child: 0 to 12 years**
- **Teenager: 13 to 19 years**
- **Adult: 20 years and above**

A user authentication system that checks if the user is authorized based on certain conditions, like having a correct password and being over the age of 18. Write a Python program for the above scenario.

In a student registration system, a student must meet certain criteria to be eligible for course registration:

- **The student must have a GPA of 3.0 or above.**
- **The student must have completed the prerequisite course (True/False).**

Module 3	**Control flow, Functions, Strings**	Assignment		Programming	**16 Sessions**

<u>Lab Sheet:</u>

An e-commerce store that offers discounts based on the following criteria:

- **The customer must be a loyal customer (i.e., True).**
- **The total purchase amount must be greater than $100.**

Python program to print the Fibonacci sequence up to n terms

Python program to print the Fibonacci sequence up to n terms using Recursion.

Apply slicing on the given data or dictionary.

Python Programs to create array and print the array.

Python program to check if a given number is an Armstrong number. An Armstrong number for a 3-digit number is one where the sum of the cubes of its digits is equal to the number itself.

The media platform wants to count the number of words in user-submitted posts to enforce character limits or to analyze the length of posts. .

In a bookstore inventory system, You need to implement a feature that checks if a book title is a palindrome. The bookstore wants to offer special discounts for books with titles that are palindromes. You need to create a Python function that reads the book title and determines if it's a palindrome.

In a library management system. The library has a database of books identified by unique numbers (IDs). The library staff wants to apply a special offer to books whose IDs are prime numbers. You need to create a Python program that finds all prime numbers between a given range of book IDs.

In a school management system that stores the marks of students for each subject. You are asked to compute the average marks of a student to evaluate their overall performance.

Course Code: CSE2251	**Course Title: Data Communication and Computer Networks Lab**	**L-T-P-C**	0	0	2	1
	Type of Course: Lab					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This lab course is to get practical knowledge of working principles of various communication protocols. Analyse structure and formats of TCP/IP layer protocols using network tools such as Wireshark and network simulators. Implementing various network algorithms such as error control, error detection, routing, and security related algorithms.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Computer Networks and attain Skill Development through Participative Learning techniques					
Course Out Comes	On successful completion of the course the students shall be able to: • To understand the working principle of various communication protocols. • To understand the network simulator environment and visualize a network topology and observe its performance. • To analyze the traffic flow and the contents of protocol frames. • To analyze data flow in wired and wireless environment					
Course Content						
Module 1	**Introduction to Computer Networks**					**7 Sessions**
Learn to use commands like tcpdump, netstat, ifconfig, nslookup, ARP, NbtStat-n, Route, GETMAC, SYSTEMINFO and traceroute – Capture ping and traceroute PDUs using a network protocol analyzer and examine - Configuration and logging to a CISCO Router and introduction to the basic user Interfaces. Introduction to the basic router configuration and basic commands.						
Module 2	**Physical And Data Link Layer**					**8 Sessions**
Configuration of IP addressing for a given scenario for a given set of topologie – Connecting devise – Configuration of Hub, Router, Switch and Repeaters using cisco packet tracer- Configure the privilege level password and user authentication in switch.						
Module 3	**Network Layer** **Transport Layer**					**7 Sesions**
Configure the DHCP Server and wireless router and check the connectivity - Configure the static routing using cisco packet tracer- Configure the Dynamic Routing routing (RIP Routing) using cisco packet tracer						

Module 4	**A tuple stores 1 Application Layer and Security in Computer Networks** • **Display** • **Find fli** • **Access t**	**Flight Number, Destination, Duration). Write a prog m to:** **ration of more than 3 hours.** **n of a specific flight.**	Assignment	Problem Solving	**08 Classes**

Configure the Static NAT using cisco packet tracer - Configure the Dynamic NAT using cisco packet tracer. - Configure the DNS Server using cisco packet tracer - Configure the telnet protocol using cisco packet tracer - Wireshark Tool - Three Node Point To Point Network Using NS2 Simulator - Transmission of Ping Message Using NS2 Simulator - Ethernet LAN Using N-Nodes Using NS2 Simulator - Ethernet LAN Using N-Nodes With Multiple Traffic

- **Sort items by price in ascending order.**

Targeted Application & Tools that can be used: Cisco Packet Tracer, Wireshark, NS2

Case Study/Assignment: Assignment proposed for this course in CO1-CO4

1. Assume that a computer sends a frame at the transport layer to another computer and the destination port address is not running. According to what you read from chapter 2, what will happen to that process?

- **D**

2. Determine the possible bit rate and the number of levels over a channel for these cases? a. B = 2.4K Hz, noiseless channel with L = 16. b. B= 2.4K Hz, SNR = 20 dB. c. B = 3.0K Hz, SNR = 40 db.

3. Using CISCO Packet Tracer Configuring Static and Default Routes

Objectives

- Configure static routes on each router to allow communication between all clients.
- Test connectivity to ensure that each device can fully communicate with all other devices.

4. Getting familiar with Wireshark software by installing it I your system, and perform following task:

1. List out the packets which are having DNS protocols
2. List of IP address present in the cache along with its MAC addresses
3. Display all the packets which are having the DNS or HTTP protocol

Module 5

5. 6. Problem Solving: Choose and appropriate devices and implement various network concepts.

Text Book

1. CCNA Routing and Switching Study Guide – Todd Lammle, 2013, Sybex.
2. Wireshark Network Analysis: The Official Wireshark Certified Network Analyst Study Guide – Laura Chappell, 2012, Wireshark University.
3. Computer Network Simulation Using NS2 – Ajit Kumar Nayak, Rajlaxmi Rai, Rakesh Mall, 2020, Routledge.

References

R1: Alberto Leon-Garcia and IndraWidjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.

R2: William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.

R3: "Computer Networking: A Top-Down Approach" – James F. Kurose and Keith W. Ross, 7th Edition, 2016, Pearson.

Web Based Resources and E-books:

W1: https://gaia.cs.umass.edu/kurose_ross/wireshark.php

W2: https://www.youtube.com/watch?v=x7EJSY0bOK4&ab_channel=ChrisGreer

W3: https://tutorials.ptnetacad.net/

Topics relevant to "SKILL DEVELOPMENT":

Application Layer, Transport Layer, Network Laryer for **Skill development** through **Participative Learning t**echniques. This is attained through the assessment component mentioned in the course handout.

~~**5. Assignment 2 on (Module 3 and Module 4 & 5)**~~

Text Book

1Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021

2)Eric Matthes, Python Crash Course,: A Hands-On, Project-Based Introduction to Programming, 3rd Edition, 2023

References

1.Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.

2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

Web Resources

W2. https://onlinecourses.nptel.ac.in/noc20_cs70/preview
W3. https://onlinecourses.swayam2.ac.in/cec23_cs02/preview
W4. https://www.coursera.org/learn/ai-python-for-beginners

	Topics relevant to development of "Employability": Data structures using python. **Topics relevant to "PROFESSIONAL ETHICS":** Naming and coding convention for simple programs using python.

Course Code: **MAT2064**	**Course Title: Numerical Computing** **Type of Course:1] School Core**	**L-T- P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	Calculus, Linear Algebra, Differential Equations					
Anti-requisites	**NIL**					
Course Description	The course explores mathematical techniques used to approximate solutions to complex problems that are difficult to solve analytically, often utilizing computers to perform calculations, including methods for root finding, interpolation, numerical differentiation and integration, solving systems of linear equations, and approximating solutions to differential equations, with applications across various scientific and engineering fields. It focuses on understanding the theoretical basis behind these methods, their implementation in programming languages, and analyzing their accuracy and stability.					
Course Objective	The objective of the course is to equip students with understanding and ability to apply various numerical techniques to approximate solutions to complex mathematical problems that are difficult or impossible to solve analytically, particularly focusing on areas like solving systems of equations, finding roots of functions, interpolation, numerical differentiation, and integration, often utilizing computational tools to implement these methods.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1 - Calculate errors induced in the values by truncation of a series expansion. CO2 - Demonstrate the applications of numerical methods to find the roots of polynomial equations and eigen values of real symmetric matrices. CO3 - Apply the knowledge of numerical methods in modelling of various physical and engineering phenomena.					

Course Code: MAT2013	**Course Title: Discrete Mathematics** **Type of Course:1] School Core**	**L-T- P- C**	**4**	**0**	**0**	**4**
Version No.	1.0					
Course Pre-requisites	Linear Algebra					
Anti-requisites	NIL					
Course Description	The course explores the study of mathematical structures that are fundamentally discrete (not continuous), focusing on concepts like set theory, logic, graph theory, 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, functions, counting 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 particular set of mathematical facts and how to apply them. It teaches students how to think logically and mathematically through five important themes: mathematical reasoning, combinatorial analysis, discrete structures, algorithmic thinking, and applications and modeling. A successful discrete mathematics course should carefully blend and balance all five themes.					
Course Outcomes	On successful completion of the course the students shall be able to: CO1 - Explain logical sentences through predicates, quantifiers and logical connectives. CO2 - Deploy the counting techniques to tackle combinatorial problems CO3 - Comprehend the basic principles of set theory and different types of relations. CO4 - Apply different types of structures of trees for developing programming skills					
Course Content:						
Module 1	**Fundamentals of Logic**					**(10 Classes)**
Basic Connectives and Truth Tables, Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.						
Module 2	**Principle of Counting**		**Assignment**			**(15 Classes)**
The Well Ordering Principle – Mathematical Induction						

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 Principle, Derangements – Nothing is in its Right Place, Rook Polynomials.

Text Book

Module 3	**Relations and Functions**		**(10 Classes)**

Cartesian Products and Relations, Functions, One-to-One, Onto Functions. The Pigeon-hole Principle, Function Composition and Inverse Functions.

Relations, Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders, Lattice, Hasse Diagrams, Equivalence Relations and Partitions.

Module 4	**Recurrence Relations and Generating Functions**		**(10 Classes)**

Homogeneous and inhomogeneous recurrences and their solutions - solving recurrences using generating functions - Repertoire method - Perturbation method - Convolutions - simple manipulations and tricks.

Module 5	**Graph Theory & Algorithms on Networks**	**Assignment**	**(15 Classes)**

Definitions and basic results - Representation of a graph by a matrix and adjacency list - Trees - Cycles - Properties - Paths and connectedness - Sub graphs - Graph Isomorphism - Operations on graphs - Vertex and edge cuts - Vertex and edge connectivity, Euler and Hamilton Paths, Shortest-Paths.

Tree - Definitions, Properties, and Examples, Routed Trees, Binary search tree, Decision tree, spanning tree: BFS, DFS.

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:

3. **Assignment 1: Logic Equivalences and Predicate calculus.**
4. **Assignment 2: Equivalence Relations and Lattices**
5. **Assignment 3: Recurrence Relations**

Text Book

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", McGraw-Hill,s 8th 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: 7. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_54588 8. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_375 9. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html 10. https://www.scu.edu.au/study-at-scu/units/math1005/2022/ 11.
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: CSE1512	**Course Title: Analysis of Algorithms** **Type of Course: THEORY Only**	**L- T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	**CSE2001 - Data Structures and Algorithms.**					
Anti-requisites	Nil					
Course Description	This course introduces techniques for the design and analysis of efficient algorithms and methods of applications. This course discusses the classic approaches for algorithm design such as Divide and 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 various complexity classes is covered in the end.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Analysis of Algorithms** and attain **Skill Development** through **Problem Solving** Methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: 1. Compute efficiency of a given algorithm.[Applying] 2. Apply divide and conquer technique for searching and sorting Problems.[Applying] 3. Apply the Dynamic Programming technique for a given problem. [Applying] 4. Apply greedy technique for solving a Problem.[Applying] 5. Demonstrate Back tracking technique and limitations of Algorithms.[Applying]					

Course Content:				
Module 1	**Introduction**	Assignment	Simulation/Data Analysis	**10 Sessions**
Introduction, Asymptotic Notations and its properties, Best case, worst case and average case-Sequential search, Sorting; Mathematical analysis for Recursive and Non-recursive algorithms: Substitution method and Master's Theorem.				
Module 2	**Divide-and-conquer**	Assignment	Simulation/Data Analysis	**08 Sessions**
Introduction. Insertion Sort; Merge sort, Quick sort, Binary search.				
Module 3	**Dynamic programming**	Term paper/Assignment	Simulation/Data Analysis	**10 Sessions**
Introduction with examples, Principles of Memoization, 0-1 Knapsack Problem, Bellman-Ford algorithm, Floyd-Warshall's Algorithms. Chain Matrix Multiplication.				
Module 4	**Greedy technique**	Term paper/Assignment	Simulation/Data Analysis	**09 Sessions**
Introduction, Fractional Knapsack Problem, Minimal Spanning Tree: Prim's Algorithm and Kruskal's Algorithm, Single-source Shortest Path: Dijkstra's Algorithm				
Module 5	**Complexity Classes**	Term paper/Assignment	Simulation/Data Analysis	**08 Sessions**
Complexity Classes- P,NP- NP Hard and NP Complete - Boolean Satisfiability Problem (SAT). Branch and Bound: Knapsack problem; Backtracking, - N-Queens problem.				
Text Book 3. Anany Levitin, *"Introduction to the Design and Analysis of Algorithms*", 3rd edition, Pearson Education, 2018. 4. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, *"Introduction to Algorithms*", 4th edition, MIT Press, 2022.				

Course Code: CSE2503	**Course Title: Cryptography and Network Security**	**L- T-P-C**	3	0	0	3
Version No.	1					
Course Pre-requisites	"Data Communications and Computer Networks".					
Anti-requisites	**NIL**					
Course Description	The Course covers the principles and practice of cryptography and network security, focusing in particular on the security aspects of the web and Internet.					

References 5. J. Kleinbe 6. Tim Roug Design an 7. AV Aho, J 8. Donald E.	**Topics**: The cryptographic tools such as shared key encryption, public key encryption, key exchange, and digital signature are explored. The use and utilization of the internet protocols and applications such as SSL/ TLS, IPSEC, Kerberos, PGP, and S/ MIME, SET are reviewed. System security issues such as viruses, intrusion and firewalls are also explored.
Course Objective	The objective of the course is **SKILL DEVELOPMENT** of student by using **PARTICIPATIVE LEARNING** techniques.
Web-Resources **Course Outcomes** 7. Algorithm 8. Algorithm Universit	On successful completion of this course the students shall be able to: **CO1:** Identifies the basic concept of Cryptography **(Knowledge)** **CO2:** Express the different types of Cryptographic Algorithms. **(Comprehension)** **CO3:** Recognize the Public key Cryptographic Techniques for various applications. **(Comprehension)** **CO4:** Apply the network security concepts during their implementation of network security application developments. **(Application)**
Course Content:	

Topics relevant to "SKILL DEVELOPMENT": knapsack, prim's, kruskal's algorithm, quick sort

Module 1	**Introduction to Cryptography**	Assignment	Identify the Concepts	08 Sessions

through assessme... ...ned in course handout. his is attained

Topics:

Introduction to Cryptography, Model of Network Security, OSI Security architecture, Security Attacks: active attacks, passive attacks, services: Authentication, Access Control, Data Confidentiality, Data Integrity, Nonrepudiation, Substitution Ciphers : Caesar, Mono alphabetic, Polyalphabetic, Play-fair and Hill Cipher, Introduction to Block Cipher and Stream Cipher, Festal Structure.

Module 2	**Private Key Cryptography and Number Theory**	Assignment	Analysis of requirement of complexity in cryptography	13 Sessions

Topics:

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

Module 3	**Public Key Cryptography and its Applications**	Assignment	Recognize the importance of various security concepts to achieve sufficient solutions	10 Sessions

Topics:

	Overview of Public Key Cryptography, RSA, Diffie - Helman Key exchange, Man in the middle attack, Cryptographic Hash functions, Secure Hash Algorithm, Message Authentication Codes – HMAC, Digital Signature, Discussion on real time practices of Cryptography.			
Module 4	**Network Security**	Assignment	Implement the advanced network security algorithms in recent applications.	07 Sessions

Topics:

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

Targeted Application & Tools that can be used:
Students get the knowledge about cryptography techniques followed, the algorithms used for encryption and decryptions & the techniques for authentication and confidentiality of messages.

Assignment:

Assignment 1: Solve the problems of basic encryption techniques.
Assignment 2: Solve and analyze the problems on symmetric and asymmetric encryption.

Textbooks:

1.William Stallings, "Cryptography and Network Security - Principles and Practices", Prentice Hall, 8th Edition, 2019.

2. Wade Trappe and Lawrence C Washington, “Introduction to Cryptography with Coding Theory”, Pearson, 2020.

Reference Books:

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

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

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

Web references:

1.https://onlinecourses.nptel.ac.in/noc22_cs90/preview
2.e-pgpathshala UGC lecture series : E-Series and Self learning Materials.
https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==
3. http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=10133&query_desc=kw%2Cwrdl%3A%20Cryptography%20and%20Network%20Security
4.http://182.72.188.195/cgi-bin/koha/opac-detail.pl?biblionumber=5875&query_desc=kw%2Cwrdl%3A%20Cryptography%20and%20Network%20Security.

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

Course Code: CSE1510	**Course Title: Database Management Systems** **Type of Course: 1) Program Core & Theory only**	**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Foundational understanding of data types, data structures, basic programming knowledge, familiarity with operating systems and file management. Basic knowledge of set theory, logic, and discrete mathematics to understand relational algebra and query formulation.					
Anti-requisites	NIL					
Course Description	This course introduces the foundational principles of database management systems, including data models, schemas, and architectures. This course provides a solid foundation on the relational model of data and the use of relational algebra. It develops skills in SQL for data definition, manipulation, and control, enabling students to construct and execute complex queries. The course also introduces the concept of object oriented and object relational databases and modern database technologies like **NoSQL.** The also course allows the students to gain insights into data storage structures and indexing strategies for optimizing query performance.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Database Management Systems and attain **Employability** through **Problem Solving** Methodologies.					
Course OutComes	On successful completion of the course the students shall be able to: 9. Describe the fundamental elements of relational database management systems. [Understand] 10. Examine databases using SQL query processing and Optimization. [Apply] 11. Design simple database systems applying the normalization constraints and demonstrate the database transaction processing, recovery, and security. [Apply] 12. Interpret the concept of advanced databases and its applications. [Apply]					

Course Content:

Module 1	**Introduction to Database Modelling and Relational Algebra (Understand)**	Assignment	**Problem Solving**	**10 Sessions**

Topics:

Introduction to Database: Schema, Instance, 3-shema architecture, physical and logical data independence, Data isolation problem in traditional file system, advantages of database over traditional file systems. Entity Relationship (ER) Model, ER Model to Relational Model, Examples on ER model. **Relational Algebra** with selection, projection, rename, set operations, Cartesian product, joins (inner and outer joins), and division operator. Examples on Relational Algebra Operations.

Module 2	**Fundamentals of SQL and Query Optimization (Apply)**	Assignment	**Programming**	**11 Sessions**

Topics:
SQL Database Querying, DDL, DML, Constraints, Operators, Set Operators, Aggregate Functions, Joins, Views, Procedures, Functions and Triggers.
Database programming issues and techniques: Embedded SQL, Dynamic SQL; SQL / PSM and NoSQL.
Query Optimization: Purpose, transformation of relational expressions, estimating cost and statistics of expression, choosing evaluation plans, linear and bushy plans, dynamic programming algorithms.

Module 3	**Relational Database Design & Transaction Management (Apply)**	Assignment	**Problem Solving**	**12 Sessions**

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.

3. 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

Course Code: CSE1504	**Course Title: Web Technology** **Type of Course: Program core** **Theory Only**	**L- T-P-C**	2-0-0-2
Version No.	2.0		
Course Pre-requisites	**NIL**		
Anti-requisites	**NIL**		
Course Description	This course highlights the basic web design using Hypertext Markup Language and Cascading Style Sheets. Students will be trained in planning and designing effective web pages by writing code using current leading trends in the web domain, enhancing web pages with the use of page layout techniques, text formatting, graphics, images, and multimedia. The focus is on popular key technologies that will help students to build Internet- and web-based applications that interact with other applications and with databases.		
Course Objective	**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 Outcomes	**On successful completion of this course the students shall be able to:** **CO1:** Implement web-based application using client-side scripting languages. **(Application level)** **CO2**: Apply various constructs to enhance the appearance of a website. **(Application level)** **CO3**: Illustrate java-script concepts to demonstration dynamic web site **(Application level)** **CO4:** Apply server-side scripting languages to develop a web page linked to a database. **(Application level)**			
Course Content:				
Module 1	**Introduction to XHTML**	Quizzes and Assignments	Quizzes on various features of XHTML, simple applications	**8 Sessions**
Topics: Basics: Web, WWW, Web browsers, Web servers, Internet. XHTML: Origins and Evolution of HTML and XHTML: Basic Syntax, Standard XHTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, Frames, Syntactic Differences between HTML and XHTML.				
Module 2	**Advanced CSS**	Quizzes and assignments	Comprehension based Quizzes and assignments; Application of CSS in designing webpages	**8 Sessions**
Topics: **CSS:** Introduction to CSS, Defining & Applying a style, Creating style sheets, types of style sheet, selectors, CSS font properties, border properties, Box model, opacity, CSS pseudo class and pseudo-elements. **Advanced CSS:** Layout, Normal Flow, Positioning Elements, Floating Elements, Responsive Design, CSS Frameworks **XML:** Basics, demonstration of applications using XML				
Module 3	**Fundamentals of JavaScript**	Quizzes and assignments	Application of JavaScript for dynamic web page designing	**7 Sessions**
Topics:				

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

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

Topics:

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

Targeted Application & Tools that can be used:

Xampp web server to be used to demonstrate PHP.

Project work/Assignment:

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

Textbook(s):

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

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

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

References

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

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

Topics related to development of "FOUNDATION":

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

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

E-References

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

Course Code: CBC1701

Course Title: Introduction to Blockchain Platforms
L:T:P:C – 3:0:0:3

Course Description

This course introduces various blockchain platforms with a focus on their architecture, consensus mechanisms, smart contract capabilities, and use cases. Students will gain insights into leading blockchain ecosystems like Bitcoin, Ethereum, Hyperledger, and others to understand their comparative features and applications.

Course Objectives

— Understand the structural design and functionality of popular blockchain platforms
— Analyze consensus mechanisms used across different blockchain networks
— Explore platform-specific capabilities like smart contracts, tokens, and assets
— Evaluate the suitability of blockchain platforms for specific applications

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Course Outcomes

CO1 (Understand): Describe the architecture and consensus of various blockchain platforms
CO2 (Analyze): Compare different blockchain ecosystems in terms of performance, security, and flexibility
CO3 (Apply): Illustrate smart contract functionalities in Ethereum and Hyperledger
CO4 (Apply): Design application scenarios with suitable blockchain platforms

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Course Content (45 Hours Total)

Module 1: Overview of Blockchain Platforms – 11 Sessions

Bitcoin: architecture, scripting, transactions, Ethereum: EVM, gas, smart contracts, Overview of permissioned vs permissionless platforms

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Module 2: Ethereum and Smart Contracts – 11 Sessions

Ethereum accounts, transactions, Solidity basics, Gas optimization, ERC standards (ERC-20, ERC-721), DApps and use cases

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Module 3: Hyperledger Fabric and Enterprise Platforms – 11 Sessions

Fabric architecture: peers, orderers, channels, Chaincode vs smart contract, Membership Service Providers (MSP), Hyperledger use cases

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Module 4: Comparative Study and Emerging Platforms – 12 Sessions

Quorum, Corda, Polygon, Binance Smart Chain, Flow and Avalanche overview, Interoperability and bridging, Platform selection for applications

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Textbooks

T1: Imran Bashir, *Mastering Blockchain*, Packt Publishing, 3rd Edition, 2020
T2: Andreas Antonopoulos & Gavin Wood, *Mastering Ethereum*, O'Reilly Media

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Reference Books **R1**: Narayanan et al., *Bitcoin and Cryptocurrency Technologies*, Princeton University Press **R2**: Arnaud Le Hors et al., *Hyperledger Fabric Documentation*, Linux Foundation **R3**: Tanmay Bakshi, *Getting Started with Blockchain and Hyperledger*, Apress **R4**: Roger Wattenhofer, *Distributed Ledger Technology: The Science of the Blockchain*, InTechOpen
Web Resources **W1**: https://ethereum.org **W2**: https://hyperledger.org **W3**: https://soliditylang.org **W4**: https://quorumconsortium.org **W5**: https://corda.net

Course Code: CSE1505	**Course Title: Web Technologies Lab** **Type of Course: Program core lab course**	**L-T-P- C**	0	0	2	1

Version No.		1.0
Course Pre-requisites		Database Management Systems-CSE3156
Anti-requisites		**NIL**
Course Description		This course highlights the comprehensive introduction to scripting languages that are used for creating web-based applications. The associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills.
Course Objective		**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 Outcomes		**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)**
Course Content:		

List of Laboratory Tasks:

Experiment No. 1: Demonstration of XHTML features

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

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

Experiment No. 2: Application of CSS in web designing

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

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

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

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

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

Experiment No. 4: Building a website.

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

Targeted Application & Tools that can be used:
Xampp web server to be used to demonstrate
PHP.

Project work/Assignment:

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

Textbook(s):

1. Robert. W. Sebesta, "*Programming the World Wide Web"*, Pearson Education, 9th Edition, 2016.

2]Paul Deitel, Harvey Deitel, Abbey Deital,"Internet & World Wide Web How to Program", Fifth Edition, Pearson Education, 2021.

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

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

Reference Book(s):

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

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

Additional web-based resources

W1. W3schools.com

W2. Developer.mozilla.org/en-US/docs/Learn

W3. docs.microsoft.com

W4. informit.com/articles/ The Relationship Between Web 2.0 and Social Networking

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: **CSE2000**	**Course Title: Software Design and Development** **Type of Course: School Core [Theory Only]**	**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 course is to provide the fundamentals concepts of Software Engineering process and principles. The course covers software requirement engineering processes, system analysis, design, implementation and testing aspects of software system development. The course covers software quality, configuration management and maintenance.			
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Software Engineering and attain Skill Development through Participative Learning techniques.			
Course Out Comes	On successful completion of this course the students shall be able to: 1] Describe the Software Engineering principles, ethics and process models(Knowledge) 2] Identify the requirements, analysis and appropriate design models for a given application(Comprehension) 3] Understand the Agile Principles(Knowledge) 4] Apply an appropriate planning, scheduling, evaluation and maintenance principles involved in software(Application)			
Module 1	**Introduction to Software Engineering and Process Models** **(Knowledge level)**	Quiz		**10 Hours**
Introduction: Need for Software Engineering, Professional Software Development, Software Engineering Ethics, Software Engineering Practice-Essence of Practice, General Principles Software Development Life Cycle **Models:** Waterfall Model – Classical Waterfall Model, Iterative Waterfall Model, Evolutionary model-Spiral, Prototype.				
Module 2	**Software Requirements, Analysis and Design** **(Comprehension level)**	Assignment	Development of SRS documents for a given scenario	**12 Hours**

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

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

Module 3	**Agile Principles & Devops** **(Knowledge level)**	Quiz		**10 Hours**

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

Devops: Introduction, definition, history, tools.

Module 4	**Software Testing and Maintenance** **(Application Level)**	Assignment	Apply the testing concepts using Programing	**13 Hours**

Software Testing-verification and validation, Test Strategies - White Box Testing, Black box Testing. Automation Tools for Testing.

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

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

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

Text Book

1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", VII Edition, McGraw-Hill, 7.

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

References

4. Rajib Mall, "Fundamentals of Software Engineering", VI Edition, PHI learning private limited, 2015.
5. Ian Sommerville, "Software Engineering", IX Edition, Pearson Education Asia, 2011.
6. Agile Software Development Principles, Patterns and Practices.1st Edition, Wiley, 2002

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

Course Code: CSE1511	**Course Title: Database Management Systems Laboratory** **Type of Course: 1) Laboratory**	**L-T-P-C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Foundational understanding of data types, basic programming knowledge, operating systems and file management.					
Anti-requisites	NIL					
Course Description	The Database Management Systems (DBMS) Laboratory is designed to provide students with hands-on experience in database design, implementation, and management using SQL and database management tools such as MySQL. The lab complements theoretical concepts learned in database courses by allowing students to practice database creation, querying, and optimization techniques. The DBMS Lab enables students to develop industry-relevant skills in database management, preparing them for careers in **software development, data engineering, and database administration**.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Database Management Systems and attain **Employability** through **Problem Solving** Methodologies.					
Course OutComes	On successful completion of the course the students shall be able to: 13. Demonstrate the database concepts, practice, and SQL queries. [Apply] 14. Design and implement database schemas while applying normalization techniques to optimize structure. [Apply]] 15. Develop and implement stored procedures, triggers, and views for automation and efficiency. [Apply] 16. To Design and build database applications for real world problems. [Apply]					

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]

8. 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.

Course Code: CSE1513	**Course Title: Analysis of Algorithms Laboratory Type of Course: Integrated**	**L- T-P-C**	0	0	2	1
Version No.	1					
Course Pre-requisites	**CSE2001 - Data Structures and Algorithms.**					

Anti-requisites	NIL	
Course Description	This course introduces techniques for the design and analysis of efficient algorithms and methods of applications. This course discusses the classic approaches for algorithm design such as Divide and 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 various complexity classes is covered in the end.	
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Analysis of Algorithms** and attain **Skill Development** through **Experiential Learning** Methodologies.	
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. Compute efficiency of a given algorithm. [Applying] 2. Apply divide and conquer technique for searching and sorting Problems.[Applying] 3. Apply the Dynamic Programming technique for a given problem. [Applying] 4. Apply greedy technique for solving a Problem.[Applying] 5. Demonstrate Back tracking technique and limitations of Algorithms.[Applying]	
Course Content		
Module 1	**Introduction**	**3 Sessions**
Measuring running time of an algorithm, Compare running time of algorithms, Implement sorting algorithms such as bubble sort, selection sort		
Module 2	**Divide-and-conquer**	**3 Sessions**
Compare searching algorithms: Linear Search, Binary Search; Compare Sorting algorithms: Insertion Sort, Merge Sort, QuickSort.		
Module 3	**Dynamic programming**	**3 Sessions**
Introduction and memorization: Factorial; Coin Change Problem ; Floyd-Warshall's Algorithm.		
Module 4	**Greedy technique**	**3 Sessions**
Fractional Knapsack Problem; Minimal Spanning Tree Algorithms-Prim's Algorithm, Kruskal's algorithm		
Module 5	**Complexity Classes**	**3 Sessions**
Branch and Bound: Knapsack problem; Backtracking, - N-Queens problem.		
	List of Laboratory Tasks:	

1. Measuring running time of an algorithm

Objective: To experimentally determine the running time of basic algorithms for input size n=10, 100, 1000, etc. by taking difference of starting time and ending time.

2. Compare running time of algorithms

Objective: To execute two algorithms to solve the same problem, and to comparatively evaluate the better algorithm for large values of N.

3. Implement sorting algorithms such as bubble sort, selection sort

Objective: To implement comparison based sorting strategies.

4. Compare searching algorithms

Objective: To implement two searching strategies and compare their performance.

5. Compare Sorting algorithms

Objective: To implement searching strategies that follow top down design approach(Insertion sort, merge 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 2. 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 1and 3 Pearson. Web Based Resources and E-books: W1. NPTEL: https://onlinecourses.nptel.ac.in/noc19_cs47/preview W2. Coursera: Analysis of Algorithms by Princeton University W3. Algorithms Specialization in Coursera by Stanford University(Group of 4 courses).

	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

Course Code: CBD2518 | Course Title: Data Security and Cryptography | L:T:P:C = 3:0:0:3

| Version No: 1.0 |

Course Pre-requisites:

Anti-requisites: NIL

Course Description:
This course offers a comprehensive introduction to the principles and practices of data security and cryptography. It covers classical and modern cryptographic algorithms, key management, authentication protocols, data integrity, and network security mechanisms. Students gain a practical understanding of how cryptographic techniques ensure confidentiality, integrity, and availability in real-world applications.

Course Objectives:
1. To introduce the fundamentals of cryptographic techniques and their mathematical foundations
2. To understand symmetric and asymmetric encryption algorithms and their applications
3. To explore cryptographic protocols for authentication, digital signatures, and secure communication
4. To analyze and evaluate security threats and countermeasures in digital systems and networks

Course Outcomes:
CO1 (Understand): Explain fundamental concepts of cryptography and data security
CO2 (Analyze): Compare and analyze various encryption techniques and cryptographic protocols
CO3 (Apply): Implement encryption/decryption algorithms and simulate secure data communication
CO4 (Apply): Apply security mechanisms to assess and solve real-time data security issues

Course Content:

Module 1: Introduction to Cryptography and Number Theory | No. of Sessions: 12
Cryptography Basics, Security Attacks, Services, Mechanisms, Symmetric vs. Asymmetric Cryptography, Modular Arithmetic, Euler's Theorem, Fermat's Theorem, Euclidean Algorithm

Module 2: Symmetric and Asymmetric Encryption Algorithms | No. of Sessions: 11
DES, Triple DES, AES, Blowfish, RC4, RSA Algorithm, ElGamal, Key Distribution and Management, Diffie-Hellman Key Exchange

Module 3: Authentication, Hashing and Digital Signatures | No. of Sessions: 11
Authentication Protocols, Message Authentication Codes (MAC), Hash Functions (SHA, MD5), Digital Signatures, Public Key Infrastructure (PKI), Certificate Authorities

Module 4: Data Security and Network Protocols | No. of Sessions: 11
IPSec, SSL/TLS, Secure Email (PGP, S/MIME), Secure E-commerce, Firewalls, Intrusion Detection Systems (IDS), Blockchain Basics for Security

Textbooks:
T1: William Stallings, *Cryptography and Network Security: Principles and Practice*, Pearson, 7th Edition, 2017
T2: Behrouz A. Forouzan, *Cryptography and Network Security*, McGraw-Hill Education, 2nd Edition, 2011

Reference Books:
R1: Bruce Schneier, *Applied Cryptography: Protocols, Algorithms, and Source Code in C*, Wiley, 2nd Edition, 1996
R2: Douglas R. Stinson, *Cryptography: Theory and Practice*, CRC Press, 4th Edition, 2018
R3: Charlie Kaufman et al., *Network Security: Private Communication in a Public World*, Prentice Hall, 2nd Edition, 2002
R4: Christof Paar and Jan Pelzl, *Understanding Cryptography*, Springer, 2010

Web Resources:
W1: https://cryptography.io
W2: https://nvlpubs.nist.gov

W3: https://www.owasp.org
W4: https://www.tutorialspoint.com/cryptography/index.htm
W5: https://www.coursera.org/learn/crypto

Course Code: CBC2500	**Course Title: Smart Contract and Solidity Type of Course: Integrated**		**L- T- P- C**	3-0-0-3
Version No.	1			
Course Pre-requisites	Basics of Mathematics and any Programming Language			
Anti-requisites	NONE			
Course Description	Solidity is an object-oriented, high-level language for implementing smart contracts. Smart contracts are programs which govern the behaviour of accounts within the Ethereum state. Solidity is a curly- bracket language designed to target the Ethereum Virtual Machine (EVM). It is influenced by C++, Python and JavaScript. The Ethereum Virtual Machine (EVM) and assembly (low level language), events and logging blockchain emissions, send vs transfer methods, scoping and more			
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Smart Contract and Solidity** and attain **EMPLOYABILITY** through **Experiential Learning Techniques.**.			
Course Out Comes	**On successful completion of the course the students shall be able to:** **CO 1 :**Understand the fundamentals of computational Element of the Blockchain Technology **C.O 2:** Implementuser-defined operations of arbitrary complexity that are not possible through plain cryptocurrency protocols **C.O 3:** Exhibitbest practices for designing solutions with smart contracts using Solidity and Remix IDE			
Module 1	Introduction to Smart Contract	TEST-1	Fundaments of Smart Contract and Solidity	**12Sessions**
Topics: A Simple Smart Contract, Blockchain Basics, The Ethereum Virtual Machine, Versioning, Remix, npm				

/ Node.js, Docker, Binary Packages, Building from Source, CMake options.				
Module 2	Solidity in Depth	TEST-1	Case studies / Case let	**12 Sessions**
Topics: Layout of a Solidity Source File, Structure of a Contract, Types, Units and Globally Available Variables, Expressions and Control Structures, Contracts, Solidity Assembly, Miscellaneous, Solidity v0.5.0 Breaking Changes				
Module 3	Contract Metadata & Contract ABI Specification	Endterm lab Exam	Implementing Applications	**14 Sessions**
Topics: Encoding of the Metadata Hash in the Bytecode, Usage for Automatic Interface Generation and NatSpec, Usage for Source Code Verification, Basic Design, Function Selector, Argument Encoding, Types, Design Criteria for the Encoding, Formal Specification of the Encoding, Function Selector and Argument Encoding, Examples, Use of Dynamic Types, Events, JSON, Strict Encoding Mode, Non- standard Packed Mode				

Textbooks:

T1: William Stallings, *Cryptography and Network Security: Principles and Practice*, Pearson, 7th Edition, 2017
T2: Behrouz A. Forouzan, *Cryptography and Network Security*, McGraw-Hill Education, 2nd Edition, 2011

Reference Books:

R1: Bruce Schneier, *Applied Cryptography: Protocols, Algorithms, and Source Code in C*, Wiley, 2nd Edition, 1996
R2: Douglas R. Stinson, *Cryptography: Theory and Practice*, CRC Press, 4th Edition, 2018
R3: Charlie Kaufman et al., *Network Security: Private Communication in a Public World*, Prentice Hall, 2nd Edition, 2002
R4: Christof Paar and Jan Pelzl, *Understanding Cryptography*, Springer, 2010

Web Resources:

W1: https://cryptography.io
W2: https://nvlpubs.nist.gov
W3: https://www.owasp.org
W4: https://www.tutorialspoint.com/cryptography/index.htm
W5: https://www.coursera.org/learn/crypto

Course Code: CBC2501	**Course Title: Smart Contract and Solidity Lab** **Type of Course: Integrated**	**L- T- P- C**	0-0-2-1
Version No.	1		

Course Pre-requisites	Basics of Mathematics and any Programming Language			
Anti-requisites	NONE			
Course Description	Solidity is an object-oriented, high-level language for implementing smart contracts. Smart contracts are programs which govern the behaviour of accounts within the Ethereum state. Solidity is a curly- bracket language designed to target the Ethereum Virtual Machine (EVM). It is influenced by C++, Python and JavaScript. The Ethereum Virtual Machine (EVM) and assembly (low level language), events and logging blockchain emissions, send vs transfer methods, scoping and more			
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Smart Contract and Solidity** and attain **EMPLOYABILITY** through **Experiential Learning Techniques.**.			
Course Out Comes	**On successful completion of the course the students shall be able to:** **CO 1 :**Understand the fundamentals of computational Element of the Blockchain Technology **C.O 2:** Implementuser-defined operations of arbitrary complexity that are not possible through plain cryptocurrency protocols **C.O 3:** Exhibitbest practices for designing solutions with smart contracts using Solidity and Remix IDE			
Module 1	Introduction to Smart Contract	TEST-1	Fundaments of Smart Contract and Solidity	**12Sessions**
Topics: A Simple Smart Contract, Blockchain Basics, The Ethereum Virtual Machine, Versioning, Remix, npm / Node.js, Docker, Binary Packages, Building from Source, CMake options.				
Module 2	Solidity in Depth	TEST-1	Case studies / Case let	**12 Sessions**
Topics: Layout of a Solidity Source File, Structure of a Contract, Types, Units and Globally Available Variables, Expressions and Control Structures, Contracts, Solidity Assembly, Miscellaneous, Solidity v0.5.0 Breaking Changes				
Module 3	Contract Metadata & Contract ABI Specification	Endterm lab Exam	Implementing Applications	**14 Sessions**
Topics: Encoding of the Metadata Hash in the Bytecode, Usage for Automatic Interface Generation and NatSpec, Usage for Source Code Verification, Basic Design, Function Selector, Argument Encoding, Types, Design Criteria for the Encoding, Formal Specification of the Encoding, Function Selector and Argument Encoding, Examples, Use of Dynamic Types, Events, JSON, Strict Encoding Mode, Non- standard Packed Mode				

List of Experiments

Week	Lab Experiment Title	Tool/Technology Used
Week 1	Introduction to cryptographic tools and basic encryption techniques	CrypTool / Python (PyCryptodome)
Week 2	Implementation of Caesar and Monoalphabetic ciphers	Python / CrypTool
Week 3	Playfair and Hill Cipher encryption and decryption	Python / CrypTool
Week 4	DES algorithm implementation and file encryption	OpenSSL / Python (PyCryptodome)
Week 5	AES encryption in ECB and CBC modes	OpenSSL / Python (cryptography)
Week 6	RSA key generation, encryption, and decryption	OpenSSL / Python
Week 7	Diffie-Hellman key exchange simulation	Python
Week 8	Hashing and message digest using SHA, MD5	Python (hashlib) / OpenSSL
Week 9	Digital signature creation and verification	GnuPG / Python (cryptography)
Week 10	Setup secure communication using SSL/TLS	OpenSSL / Wireshark
Week 11	Steganography and cryptanalysis demo	Steghide / CrypTool
Week 12	Password hashing and brute force attack demo	John the Ripper / Hashcat
Week 13	Secure Email communication using GnuPG (PGP Simulation)	GnuPG
Week 14	Network traffic capture and analysis for secure protocols	Wireshark
Week 15	Mini project: End-to-end secure message exchange with key management	Python + GPG + OpenSSL

🛠 **Open-Source Tools Overview**

- **CrypTool – Educational tool for learning cryptography visually**
- **Python (PyCryptodome, hashlib, cryptography) – For programmatic encryption/decryption**
- **OpenSSL – Command-line utility for SSL, AES, RSA operations**
- **GnuPG – For creating and verifying digital signatures and PGP**
- **Wireshark – Packet sniffer for analyzing network-level security**

Textbooks:

T1: William Stallings, *Cryptography and Network Security: Principles and Practice*, Pearson, 7th Edition, 2017
T2: Behrouz A. Forouzan, *Cryptography and Network Security*, McGraw-Hill Education, 2nd Edition, 2011

Reference Books:
R1: Bruce Schneier, *Applied Cryptography: Protocols, Algorithms, and Source Code in C*, Wiley, 2nd Edition, 1996
R2: Douglas R. Stinson, *Cryptography: Theory and Practice*, CRC Press, 4th Edition, 2018
R3: Charlie Kaufman et al., *Network Security: Private Communication in a Public World*, Prentice Hall, 2nd Edition, 2002
R4: Christof Paar and Jan Pelzl, *Understanding Cryptography*, Springer, 2010

Web Resources:
W1: https://cryptography.io
W2: https://nvlpubs.nist.gov
W3: https://www.owasp.org
W4: https://www.tutorialspoint.com/cryptography/index.htm
W5: https://www.coursera.org/learn/crypto

| Course Code: CBC2502 | Course Title: Distributed Ledger Technology | L:T:P:C = 3:0:0:3

Version No: 1.0

Course Pre-requisites:

Anti-requisites: NIL

Course Description:
This course introduces the principles, architectures, and applications of Distributed Ledger Technology (DLT), with a special focus on blockchain systems. Students will explore consensus mechanisms, smart contracts, permissioned and permissionless ledgers, and enterprise blockchain frameworks like Hyperledger Fabric and Corda. Real-world use cases in supply chain, finance, and digital identity are emphasized.

Course Objectives:
1. Understand the fundamentals and types of distributed ledger technologies.
2. Explore blockchain architecture and consensus mechanisms.
3. Analyze security, scalability, and privacy in decentralized systems.
4. Apply DLT in enterprise and public applications through smart contracts and platforms.

Course Outcomes:

CO1 (Understand): Explain the architecture and working principles of DLT and blockchain.
CO2 (Analyze): Compare consensus mechanisms and evaluate DLT use cases and limitations.
CO3 (Apply): Implement smart contracts using Ethereum or Hyperledger.
CO4 (Apply): Develop secure and scalable DLT applications for real-world problems.

Course Content:

Module 1: Introduction to DLT and Blockchain | No. of Sessions: 11
Distributed Ledger vs Centralized Systems, Blockchain overview, Key features of DLT (immutability, transparency, decentralization), Cryptographic primitives, Merkle trees, Hash functions, Public vs Private blockchains, Peer-to-peer networking

Module 2: Blockchain Architecture and Consensus Mechanisms | No. of Sessions: 12
Blockchain structure, Blocks and transactions, Consensus algorithms: Proof of Work, Proof of Stake, Delegated PoS, Byzantine Fault Tolerance, Forks, Block finality, Challenges in consensus, Network latency, Scalability

Module 3: Smart Contracts and DLT Frameworks | No. of Sessions: 11
Introduction to smart contracts, Ethereum architecture, Solidity basics, Hyperledger Fabric architecture and components, Chaincode in Go/Node.js, Smart contract lifecycle, Oracles and off-chain data access

Module 4: Applications, Security, and Industry Use Cases | No. of Sessions: 11
DLT in supply chain, digital identity, healthcare, fintech, Security issues in blockchain: 51% attack, Sybil attacks, Double spending, Data privacy and GDPR, Case studies: IBM Food Trust, TradeLens, Digital Voting

Textbooks:
T1: Imran Bashir, *Mastering Blockchain*, Packt Publishing, 3rd Edition, 2020
T2: Melanie Swan, *Blockchain: Blueprint for a New Economy*, O'Reilly Media, 2015

Reference Books:
R1: Arshdeep Bahga and Vijay Madisetti, *Blockchain Applications: A Hands-On Approach*, VPT, 2017
R2: Andreas M. Antonopoulos and Gavin Wood, *Mastering Ethereum*, O'Reilly Media, 2018
R3: Narayan Prusty, *Building Blockchain Projects*, Packt Publishing, 2018
R4: Nitin Gaur et al., *Hands-On Blockchain for Python Developers*, Packt, 2020

Web Resources: W1: https://ethereum.org/en/developers/ W2: https://hyperledger.org/use/fabric W3: https://www.ibm.com/blockchain W4: https://www.blockchain-council.org/ W5: https://developer.algorand.org/ +==========+

Course Code: CSE1700	**Course Title:** Essentials of AI **Type of Course:** Theory	**L- T-P-C**	3	**0**	0	**3**
Version No.	2.0					
Course Pre-requisi Dates	Basic knowledge of programming, mathematics, understanding of data handling					
Anti-requisites	**NIL**					
Course Description	This course is a comprehensive introductory course designed to equip learners with the fundamental Python programming skills necessary to work with artificial intelligence (AI) technologies. This course is aimed at individuals who are new to AI but have a basic understanding of programming concepts. It combines Python programming fundamentals with hands-on experience in implementing AI techniques such as machine learning, neural networks, and natural language processing.					
Course Objective	The objective of the course is to Understand Python Programming Fundamentals, Manipulate and Process Data with Python, Implement Machine Learning Algorithms and Build and Train Neural Networks for AI Applications.					
Course Outcomes	On successful completion of the course the students shall be able to: CO 1: Apply Python Programming to AI Projects CO 2: Build and Train Machine Learning Models CO 3: Develop Deep Learning Models with Neural Networks CO 4: Deploy AI Solutions and Understand Ethical Implications					
Course Content:						
Module 1	Introduction to Python Programming for AI	Assignment	Implementation	**10 Sessions**		
Topics:						

Python Basics: Variables, Data Types, Operators, and Control Flow Functions, Loops, and Conditionals statements, Data Structures: Lists, Tuples, Dictionaries, Sets ,Introduction to Libraries: NumPy and Pandas for data manipulation, Basic Input/Output and File Handling Introduction to Python for AI: Libraries and Frameworks Overview

Module 2	Data Processing, Visualization	Assignment	Implementation	10 Sessions

Topics:
cleaning and preprocessing with Pandas,Handling missing data, outliers, and duplicates, Data transformation (Normalization, Encoding), Introduction to Matplotlib and Seaborn for Data Visualization, Exploratory Data Analysis (EDA), Visualizing datasets to understand patterns and relationships.

Module 3	Introduction to Machine Learning	Mini - Project	Implementation	10 Sessions

Topics:
What is Machine Learning? Types of ML algorithms Supervised Learning: Regression, Classification, Unsupervised Learning: Clustering, Key ML Algorithms: Linear Regression, Decision Trees, K-Means ,Introduction to Scikit-learn library
Model evaluation (Accuracy, Precision, Recall, Confusion Matrix)

Module 4	Neural Networks and Deep Learning	Quiz	Implementation	10 Sessions

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:

1. **Data Preprocessing**: Clean and manipulate data from various sources such as CSV, Excel, SQL databases, and APIs.
2. **Exploratory Data Analysis (EDA)**: Gain insights into datasets by identifying trends, patterns, and outliers.
3. **Predictive Modeling**: Build models for classification (e.g., spam detection) and regression (e.g., house price prediction).
4. **Clustering**: Group data into clusters for unsupervised learning tasks (e.g., customer segmentation).
5. **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 models.
  NLTK: 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 Hugging Face): A powerful library for using pre-trained Transformer-based models like 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):

- "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

Course Code: CBC2504	**Block Chain Architecture Design**	**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	CBC 1701 Introduction to Block Chain Platforms					
Anti-requisites	NIL					
Course Description	This course introduces the core concepts and architecture of blockchain systems. It covers decentralized ledger structures, consensus algorithms, smart contracts, and cryptographic techniques. Students will analyze public and private blockchain platforms, including Ethereum and Hyperledger. The course emphasizes the design, scalability, and security of blockchain-based applications. Real-world case studies illustrate blockchain's transformative potential across industries.					

Course Objectives	Understand the fundamental concepts, architecture, and components of blockchain technology. Analyze various consensus mechanisms and evaluate their role in securing blockchain networks. Design and develop smart contracts and decentralized applications using suitable blockchain platforms. Evaluate the scalability, security, and real-world applicability of blockchain solutions across domains.
Course Out Comes	CO1 – Understand the fundamental architecture and core components of blockchain systems, including data structures, cryptographic principles, and peer-to-peer networks. CO2 – Analyze the design and implementation of consensus mechanisms and assess their impact on decentralization, performance, and security. CO3 – Analyze the architectural differences and scalability approaches of leading blockchain platforms like Ethereum, Hyperledger Fabric, and Corda. CO4 – Analyze the design patterns, security considerations, and architectural trade-offs in developing robust and scalable blockchain solutions.

Course Content:

Module 1	**Fundamentals of Blockchain Architecture**		**Understand**	**No. of Sessions: 10**
Introduction to blockchain, Distributed ledger technology, Blockchain structure, Blocks and chaining, Merkle trees, Hash functions, Digital signatures, Public and private keys, P2P networks, Cryptographic fundamentals.				
Module 2	**Consensus Mechanisms and Protocol Design**		**Analyse**	**No. of Sessions: 12**
Consensus principles, Proof of Work (PoW), Proof of Stake (PoS), Practical Byzantine Fault Tolerance (PBFT), Delegated PoS, Proof of Authority, Block propagation, Forking and finality, Impact on decentralization and security.				
Module 3	**Comparative Blockchain Platform Architectures**			**No. of Sessions: 11**
Ethereum architecture, Smart contract execution with EVM, Hyperledger Fabric components, Channel architecture and endorsement policy, Corda design principles, Platform use-case suitability, Scalability and performance considerations.				
Module 4	**Design Patterns, Security, and Scalability in Blockchain Systems**			**No. of Sessions: 12**
Blockchain solution design process, Architectural trade-offs, Privacy layers and off-chain solutions, Sharding, Sidechains, Layer 2 solutions, Security threats and mitigations, Blockchain development patterns, Case studies and best practices.				

Textbook(s):

4. Daniel Drescher, "Blockchain Basics: A Non-Technical Introduction in 25 Steps", Apress, 2017.

5. Imran Bashir, "Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications", Packt Publishing, 2023 (4th Edition).

References:

R1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press, 2016.

R2. Sina Esfandyari, "Architecting Blockchain Solutions: A Guide to Design and Development", Packt Publishing, 2021.

R3. Mouftah H.T., Al-Anbagi I. (Eds.), "Blockchain for Cybersecurity and Privacy: Architectures and Applications", Springer, 2020.

R4. Rajeev Agrawal, Abhishek Kumar, Kamlesh Dutta, "Blockchain Technology: Architecture and Applications", CRC Press, 2021.

Weblinks

IBM Blockchain Architecture Overview
https://www.ibm.com/blockchain/architecture

Ethereum Whitepaper (Blockchain Design Insights)
https://ethereum.org/en/whitepaper/

Hyperledger Fabric Documentation (Blockchain Architecture Focus)
https://hyperledger-fabric.readthedocs.io/en/release-2.2/

Blockchain Technology Overview – NIST Report
https://nvlpubs.nist.gov/nistpubs/ir/2018/NIST.IR.8202.pdf

Mastering Blockchain GitHub Resources by Imran Bashir
https://github.com/PacktPublishing/Mastering-Blockchain-Third-Edition

Blockchain Hub – Educational Resources on Blockchain
https://blockchainhub.net/

CoinDesk – Blockchain 101 Guides
https://www.coindesk.com/learn/blockchain-101

Course Code: **CSE2508**	**Course Title:** Mobile Applications and Development **Type of Course:** Theory		**L- T-P- C**	2	**0**	0	**2**
Version No.	2.0					
Course Pre-requisites	CSE3514 Object Oriented Programming Using Java					
Anti-requisites	**NIL**					
Course Description	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 concepts for mobile application development. (Application)					
Course Content:						
Module 1	Introduction and Architecture of Android	Assignment	Simulation/Data Analysis	5 Sessions		
Topics: Android: History and features, Architecture, Development Tools, Android Debug Bridge (ADB), and Life cycle.						
Module 2	User Interfaces, Intent and Fragments	Term paper/Assignment	Simulation/Data Analysis	6 Sessions		

Topics: Views, Layout, Menu, Intent and Fragments.				
Module 3	Components of Android	Term paper/Assignment	Simulation/Data Analysis	6 Sessions
Topics: Activities, Services, Broadcast receivers, Content providers, User Navigation				
Module 4	Notifications and Data Persistence	Term paper/Assignment	Simulation/Data Analysis	6 Sessions
Topics: Notification, Shared Preferences, SQLite database, Android Room with a View, Firebase.				
Module 5	Advance App Development	Term paper/Assignment	Simulation/Data Analysis	7 Sessions
Topics: Graphics and Animation, App Widgets, Sensors, Performance, Location, Places, Mapping, Custom Views, Canvas.				

Targeted Application & Tools that can be used:

Applications:

- Native Android Applications
- Native iOS Applications
- 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/

Catalogue prepared by	
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: CBC2503 | Course Title: Distributed Ledger Technology Laboratory | L:T:P:C = 0:0:2:1

| Version 1.0 |

Course Pre-requisites:
Anti-requisites: NIL

Course Description:
This laboratory course provides hands-on experience in working with blockchain-based distributed ledger platforms such as Ethereum and Hyperledger. Students will learn to develop, deploy, and test smart contracts, create blockchain networks, and simulate real-world DLT use cases using open-source tools.

Course Objectives:
1. To provide practical understanding of blockchain platforms like Ethereum and Hyperledger.
2. To develop and test smart contracts using Solidity and Chaincode.
3. To simulate peer-to-peer blockchain networks and transaction flows.
4. To integrate DLT with applications for real-world solutions.

Course Outcomes:
CO1: Understand the setup and configuration of blockchain environments.
CO2: Apply skills to write, deploy, and test smart contracts on Ethereum.
CO3: Implement and manage blockchain networks using Hyperledger Fabric.
CO4: Apply integration and debugging techniques to test and deploy decentralized applications.

Lab Experiments (15 Weeks):
1. Installation and setup of blockchain development environment
   (Tools: Node.js, Ganache, MetaMask, Remix IDE)

2. Creating a local Ethereum blockchain using Ganache CLI
   (Tool: Ganache CLI)

3. Creating Ethereum wallets and sending Ether between accounts
   (Tools: MetaMask, Web3.js)

4. Writing and deploying a basic smart contract in Solidity
   (Tool: Remix IDE)

5. Solidity programming: control structures, data types, modifiers
   (Tool: Remix IDE)

6. Deploying smart contracts on Ganache and interacting with Web3.js
   (Tools: Ganache, Web3.js, Node.js)

7. Smart contract functions: Events, state variables, and mappings
   (Tool: Remix IDE)

8. Testing smart contracts using Truffle framework
   (Tools: Truffle, Mocha/Chai for test cases)

9. Setup of a Hyperledger Fabric blockchain network using Docker

(Tools: Hyperledger Fabric, Docker)

10. Writing and deploying Chaincode (smart contracts) on Fabric
    (Languages: Go or Node.js)

11. Invoking transactions and querying the ledger in Fabric
    (Tools: Fabric CLI or SDK)

12. Developing a basic asset transfer DApp on Ethereum
    (Tools: Solidity, Web3.js, HTML/JS frontend)

13. Smart contract security: Detecting vulnerabilities (e.g., reentrancy)
    (Tools: MythX, Slither)

14. End-to-end DApp project integration and deployment
    (Tools: Truffle/Hardhat + Web3.js + frontend)

15. Mini Project Demo: Real-world use case using DLT (group work)
    (Students choose Ethereum or Fabric for implementation)

Textbooks:

T1: Imran Bashir, *Mastering Blockchain*, Packt Publishing, 3rd Edition, 2020
T2: Melanie Swan, *Blockchain: Blueprint for a New Economy*, O'Reilly Media, 2015

Reference Books:

R1: Arshdeep Bahga and Vijay Madisetti, *Blockchain Applications: A Hands-On Approach*, VPT, 2017
R2: Andreas M. Antonopoulos and Gavin Wood, *Mastering Ethereum*, O'Reilly Media, 2018
R3: Narayan Prusty, *Building Blockchain Projects*, Packt Publishing, 2018
R4: Nitin Gaur et al., *Hands-On Blockchain for Python Developers*, Packt, 2020

Web Resources:

W1: https://ethereum.org/en/developers/
W2: https://hyperledger.org/use/fabric
W3: https://www.ibm.com/blockchain
W4: https://www.blockchain-council.org/
W5: https://developer.algorand.org/

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Course Code: **CSE2509**	**Course Title:** Mobile Applications and Development Lab **Type of Course:** Lab		**L- T-P- C**	0	**0**	4	**2**
Version No.	2.0						
Course Pre-requisites	CSE1514 Object Oriented Programming using Java						
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 Outcomes	On successful completion of the course the students shall be able to: 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/Data Analysis	8 Sessions			
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.							
Module 2	User Interfaces, Intent and Fragments	Term paper/Assignment	Simulation/Data Analysis	13 Sessions			

3. a. Design an app to select elective course using spinner view and on click of the display button, toast your ID and selected elective course.

3. b. Design a restaurant menu app to print the total amount of orders.

Module 3	Components of Android	Term paper/Assignment	Simulation/Data Analysis	13 Sessions

4. Develop an android app that uses intent to maintain the following scenario.

Check the eligibility criteria for voting. Input the Aadhar no., Name & age in the first activity. If the age is above 18, display the voter's detail in the second activity. Else, display, “You are not eligible to vote” in the second Activity.

5. Demonstrate the use of fragment with list of buttons representing various colors, and on click of these buttons, the appropriate color is filled in the next fragment. Create an Android application to input the vitals of a person (temperature, BP). If the vitals are abnormal, give proper notification to the user.

6. Create an android 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 Data Persistence	Term paper/Assignment	Simulation/Data Analysis	13 Sessions

7. Create an android application to manage the details of students' database using SQLite.Use necessary UI components, which perform the operations such as insertion, modification, removal and

view.Presidency University needs an APP for Admission eligibility checking for students, for that you need to take the following information from the Student: registration ID, physics, chemistry and mathematics marks (PCM), fees is allotted as below criteria.

PCM (Total marks %) Fee concession

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 fade-in effect. Create an appropriate XML file named fade-in and write the application to perform the property animation.

Module 5	Advance App Development	Term paper/Assignment	Simulation/Data Analysis	13 Sessions

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:

1. Native Android Applications (Java/Kotlin)
   - Android Mobile Apps built for Android smartphones and tablets using Java or Kotlin programming languages.
   - Target audience: Android users.
2. Native iOS Applications (Swift)
   - iOS Mobile Apps designed for iPhone and iPad using Swift.
   - Target audience: iOS users (Apple ecosystem).
3. 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.
4. 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

1. 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.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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/

Catalogue prepared by	

Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: **CSE1701**	**Course Title:** Essentials of AI LAB **Type of Course:** Lab	**L- T-P-C**	0	0	4	2
Version No.	2.0					
Course Prerequisites	Basic Java Programming Knowledge, Mathematics: Linear Algebra and Probability, Basic Data Structures and Algorithms, Familiarity with Libraries and Tools, Understanding of Basic Machine Learning Concepts.					
Anti-requisites	**NIL**					
Course Description	This course introduces students to the essential concepts and techniques of Artificial Intelligence (AI) with a focus on practical implementation using Python. Students will explore core AI topics such as search algorithms, knowledge representation, machine learning, and neural networks, while gaining proficiency in using popular Python libraries like NumPy, pandas, scikit-learn, and TensorFlow. Through a series of lab exercises and projects, students will apply AI principles to solve real-world problems, develop intelligent applications, and understand how AI systems function at a foundational level.					
Course Objective	The primary objectives of the course are to Gain Proficiency in AI Concepts and Python Implementation, Develop and Implement Machine Learning Models, Understand and Build Neural Networks, Apply AI to Real-World Problems					
Course Outcomes	On successful completion of the course the students shall be able to: 1. Proficiency in Implementing AI Algorithms Using Python 2. Ability to Build and Evaluate Machine Learning Models 3. Hands-on Experience with Neural Networks and Deep Learning 4. Practical Application of AI to Solve Real-World Problems					
Course Content:						
Module 1	Introduction to AI and Python for AI	Assignment	mplementation		**8 Sessions**	
Lab Assignment 1: Setting Up the Python Environment						

- **Objective:** Get familiar with setting up a Python environment for AI projects.
- **Tasks:**
    1. Install Python, Anaconda, and Jupyter Notebook.
    2. Set up a virtual environment for AI development.
    3. Install essential Python libraries: numpy, pandas, matplotlib, and scikit-learn.
    4. Write and execute simple Python code to verify installation (e.g., print a "Hello AI" message).

Lab Assignment 2: Basic Python Programming for AI

- **Objective:** Understand and practice the basic Python syntax and data structures used in AI.
- **Tasks:**
    1. Write Python code to work with basic data types (integer, float, string, boolean).
    2. Implement and manipulate Python lists, tuples, sets, and dictionaries.
    3. Create basic control flow structures: if-else, for loops, while loops.
    4. Use functions and lambda functions to solve small AI-related problems, such as calculating factorial or Fibonacci numbers.

Lab Assignment 3: Data Exploration and Preprocessing

- **Objective:** Learn how to work with data for AI models.
- **Tasks:**
    1. Load a dataset (e.g., Titanic or Iris dataset) using pandas.
    2. Clean the dataset by handling missing values, removing duplicates, and converting data types if needed.
    3. Explore the dataset by visualizing it using matplotlib and seaborn.
    4. Perform basic data preprocessing tasks such as feature scaling, encoding categorical variables, and splitting data into training and testing sets.

Module 2	Data Processing, Visualization	Assignment	Implementation	8 Sessions

Lab Assignment 1: Data Preprocessing with Pandas

Objective:
Learn the fundamentals of data preprocessing, including cleaning, handling missing values, and performing basic transformations using **Pandas**.

Tasks:

1. **Load and Inspect the Dataset:**
    - Load a dataset (e.g., **Iris**, **Titanic**, **Wine Quality** dataset) using pandas.read_csv() or pandas.read_excel().
    - Inspect the first few rows of the dataset using .head() and check basic information using .info().
2. **Handle Missing Values:**
    - Identify missing values in the dataset using .isnull() or .isna().
    - Handle missing data by imputing with mean, median, or mode using SimpleImputer from sklearn, or remove rows with missing data using .dropna().
3. **Data Transformation:**
    - Convert categorical variables to numerical values using one-hot encoding or label encoding.

- Normalize/standardize numerical columns using StandardScaler or MinMaxScaler from sklearn.

4. **Subset and Filter Data:**
   - Create subsets based on certain conditions (e.g., select rows where a specific feature value is greater than a threshold).
   - Filter outliers from numerical data using interquartile range (IQR).

Lab Assignment 2: Data Aggregation and Grouping with Pandas

Objective:
Master aggregation and grouping techniques using **Pandas** for summarizing data.
Tasks:

1. **Group Data by Category:**
   - Group data by one or more categorical features (e.g., "class" in the Iris dataset or "embarked" in Titanic dataset).
   - Use .groupby() to calculate aggregate statistics such as mean, median, sum, and count.
2. **Pivot Tables:**
   - Create a pivot table to summarize data (e.g., aggregate the average age of passengers in the Titanic dataset by class and gender).
   - Use .pivot_table() to perform multi-dimensional aggregation.
3. **Data Aggregation and Custom Functions:**
   - Apply custom aggregation functions to the grouped data (e.g., calculate custom metrics or perform complex transformations within each group).
4. **Sorting and Ranking Data:**
   - Sort the dataset by multiple columns (e.g., sorting by "age" or "fare").
   - Rank data based on specific metrics (e.g., assign ranks to passengers by fare in the Titanic dataset).

Lab Assignment 3: Data Visualization with Matplotlib and Seaborn

Objective:
Learn to visualize datasets using **Matplotlib** and **Seaborn** for better understanding and insights.
Tasks:

1. **Basic Plotting with Matplotlib:**
   - Create simple plots like line plots, bar plots, and histograms using **Matplotlib**.
   - Customize the plots by setting titles, labels, and legends.
   - Create scatter plots to visualize relationships between two variables.
2. **Advanced Plotting with Seaborn:**
   - Use **Seaborn** to create advanced visualizations like pair plots, heatmaps, box plots, and violin plots.
   - Customize visualizations with color palettes, styling, and themes.
   - Create a correlation heatmap to visualize correlations between features in the dataset.
3. **Distribution Visualizations:**
   - Plot distributions of continuous variables using **Seaborn's** distplot() or kdeplot().

- Create bar plots for categorical variables to understand their frequency distribution.

4. **Multi-Plot Grid Layouts:**
   - Use **Matplotlib's** subplots() function to create multiple plots in a grid layout for comparison (e.g., scatter plot and histogram in the same figure).

Lab Assignment 4: Visualizing Relationships and Feature Importance

Objective:
Understand how to visualize relationships between features and evaluate feature importance for predictive models.
Tasks:

1. **Scatter Plot Matrix:**
   - Use **Seaborn's** pairplot() to create a scatter plot matrix to visualize the relationships between multiple features.
   - Analyze the pairwise relationships between features and identify any patterns or correlations.
2. **Heatmap of Correlation Matrix:**
   - Use **Pandas** to calculate the correlation matrix of numeric features.
   - Visualize the correlation matrix using **Seaborn's** heatmap() to understand feature correlations and multicollinearity.
3. **Feature Importance from Models:**
   - Train a decision tree or random forest model using **scikit-learn** on a dataset (e.g., **Iris** or **Titanic**).
   - Visualize feature importance using a bar chart to understand which features have the most impact on the model.
4. **Visualizing Predictions vs. Actual Values:**
   - For regression tasks, visualize the predicted values against the actual values using a scatter plot.
   - For classification tasks, visualize the classification results with a confusion matrix.

Lab Assignment 5: Time Series Data Visualization and Processing

Objective:
Learn how to process and visualize time series data, which is common in AI applications like forecasting and trend analysis.
Tasks:

1. **Load and Preprocess Time Series Data:**
   - Load a time series dataset (e.g., stock market data, weather data).
   - Parse dates properly and set the date column as the index using pd.to_datetime() and .set_index().
2. **Plot Time Series Data:**
   - Plot a time series line chart using **Matplotlib** to visualize trends over time.
   - Create rolling averages (e.g., 7-day, 30-day) to smooth out short-term fluctuations in the time series data.

3. **Seasonal Decomposition of Time Series:**
    - Use **statsmodels** to decompose a time series into seasonal, trend, and residual components.
    - Visualize the decomposed components to understand seasonal variations.
4. **Forecasting with Simple Models:**
    - Use simple forecasting models (e.g., moving average, ARIMA) to predict future values.
    - Visualize the forecasted data along with actual historical data.

Module 3	Introduction to Machine Learning	Assignments	Implementation	8 Sessions

Lab Assignment 3: Implementing Linear Regression

- **Tasks:**
    1. Load a real-world dataset (e.g., **Boston Housing Price** dataset).
    2. Train a **Linear Regression** model using LinearRegression() from scikit-learn.
    3. Evaluate the model using **Mean Squared Error (MSE)** and **R-squared Score**.
    4. Visualize the regression line using Matplotlib.

Lab Assignment 4: Logistic Regression for Classification

- **Tasks:**
    1. Load the **Iris** or **Breast Cancer** dataset.
    2. Preprocess the dataset (handle missing values, encode categorical variables, scale data).
    3. Train a **Logistic Regression** model using LogisticRegression().
    4. Evaluate performance using **Accuracy, Precision, Recall, F1-score**.
    5. Plot the **Confusion Matrix** and **ROC Curve**.

Lab Assignment 5: Implementing K-Nearest Neighbors (KNN)

- **Tasks:**
    1. Load the **Iris dataset** and split it into training and testing sets.
    2. Train a **KNN classifier** using KNeighborsClassifier().
    3. Experiment with different values of **K** and evaluate performance.
    4. Visualize decision boundaries using a **scatter plot**.

Lab Assignment 6: Decision Trees and Random Forests

- **Tasks:**
    1. Train a **Decision Tree classifier** on the Titanic dataset.
    2. Visualize the tree structure using plot_tree().
    3. Train a **Random Forest classifier** and compare performance with the decision tree.
    4. Determine the **feature importance** using feature_importances_.

Module 4	Neural Networks and Deep Learning	Quiz	Implementation	6 Sessions

Lab Assignment 7: Introduction to Perceptron and Activation Functions

Tasks:

1. Implement a **single-layer perceptron** using NumPy.
2. Train the perceptron to classify **AND, OR, XOR** gates.
3. Experiment with different **activation functions** (Sigmoid, ReLU, Tanh).
4. Visualize decision boundaries.

Lab Assignment 8: Building a Simple Neural Network with Keras

Tasks:

1. Load the **MNIST dataset** from keras.datasets.
2. Preprocess the data (normalize pixel values, reshape input).
3. Create a **fully connected neural network** using Sequential API.
4. Train and evaluate the model using **categorical cross-entropy loss** and **accuracy**.

Lab Assignment 9: Implementing CNN from Scratch

Tasks:

1. Load the **CIFAR-10 dataset**.
2. Build a CNN with **Conv2D, MaxPooling2D, Flatten, Dense, Dropout** layers.
3. Use **Adam optimizer** and **categorical cross-entropy loss**.
4. Train and visualize loss/accuracy curves.

Lab Assignment 10: Image Augmentation & Regularization

Tasks:

1. Apply **data augmentation** (rotation, zoom, flipping) using ImageDataGenerator.
2. Add **dropout and batch normalization** to prevent overfitting.
3. Compare model performance with and without augmentation.

Lab Assignment 11: Transfer Learning with Pre-trained Models

Tasks:

1. Use **VGG16 or ResNet50** pre-trained on ImageNet.
2. Replace the output layer to classify **new images**.
3. Freeze earlier layers and fine-tune deeper layers.
4. Evaluate the model on a custom **dataset (e.g., Cats vs. Dogs)**.

Lab Assignment 12: Implementing RNN for Text Classification

Tasks:

1. Load **IMDB movie reviews dataset** from keras.datasets.
2. Preprocess text (tokenization, padding sequences).
3. Build an **RNN** with **Embedding, SimpleRNN, Dense** layers.
4. Train and evaluate the model.

Lab Assignment 13: Building an LSTM for Time Series Prediction

Tasks:

1. Load a **time series dataset** (e.g., stock prices, temperature data).
2. Preprocess the data (normalize, reshape).
3. Build an **LSTM-based model**.
4. Predict future values and visualize trends.

Targeted Application & Tools that can be used:

Applications:

1. **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 models.

NLTK: 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 Hugging Face): A powerful library for using pre-trained Transformer-based models like 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. "Python Machine Learning" – Sebastian Raschka & Vahid Mirjalili
3. "Hands-On Artificial Intelligence with Python" – Teet Straus
4. "Deep Learning for Coders with Fastai and PyTorch" – Jeremy Howard & Sylvain Gugger

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 courses studied in previous semesters.**					
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 learners with the concepts of Professional Practice and attain Employability Skills through Experiential Learning techniques.
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) 4. Interpret the events and results for meaningful conclusions. (Evaluate)

| Course Code: CBC2000 | Course Title: Blockchain Technology and Applications |
L:T:P:C = 3:0:0:3

| Version 1.0 |

Course Pre-requisites: Basics of Computer Networks, Database Systems

Anti-requisites: NIL

Course Description:
This course introduces the core concepts of blockchain technology, including its structure, consensus algorithms, and cryptographic foundations. It explores the various applications of blockchain in sectors such as finance, healthcare, supply chain, and digital identity. Students will also understand the legal, ethical, and scalability challenges of blockchain systems.

Course Objectives:
1. Understand the foundational principles of blockchain technology.
2. Explore blockchain architecture, cryptographic elements, and consensus mechanisms.
3. Analyze real-world blockchain use cases and evaluate their effectiveness.
4. Examine privacy, scalability, legal, and governance issues in blockchain ecosystems.

Course Outcomes:
CO1 (Understand): Describe blockchain architecture, key components, and cryptographic elements.
CO2 (Analyze): Compare different types of blockchains and consensus mechanisms.
CO3 (Apply): Demonstrate blockchain use cases across various industries.
CO4 (Apply): Analyze the social, legal, and ethical implications of blockchain adoption.

Course Content:

Module 1: Introduction to Blockchain and Cryptographic Foundations | No. of Sessions: 11
Distributed systems, Introduction to Blockchain, Properties of blockchain, Cryptographic hash functions, Merkle trees, Digital signatures, Public key infrastructure (PKI), Blockchain transactions

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Module 2: Blockchain Types and Consensus Mechanisms | No. of Sessions: 11
Permissioned vs Permissionless blockchains, Public vs Private vs Consortium blockchains, Bitcoin architecture, Ethereum overview, Consensus algorithms: PoW, PoS, DPoS, PBFT

Module 3: Blockchain Platforms and Applications | No. of Sessions: 12
Smart contracts and dApps, Ethereum use cases, Hyperledger Fabric, Blockchain in finance (DeFi, tokenization), Healthcare, Supply chain, Identity verification, Voting systems

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Module 4: Challenges, Governance, and Future Trends | No. of Sessions: 11
Scalability and interoperability, Energy consumption, Privacy challenges, Legal and regulatory frameworks, Blockchain governance models, Emerging trends: CBDCs, NFTs, Web3, DAOs

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Textbooks:
T1: Melanie Swan, *Blockchain: Blueprint for a New Economy*, O'Reilly Media, 2015
T2: Imran Bashir, *Mastering Blockchain*, Packt Publishing, 3rd Edition, 2020

Reference Books:
R1: Arshdeep Bahga, Vijay Madisetti, *Blockchain Applications: A Hands-on Approach*, VPT, 2017
R2: Andreas M. Antonopoulos, *Mastering Bitcoin*, O'Reilly Media, 2nd Edition, 2017
R3: Bettina Warburg, *Basics of Blockchain*, LTS Publishing, 2019
R4: Nitin Gaur et al., *Blockchain for Business*, Pearson Education, 2021

Web Resources:
W1: https://ethereum.org
W2: https://hyperledger.org
W3: https://bitcoin.org/en/
W4: https://blockchainhub.net
W5: https://web3.foundation

Course Code: CBC2504
Course Title: Blockchain Security and Performance
L:T:P:C – 3:0:0:3

Course Description
This course delves into the security and performance aspects of blockchain systems. It covers consensus attacks, smart contract vulnerabilities, performance bottlenecks, and secure protocol design. Emphasis is laid on techniques to improve resilience, scalability, and privacy while preserving decentralization.

Course Objectives
— Understand blockchain-specific threats and security principles
— Analyze performance metrics in blockchain platforms
— Explore security techniques for smart contracts and consensus algorithms
— Evaluate design strategies to enhance scalability and privacy

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Course Outcomes
CO1 (Understand): Identify and describe security challenges in blockchain platforms
CO2 (Analyze): Evaluate consensus attacks and performance issues in different blockchain frameworks
CO3 (Apply): Implement security-aware smart contracts and mitigation techniques
CO4 (Apply): Analyze and optimize blockchain performance under diverse network loads

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Course Content (45 Hours Total)
Module 1: Blockchain Security Foundations – 11 Sessions
Security principles in distributed systems, Blockchain threat models, Sybil attacks, Eclipse attacks, 51% attack, Cryptographic assumptions, Consensus vulnerabilities, Double-spending

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Module 2: Smart Contract Security – 11 Sessions
Ethereum vulnerabilities, DAO attack analysis, Reentrancy, Arithmetic overflow/underflow, Front-running, Best practices in secure smart contract design, Tools for smart contract auditing

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Module 3: Blockchain Performance Metrics – 11 Sessions
Performance benchmarks: latency, throughput, block size, transaction rate, Bottlenecks in scalability, Network propagation delay, Chain growth and quality, Trade-offs in performance vs security

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Module 4: Enhancing Blockchain Performance and Privacy – 12 Sessions
Layer-2 scaling (State Channels, Rollups), Sharding, DAG-based architectures, ZKPs, Mixers and Privacy coins, Secure multi-party computation, Formal verification of performance

Textbooks

T1: Joseph Bonneau et al., *SoK: Research Perspectives and Challenges for Bitcoin and Cryptocurrencies*, IEEE Security & Privacy, 2015

T2: Imran Bashir, *Mastering Blockchain*, Packt Publishing, 3rd Edition, 2020

Reference Books

R1: Antonopoulos & Wood, *Mastering Ethereum*, O'Reilly Media

R2: Narayanan et al., *Bitcoin and Cryptocurrency Technologies*, Princeton University Press

R3: Koshy & Arvind, *Blockchain Security and Performance*, Springer, 2021

R4: Bonneau et al., *Security Analysis of Blockchain Protocols*, ACM Reviews

Web Resources

W1: https://consensys.net

W2: https://ethereum.org/en/developers/docs/security/

W3: https://chainsecurity.com/

W4: https://cryptozombies.io

W5: https://bitcoin.org/en/security

Course Code: CBC2505

Course Title: Blockchain Security and Performance lab

L:T:P:C – 3:0:0:3

Course Description

This course delves into the security and performance aspects of blockchain systems. It covers consensus attacks, smart contract vulnerabilities, performance bottlenecks, and secure protocol design. Emphasis is laid on techniques to improve resilience, scalability, and privacy while preserving decentralization.

Course Objectives

— Understand blockchain-specific threats and security principles

— Analyze performance metrics in blockchain platforms

— Explore security techniques for smart contracts and consensus algorithms

— Evaluate design strategies to enhance scalability and privacy

Course Outcomes

CO1 (Understand): Identify and describe security challenges in blockchain platforms

CO2 (Analyze): Evaluate consensus attacks and performance issues in different blockchain frameworks

CO3 (Apply): Implement security-aware smart contracts and mitigation techniques
CO4 (Apply): Analyze and optimize blockchain performance under diverse network loads

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Course Content (45 Hours Total)

Module 1: Blockchain Security Foundations – 11 Sessions

Security principles in distributed systems, Blockchain threat models, Sybil attacks, Eclipse attacks, 51% attack, Cryptographic assumptions, Consensus vulnerabilities, Double-spending

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Module 2: Smart Contract Security – 11 Sessions

Ethereum vulnerabilities, DAO attack analysis, Reentrancy, Arithmetic overflow/underflow, Front-running, Best practices in secure smart contract design, Tools for smart contract auditing

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Module 3: Blockchain Performance Metrics – 11 Sessions

Performance benchmarks: latency, throughput, block size, transaction rate, Bottlenecks in scalability, Network propagation delay, Chain growth and quality, Trade-offs in performance vs security

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Module 4: Enhancing Blockchain Performance and Privacy – 12 Sessions

Layer-2 scaling (State Channels, Rollups), Sharding, DAG-based architectures, ZKPs, Mixers and Privacy coins, Secure multi-party computation, Formal verification of performance

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Week	Lab Experiment Title	Tools/Platforms
1	Introduction to Blockchain Security Concepts and Tools	Ganache, MetaMask
2	Setup and Configuration of Private Ethereum Network	Geth, Truffle
3	Smart Contract Vulnerability Assessment (Reentrancy Attack)	Remix IDE, Solidity
4	Implementing Access Control in Smart Contracts	Solidity, Truffle
5	Role-based Authorization with OpenZeppelin Libraries	OpenZeppelin, Remix
6	Timestamp Manipulation Attack Analysis	Remix, MetaMask
7	Replay Attack Detection and Prevention	Hardhat, Wireshark
8	Gas Optimization Techniques for Smart Contracts	Remix IDE, Truffle
9	DoS (Denial of Service) Attack Simulation and Handling	Solidity, Ganache
10	Event Logging and Auditing in Blockchain Systems	Web3.js, Ethers.js
11	Zero Knowledge Proof (ZKP) based Smart Contract Implementation	ZoKrates, Hardhat
12	Analyzing Blockchain Performance – Throughput and Latency	Hyperledger Caliper

13	Implementing Multi-signature Wallets	Solidity, Gnosis Safe
14	Secure Oracle Integration in Blockchain	Chainlink, Hardhat
15	Mini Project Presentation – Secure & Performance-oriented Blockchain Application	Tools as per project

Textbooks

T1: Joseph Bonneau et al., *SoK: Research Perspectives and Challenges for Bitcoin and Cryptocurrencies*, IEEE Security & Privacy, 2015

T2: Imran Bashir, *Mastering Blockchain*, Packt Publishing, 3rd Edition, 2020

Reference Books

R1: Antonopoulos & Wood, *Mastering Ethereum*, O'Reilly Media

R2: Narayanan et al., *Bitcoin and Cryptocurrency Technologies*, Princeton University Press

R3: Koshy & Arvind, *Blockchain Security and Performance*, Springer, 2021

R4: Bonneau et al., *Security Analysis of Blockchain Protocols*, ACM Reviews

Web Resources

W1: https://consensys.net

W2: https://ethereum.org/en/developers/docs/security/

W3: https://chainsecurity.com/

W4: https://cryptozombies.io

W5: https://bitcoin.org/en/security

Course Code: CSE2510	**Course Title:** Competitive Programming and Problem Solving **Type of Course: Program Core**	L-T-P-C	0	0		
Version No.	1.0					
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 algorithmic approaches to solve relevant CP problems. CO4: Creating efficient solutions of CP problems using the learnt algorithmic approaches.
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Competitive Programming and Problem Solving** and attain **Skill Development** through **Experiential Learning** techniques.

Module 1: Introduction to Competitive Programming

Overview of Efficient Coding for Problem Solving and CP: Introduction to competitive programming (CP); revisit of complexity analysis; introduction to online platforms such as codechef, codeforces etc and online submission; constraints during CP, online testing process and common errors such as TLE; use of STL

Module 2: Number Theory for Problem-Solving

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:

31. 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.
32. 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.
33. 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).
34. 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.
35. 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.
36. 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.
37. 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.
38. 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.
39. 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.
40. 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.
41. 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).
42. 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.
43. 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.
44. 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.

45. Given a string, find the number of occurrences of a specific substring within the string. **Focus:** Basic string manipulation, string matching (brute-force approach).
46. 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.
47. 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.
48. 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.
49. 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).
50. 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.
51. 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).
52. 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.
53. 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.
54. 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.
55. 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.
56. 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.
57. 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.

58. 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.
59. 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.
60. 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:

10. C or C++ Compiler (g++): The standard compiler for CP. Familiarize students with compilation flags (e.g., -O2 for optimization).
11. IDE (Integrated Development Environment): Code:: Blocks, Visual Studio, CLion, or similar IDEs. These provide debugging capabilities, code completion, and other helpful features.
12. Online Judges (CodeChef, Codeforces, LeetCode, HackerRank): Essential for practicing and submitting solutions.
13. Debugger (gdb): Crucial for understanding code execution and finding bugs. Origin, excel and Mat lab soft wares for programming and data analysis.
14. Number Theory Libraries: Some libraries provide pre-built functions for number theory operations (though often it's better to implement them yourself for learning).
15. Wolfram Alpha: A useful tool for verifying number theory calculations and exploring concepts.
16. **String Libraries:** Familiarize students with the string manipulation functions available in C++.
17. **Graph Visualization Tools:** Tools like Graphviz can be helpful for visualizing graphs and understanding graph algorithms.
18. **DP Debugging Techniques:** Practice debugging DP solutions, as they can be complex. Visualizing the DP table can be helpful.

Text Books:

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

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

Reference Books:

3. **Data Structures and Algorithmic Thinking with Python/C++/Java", *Narasimha Karumanchi, 5th Edition, Career Monk, 2017.***
4. **Introduction to Algorithms, Thomas H. Cormen (Author), Charles E. Leiserson (Author), Ronald L. Rivest , fourth edition April 2022**

Web Resources

3. https://nptel.ac.in/courses/106106231
4.

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

Course Code: CSE 7300	**Course Title:** Capstone Project **Type of Course:**	**L- T-P- C**	0	0	0	10
Version No.	**1.0**					
Course Pre-requisites	**Knowledge and Skills related to all the courses studied in previous semesters.**					
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 learners with the concepts of Professional Practice and attain Employability Skills through Experiential Learning techniques.					
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 lifelong learning. (Understand)					


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Course Code: MAT2064	Course Title: Numerical Computing Type of Course:1] School Core	L-T- P-C	3	0	0	3

Version No.		1.0
Course Pre-requisites		Calculus, Linear Algebra, Differential Equations
Anti-requisites		**NIL**
Course Description		The course explores mathematical techniques used to approximate solutions to complex problems that are difficult to solve analytically, often utilizing computers to perform calculations, including methods for root finding, interpolation, numerical differentiation and integration, solving systems of linear equations, and approximating solutions to differential equations, with applications across various scientific and engineering fields. It focuses on understanding the theoretical basis behind these methods, their implementation in programming languages, and analyzing their accuracy and stability.
Course Objective		The objective of the course is to equip students with understanding and ability to apply various numerical techniques to approximate solutions to complex mathematical problems that are difficult or impossible to solve analytically, particularly focusing on areas like solving systems of equations, finding roots of functions, interpolation, numerical differentiation, and integration, often utilizing computational tools to implement these methods.
Course Out Comes		On successful completion of the course the students shall be able to: CO1 - Calculate errors induced in the values by truncation of a series expansion. CO2 - Demonstrate the applications of numerical methods to find the roots of polynomial equations and eigen values of real symmetric matrices. CO3 - Apply the knowledge of numerical methods in modelling of various physical and engineering phenomena. CO4 - Apply various numerical methods for solving linear Ordinary & Partial differential equations arising in engineering field.
Course Content:		

Module 1	**Solution of Linear Systems of Equation**		**(12 Classes)**

Numerical Computation: Motivation and Objectives, Number Representation, Machine Precision, Round-of Error, Truncation Error, Random Number Generation.

Solution of algebraic and transcendental equations: Various types of errors - Bisection method, Regula-Falsi method, Newton-Raphson method, Graffe's method - Bairstow's method - Newton's method for solving f(x,y) = 0 and g(x,y) = 0, secant method, Fixed point iteration method, Solution of linear system of equations, Gauss elimination method, Pivoting, Gauss Jordan method, Iterative methods of Gauss Jacobi and Gauss Seidel, Sufficient conditions for convergence - LU decomposition method, Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

Module 2	**Interpolation and Approximation**	**Assignment**	**(8 Classes)**

Interpolation with equal intervals, Newton's forward and backward difference formulae, Interpolation with unequal intervals, Lagrange's interpolation, Newton's divided difference interpolation, Cubic Splines, Difference operators and relations.

Module 3	**Numerical Differentiation and Integration**		**(10 Classes)**

Numerical differentiation, Approximation of derivatives using interpolation polynomials, Numerical integration using Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule, Weddle's rule, Romberg's Method, Two point and three point Gaussian quadrature formulae, Evaluation of double integrals by Trapezoidal rule and Simpson's one-third rule

Module 4	**Initial & Boundary Value Problems for Ordinary & Partial Differential Equations**	**Assignment**	**(15 Classes)**

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:

6. 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

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

References:

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

E-resources/ Web links:

13. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_135224
14. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_141727
15. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_217628
16. http://.ac.in/courses.php?disciplineID=111
17. http://www.class-central.com/subject/math(MOOCs)
18. http://academicearth.org/
19. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html
20. https://www.scu.edu.au/study-at-scu/units/math1005/2022/

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: CBC3400
Course Title: Cryptography and Security in Blockchain
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course provides a deep dive into the **cryptographic principles and security mechanisms** that underpin blockchain technology. It explores key cryptographic algorithms, consensus protocols, wallet security, smart contract vulnerabilities, and advanced security features essential for safeguarding decentralized systems.

Course Objectives
— Understand core cryptographic techniques used in blockchain ecosystems
— Explore consensus protocols and their security implications
— Analyze common attacks and vulnerabilities in blockchain networks
— Apply cryptographic methods for secure blockchain applications and smart contracts

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Course Outcomes
CO1 (Understand): Explain the role of cryptographic primitives in securing blockchain data and identity
CO2 (Analyze): Evaluate consensus protocols and blockchain attack surfaces
CO3 (Apply): Implement and test cryptographic algorithms and secure wallet mechanisms
CO4 (Apply): Identify and mitigate security flaws in smart contracts and blockchain systems

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Course Content (45 Hours Total)

Module 1: Cryptographic Foundations – 11 Sessions (Understand)
Symmetric vs. asymmetric cryptography, Hash functions (SHA-256, Keccak), Digital signatures (ECDSA), Message integrity and non-repudiation, Merkle trees, Zero-knowledge proofs basics

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Module 2: Consensus and Blockchain Security – 11 Sessions (Analyze)
Proof of Work (PoW), Proof of Stake (PoS), PBFT, Delegated PoS, Sybil attacks, 51% attack, Forking issues, Blockchain scalability vs. security trade-offs

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Module 3: Wallets and Transaction Security – 11 Sessions (Apply)
Public/private key generation, Wallet types (hot, cold, hardware), Multisig wallets, Transaction signing and verification, Secure key storage, Replay protection

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Module 4: Smart Contract and Platform Security – 12 Sessions (Apply)
Smart contract vulnerabilities (reentrancy, overflow), DAO case study, Formal verification, Auditing tools (Mythril, Slither), Secure coding standards, Layer-2 security (ZK-rollups, state channels), Privacy coins (ZCash, Monero)

Textbooks
T1: Kelsey Hightower et al., *Blockchain Security and Privacy*, Wiley, **2023**
T2: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **4th Edition, 2023**

Reference Books
R1: Arvind Narayanan et al., *Bitcoin and Cryptocurrency Technologies*, Princeton University Press, **2022**
R2: William Stallings, *Cryptography and Network Security*, Pearson, **7th Edition, 2022**
R3: Andreas M. Antonopoulos, *Mastering Bitcoin*, O'Reilly Media, **2022**
R4: Nipun Jaswal, *Mastering Blockchain Security*, Packt Publishing, **2022**

Web Resources

W1: https://cryptozombies.io
W2: https://soliditylang.org/security
W3: https://ethereum.org/en/developers/docs/security
W4: https://z.cash/technology
W5: https://slither.readthedocs.io

Course Code: CBC3401
Course Title: Crypto Trading Strategies & Risk Management
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course provides an in-depth understanding of **crypto trading mechanisms, investment strategies**, and **risk management techniques**. It covers technical and fundamental analysis, trading indicators, automated strategies, and regulatory considerations. Emphasis is placed on market psychology, portfolio diversification, and risk mitigation in highly volatile crypto markets.

Course Objectives
— Understand cryptocurrency markets, exchanges, and trading instruments
— Learn technical and fundamental analysis techniques for crypto assets
— Explore risk assessment models and portfolio protection strategies
— Apply trading strategies and automation tools within regulatory frameworks

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Course Outcomes
CO1 (Understand): Explain cryptocurrency market structures, instruments, and volatility characteristics
CO2 (Analyze): Evaluate and compare crypto trading strategies and their performance indicators
CO3 (Apply): Apply risk management techniques and portfolio diversification methods
CO4 (Apply): Use tools to implement, simulate, or automate crypto trading strategies

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Course Content (45 Hours Total)

Module 1: Cryptocurrency Markets & Exchanges – 11 Sessions (Understand)
Overview of crypto assets, Exchanges (CEX vs DEX), Trading pairs, Order types (market, limit, stop-loss), Market liquidity and volatility, Understanding spreads, slippage, and fees

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Module 2: Trading Strategies and Analytics – 11 Sessions (Analyze)
Technical indicators (MACD, RSI, Bollinger Bands), Candlestick patterns, Moving averages, Breakout and momentum strategies, Arbitrage and swing trading, Volume analysis, On-chain analytics

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Module 3: Risk Management in Crypto Trading – 11 Sessions (Apply)
Position sizing, Risk-reward ratio, Stop-loss vs trailing stops, Leverage and margin risks, Portfolio diversification, Drawdown analysis, Hedging strategies

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Module 4: Automation, Tools & Regulations – 12 Sessions (Apply)
Trading bots and scripting basics (Python, Pionex), Backtesting tools (TradingView, CryptoCompare), Trading APIs (Binance, Coinbase), Regulatory risks, KYC/AML, Taxation, Real-world strategy simulation

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Textbooks
T1: Glen Goodman, *The Crypto Trader: How Anyone Can Make Money Trading Bitcoin and Other Cryptocurrencies*, Harriman House, **2023**

T2: Rolf Schlotmann, *Crypto Trading: A Comprehensive Beginner's Guide*, Independently Published, **2022**

Reference Books
R1: Steve Burns, *Technical Analysis for Crypto Traders*, New Trader U, **2022**
R2: Michael Radkay, *Cryptocurrency Risk Management*, Wiley, **2023**
R3: Victor Lucas, *The Cryptocurrency Trading Guide*, Kindle Edition, **2022**
R4: Nik Patel, *An Altcoin Trader's Handbook*, Amazon Publishing, **2021**

Web Resources
W1: https://www.tradingview.com
W2: https://coinmarketcap.com
W3: https://pionex.com
W4: https://academy.binance.com
W5: https://cryptoquant.com

Course Code: CBC3402
Course Title: Bitcoin and Ethereum Protocols
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course offers an in-depth exploration of the **technical protocols behind Bitcoin and Ethereum**, the two most prominent blockchain platforms. It focuses on consensus algorithms, cryptographic structures, transaction lifecycles, smart contract execution, protocol upgrades, and governance models. Students will gain foundational knowledge to build, secure, and innovate on these platforms.

Course Objectives
— Understand the architecture and protocols of Bitcoin and Ethereum blockchains
— Explore the transaction mechanisms and consensus protocols of both platforms
— Learn how Ethereum enables smart contracts and decentralized applications
— Analyze protocol limitations, upgrades, and scalability efforts

Course Outcomes
CO1 (Understand): Describe the technical components and operation of Bitcoin and Ethereum
CO2 (Analyze): Compare consensus mechanisms and data structures used in both platforms
CO3 (Apply): Trace transaction flow and analyze smart contract execution
CO4 (Apply): Evaluate scaling solutions, forks, and governance in decentralized networks

Course Content (45 Hours Total)

Module 1: Bitcoin Protocol Internals – 11 Sessions (Understand)
Bitcoin architecture, UTXO model, SHA-256 and ECDSA cryptography, Merkle trees, Block structure and mining, Proof-of-Work (PoW), Difficulty adjustment, Nakamoto consensus

Module 2: Ethereum Platform and EVM – 11 Sessions (Analyze)
Ethereum accounts model (EOA vs Contract), Gas and transaction fees, Ethereum Virtual Machine (EVM), Solidity basics, State transitions, Keccak-256 hashing, Contract storage and execution

Module 3: Transaction Lifecycle & Security – 11 Sessions (Apply)
Transaction creation, mempool, mining and validation, Transaction finality, Smart contract deployment, Reentrancy and gas-related vulnerabilities, Forking and transaction replay

Module 4: Protocol Upgrades, Governance & Scaling – 12 Sessions (Apply)
Bitcoin forks (SegWit, Taproot), Ethereum forks (Byzantium to Shanghai), Ethereum 2.0 and Proof-of-Stake (PoS), Rollups and Layer 2 scaling, DAO governance models, Limitations and innovations

Textbooks
T1: Andreas M. Antonopoulos, *Mastering Bitcoin*, O'Reilly Media, **2nd Edition, 2023**
T2: Andreas M. Antonopoulos & Gavin Wood, *Mastering Ethereum*, O'Reilly Media, **2023**

Reference Books
R1: Arvind Narayanan et al., *Bitcoin and Cryptocurrency Technologies*, Princeton University Press, **2022**
R2: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **2023**
R3: Ritesh Modi, *Introducing Ethereum and Solidity*, Apress, **2022**
R4: Roger Wattenhofer, *The Science of the Blockchain*, InTechOpen, **2021**

Web Resources
W1: https://bitcoin.org/en/developer-documentation
W2: https://ethereum.org/en/developers/docs
W3: https://soliditylang.org
W4: https://github.com/ethereum/EIPs
W5: https://bitcoin.stackexchange.com

Course Code: CBC3403
Course Title: Blockchain for Digital Identity Management
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course explores how **blockchain technology** is revolutionizing **digital identity management** by enabling decentralized, secure, and privacy-preserving solutions. Topics include identity lifecycle, verifiable credentials, decentralized identifiers (DIDs), self-sovereign identity (SSI), and regulatory compliance. Real-world platforms and government use cases are also covered.

Course Objectives
— Understand the challenges of traditional identity management systems
— Explore blockchain-based identity frameworks and standards
— Learn to design and implement decentralized digital identity models
— Evaluate security, privacy, and compliance aspects in identity solutions

Course Outcomes
CO1 (Understand): Describe the principles and components of blockchain-based digital identity systems
CO2 (Analyze): Compare centralized and decentralized identity models and their implications
CO3 (Apply): Design verifiable credentials and DIDs using standard protocols
CO4 (Apply): Evaluate use cases and compliance aspects of blockchain-enabled identity frameworks

Course Content (45 Hours Total)

Module 1: Digital Identity Concepts & Challenges – 11 Sessions (Understand)
Digital identity basics, Authentication vs authorization, Centralized identity systems, Federated login issues, Identity theft and fraud, Introduction to identity on blockchain

Module 2: Decentralized Identity & Standards – 11 Sessions (Analyze)
Decentralized Identifiers (DIDs), Verifiable Credentials (VCs), Self-Sovereign Identity (SSI), DIDComm, W3C standards, Privacy-preserving principles (ZKP, selective disclosure)

Module 3: Platforms & Architecture – 11 Sessions (Apply)
Sovrin, uPort, Hyperledger Indy, Aries, Trust over IP (ToIP), Blockchain identity layers, Wallets and credential holders, Issuer-verifier-holder architecture

Module 4: Implementation & Regulatory Compliance – 12 Sessions (Apply)
Smart contract-enabled identity, GDPR compliance, KYC/AML on blockchain, Identity in banking and e-governance, Cross-border identity solutions, Use cases: Aadhaar on blockchain, eIDAS, decentralized healthcare ID

Textbooks
T1: Alex Preukschat & Drummond Reed, *Self-Sovereign Identity*, Manning Publications, **2023**
T2: Mearian Lucas, *Blockchain for Digital Identity*, BPB Publications, **2022**

Reference Books
R1: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **2023**
R2: Arvind Narayanan et al., *Bitcoin and Cryptocurrency Technologies*, Princeton University Press, **2022**
R3: Phillip J. Windley, *Digital Identity*, O'Reilly Media, **2021**
R4: Sovrin Foundation Whitepapers and ToIP Framework Documents

Web Resources
W1: https://www.w3.org/TR/did-core/
W2: https://identity.foundation
W3: https://www.hyperledger.org/use/hyperledger-indy
W4: https://www.sovrin.org
W5: https://trustoverip.org

Course Code: CBC3404
Course Title: Cryptocurrency Wallet Development
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course focuses on the **design, development, and security of cryptocurrency wallets**, which are essential tools for interacting with blockchain networks. Students will learn about wallet types, key management, transaction signing, wallet APIs, and user interface design, along with best practices for developing secure and user-friendly crypto wallets.

Course Objectives
— Understand the fundamentals of cryptocurrency wallets and key management
— Learn to build and secure wallets for Bitcoin, Ethereum, and other blockchains

— Explore wallet SDKs, libraries, and integration techniques
— Apply secure coding practices to prevent theft, fraud, and misuse

Course Outcomes
CO1 (Understand): Explain the architecture and functionality of cryptocurrency wallets
CO2 (Analyze): Compare wallet types and evaluate their security mechanisms
CO3 (Apply): Design and develop wallets with secure key storage and transaction capabilities
CO4 (Apply): Integrate wallet features with DApps and blockchain networks using APIs and SDKs

Course Content (45 Hours Total)

Module 1: Wallet Architecture & Key Management – 11 Sessions (Understand)
Wallet types (hot, cold, custodial, non-custodial), Mnemonic phrases and HD wallets (BIP32/39/44), Public-private key pairs, Address generation, Key encryption, Backup and recovery mechanisms

Module 2: Wallet Security & Compliance – 11 Sessions (Analyze)
Threats and attack vectors (phishing, malware, keylogging), Secure enclave and HSM, 2FA and biometric protection, Anti-fraud mechanisms, KYC/AML integration, Regulatory frameworks (FATF, GDPR)

Module 3: Wallet Development – 11 Sessions (Apply)
Bitcoin and Ethereum transaction lifecycle, Signing and broadcasting transactions, Wallet SDKs (Web3.js, ethers.js, bitcoinjs-lib), QR code integration, Multi-currency support, UI/UX for wallet apps

Module 4: DApp Integration & Advanced Features – 12 Sessions (Apply)
Interfacing with smart contracts, MetaMask integration, Web3 wallets, WalletConnect protocol, Hardware wallet integration (Ledger, Trezor), Lightning wallets, Token swap and staking support

Textbooks
T1: Andreas M. Antonopoulos, *Mastering Bitcoin*, O'Reilly Media, **2nd Edition, 2023**
T2: Chris Dannen, *Introducing Ethereum and Solidity*, Apress, **2022**

Reference Books
R1: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **2023**
R2: Tim Coulter, *Blockchain Developer's Guide*, Packt Publishing, **2022**
R3: Joseph Bonneau et al., *SoK: Research Perspectives and Challenges for Bitcoin and Cryptocurrencies*, IEEE Security & Privacy, **2022**
R4: Ledger Academy and Trezor Docs (for practical wallet development)

Web Resources
W1: https://web3js.readthedocs.io
W2: https://docs.ethers.org
W3: https://bitcoin.org/en/developer-guide
W4: https://developer.metamask.io
W5: https://walletconnect.com

Course Code: CBC3405
Course Title: Blockchain Security & Ethical Hacking
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description

This course focuses on **security challenges and ethical hacking techniques** specific to blockchain systems. It explores vulnerabilities in smart contracts, consensus mechanisms, cryptographic exploits, and network-level attacks. Students will gain hands-on knowledge in penetration testing, auditing, and securing decentralized applications in a responsible and ethical manner.

Course Objectives

— Understand blockchain security principles and ethical hacking frameworks
— Explore attack vectors in consensus, smart contracts, wallets, and networks
— Learn secure development practices and ethical exploitation techniques
— Apply auditing tools and mitigation strategies to secure blockchain ecosystems

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Course Outcomes

CO1 (Understand): Describe blockchain security models, attack surfaces, and ethical hacking methodologies
CO2 (Analyze): Identify and assess vulnerabilities in blockchain components and smart contracts
CO3 (Apply): Simulate blockchain-specific attacks in a controlled environment
CO4 (Apply): Use auditing tools and secure coding techniques to mitigate real-world blockchain threats

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Course Content (45 Hours Total)

Module 1: Blockchain Threat Landscape & Security Models – 11 Sessions (Understand)

Security principles in decentralized systems, Attack surfaces in blockchain, Common vulnerabilities (51% attack, Sybil attack, DDoS), Smart contract security flaws, Wallet security risks, Ethics and legalities in hacking

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Module 2: Ethical Hacking & Penetration Testing – 11 Sessions (Analyze)

Reconnaissance and scanning, Blockchain-specific enumeration, Network sniffing, Exploit development for smart contracts, Bug bounty frameworks (Immunefi, HackenProof), Legal compliance and scope setting

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Module 3: Secure Development & Mitigation – 11 Sessions (Apply)

Secure coding standards (Solidity), Gas optimization and fallback protection, Reentrancy guards, Rate limiting and throttling, Smart contract auditing lifecycle, Continuous security integration (DevSecOps)

Module 4: Tools & Real-World Case Studies – 12 Sessions (Apply)

Tools: Mythril, Slither, Hardhat, Truffle Security, Wireshark, Metasploit, Analysis of DAO hack, Poly Network breach, DeFi protocol exploits, Wallet draining scams, Building a secure DApp from scratch

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Textbooks

T1: Rajneesh Gupta, *Blockchain Security and Ethical Hacking*, BPB Publications, **2023**
T2: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **4th Edition, 2023**

Reference Books

R1: Joseph Bonneau et al., *SoK: Research Perspectives and Challenges for Bitcoin and Cryptocurrencies*, IEEE, **2022**
R2: Mudit Gupta, *Smart Contract Hacking Handbook*, Immunefi Community Docs, **2022**
R3: Damilare Daramola, *Ethereum Smart Contract Security*, Apress, **2023**
R4: Kevin Mitnick, *The Art of Invisibility*, Little Brown, **2022**

Web Resources

W1: https://ethereum.org/en/developers/docs/security
W2: https://consensys.github.io/smart-contract-best-practices/
W3: https://cryptozombies.io

W4: https://immunefi.com/learn
W5: https://github.com/crytic/slither

Course Code: CBC3406
Course Title: Introduction to Artificial Intelligence in Blockchain
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course introduces how **Artificial Intelligence (AI)** can be integrated with **blockchain technology** to create intelligent, secure, and autonomous decentralized systems. Topics include AI-driven smart contracts, secure data sharing, AI model integrity on-chain, blockchain for AI auditability, and applications in finance, healthcare, and supply chain.

Course Objectives
— Understand the synergy between AI and blockchain technologies
— Explore architectures that combine decentralized data with intelligent decision-making
— Learn use cases of AI-powered blockchain applications
— Analyze challenges in data privacy, trust, and model governance in AI-blockchain systems

Course Outcomes
CO1 (Understand): Explain the fundamentals of AI and blockchain and their convergence
CO2 (Analyze): Evaluate use cases and architectures of AI-powered blockchain systems
CO3 (Apply): Integrate AI models into smart contracts and decentralized applications
CO4 (Apply): Examine the challenges and ethical concerns of deploying AI on the blockchain

Course Content (45 Hours Total)

Module 1: Fundamentals of AI and Blockchain – 11 Sessions (Understand)
Overview of AI (ML, DL, NLP), Blockchain structure, consensus, and smart contracts, AI vs blockchain roles, Benefits of integration, Blockchain for AI audit trails and data provenance

Module 2: Intelligent Smart Contracts & AI Models On-Chain – 11 Sessions (Analyze)
Embedding decision-making into contracts, Oracle networks, AI-driven DApps, Federated learning and blockchain, Edge AI and decentralized AI agents

Module 3: Use Cases in Industry – 11 Sessions (Apply)
AI in DeFi fraud detection, Healthcare diagnostics with secure sharing, Predictive analytics in blockchain logistics, Tokenizing AI models, Model training marketplaces, NFT + AI systems

Module 4: Challenges, Ethics & Future Directions – 12 Sessions (Apply)
Data privacy, GDPR, Explainable AI (XAI) on blockchain, Resource constraints, Model verification and updates, Regulatory landscape, Ethical implications, Roadmap to autonomous decentralized AI

Textbooks
T1: Arshdeep Bahga & Vijay Madisetti, *Blockchain Applications: A Hands-On Approach*, VPT, **2023**

T2: Mohammad Rezaul Karim, *AI and Blockchain for Beginners*, Packt Publishing, **2023**

Reference Books
R1: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **2023**
R2: Kai-Fu Lee, *AI Superpowers: China, Silicon Valley, and the New World Order*, HMH, **2022**
R3: Bhaskar Krishnamachari, *Blockchain and AI for Internet of Things*, Springer, **2022**
R4: Jaspreet Bindra, *The Tech Whisperer: On Digital Transformation and the Technologies That Enable It*, Penguin, **2021**

Web Resources
W1: https://ai.google
W2: https://ethereum.org/en/developers/docs/oracles
W3: https://deeplearning.ai
W4: https://oceanprotocol.com
W5: https://h2020bonseyes.eu

Course Code: CBC3407
Course Title: Machine Learning for Cyber Threat Detection
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course focuses on the application of **machine learning techniques** for detecting and preventing **cybersecurity threats**. It explores supervised, unsupervised, and deep learning methods for anomaly detection, intrusion detection systems (IDS), malware analysis, and phishing detection. Real-time threat analytics, datasets, and evaluation metrics are emphasized.

Course Objectives
— Understand the fundamentals of cyber threats and threat detection strategies
— Learn to apply machine learning models to identify malicious activities
— Explore threat datasets, feature engineering, and evaluation metrics
— Analyze and compare ML techniques for cybersecurity use cases

Course Outcomes
CO1 (Understand): Explain the types of cyber threats and the role of machine learning in threat detection
CO2 (Analyze): Evaluate datasets and select appropriate ML models for different security tasks
CO3 (Apply): Build and train ML models for intrusion detection and malware classification
CO4 (Apply): Implement real-time threat detection and evaluate model performance

Course Content (45 Hours Total)

Module 1: Introduction to Cybersecurity and Threat Types – 11 Sessions (Understand)
Cyber threat landscape, Attack vectors (phishing, malware, DoS, ransomware), Indicators of compromise (IOCs), Traditional IDS vs ML-based IDS, Need for intelligent threat detection

Module 2: Machine Learning for Threat Modeling – 11 Sessions (Analyze)
Supervised vs unsupervised learning, Feature selection from logs/packets, Preprocessing and encoding, Cyber threat datasets (NSL-KDD, CICIDS, CTU-13), Model selection strategies

Module 3: Model Development and Application – 11 Sessions (Apply)
Logistic regression, Decision trees, SVM, Random Forests, K-means, Autoencoders, Neural networks for classification, Evaluation metrics (precision, recall, F1, ROC-AUC)

Module 4: Advanced Detection and Real-World Use Cases – 12 Sessions (Apply)
Deep learning for APT and malware detection, Threat intelligence integration, Adversarial ML, Real-time IDS with streaming data, SOC and SIEM integration, Case studies: phishing, botnet, zero-day detection

Textbooks
T1: Emmanuel Tsukerman, *Machine Learning for Cybersecurity Cookbook*, Packt Publishing, **2023**
T2: Clarence Chio & David Freeman, *Machine Learning and Security*, O'Reilly Media, **2023**

Reference Books
R1: Xiaofeng Chen, *AI in Cybersecurity*, Springer, **2022**
R2: Richard MacDonald, *Practical Machine Learning for Cybersecurity*, Apress, **2021**
R3: Mark Stamp, *Information Security: Principles and Practice*, Wiley, **2022**
R4: Kim Crawley, *Hacking AI: The Security Threat of Artificial Intelligence*, Wiley, **2022**

Web Resources
W1: https://www.kaggle.com/datasets
W2: https://www.unb.ca/cic/datasets
W3: https://github.com/nu11secur1ty
W4: https://scikit-learn.org/stable/
W5: https://cybersecurity.att.com

Course Code: CBC3408
Course Title: AI-Powered Fraud Detection in Blockchain
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course explores the application of **Artificial Intelligence (AI)** for detecting **fraudulent activities** in blockchain-based systems. It covers anomaly detection, behavioral analysis, graph-based fraud detection, and ML techniques to identify suspicious patterns in transactions, smart contracts, and decentralized applications. Real-world case studies and tools for fraud prevention are also included.

Course Objectives
— Understand the nature of fraud in blockchain networks and DeFi systems
— Explore AI and ML techniques for fraud detection
— Apply anomaly detection and classification models on blockchain datasets
— Learn to deploy real-time fraud detection pipelines and interpret alerts

Course Outcomes
CO1 (Understand): Describe types of fraud in blockchain systems and the role of AI in detecting them
CO2 (Analyze): Evaluate transaction patterns using AI algorithms to identify anomalies
CO3 (Apply): Implement supervised and unsupervised models for fraud detection in smart contracts and wallets
CO4 (Apply): Build and test AI-driven fraud analytics dashboards for real-time monitoring

Course Content (45 Hours Total)

Module 1: Blockchain Fraud & Risk Landscape – 11 Sessions (Understand)
Types of fraud: double-spending, Sybil attacks, wash trading, flash loan exploits, rug pulls, Ponzi schemes in DeFi, Anti-fraud mechanisms, AML/KYC challenges, Role of explainable AI (XAI)

Module 2: ML Techniques for Fraud Detection – 11 Sessions (Analyze)
Supervised learning (logistic regression, decision trees, SVM), Unsupervised methods (k-means, Isolation Forest, PCA), Graph-based approaches (Graph Neural Networks), Transaction feature engineering, Datasets (EtherScan, Elliptic, AMLSim)

Module 3: Smart Contract & Wallet Behavior Analysis – 11 Sessions (Apply)
Contract flow analysis, Malicious patterns in Solidity, Detecting honeypots and backdoors, Wallet profiling, Time-series analysis of transfers, API integration for behavioral monitoring

Module 4: Tools, Visualization & Real-Time Analytics – 12 Sessions (Apply)
Building fraud dashboards with Kibana/Grafana, Stream analytics for fraud signals, Alerting engines, Case studies (DAO exploit, PolyNetwork hack), Integration with Chainalysis, CipherTrace, AML Bot APIs

Textbooks
T1: M. Rezaul Karim, *Artificial Intelligence for Blockchain*, Packt Publishing, **2023**
T2: Sudeep Tanwar et al., *Blockchain and AI for Cybersecurity and Privacy*, Springer, **2022**

Reference Books
R1: Thomas Holt, *Cybercrime Through the Blockchain*, Routledge, **2022**
R2: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **2023**
R3: Ashish Mishra, *AI in Finance and Blockchain*, Wiley, **2022**
R4: Yulia Timofeeva, *Detecting Fraud and Financial Crime Using Machine Learning*, Springer, **2023**

Web Resources
W1: https://www.chainalysis.com
W2: https://ciphertrace.com
W3: https://www.amlbot.com
W4: https://etherscan.io
W5: https://elliptic.co/resources

Course Code: CBC3409
Course Title: Optimizing Blockchain Networks with AI
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course focuses on leveraging **Artificial Intelligence (AI)** to enhance the **performance, scalability, and security of blockchain networks**. It explores optimization techniques for transaction throughput, consensus efficiency, node management, and predictive maintenance using AI models. The course emphasizes both theoretical foundations and practical applications of AI in blockchain infrastructure.

Course Objectives
— Understand performance challenges in blockchain networks
— Explore AI techniques for optimizing consensus, throughput, and latency

— Learn predictive models for network behavior and threat detection
— Apply intelligent algorithms to improve scalability and resource management

Course Outcomes
CO1 (Understand): Explain the performance and scalability limitations of blockchain networks
CO2 (Analyze): Evaluate the role of AI in enhancing consensus mechanisms and throughput
CO3 (Apply): Design and test AI models to predict congestion, detect anomalies, and optimize node behavior
CO4 (Apply): Integrate AI algorithms for energy efficiency, resource allocation, and real-time network tuning

Course Content (45 Hours Total)

Module 1: Blockchain Network Architecture & Bottlenecks – 11 Sessions (Understand)
Node types and network topology, Transaction processing pipeline, Consensus protocol overview (PoW, PoS, PBFT), Throughput and latency issues, Scalability trilemma, Gas fee dynamics

Module 2: AI Techniques for Network Optimization – 11 Sessions (Analyze)
Reinforcement Learning for block size tuning, Neural networks for congestion prediction, Anomaly detection in peer behavior, AI-assisted block propagation, ML models for dynamic fee estimation

Module 3: Resource & Energy Optimization – 11 Sessions (Apply)
AI for miner/validator selection, Load balancing, Smart node clustering, Energy-efficient scheduling, Predictive fault detection in blockchain nodes, Real-time node health monitoring

Module 4: Intelligent Consensus & Future Directions – 12 Sessions (Apply)
AI-enhanced consensus models, Swarm intelligence, Federated learning for decentralized AI, Hybrid optimization architectures (AI + DLT), Use cases in DeFi, supply chain, and CBDC networks

Textbooks
T1: Sudeep Tanwar et al., *Blockchain with AI and Machine Learning*, Springer, **2023**
T2: M. Rezaul Karim, *Artificial Intelligence for Blockchain*, Packt Publishing, **2023**

Reference Books
R1: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **4th Edition, 2023**
R2: Zheng Zibin, *Blockchain Technologies for AI Applications*, Springer, **2022**
R3: Md. Sadek Ferdous, *AI and Blockchain for Smart Systems*, CRC Press, **2022**
R4: Qusay H. Mahmoud, *Cognitive Blockchain*, Springer, **2021**

Web Resources
W1: https://ethereum.org/en/developers/docs/scaling
W2: https://deeplearning.ai
W3: https://github.com/OpenMined
W4: https://developer.ibm.com/blogs/blockchain-ai
W5: https://research.ibm.com/blog/ai-blockchain

Course Code: CBC3410
Course Title: Generative AI for Blockchain Applications
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course introduces the integration of **Generative AI** with **Blockchain technology** to develop intelligent, decentralized, and automated applications. It focuses on the use of models like GPT, LLMs, and diffusion networks to enhance smart contracts, autonomous agents, decentralized content creation, NFT generation, and AI transparency using blockchain.

Course Objectives
— Understand the fundamentals of Generative AI and its potential in blockchain ecosystems
— Explore the use of LLMs and generative models for smart contracts, NFTs, and decentralized apps
— Apply decentralized storage and blockchain for provenance and model verification
— Investigate real-world use cases and ethical implications of AI-generated content on-chain

Course Outcomes
CO1 (Understand): Describe the principles of Generative AI and how it enhances blockchain use cases
CO2 (Analyze): Evaluate generative models for decentralized identity, content, and NFTs
CO3 (Apply): Design applications that combine smart contracts with LLM-generated outputs
CO4 (Apply): Implement provenance, audit trails, and ownership models using blockchain for AI-generated assets

Course Content (45 Hours Total)

Module 1: Introduction to Generative AI & Blockchain – 11 Sessions (Understand)
Overview of Generative AI: GPT, GANs, VAEs, Diffusion Models, Blockchain basics: smart contracts, transactions, oracles, Benefits of integrating AI with blockchain (immutability, trust, decentralization)

Module 2: Generative AI for NFTs and Smart Contracts – 11 Sessions (Analyze)
AI-generated NFTs and metadata, Smart contract-driven art/music/token generation, Prompt engineering for blockchain use, Ethereum, IPFS, and Arweave for content storage, Creative commons and licensing on-chain

Module 3: Autonomous Agents & Decentralized AI Apps – 11 Sessions (Apply)
Autonomous AI agents for DeFi and DAO governance, Blockchain-based prompt markets, Agent verification and staking, AI for DAO proposals and decision-making, Combining LLMs with Chainlink oracles

Module 4: Security, Ethics & Use Cases – 12 Sessions (Apply)
AI model validation and IP protection using blockchain, Verifiable credentials, Combatting AI-generated misinformation, Case studies: OpenAI tokens, Alethea AI, Bittensor, Web3 AI marketplaces, Regulatory landscape and ethical concerns

Textbooks
T1: Rex St. John, *Generative AI on Web3: LLMs and Blockchain Integration*, Independently Published, **2023**
T2: M. Rezaul Karim, *Artificial Intelligence and Blockchain for Beginners*, Packt Publishing, **2023**

Reference Books
R1: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **2023**
R2: Peter Van Hardenberg, *Understanding Large Language Models*, O'Reilly Media,

2023
R3: Sudeep Tanwar et al., *Blockchain and AI for Cybersecurity and Privacy*, Springer,
2022
R4: OpenAI Research Papers & Alethea Whitepapers

Web Resources
W1: https://platform.openai.com/docs
W2: https://ethereum.org/en/developers
W3: https://ipfs.tech
W4: https://alethea.ai
W5: https://bittensor.com

Course Code: CBC3411
Course Title: Quantum Computing & Blockchain-AI Security
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course provides an interdisciplinary overview of **quantum computing** and its implications for the **security of blockchain and AI systems**. It covers quantum algorithms, post-quantum cryptography, quantum-safe blockchain protocols, and the impact of quantum advancements on AI model integrity, smart contracts, and decentralized security mechanisms.

Course Objectives
— Understand the fundamentals of quantum computing and its threat to classical cryptography
— Explore quantum-resistant cryptographic techniques and blockchain adaptations
— Analyze the vulnerabilities in AI and blockchain systems in a post-quantum world
— Apply hybrid security models combining quantum safety, blockchain, and AI

Course Outcomes
CO1 (Understand): Explain the principles of quantum computing and quantum threats to cryptographic systems
CO2 (Analyze): Evaluate the impact of quantum algorithms on blockchain consensus and AI model security
CO3 (Apply): Implement basic post-quantum algorithms and analyze their integration in blockchain
CO4 (Apply): Propose secure architectures combining AI, blockchain, and quantum-safe techniques

Course Content (45 Hours Total)

Module 1: Foundations of Quantum Computing – 11 Sessions (Understand)
Qubits, superposition, entanglement, quantum gates and circuits, Quantum parallelism, Quantum vs classical models, Introduction to quantum programming (Qiskit, Cirq)

Module 2: Quantum Threats to Blockchain and AI – 11 Sessions (Analyze)
Shor's algorithm, Grover's algorithm, Breaking RSA/ECC, Threats to Bitcoin and Ethereum, Risks to AI model integrity, Quantum attacks on hashes and signatures

Module 3: Post-Quantum Cryptography & Blockchain – 11 Sessions (Apply)
Lattice-based, hash-based, code-based cryptography, NIST PQC candidates, Blockchain modifications for quantum resistance, Quantum key distribution (QKD), Hybrid encryption in smart contracts

Module 4: Secure Architectures & Use Cases – 12 Sessions (Apply)
Combining AI with quantum-safe blockchains, Use cases: quantum voting, decentralized identity, healthcare AI security, IBM Q and Google Quantum AI tools, Regulatory and ethical considerations

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Textbooks
T1: Mikio Nakahara & Tetsuo Ohmi, *Quantum Computing: An Applied Approach*, Springer, **2023**
T2: Mehran Mozaffari, *Post-Quantum Blockchain*, Springer, **2023**

Reference Books
R1: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **2023**
R2: Scott Aaronson, *Quantum Computing Since Democritus*, Cambridge University Press, **2022**
R3: Ronald de Wolf, *Quantum Computing: Lecture Notes*, CWI Amsterdam, **2022**
R4: NIST PQC Project Resources and IBM Q Experience Whitepapers

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Web Resources
W1: https://qiskit.org
W2: https://quantumai.google
W3: https://csrc.nist.gov/projects/post-quantum-cryptography
W4: https://quantum-computing.ibm.com
W5: https://ethereum.org/en/developers/docs/security/

Course Code: CBC3412
Course Title: Introduction to Decentralized Finance (DeFi)
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course provides a foundational understanding of **Decentralized Finance (DeFi)**—an open financial ecosystem built on blockchain networks. It covers core DeFi primitives such as lending, staking, token exchanges, liquidity pools, stablecoins, DAOs, and yield farming. Emphasis is placed on smart contract mechanics, platform security, and regulatory considerations.

Course Objectives
— Understand the architecture and protocols that power DeFi systems
— Explore key DeFi applications including lending, trading, and insurance
— Learn how smart contracts automate financial services in DeFi
— Analyze risks, governance, and compliance challenges in decentralized finance

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Course Outcomes
CO1 (Understand): Explain the foundational concepts, architecture, and drivers of DeFi
CO2 (Analyze): Evaluate DeFi protocols such as DEXs, lending markets, and stablecoins
CO3 (Apply): Simulate DeFi operations such as liquidity provision and staking on testnets
CO4 (Apply): Analyze risks (smart contract, liquidity, governance) and suggest mitigation strategies

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Course Content (45 Hours Total)

Module 1: Introduction to DeFi and Blockchain Infrastructure – 11 Sessions (Understand)
What is DeFi?, DeFi vs TradFi, Ethereum and EVM, Smart contracts in DeFi, Token

standards (ERC-20, ERC-721), Role of oracles, Introduction to wallets (MetaMask, Ledger)

Module 2: DeFi Applications & Protocols – 11 Sessions (Analyze)
Decentralized exchanges (Uniswap, Curve), Lending/borrowing protocols (Aave, Compound), Stablecoins (DAI, USDC, algorithmic types), Derivatives and synthetic assets, Cross-chain DeFi

Module 3: Participation in DeFi Ecosystem – 11 Sessions (Apply)
Liquidity provision, Yield farming, Staking and governance tokens, DAO voting, Token bonding curves, Farming simulations on testnets (Ropsten, Mumbai)

Module 4: Security, Risks & Regulation – 12 Sessions (Apply)
Smart contract bugs and audits, Flash loan attacks, Liquidity risks, Rug pulls, DeFi insurance, Regulatory overview (FATF, SEC, MiCA), DeFi compliance tools and trends

Textbooks
T1: Camila Russo, *The Infinite Machine*, Harper Business, **2022**
T2: Lasse Clausen, *Mastering DeFi: Decentralized Finance for Everyone*, Independently Published, **2023**

Reference Books
R1: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **2023**
R2: Ashwin Ramachandran et al., *The DeFi Stack: A Guide to Decentralized Finance*, Github Release, **2023**
R3: Rainer Böhme, *Cryptoassets and DeFi*, Springer, **2022**
R4: Binance Academy & CoinGecko Research Papers

Web Resources
W1: https://defillama.com
W2: https://ethereum.org/en/defi
W3: https://aave.com
W4: https://uniswap.org
W5: https://dappradar.com

Course Code: CBC3413
Course Title: Blockchain in Financial Services
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course explores how **blockchain technology is transforming the financial services industry**, from traditional banking to insurance and capital markets. Topics include decentralized clearing and settlement, digital identity, smart contracts, CBDCs, and regulatory frameworks. Emphasis is placed on architecture, security, scalability, and practical applications.

Course Objectives
— Understand blockchain fundamentals in the context of financial services
— Explore real-world applications in payments, lending, trade finance, and capital markets
— Learn about digital identity, regulatory compliance, and tokenization
— Analyze challenges of adoption, scalability, and integration with legacy systems

Course Outcomes
CO1 (Understand): Explain how blockchain redefines processes in financial services
CO2 (Analyze): Evaluate blockchain use cases across banking, insurance, and investment sectors

CO3 (Apply): Design secure blockchain-based workflows for financial operations
CO4 (Apply): Assess integration, scalability, and regulatory strategies for blockchain solutions in finance

Course Content (45 Hours Total)

Module 1: Blockchain Basics for Finance – 11 Sessions (Understand)
Distributed ledgers and consensus, Cryptographic primitives (hashing, digital signatures), Smart contracts, Tokenization of assets, Permissioned vs permissionless blockchains, Architecture of financial blockchain platforms (Corda, Quorum)

Module 2: Applications in Core Financial Services – 11 Sessions (Analyze)
Cross-border payments (Ripple, Stellar), Clearing and settlement, Lending & credit scoring (DeFi, tokenized loans), Trade finance (Letter of credit digitization), Digital identity and KYC/AML

Module 3: Capital Markets, Insurance & Emerging Trends – 11 Sessions (Apply)
Tokenized securities and STOs, Fractional ownership, Reinsurance on chain, Parametric insurance, CBDCs and stablecoins, Robo-advisors with blockchain backend, ESG finance with smart contracts

Module 4: Risk, Regulation & Integration – 12 Sessions (Apply)
Security risks (51%, front-running, reentrancy), Regulatory standards (MiCA, FATF), Auditability and traceability, Integration with core banking systems, Blockchain sandboxing, Interoperability (Polkadot, Cosmos)

Textbooks
T1: Antony Welfare, *Commercializing Blockchain: Strategic Applications in the Real World*, Wiley, **2023**
T2: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **4th Edition, 2023**

Reference Books
R1: Arvind Narayanan et al., *Bitcoin and Cryptocurrency Technologies*, Princeton University Press, **2022**
R2: David Shrier, *Basic Blockchain*, Little Brown, **2022**
R3: Ash Costello, *Blockchain in Banking and Finance: Innovating with Purpose*, Springer, **2022**
R4: Deloitte and World Bank Blockchain Reports

Web Resources
W1: https://r3.com
W2: https://www.weforum.org/projects/blockchain
W3: https://www.bis.org
W4: https://coincenter.org
W5: https://www2.deloitte.com/global/en/pages/financial-services/articles/blockchain-in-banking.html

Course Code: CBC3414
Course Title: Building Decentralized Applications (DApps) for Finance
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course focuses on the **design and development of Decentralized Applications (DApps)** for financial use cases using blockchain platforms. Students

will explore smart contract programming, Web3 integration, decentralized finance protocols, and wallet connectivity. The course emphasizes security, UX design, and compliance in DApp development.

Course Objectives

— Understand DApp architecture and smart contract fundamentals
— Learn to build secure, finance-focused DApps using Ethereum and Web3 tools
— Explore UI/UX design, wallet integration, and backend connectivity
— Analyze security, scalability, and deployment challenges in real-world DApps

Course Outcomes

CO1 (Understand): Explain the architecture and components of decentralized financial applications
CO2 (Analyze): Evaluate DApp frameworks, smart contract interactions, and Web3 interfaces
CO3 (Apply): Build and test secure DApps for financial services using blockchain tools
CO4 (Apply): Deploy and optimize DApps with wallet, API, and decentralized storage integration

Course Content (45 Hours Total)

Module 1: DApp Architecture & Financial Use Cases – 11 Sessions (Understand)

Overview of DApps, Differences between traditional apps and DApps, Financial DApp use cases (wallets, lending, insurance), Blockchain platforms (Ethereum, Polygon), DApp lifecycle

Module 2: Smart Contracts for DApps – 11 Sessions (Analyze)

Solidity fundamentals, Contract structure, Inheritance and modifiers, Events and data flow, Interaction with oracles, Audit practices, Gas optimization, Contract upgradeability

Module 3: DApp Frontend, Wallet & Web3 Integration – 11 Sessions (Apply)

Web3.js/ethers.js setup, MetaMask and WalletConnect integration, DApp UI design principles, React.js frontend, Reading/writing contract data from frontend, Decentralized authentication

Module 4: Deployment, Storage & Real-World DApps – 12 Sessions (Apply)

IPFS and Arweave for decentralized storage, Hardhat/Truffle for testing and deployment, DeFi API integration (Uniswap, Aave), Use cases: DApp lending platform, staking, NFT marketplace, Compliance and user privacy

Textbooks

T1: Nader Dabit, *Full Stack DApp Development*, O'Reilly Media, **2023**
T2: David Hoover, *Decentralized Applications: Harnessing Ethereum & Solidity*, Manning, **2023**

Reference Books

R1: Andreas M. Antonopoulos, *Mastering Ethereum*, O'Reilly Media, **2023**
R2: Greg Lim, *Beginning Ethereum and Solidity Smart Contracts*, Packt, **2022**
R3: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **2023**
R4: OpenZeppelin Docs, Ethereum Dev Community Resources

Web Resources

W1: https://ethereum.org/en/developers
W2: https://docs.metamask.io
W3: https://web3js.readthedocs.io
W4: https://hardhat.org
W5: https://openzeppelin.com

Course Code: CBC3415
Course Title: Smart Contracts for Financial Products
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course focuses on the **design, development, and deployment of smart contracts** specifically for **financial products and services**. It introduces smart contract logic, digital agreements, automated settlements, and programmable finance using platforms like Ethereum and Hyperledger. Use cases include insurance, lending, escrow, tokenized assets, and derivatives.

Course Objectives
— Understand the fundamentals and architecture of smart contracts
— Learn how to model financial instruments using code-based contracts
— Build and deploy secure smart contracts for DeFi and traditional finance applications
— Explore risks, audit strategies, and compliance issues in financial smart contracts

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Course Outcomes
CO1 (Understand): Explain the architecture, lifecycle, and legal implications of smart contracts in finance
CO2 (Analyze): Compare financial product types and model them using Solidity or other smart contract languages
CO3 (Apply): Build, test, and deploy smart contracts for loans, insurance, and tokenized securities
CO4 (Apply): Audit and optimize smart contracts for security, gas usage, and regulatory alignment

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Course Content (45 Hours Total)

Module 1: Introduction to Smart Contracts – 11 Sessions (Understand)
Concept and origin, Contract lifecycle, Ethereum and EVM, Benefits and risks in finance, Platforms (Solidity, Vyper, DAML), Role of oracles and event logs

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Module 2: Modeling Financial Instruments – 11 Sessions (Analyze)
Smart contracts for loans (collateralized, flash), Escrow services, Insurance contracts (parametric, peer-to-peer), Structured products, Tokenized bonds and equities

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Module 3: Development, Testing & Deployment – 11 Sessions (Apply)
Solidity contract structure, Events and modifiers, Testing with Truffle/Hardhat, Gas optimization, Upgradable contracts using proxies, Remix and blockchain testnets

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Module 4: Security, Audits & Compliance – 12 Sessions (Apply)
Smart contract vulnerabilities (overflow, reentrancy), Audit frameworks (Mythril, Slither), Access control (OpenZeppelin), Compliance considerations (MiCA, SEC), Real-world failures (DAO, Wormhole), Best practices

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Textbooks
T1: Ritesh Modi, *Building Smart Contracts and DApps on Ethereum*, BPB Publications, **2023**
T2: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **4th Edition, 2023**

Reference Books
R1: Andreas M. Antonopoulos & Gavin Wood, *Mastering Ethereum*, O'Reilly Media, **2023**
R2: Chris Dannen, *Introducing Ethereum and Solidity*, Apress, **2022**
R3: S. Seijas et al., *Financial Smart Contracts and the Future of Banking*, Springer,

2021
R4: OpenZeppelin Docs and Solidity Audit Guides

Web Resources
W1: https://soliditylang.org
W2: https://remix.ethereum.org
W3: https://openzeppelin.com
W4: https://consensys.net
W5: https://chain.link

Course Code: CBC3416
Course Title: Decentralized Autonomous Organizations and Risk Management in Finance
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course explores **Decentralized Autonomous Organizations (DAOs)** and their application in **financial risk management**. It delves into governance models, treasury operations, legal status, and smart contract-driven automation of financial processes. It also covers various risk types—operational, smart contract, and market—and their mitigation strategies in decentralized environments.

Course Objectives
— Understand the structure and operational logic of DAOs
— Explore DAO use cases in investment, lending, and decentralized governance
— Learn how risk is modeled and managed within decentralized financial systems
— Analyze legal, regulatory, and technical frameworks for DAO-based finance

Course Outcomes
CO1 (Understand): Describe the architecture, governance, and funding mechanisms of DAOs
CO2 (Analyze): Evaluate DAO-based models for financial services and risk exposure
CO3 (Apply): Build and simulate DAO smart contracts and voting systems
CO4 (Apply): Develop risk mitigation strategies for DAO-managed financial operations

Course Content (45 Hours Total)

Module 1: DAO Fundamentals and Governance – 11 Sessions (Understand)
Definition and DAO structure, Key smart contracts in DAOs, Voting mechanisms (token-based, quadratic), Treasury management, Governance tokens, DAO platforms (Aragon, DAOstack)

Module 2: DAO Use Cases in Finance – 11 Sessions (Analyze)
DAO-based lending platforms, Investment DAOs, Yield aggregators, DAO-managed stablecoins, DAO for insurance and asset management, Real-world case studies (MakerDAO, Yearn Finance, ConstitutionDAO)

Module 3: Risk Management in DAO Ecosystems – 11 Sessions (Apply)
Types of risks: protocol, liquidity, operational, regulatory, Risk scoring systems, DAO treasury risk modeling, Smart contract vulnerabilities, Flash loan attacks, DAO governance attacks

Module 4: Legal Frameworks and Compliance – 12 Sessions (Apply)
Legal entity status of DAOs, Jurisdictions (Wyoming, Malta, Liechtenstein), DAO

compliance toolkits, Auditing and reporting in DAO finance, Security vs utility tokens, Regulatory overlaps (SEC, MiCA, FATF)

Textbooks
T1: Oriol Caudevilla et al., *Decentralized Finance and DAOs*, Springer, **2023**
T2: Linda Xie, *A Beginner's Guide to DAOs*, Ethereum Foundation Series, **2023**

Reference Books
R1: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **2023**
R2: Nathan Schneider, *Exit to Community: DAO Governance and the Future of Finance*, Yale University Press, **2022**
R3: Primavera De Filippi et al., *Blockchain and the Law: The Rule of Code*, Harvard Press, **2022**
R4: DAO Research Collective Whitepapers & LexDAO Legal Templates

Web Resources
W1: https://daostack.io
W2: https://aragon.org
W3: https://ethereum.org/en/dao
W4: https://makerdao.com
W5: https://lexdao.substack.com

Course Code: CBC3417
Course Title: Regulatory and Compliance Challenges in DeFi
L:T:P:C – 3:0:0:3
Prerequisite: Nil

Course Description
This course explores the **regulatory, legal, and compliance frameworks** surrounding **Decentralized Finance (DeFi)**. It analyzes how DeFi challenges traditional financial regulation and examines global responses, such as MiCA, FATF, SEC guidance, and KYC/AML implementations. The course includes real-world case studies, compliance tools, and ethical considerations for DeFi innovation.

Course Objectives
— Understand the regulatory landscape for DeFi and decentralized platforms
— Examine compliance obligations related to KYC, AML, and taxation
— Analyze global approaches to DeFi oversight, classification of tokens, and enforcement trends
— Explore solutions for integrating compliance into decentralized systems

Course Outcomes
CO1 (Understand): Identify the key regulatory concerns and frameworks applicable to DeFi systems
CO2 (Analyze): Evaluate compliance challenges in decentralized lending, trading, and asset issuance
CO3 (Apply): Implement KYC/AML procedures and governance models in DeFi applications
CO4 (Apply): Assess risk and compliance strategies using real-world legal and technical tools

Course Content (45 Hours Total)

Module 1: Introduction to DeFi Regulation – 11 Sessions (Understand)
What is DeFi and why it's difficult to regulate, Regulatory bodies (FATF, SEC, EU, BIS), Principles-based vs rules-based regulation, Legal identity and anonymity, Public vs permissioned protocols

Module 2: Global Regulatory Frameworks – 11 Sessions (Analyze)
MiCA (EU), FinCEN (USA), MAS (Singapore), FCA (UK), Taxation of crypto assets, Classifying tokens (security, utility, hybrid), Regulatory sandbox models, DAO regulation

Module 3: Compliance Integration in DeFi Platforms – 11 Sessions (Apply)
On-chain KYC/AML, Decentralized identity (DID, VC), Risk scoring and monitoring tools, AML compliance engines (Chainalysis, TRM Labs), Oracle-based compliance feeds, Smart contract-based compliance controls

Module 4: Case Studies, Ethics & Emerging Trends – 12 Sessions (Apply)
Notable enforcement actions (SEC vs Ripple, Tornado Cash sanctions), DeFi rug pulls and litigation, Data privacy (GDPR in DeFi), Self-regulatory organizations (SROs), Compliance-by-design models, Future of regulated DeFi

Textbooks
T1: Jason Gottlieb, *Crypto Regulation: Navigating Compliance in the Decentralized World*, Wiley, **2023**
T2: Christopher Giancarlo, *CryptoDad: The Fight for the Future of Money*, Wiley, **2023**

Reference Books
R1: Primavera De Filippi & Aaron Wright, *Blockchain and the Law*, Harvard University Press, **2022**
R2: Imran Bashir, *Mastering Blockchain*, Packt Publishing, **2023**
R3: World Economic Forum, *DeFi Policy Toolkit*, WEF, **2022**
R4: Global Financial Stability Reports – IMF, BIS, FATF Recommendations

Web Resources
W1: https://www.fatf-gafi.org
W2: https://www.sec.gov/spotlight/cybersecurity
W3: https://www.european-union.europa.eu
W4: https://www.chainalysis.com
W5: https://trmlabs.com

Course Code: MAT2301	**Course Title: Calculus and Differential Equations** **Type of Course: BSC**	**L-T- P- C**	**3**	**1**	**0**	**4**
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	**NIL**					
Course Description	Calculus and differential equations are used ubiquitously throughout mathematics, statistics and operations research. In this course, students can be able to build upon the foundations of calculus established to greatly enhance their repertoire of theory and practice in these areas. The application of calculus and differential equations in the description and modelling of real-world problems will also be considered. This unit will extend the problem-solving skills, range of knowledge and use of techniques in differential and integral calculus. The course focuses on the concepts of Calculus and Differential Equations with reference to specific engineering problems. The course is of both conceptual and analytical type in nature.					

Course Objective	The goal of the course Calculus and Differential Equations is to facilitate the students with a concrete foundation of differential calculus and to solve the first and higher-order ordinary differential equations enabling them to acquire the knowledge of these mathematical tools.		
Course Out Comes	On successful completion of the course the students shall be able to: 5. Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve. 6. Apply the principles of integral calculus to evaluate integrals. 7. Learn the notion of partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobian. 8. Solve first-order linear/nonlinear ordinary differential equations analytically using standard methods.		
Course Content:			
Module 1	**Differential Calculus**		**(10 Classes)**
Polar Coordinates, polar curves, angle between radius vector and the tangent, angle between two curves, pedal equations, curvature and radius of curvature. Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.			
Module 2	**Integral Calculus**	**Assignment**	**(10 Classes)**
Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.			
Module 3	**Multivariable Calculus**		**(10 lectures)**
Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.			
Module 4	**Differential Equations**	**Assignment**	**(15 lectures)**
Definition, types of Differential Equations, Applications, Variable Separable, Homogeneous, Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. Linear differential equations of second and higher order with constant coefficients - Non-Homogeneous term of the type $Q(x) = e^{ax}$, Sin ax, Cosax, $e^{ax}v(x)$, $x^n v(x)$ - Method of variation of parameters.			
Targeted Application & Tools that can be used: Differential calculus is used extensively in science and engineering. It can solve problems related to motion, velocity, acceleration, angles of incline or curve on a surface, etc. Differential Equations are used to model the behavior of electromagnetic fields, including in the design of antennas, microwave ovens, and other devices. Biology: PDEs are used to model biological processes, such as the spread of diseases and the development of biological tissues.			

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 3. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition 4. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.
References: 21. Victor Henner, Tatyana Belozerova, Mickhail Khenner, Ordinary and Partial Differential Equations, CRC Press, Edition, 2013. 22. Walter Ledermann, Multiple integrals, Springer, 1st edition 23. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002. 24. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008. **E-resources/ Web links:** 12. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_103205 13. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_106839 14. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_61605 15. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_134719 16. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html 17. https://www.scu.edu.au/study-at-scu/units/math1005/2022/
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: MEC1006	**Course Title: Engineering Graphics** **Type of Course: School Core & Theory Only**	**L- T-P-C**	2	0	0	2
Version No.	1.2					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	The course is designed with the objective of giving an overview of engineering graphics. It is introductory in nature and acquaints thestudents with the techniques used to create engineering drawings. The course emphasizes on projection of points, lines, planes and solids and isometric projections.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of “Engineering Graphics” and attain SKILL DEVELOPMENT through Problem solving methodologies.					

Course Outcomes	On successful completion of this course the students shall be able to: 1. Demonstrate competency of Engineering Graphics as per BIS conventions and standards. 2. Comprehend the theory of projection for drawing projections of Points, Lines andPlanes under different conditions. 3. Prepare multiview orthographic projections of Solids by visualizing them indifferent positions. 4. Prepare pictorial drawings using the principles of isometric projections to visualizeobjects in three dimensions.			
Course Content:				
Module 1	Introduction to Drawing	Assignment	Standard technical drawing	**02 Sessions**
Topics: Introduction, drawing instruments and their uses, relevant BIS conventions and standards, Lettering, Lineconventions, dimensioning, Selection of drawing sheet size and scale.				
Module 2	Orthographic projections of Points, Straight Linesand Plane Surfaces	Assignment	Projection methods Analysis	**10 Sessions**
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.				
Module 3	Orthographic Projections of Solids	Assignment	Multi-view drawing Analysis	**10 Sessions**
Topics: **Introduction, Projection of right regular prisms, pyramids, cone, hexahedron and tetrahedron indifferent positions (Problems resting on HP only and First angle projection).**				
Module 4	Isometric Projections of Solids (Using isometric scale only)	Assignment	Spatial Visualization	**8 Sessions**

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.

ENG2501	**Advanced English**	**L- T- P- C**	2	0	0	2
Version No.	2.0					
Course Pre-requisites	ENG1900 - English for Technical Communication					
Anti-requisites	**NIL**					
Course Description	This course is designed to equip students to enhance their communication abilities in Listening, Speaking, Reading, and Writing. The curriculum covers interpersonal communication principles, the art of speech writing and delivery (including impromptu speaking), strategic approaches to critical reading, the identification of logical fallacies, and persuasive writing. Furthermore, the course will introduce students to the potential of AI tools and the techniques of prompt engineering to elevate their communication skills in the digital age. Upon course completion, students will be well-prepared to communicate effectively and critically in both academic and professional environments.					
Course Out Come	On successful completion of the course the students shall be able to: 5. Recognize the elements of interpersonal and cross-cultural communication to address communication challenges effectively. 6. Demonstrate the ability to deliver structured and impromptu speeches using effective speaking techniques.					

	7. Interpret textual and visual materials using critical reading strategies to evaluate arguments, logic, and persuasion. 8. Produce persuasive and analytical essays using effective argumentation techniques and structured writing strategies.

Course Content:

Module 1	**Foundations of Effective Communication**	**Case Studies/ Role play**	**Cross-Cultural Competency**	**12 Classes**

Topics:

- Fundamentals of Interpersonal Communication
- Verbal, Non-verbal, and Paraverbal communication.
- Cultural dimensions theory (Hofstede's Cultural Dimensions).
- Active Listening Techniques
- Common Errors in Communication

Activities:

- Instagram/YouTube Vocabulary Activity
- Charades with a Twist/Tone and Emotion Experiment/Mixed Messages Challenge/Role Reversal Conversations/Observation Exercise

Module 2	**Mastering Speech Delivery**	**JAM**	**Public Speaking Confidence**	**12 Classes**

Topics:

- Introduction to Prompt Engineering
- Speech Preparation and Organization
- Techniques for Effective Impromptu Speaking
- Practice Speech Delivery

Activities:

- Speech Writing
- Impromptu Speech

Module 3	**Critical Reading and Logical Analysis**	**Worksheet**	**Critical Thinking and Analysis**	**12 Classes**

Topics:

- Critical Reading Strategies: Contextualizing, Figurative Language, Evaluating Logic of an Argument, Recognizing Emotional Manipulation, Analysing Visuals
- Recognizing Logical Fallacies: Slippery Slope, False Dilemma, Post Hoc, Hasty Generalization, Ad Hominem, Straw Man, Bandwagon, No True Scotsman, Red Herring, Appeal to Authority, Sunk Cost, Appeal to ignorance

Activities:

- Critical Reading Worksheet/Identifying Bias in News Articles

Module 4	**Writing Effective Arguments**	**Assignment**	**Clear and Coherent Writing**	**9 Classes**

Topics:

- Understanding Critical Writing
- Building Arguments (Pathos, Ethos, Logos)
- Techniques for Persuasion

Activities:

- Causes or Effects/Appeal Mash-Up/Debates on Controversial Topics
- Opinion Writing

Targeted Application & Tools that can be used: Quizziz, Chatgpt, Gemini, Youtube, Instagram, Quillbot, Grammarly, Padlet

References

6. Adler, R. B., Rodman, G., & DuPré, A. (2019). *Understanding human communication (14th ed.)*. Oxford University Press.
7. Moore, B. N., & Parker, R. (2020). *Critical thinking* (13th ed.). McGraw-Hill Education.
8. Hamilton, C. (2020). *Communicating for success* (2nd ed.). Routledge.
9. Ting-Toomey, S., & Dorjee, T. (2018). Intercultural competence: A model for teaching and assessing cross-cultural communication. *Journal of Intercultural Communication, 47*(2), 213–229. https://doi.org/10.1016/j.jicc.2018.03.004
10. https://www.ted.com/

Topics Relevant to "employability": Teamwork and Collaboration, Critical Thinking and Problem-Solving

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

Course Code: ECE2022	**Course Title:** Digital Design **Type of Course:** ESC	**L- T-P- C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites	[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.					

Course Code: PHY2504	Course Objective	**Course Title: Optoelectronics and Quantum Physics Lab** **Type of Course: BSC**	L-T-P-C	0	0	2	1
Version No.	1.0	
Course Pre-requisites	**NIL**	
Anti-requisites	**NIL**	
Course Description	Course Content:	The objective of this course is to familiarize the learners with the concepts of Digital Design and attain the SKILL DEVELOPMENT through EXPERIENTIAL LEARNING.
Course Outcomes	On successful completion of this course the students shall be able to: v. Describe the concepts of number systems, Boolean algebra and logic gates. vi. Apply minimization techniques to simplify Boolean expressions. vii. Demonstrate the Combinational circuits for a given logic viii. Demonstrate the Sequential and programmable logic circuits	
Course Content	The 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.**					
	Module 1	Fundamentals of Number systems, Boolean algebra and digital logic	Application Assignment	Data Analysis task	06 classes
	Topics:				
Course Out Comes	On successful completion of the course the students shall be able to: CO1: To understand electrical and optical properties of materials CO2: Interpret the results of various experiments to verify the concepts used in optoelectronics and advanced devices.				
	Module 2	Boolean function simplification	Application Assignment	Data Analysis task	08 Classes
	Topics:				
Course Objective	The objective of the course is to familiarize the learners with the concepts of " Applied Physics for Computer Science Cluster "and attain **Skill Development** through **Experiential Learning** techniques				
	Module 3	Combinational Logic circuits:	Application Assignment	Programming Task & Data Analysis task	08 Classes
	Topics:				

Introduction to sequential circuits, Storage elements: latches and flip flops, Characteristic tables and equations, excitation table, Analysis of clocked sequential circuits, Mealy & Moore Models of finite state machines - Registers & Counters. HDL Models of Sequential circuits.

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

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.

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

List of Laboratory Tasks:

Experiment No. 1: Experimental errors and uncertainty using excel

Level 1: Calculation of accuracy and precision of a given data

Level 2: Propagation of errors in addition, subtraction, multiplication and division.

Experiment No 2: To determine the wavelength of semiconductor diode Laser and to estimate the particle size of lycopodium powder using diffraction.

Level 1: Determination of Wavelength of Laser

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.

Text Book(s):

3. Mano, M. Morris and Ciletti Michael D., *"Digital Design"*, Pearson Education, 6th edition

4. 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

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 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. 8: 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. 9: 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. 10: Determination of Stefan's constant and verification of Stefan-Boltzmann Law.

Level 1: Determination of Stefan's constant

Level 2: Verification of Stefan-Boltzmann Law.

Experiment No. 11: Determination of dielectric constant of given materials

Level 1: Determination of Stefan's constant

Level 2: compare the obtain results with other materials

Experiment No. 12: determine the wavelength of monochromatic light, such as sodium light, using Newton's rings.

Level 1: Determination of wavelength

Level 2: determine the radius of curvature of the Plano-convex lens.

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

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

8. eBook1: Mano, M. Morris and Ciletti Michael D., "*Digital Design*", Pearson Education.
9. {[PDF] Digital Design By M. Morris Mano, Michael D Ciletti Book Free Download}
10. eBook2:Floyd "DIGITAL LOGIC DESIGN" fourth edition- ePub, eBook- [PDF] DIGITAL LOGIC DESIGN FOURTH EDITION FLOYD | abri.engenderhealth.org.
11. NPTEL Course- NPTEL :: Electrical Engineering - NOC:Digital Electronic Circuits
12. Digital Logic Design PPT Slide 1 (iare.ac.in)
13. Lab Tutorial: Multisim Tutorial for Digital Circuits - Bing video
CircuitVerse - Digital Circuit Simulator online
Learn Logisim ➠ Beginners Tutorial | Easy Explanation! - Bing video
Digital Design 5: LOGISIM Tutorial & Demo
14. https://presiuniv.knimbus.com/user#/home

E-content:

5. 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.
6. An encoding technique for design and optimization of combinational logic circuit DipayanBhadra;Tanvir Ahmed Tarique;Sultan Uddin Ahmed;Md. Shahjahan;Kazuyuki Murase2010 13th International Conference on Computer and Information Technology (ICCIT)
7. 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.
8. 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.

Targeted Application & Tools that can be used:

5. Areas of application are optoelectronics industry, Solar panel technologies, quantum computing software, electronic devices using transistors and diodes, memory devices, endoscopy, SQUIDS in MRI, Advanced material characterizations using SEM and STM.
6. 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.

Course Code: **MAT2402**	**Course Title: Probability and Statistics** **Type of Course: BSC**	**L-T- P- C**	**3**	**1**	**0**	4
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	**NIL**					
Course Description	The course introduces the concepts of probability theory and statistical analysis, covering how to collect, organize, interpret, and draw inferences from data using mathematical models to understand randomness and uncertainty, with applications across various fields like science, engineering, economics, and social sciences.					
Course Objective	The objective of the course is to equip students with the foundational knowledge of probability theory and statistical methods, enabling them to collect, analyze, interpret data, and make informed decisions based on the likelihood of events occurring in various situations, often applied across different fields like science, engineering, and business.					
Course Out Comes	On successful completion of the course the students shall be able to: 5. Be able to compute conditional probabilities directly and using Bayes' theorem, and check for independence of events. 6. Be able to set up and work with discrete & continuous random variables; in particular, to understand the Bernoulli, binomial, geometric, Poisson distributions, uniform, normal, and exponential distributions. 7. Identifying different types of data relationships (linear, polynomial, exponential, logarithmic). 8. Be able to use specific significance tests, including z-test, t-test (one- and two-sample), and chi-squared test					

Course Content:

Module 1	**Basic Probability**		**(6 Classes)**
Probability of an Event, multiplication rule, combinations, permutations, Addition Law, Multiplication Law, Conditional Probability, Bayes's Theorem and Problems.			
Module 2	**Random Variables and Bivariate Distributions**	**Assignment**	**(15 Classes)**
Random Variables (discrete and continuous), Probability Mass/Density Functions, Mathematical Expectations, discrete probability distributions - Binomial distribution, Poisson distribution, geometric distribution, Continuous uniform distribution - exponential distribution, normal distribution, gamma distribution. Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.			

Module 3	Curve Fitting & Statistical Methods		(13 Classes)
Curve Fitting (Straight Line ($y = a + bx$), Parabola ($y = a + bx + cx^2$), Exponential Curves ($y = ae^{bx}$, $y = ab^x$ and $y = ax^b$) Measures of Central tendency, Moments, skewness and Kurtosis, Correlation - Karl Pearson's coefficient of correlation and rank correlation (with & Without repetition, Multiple Correlation - Problems. Regression analysis - lines of regression, Multiple regression - Problems.			
Module 4	**Joint Probability Distribution and Sampling Theory**	**Assignment**	**(15 Classes)**
Joint Probability distribution for two discrete random variables, expectation and covariance. Random sampling, sampling distributions, Standard Error, Type I & Type II errors, Testing of Hypothesis, Test of significance - Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations, Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.			

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: R software (Open Source)

Assignment:

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

3. Ronald .E. Walpole, Raymond. H. Myers, Sharon. L Myers, and Keying E. Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Delhi-9th edition, 2012.

4. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.

References:

4. Miller and Freund, Probability and Statistics for Engineers, Pearson Education Ltd.
5. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition.
6. Douglas C. Montgomery & George Runger, Applied Statistics and Probability for Engineers, , Wiley Publications

E-resources/ Web links:

9. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_10427

10. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_100198

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

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

13. https://nptel.ac.in/courses/111102137

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

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

16. Presidency University's Knimbus library URL is: presiuniv.knimbus.com

Topics relevant to SKILL DEVELOPMENT: The course focuses on the concepts of Vector calculus and Linear Algebra 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 the course handout.

Course Code: CIV1200	**Course Title: Foundations of Integrated Engineering** **Type of Course: ESC**	**L- T-P-C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	This interdisciplinary course introduces first-year engineering students to foundational principles and practices across key engineering domains, emphasizing real-world problem-solving, sustainability, and ethical innovation. Students explore how civil, mechanical, electrical, and IT systems intersect with emerging technologies like IoT, AI, and geomatics to address global challenges. Through case studies, learners gain deeper understanding of smart infrastructure, prototyping mechanical/electronic systems, and securing IT solutions. Topics include bioinformatics for environmental monitoring, GIS-enabled urban planning, renewable energy integration, and cybersecurity fundamentals. The course cultivates a holistic understanding of engineering's role in sustainable development, safety, and ethical decision-making, preparing students to contribute meaningfully to multidisciplinary projects in a technology-driven world.					
Course Objective	The objective of the course is skill development of student by using Participative Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: 1] Recall key principles of Agile, DevOps, and bioinformatics used in interdisciplinary engineering contexts. 2] Explain the role of GIS, LiDAR, and sustainable materials in designing smart infrastructure and disaster management systems. 3] Describe core components of mechanical systems and their real-world applications. 4] Describe the functionality of IoT-enabled wearable devices, embedded systems, and renewable energy integration in smart grids. 5] List foundational IT concepts such as cloud computing architectures, cybersecurity threats, and blockchain applications.					

Course Code: CHE2501	Course Title: Chemistry of Smart Materials	L-T- P- C	3	0	0	3
Version No. 1.0	Type of Course: Theory - BSC					
Course Pre-requisites	NIL					
Anti-requisites						
Course Description	The objective of the course is to introduce the students to concepts and applications of chemistry of smart materials. The course also aims to enhance the knowledge of smart materials associated with memory system, display devices, , sensors, energy devices and environment. It will also cultivate an ability to identify chemistry in each of smart engineered materials and interpret solutions for the challenges connected to memory, display, energy, smart, green and sustainable technologies. It targets to strengthen the fundamental concepts behind chemistry of smart materials and then builds an interface with their industrial applications. **This course is designed to cater to Environment and Sustainability**					
Course Objective	The objective of the course is 'SKILL DEVELOPMENT' of the student by using Participative learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: 1. Relate the knowledge of chemistry to computational approaches to identify materials functionalities and properties 2. Recognize and interpret solutions for the challenges connected to memory, display, smart, green and sustainable technologies. 3. Explain the quality parameters of engineering materials associated with environment and sensors. 4. Interpret the knowledge of sustainable chemistry for E- waste management 5. Analyse the importance of various electrochemical sources in energy systems.					
Course Content:						

Module 1	Computational Chemistry	Assignment	Data Collection and analysis	09 classes

Topics: Fundamental particles of atom – their mass, charge and location – atomic number and mass number, Stabilizing interactions: Bonded and non-bonded interactions, Chemistry of weak interactions - van der Waals force and hydrogen bonding, Density functional theory. 3D co-ordinate generation for small molecules, geometry optimization by Molview. Chemical Databases: Cheminformatics, MSDS

Self- learning topics: Scope, cost and efficiency of computational modeling.

Course Content

Module 1	Foundations of Engineering Practice	Assignment	Case studies	6 Sessions

Real-world problem-solving using data logic and practical applications, Collaboration and Innovation through multi-domain project, Engineering Ethics & Environmental Impact
Emerging Fields: Automation, and Introduction to bioinformatics and its application
Sustainability & Safety: Circular economy principles, carbon footprint analysis.

Module 2	Civil Engineering & Geoma			6 Sessions

Smart Infrastructure &
Geospatial data analys
Sustainable Constructi
infrastructure monitorin
Green Innovations: Ne

Module 3	Mechai Action			

Advanced Manufacturi
Reverse engineering a
Energy Systems: Solar
Biomechanics: Prosthe

Module 4	Electric Engine			

Smart Devices & Syste
hardware platforms
Energy Innovations: EV
renewables

Module 5	Fundamentals of IT	Assignment & Quiz	Case studies	6 Sessions

Core IT Topics: Networking basics, Cloud computing
Cybersecurity & Data: Encryption, phishing prevention, zero-trust models, Database management.
Emerging Tech: Blockchain for supply chains, AI/ML basics, IoT integration with cloud platforms

Targeted Application & Tools that can be used:
Application Areas include Interdisciplinary problem-solving, Smart city planning, disaster management, Robotics prototyping, renewable energy systems, Wearable health tech, smart grids, Secure cloud systems.
Tools: 3D Printers, Autocad, Tinkercad, ArcGIS / QGIS, Arduino/Raspberry Pi

Text Book:

6. William Oakes & Les Leone, "Engineering Your Future: An Introduction to Engineering", Oxford University Press, 9th Edition, 2021
7. Barry F. Kavanagh, "Introduction to Geomatics", Pearson, 5th Edition, 2021
8. Ian Gibson, David Rosen, & Brent Stucker, "Additive Manufacturing Technologies", Springer, 3rd Edition, 2021
9. Sudip Misra, "The Internet of Things: Enabling Technologies, Protocols, and Use Cases", Wiley, 2nd Edition, 2022
10. James Kurose & Keith Ross, "Computer Networking: A Top-Down Approach", Pearson, 8th Edition, 2020

Module 2	**Materials for Memory and Display Systems**	Assignment	Data Collection and analysis	**09 Classes**

Topics: Memory Systems : Introduction, classification of electronic memory devices- Transistor, capacitor, charge -transfer and Resistor, types of materials - organic, polymeric, and hybrid materials, and applications, manufacturing of semiconductor chips.

Display Systems: photo and electroactive materials , materials for display -Principle, Properties and applications- Liquid crystals for LCD-Liquid crystals display, Basics of LED- OLED organic light emitting diode and light emitting electrochemical cells.

Self- learning topics: Green computing: Biocomposite based memory devices

Module 3	**Nanomaterials based Smart Sensors and Devices**	Assignment	Data Collection and analysis	**09 Classes**

Topics: Nanomaterials Introduction, classification based on dimensionality, quantum confinement. Size dependent properties, Synthesis, Properties of CNT and Graphene and their application as **Materials for data analysis and packaging** -RFID and IONT

Sensors: Introduction, types, Principle and applications- electrochemical sensor: nanomaterials for sensing applications - Glucose, VOC sensing.

Self-learning topics: Fullerene, biomolecules in sensing, Strain sensors

Module 4	**Sustainable Materials and Development**	Quiz/Seminar	Data Collection and analysis	**09 Classes**

Topics: E waste: Introduction, E waste Hazards, E- waste management, Recovery of precious metal- Cu by Hydrometallurgy.

Green Chemistry: Fundamentals and 12 principles with examples, Carbon footprint and sequestration

Sustainable Chemistry: -Introduction to Biomaterials- PLA , polymers in bio-compatible and bio-degradable materials - Poly(3-hydroxybutyrate-co-3-hydroxyvalerate) PHBV, synthesis and applications in drug delivery.

Self-learning topics: circular economy- case studies.

Module 5	**Energy Science**	Quiz/Seminar	Data Collection and analysis	**09 Classes**

Topics: Battery technology: Fundamentals of electrochemistry, Introduction to electrochemical storage devices: battery (Lithium-ion battery- $LiMnO_2$, $LiCoO_2$, metal air batteries- LiO_2) and supercapacitors-Introduction, Principle, Types - EDLC, pseudo and asymmetric capacitor.

Photovoltaics: Solar cells - Construction and working principle; types- Inorganic, Organic and quantum dot sensitized (QDSSC's).

Self -learning topics: Battery technology for e-mobility, Green hydrogen

Targeted Application & Tools that can be used:

References

Web-resources:

8. Supratim Choudhuri, "Bioinformatics for Beginners: Genes, Genomes, and Molecular Evolution", Academic Press, 1st Edition, 2023.
9. Robert McGinn, "The Ethical Engineer: Contemporary Concepts and Cases", Princeton University Press, 1st Edition, 2020
10. Charles J. Kibert, "Sustainable Construction: Green Building Design and Delivery", Wiley, 5th Edition, 2022
11. Anthony M. Townsend, "Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia", W.W. Norton & Company, 1st Edition, 2020
12. David Buchla, "Renewable Energy Systems: A Smart Energy Systems Approach", Latest 2nd Edition, 2023
13. Charles Platt, "Make: Electronics: Learning Through Discovery", Make Community, 3rd Edition, 2021
14. Charles J. Brooks, Christopher Grow, & Philip Craig, "Cybersecurity Essentials", Wiley, 2nd Edition, 2021

5. Post-parametric Automatio
6. [illegible]vation to Cries
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1993146&site=ehost-live
7. Innovation Energy: Trends and Perspectives or Challenges of Energy Innovation
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2323766&site=ehost-live
8. Additive Manufacturing: Opportunities, Challenges, Implications
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1134464&site=ehost-live

Application areas are Data storage and analysis, logistics, Biomedicine, Energy, Environment and sustainability

Tools: Molview, chemdraw, excel 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.)
- Quiz/Student Seminar
- End Term Exam
- Self-learning

Text Book

1. Wiley, “Engineering Chemistry”, Wiley.
2. G.A. Ozin and A.C. Arsenault, Nanochemistry: A chemical approach to nanomaterials, Royal Society of Chemistry, 2009

Reference Books

1. Functional and smart materials, Chander Prakash, Sunpreet Singh, J. Paulo Davim, 2020, CRC Press,
2. ISBN: 978-036-727-510-5.
3. E-waste recycling and management: present scenarios and environmental issues, Khan, Anish, and
4. Abdullah M. Asiri. 2019, Springer, Vol. 33. ISBN: 978-3-030-14186-8.
5. Essentials of computational chemistry: theories and models, Christopher J Cramer, 2013, John Wiley &
6. Sons. ISBN: 978-0-470-09182-1.
7. Energy storage and conversion devices: Supercapacitors, batteries and hydroelectric cells, Anurag Gaur,
8. L. Sharma, Anil Arya. 2021, CRC press, 1st edition, ISBN: 978-1-003-14176-1.
9. Fundamentals of analytical chemistry: An introduction, Douglas A. Skooget etal., 2004 Thomson Asia pte
10. Ltd., 8th, ISBN: 978-0-495-55828-6
11. Functional and smart materials, Chander Prakash, Sunpreet Singh, J. Paulo Davim, 2020, CRC Press,
12. ISBN: 978-036-727-510-5.
13. Electrical and electronic devices, circuits and materials: Technological challenges and solutions. Tripathi,
14. L., Alvi, P. A., & Subramaniam, U, 2021, John Wiley & Sons, ISBN: 978-0367564261.
15. F. Jensen, Introduction to Computational Chemistry, 3rd edition, Wiley, 2017.

E resources

1. https://presiuniv.knimbus.com/user#/searchresult?searchId=computational%20chemistry&_t=1738054970142
2. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_48504
3. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_147967
4. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_130301
5. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_87297
6. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_67006

7. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_137261
8. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_86712

Skill Sets

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

Course Code: CSE2200	**Course Title: Program Solving Using C Type of Course: Theory - PCC**		**L- T-P-C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs and applications in C. ACAlso by learning the basic programming constructs they can easily switch over to any other language in future.					
Course Object	The objective of the course is to familiarize the learners with the concepts of Problem SolvingUsing C and attain Employability through Problem Solving Methodologies.					
Course Outcomes	**On successful completion of this course the students shall be able to:** 1. Write algorithms and to draw flowcharts for solving problems 2. Demonstrate knowledge and develop simple applications in C programmingconstructs 3. Develop and implement applications using arrays and strings 4. Decompose a problem into functions and develop modular reusable code 5. Solve applications in C using structures and Union 6. Design applications using Sequential and Random Access File Processing.					
Course Content:						
Module 1	Introduction to C Language	Quiz	Problem Solving	**6 Sessions**		
Topics: Introduction to Programming – Algorithms – Pseudo Code - Flow Chart – Compilation – Execution – Preprocessor Directives (#define, #include, #undef) - Overview of C – Constants, Variables and Data types – Operators and Expressions – Managing Input and Output Operations – Decision Making and Branching - Decision Making and Looping.						
Module 2	Introduction to Arrays and Strings	Quiz	Problem Solving	**6 Sessions**		
Topics: **Arrays:** Introduction – One Dimensional Array – Initialization of One Dimensional Arrays – Example Programs – Sorting (Bubble Sort, Selection Sort) – Searching (Linear Search) - Two Dimensional Arrays – Initialization of Two Dimensional Arrays. Example Programs – Matrix operations. **Strings:** Introduction – Declaring and Initializing String Variables – Reading Strings from Terminal – Writing String to Screen – String Handling Functions.						
Module 3	Functions and Pointers	Quiz	Problem Solving	**6 Sessions**		

Topics: **Functions:** Introduction – Need for User-defined functions – Elements of User-Defined Functions: declaration, definition and function call–Categories of Functions – Recursion. **Pointers:** Introduction – Declaring Pointer Variables – Initialization of Variables – Pointer Operators – Pointer Arithmetic – Arrays and Pointers – Parameter Passing: Pass by Value, Pass by Reference.				
Module 4	Structures and Union	Quiz	Problem Solving	**6 Sessions**
Topics: **Structures:** Introduction – Defining a Structure – Declaring Structure Variable – Accessing Structure Members – Array of Structures – Arrays within Structures – **Union:** Introduction – Defining and Declaring Union – Difference Between Union and Structure.				
Module 5	File handling	Case Study	Problem Solving	**6 Sessions**
Topics: Files: Defining and Opening a File – Closing a File – Input / Output Operations on File – Random Access Files				
Text Book(s): **1. E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316- 513-0.**				
Reference Book(s): 6. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020. 7. ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016. 8. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015 9. Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th Edition, 2014. 10. Stephen G. Kochan, "Programming in C", Addison-Wesley Professional, 4th Edition, 2014.				
Web Links and Video Lectures: **1. https://nptel.ac.in/courses/106/105/106105171/** **2. https://archive.nptel.ac.in/courses/106/104/106104128/**				

Course Code: EEE1200	**Course Title: Basics of Electrical and Electronics Engineering. Type of Course: Theory - ESC**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	**2.0**					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This is a fundamental Course which is designed to know the use of basics of electrical and electronics engineering principles occurs in various fields of Engineering. The course emphasises on the characteristics and applications of electrical and electronic devices. The course also emphasizes on the working, analysis and design of electrical circuits using both active & passive components. Additionally, this course creates a foundation for the future courses such as Electrical machines, power system, power electronics Linear Integrated Circuits, Analog Communication and Digital Communication etc.					

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 Participative Learning techniques.			
Course Outcomes	On successful completion of this course the students shall be able to: Apply basic laws of Electrical Engineering to compute voltage, currents and other parameters in the circuits. Discuss various fundamental parameters appearing in the characteristics of semiconductor devices and their applications. Summarize the operations of different biasing configurations of BJTs and amplifiers. Discuss the performance characteristics and applications of various electrical Machines.			
Course Content:				
Module 1	Introduction to Electrical Circuits	Assignment/ Quiz	Numerical solving Task	10 Sessions
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, Nodal 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 applications	Assignment/ Quiz	Memory Recall based Quizzes	10 Sessions
Mass Action Law, Charge densities in a semiconductor, Types of SC, Junction diodes -Ideal and practical behaviour, Modelling the Diode Forward Characteristic, and Diode applications like rectifiers, Zener diode, characteristics and its applications like voltage regulator.				
Module 3	Transistors and its Applications	Assignment/ Quiz	Memory Recall-based Quizzes	10 Sessions
Transistor characteristics, Current components, BJT Configurations (CB, CC, CE configurations) and their current gains. Operating point, Biasing, Fixed Bias, and load line analysis. Single Stage amplifier. JFET (Construction, principal of Operation and Volt –Ampere characteristics). Pinch-off voltage, Comparison of BJT and FET. MOSFET (Construction, principal of Operation and symbol), MOSFET characteristics in Enhancement and Depletion modes.				

Module 4	Fundamentals of Electrical Machines	Assignment/ Quiz	Numerical solving Task	10 Sessions

Electrical Machines: Single phase transformers: principle of operation and EMF equation, Numerical examples. DC Motor: principle of operation, Back EMF, torque equation, Numerical examples. AC Motor: Principle operation of Induction Motors and its Applications.

Self-Learning Topics:

- Clipping and clamping circuits, Stabilization Techniques, Voltage divider bias and its stability factor, Multistage amplifier, Darlington pair.
- Special Machines: Introduction to special electrical machines and its applications.

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: Multisim/ P Spice
- 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..

Project Work/ Assignment:

1. Article review: At the end, of course 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.

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

3. Case Study: - At the end of the course students will be given a 'real-world' application based circuits like Power Amplifier, Signal/Function Generator etc. as a case study. Students will be submitting a report which will include Circuit Diagrams, Design, Working Mechanism and Results etc. in appropriate format

Text Book(s):

- Kothari D. P. & Nagrath I. J., "Basic Electrical and Electronics Engineering", Tata McGraw-Hill
- Education
- 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.
- A.P.Malvino, Electronic Principles,7thEdition, Tata McGraw Hill,2007
- J. Millman, C. C. Halkias and C. D. Parikh, "Millman's Integrated Electronics", McGraw Hill Education, 2nd Edition.
- Basics of Electrical & Electronics Laboratory Manual.

Reference Book (s):

- John Hiley, Keith Brown and Ian McKenzie Smith, "HUGHES Electrical and Electronic 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.
- K Uma Rao, A Jaya Lakshmi, “Basic Electrical engineering” IK International publishing house Pvt. Ltd
- R. L. Boylestad and L. Nashelsky, “Electronic Devices and Circuit Theory”, Pearson Education India 7th Edition.
- A K. Maini, V. Agrawal, “Electronic Devices & Circuits”, Wiley, 2nd Edition
- A.S Sedra, K. C. Smith, “Microelectronic Circuits”, Oxford University Press, 6th Edition
- Online Resources (e-books, notes, ppts, video lectures etc.):
- https://presidencyuniversity.linways.com
- https://www.digimat.in/nptel/courses/video/108105112/L01 “Fundamentals of Electrical Engineering-Basic Concepts, Examples”
- Seminar Topic: https://nptel.ac.in/courses/108/105/108105153/ “Electrical Measurements”
- Video lectures on “Electronic Devices” by Prof. Dr. A. N. Chandorkar, IIT Bombay http://www.satishkashyap.com/2013/03/video-lectures-on-electron-devices-by.html
- Video lectures on “Analog Electronics” by Prof. S.C. Dutta Roy, IIT Delhi https://nptel.ac.in/courses/108/102/108102095/
- Video lectures on “Diodes”, by Prof. Chitralekha Mahanta, IIT Guwahati,
- https://nptel.ac.in/courses/117/103/117103063/
- E-content:
- “Introduction to Electrical Machines https://nptel.ac.in/courses/108/102/108102146/”
- M. -Y. Kao, H. Kam and C. Hu, "Deep-Learning-Assisted Physics-Driven MOSFET Current Voltage Modeling," 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
- F. Bonet, O. Aviñó-Salvadó, M. Vellvehi, X. Jordà, P. Godignon and X. Perpiñà, "Carrier
- Concentration Analysis in 1.2 kV SiC Schottky Diodes Under Current Crowding," in IEEE Electron Device Letters, vol. 43, no. 6, pp. 938-941, June 2022, doi: 10.1109/LED.2022.3171112. https://ieeexplore-ieeeorg-presiuniv.knimbus.com/document/9764749
- 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
- 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 electric circuit parameters, performance operation of machines, and operation of semiconductor devices for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course plan.

Course Code: CSE2201	**Course Title: Program Solving Using C Lab Type of Course: Lab - PCC**	**L- T-P-C**	0	0	4	2
Version No.	1.0					
Course Pre-requisites	**NIL**					

Anti-requisites	**NIL**
Course Description	The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs and applications in C. ACAlso by learning the basic programming constructs they can easily switch over to any other language in future.
Course Object	The objective of the course is to familiarize the learners with the concepts of Problem SolvingUsing C and attain Employability through Problem Solving Methodologies.
Course Outcomes	**On successful completion of this course the students shall be able to:** 7. Write algorithms and to draw flowcharts for solving problems 8. Demonstrate knowledge and develop simple applications in C programmingconstructs 9. Develop and implement applications using arrays and strings 10. Decompose a problem into functions and develop modular reusable code 11. Solve applications in C using structures and Union 12. Design applications using Sequential and Random Access File Processing.
Course Content:	

List of Practicals:
Lab Sheet 1: 10 Sessions

Program 1: Sum of Two Numbers
Program 2: Find the Greatest of Three Numbers
Program 3: Check Even or Odd using Conditional Operator
Program 4: Print Multiplication Table using Loop
Program 5: Count Digits in a Number using While Loop
Program 6: Demonstration of Preprocessor Directives
Program 7: Simple Calculator using Switch Case

Lab Sheet 2: 10 Sessions
Program 1: Check Whether a Number is Positive, Negative or Zero
Program 2: Find the Sum of First N Natural Numbers
Program 3: Check Whether a Number is Prime or Not
Program 4: Find Factorial of a Number
Program 5: Reverse a Number
Program 6: Simple Number Guessing Game

Lab Sheet 3: 10 Sessions
Program 1: Linear Search in a One-Dimensional Array
Program 2: Bubble Sort on an Integer Array
Program 3: Matrix Addition (2D Arrays)
Program 4: Count Vowels in a String
Program 6: Selection Sort on an Array

Lab Sheet 4: 10 Sessions
Program 1: Sum of Two Numbers Using User-Defined Function

Program 2: Factorial Using Recursion
Program 3: Swap Two Numbers Using Call by Value (No Swap)
Program 4: Swap Two Numbers Using Call by Reference (With Swap)
Program 5: Pointer Basics - Access and Modify Variable via Pointer
Program 6: Accessing Array Elements Using Pointers

Lab Sheet 5: 10 Sessions
Program 1: Basic Structure Usage
Program 2: Input and Display Array of Structures
Program 3: Array Inside Structure (Student Marks)
Program 4: Structure with Nested Structures (Date of Birth)
Program 5: Union Example and Member Access

Lab Sheet 6: 10 Sessions
Program 1: Write to a File (Text Mode)
Program 2: Read from a File (Text Mode)
Program 3: Append Data to a File
Program 4: Count Characters, Words and Lines in a File
Program 5: Write and Read Structure to/from a Binary File
Program 6: Random Access in File (Update a Record)

Text Book(s):

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

Reference Book(s):

11. **Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.**
12. **ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.**
13. **Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015**
14. **Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th Edition, 2014.**
15. **Stephen G. Kochan, "Programming in C", Addison-Wesley Professional, 4th Edition, 2014.**

Web Links and Video Lectures:

3. https://nptel.ac.in/courses/106/105/106105171/
4. https://archive.nptel.ac.in/courses/106/104/106104128/

Course Code: PPS1026	**Course Title:** Industry Readiness Program – II (Audited Course) Type of Course: Practical Only Course	L- T - P- C	0	0	2	0
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	NIL					

Course Description	This course is designed to enable students learn styles of communication, team building and use empathy in leadership. The course will benefit learners in preparing themselves effectively through various activities and learning methodologies.
Course Objective	The objective of the course is to **familiarize the learners with the concepts of "Industry Readiness for Young Professionals" and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.**
Course Out Comes	**On successful completion of this course the students shall be able to:** CO 1 **Apply** different communication skills for success in workplace CO 2 **Practice team building skills** for career success CO3 **Demonstrate** ethical leadership skills in workplace
Course Content	

Module 1	**Effective Communication**	Classroom activities	**10 Hours**
Topics: Practice effective communication skills (Verbal, Non-verbal, Written and Visual) **Activity:** Use social media prompts to prepare self-introduction videos			
Module 2	**Team Building**	Group Activity	**10 Hours**
Topics: Skills of an effective team player **Activity:** Student group activity to build class networking			
Module 3	**Leadership**	Case study	**10 Hours**
Topics: Types of leadership, using empathy in leadership **Activity:** Individual presentation by students on corporate leaders.			

Faculty : L&D

Targeted Application & Tools that can be used:

1. TED Talks
2. You Tube Links
3. Activities

Assignment proposed for this course

Assignment 1: One minute reel

Assignment 2: Team building assignment

Continuous Individual Assessment

Module 1: L-S-R-W class assessment

Module 2: Team Presentation

Module 3: Individual Assessment
The topics related to skill development: Students acquire knowledge on effective communication skills, team building skills and how to prepare themselves to be leaders in workplace using empathy and implement various skill sets during the course of their time in the university.

Course Code: **ECE1511**	**Course Title: Design Workshop** **Course Type : ESC**	**L- T-P- C**	1	0	2	2
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course is designed to provide an in-depth understanding of Arduino, microcontrollers Raspberry pi and their application in various real time projects involving sensors. Throughout the course, students will learn the fundamentals of Arduino and Raspberry Pi programming and gain hands-on experience with a wide range of sensors. Students will explore how to connect and interface sensors with Arduino and Raspberry Pi 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, Raspberry Pi and sensors.					
Course Objective	The objective of the course is **Employability Skills** of student by using **PARTICIPATIVE LEARNING** techniques.					
Course Outcomes	**On successful completion of the course the students shall be able to** 5. Explain the main features of the Arduino & the Raspberry Pi prototype board. 6. Demonstrate the hardware interfacing of the peripherals to Arduino and Raspberry Pi system. 7. Understand the types of sensors and its functions 8. Demonstrate the functioning of live projects carried out using Arduino and Raspberry Pi system.					
Course Content:						

Module 1	**Basic concepts of Microcontrollers**	Hands-on	Interfacing Task and Analysis	**3 Sessions**
Topics: Introduction to Arduino, ESP and Node MCU Pin configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board, API's , Introduction to Embedded C and Arduino platform, Arduino Datatypes and variables, Arduino i/o Functions, Arduino Communications, Arduino IDE, Various Cloud Platforms.				
Module 2	**Sensory Devices**	Hands-on	Interfacing Task and Analysis	**3 Sessions**

Course Code EEE1250	**Course Title:** Basics of Electrical and Electronics Engineering Laboratory **Type of Course:** Laboratory - ESC	**L-T- P- C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This fundamental laboratory provides an opportunity to validate the concepts taught in the basics of electrical and electronics engineering and enhances the ability to visualize 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.					
Basic skill sets required for the laboratory:	**The students shall be able to develop:** **14) An attitude of enquiry.** **15) Confidence and ability to tackle new problems.** **16) Ability to interpret events and results.** **17) Ability to work as a leader and as a member of team.** 18) Assess errors and eliminate them. **19) Observe and measure physical phenomenon.** **20) Write Reports.** **21) Select suitable equipment, instrument and materials.** 22) Locate faults in systems. 23) Manipulative skills for setting and handling equipment. **24) The ability to follow standard test procedures.** **25) An awareness of the need to observe safety precautions.** 26) To judge magnitudes without actual measurement.					
Course Out Comes	**On successful completion of the course the students shall be able to:** 5. Apply basic laws of Electrical Engineering to compute voltage, currents, and other parameters in the circuits. 6. Demonstrate the working of electrical machines to observe performance characteristics. 7. Demonstrate the working of electronic circuits to obtain the V-I Characteristics of various semiconductor devices. 8. Sketch the characteristics and waveforms relevant to standard electrical and electronic circuits					
Course Content:	**List of Laboratory Tasks:** **Experiment No 1:** Verification of KVL and KCL for a given DC circuit. **Level 1:** Study and Verify KVL and KCL for the given electrical Circuit. **Level 2:** For the same circuit considered in level 1, perform the simulation using NI LabVIEW/Multisim/MATLAB. **Experiment No 2:** Analyse AC series circuits – RL, RC and RLC . **Level 1:** Conduct an experiment to perform and verify the impedance, current and power of Series RL and RC circuits					
Topics: Types of Arduino boards, Thonny Python, Python IDLE, **sensors, 3D Printer**						
Targeted Application & Tools that can be used: **Application Area:**						

Arduino Sensors: Humidity Sensor, Temperature Sensor, Water Detector / Sensor, PIR Sensor, Ultrasonic Sensor, Connecting Switches and actuators, sensor interface with Arduino.

Introduction to 3D Printer: 3D Printer technology and its working Principles, Applications. Introduction to online Simulators: Working with AutoCAD/Fusion 360 Simulator.

Module 3	**Introduction to Micro python**	Hands-on	Interfacing Task and Analysis	**4 Sessions**

Topics:

Introduction to MicroPython; Comparison with other programming languages, Setting up the MicroPython development environment, Basics of MicroPython syntax and structure.

Module 4	**Working with Raspberry-pi**	Hands-on	Interfacing Task and Analysis	**5 Sessions**

Introduction to raspberry pi boards, pin-diagram, different types of raspberry pi boards and its application, LED and switch control. Mastering Modules, Setup Raspberry - PuTTY SSH,VNC Viewer to interface with more complicated sensors and actuators. Various Libraries and its functions.

Lab: Name of the Experiments:

16. **Introduction Lab 1:**
    Level 1: Overview on Arduino based Micro-controller and sensors.
    Level 2: Interfacing of Arduino and ESP boards with sensors and other components.
17. **Lab 2: Smart Plant Monitoring**
    Level 1- Push button-controlled LED.
    Level 2- Automatic Irrigation and monitoring System using Arduino
18. **Lab 3: Robotics with Arduino**.
    Level 1- Servo Motor control using Arduino
    Level 2: DC Motor Control Using Arduino for Robotics.
19. **Lab 4: Environmental pollution using ESP.**
    Level 1 - IoT based Air Pollution Monitoring System
    Level 2- IoT Based water pollution system
20. **Introduction Lab for raspberry pi:**
    Level 1: Overview on Different Raspberry Pi Boards, and sensors.
    Level 2: Configuring the Raspberry Pi and Interfacing with sensors and other components.
21. **Lab 7:** Raspberry Pi based Object Detection using TensorFlow and OpenCV.
22. **Lab 8:** Speech Recognition on Raspberry Pi for Voice Controlled Home Automation
23. **Lab 9:** Design the website using HTML and CSS, and host the website on Raspberry Pi.
24. **Introduction Lab for 3D printing:**
    Overview of 3D printing. Design of 3D structure using the CAD. Understand the steps of fabrication of simple rectangular box using 3D printer.
25. **Lab 10:** Design and print of Hollow Cylindrical structure using 3D CAD and 3D printer.
26. **Lab 11** Demonstration of Jetson nano board and its capability. **(OPTIONAL)**
27. **Lab 12:** Revision
28. **Lab 13:** Revision
29. **Lab 14:** Mini Project
30. **Lab 15:** Mini Project Evaluation

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, Raspberry Pi and sensors can be applied. The flexibility and affordability of Arduino and Raspberry Pi, combined with the wide range of sensors available, allow for endless possibilities in creating innovative projects.

Professionally Used Software: Students can use open SOURCE Software's Arduino IDE and Tinker CAD, Thonny Python, Python IDLE etc.

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. Presidency University Library Link .

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):

3. **Monk Simon "Programming Arduino: Getting Started with Sketches", Mc Graw Hill Publications Second Edition**
4. **Monk Simon "Raspberry Pi Cookbook: Software and Hardware Problems and Solutions", Publisher(s): O'Reilly Media, Inc. ISBN: 9781098130923 fourth 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.

3. **Charles Bell Micro Python for the Internet of Things: A Beginner's Guide to Programming with Python on Microcontrollers" by" Edition 1, 2017, ISBN 978-1-4842-3123-4**

4. Stewart Watkiss "Learn Electronics with Raspberry Pi ". Apress Berkeley, CA . second edition,2020. ISBN978-1-4842-6348-8

5. Jo Prusa, "Basic of 3D printing", Prusa Research, 3rd edition.

6. Volker Ziemann, "**A Hands-On Course in Sensors Using the Arduino and Raspberry Pi (Series in Sensors)**", CRC Press, 1st Edition. 2018.

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

6. Arduino trending Projects < https://www. https://projecthub.arduino.cc/>
7. Introduction to Arduino < https://onlinecourses.swayam2.ac.in/aic20_sp04/preview>
8. Case studies on Wearable technology< https://www.[illegible]/wearables>
9. Raspberry-pi Projects< https://magpi.raspberrypi.com/articles/category/tutorials/>
10. Introduction to internet of things< https://nptel.ac.in/courses/106105166>

Level 2: Conduct an experiment to perform and verify the impedance and current of RLC series circuits.

Experiment No 3: Calculation of power and power factor of the given AC Circuit.

Level 1: Conduct an experiment to measure the power and power factor for given resistive load.

Level 2: Conduct an experiment to measure the power and power factor for given inductive load

Experiment No 4: Perform the experiments on given Transformer.

Level 1: Verify the EMF equation of a transformer and compute the voltage transformation ratio.

Level 2: Study the effect of load on the secondary side of the transformer and verify the EMF equation under load conditions.

Experiment No 5: Load test on DC shunt motor.

Level 1: Conduct load test on DC shunt motor and find its efficiency at different loads

Level 2: Conduct load test on DC shunt motor and plot the performance characteristics.

Experiment 6: Study of PN-Junction Diode Characteristics in Forward and Reverse Bias Conditions.

Level 1: Carry out an experiment to plot VI Characteristics and hence find the cut-in voltage on forward characteristics for the Silicon P-N Junction diode.

Experiment No. 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 circui[illegible] 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.

E-content:	**Level 1**: Identify the components required to implement an RC coupled amplifier circuit. Rig up the circuit and sketch the frequency response.

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

9. 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.

10. 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.

11. 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.

12. Basil, Eliza Sawant, S.D. "IoT based traffic light control system using Raspberry Pi " DOI 10.1109/ICECDS.2017.8389604

13. Supriya S, 2Dr. Aravinda " Green leaf disease detection and identification using Raspberry Pi https://www.irjet.net/archives/V9/i8/IRJET-V9I847.

14. Dr. E.N. Ganesh., "Health Monitoring System using Raspberry Pi and IOT" DOI : http://dx.doi.org/10.13005/ojcst12.01.03

Reference Books:

14. John Hiley, Keith Brown and Ian McKenzie Smith, "HUGHES Electrical and Electronic Technology", 10th Edition (Indian Edition published by Dorling Kindersley), Pearson,2011

15. Samarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2nd Edition, Prentice Hall India, 2007.

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

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

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

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

Online Learning Resources:

20. https://presidencyuniversity.linways.com

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

22. Video lectures on "Diodes", by Prof. Chitralekha Mahanta, IIT Guwahati, https://nptel.ac.in/courses/117/103/117103063/

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

Topics relevant to "SKILL DEVELOPMENT": All the experiments which are listed are for **Skill Development** through **Experiential Learning Techniques**. This is attained through the assessment component mentioned in course handout.

Course Code: MAT2303	Course Title: Linear Algebra & Vector Calculus	L-T- P- C	3	1	0	4

	Type of Course:BSC					
Version No.		1.0				
Course Pre-requisites		Basic Concepts of Limits, Differentiation, Integration, Matrices (PU Level)				
Anti-requisites		**NIL**				
Course Description		This course explores the fundamental concepts of vectors, matrices, and their operations within the context of calculus, including vector differentiation and integration, while applying these tools to solve problems related to linear systems, transformations, and geometric interpretations in higher dimensions, often with applications in fields like physics, engineering, and computer graphics; key topics include vector algebra, matrix operations, determinants, eigenvalues, eigenvectors, gradients, divergence, curl, line integrals, surface integrals, and the fundamental theorems of vector calculus like Green's Theorem, Stokes' Theorem, and the Divergence Theorem.				
Course Objective		The course is intended to develop computational proficiency involving procedures in Matrices, Linear Algebra and Vector Calculus which are useful to all engineering disciplines. This course is to equip students with the ability to understand and manipulate vectors in multidimensional space, apply matrix operations to solve systems of linear equations, and utilize concepts like gradients, divergence, and curl to analyze physical phenomena, all while developing a strong foundation for applying these tools in various scientific and engineering fields like physics, mechanics, and computer graphics.				
Course Out Comes		On successful completion of the course the students shall be able to: CO1 - Use matrix methods and certain techniques to solve the system of linear equations and to find eigen values, eigen vectors of a matrix to check whether it is diagonalizable. CO2 - Understand the abstract notions of vector space and dimensionality of it. CO3 - find the matrix representation of a linear transformation given bases of the relevant vector spaces. CO4 - Learn different notions of vector and scalar fields with their properties. Understanding the major theorems (Green's, Stokes', Gauss') and some applications of these theorems.				
Course Content:						
Module 1	**Systems of Linear Equations**			7.	***Classes)***	
Systems of Linear Equations, Matrices and Elementary Row Operations, Echelon forms, Matrix operations, invertible matrices, Determinants and their properties, Cramer’s Rule, LU-decomposition, Applications of Systems of Linear Equations.						
Module 2	**Vector Space**		**Assignment**		***(9Classes)***	

Linear Combinations and Linear Independence, Vectors in n R^n, Linear Combinations, Linear Independence Vector Spaces, Definition of a Vector Space, Subspaces, Basis and Dimension, Coordinates and Change of Basis, Orthogonal bases and orthogonal projections.

Module 3	**Linear Transformations**		***(15 lectures)***

Linear Transformations, Algebra of transformations, The Null Space and Range, Isomorphisms, Matrix Representation of Linear Transformations, Similarity Eigenvalues and Eigenvectors, Eigen values and Eigen vectors, Diagonalization.

Inner Product Spaces, The Dot Product on R^n and Inner Product Spaces, Orthonormal Bases, Orthogonal Complements, Application: Least Squares Approximation, Diagonalization of Symmetric Matrices, Application: Quadratic Forms.

Singular Value Decomposition: Singular values, computing singular value decomposition, and Introduction to principal component analysis.

Module 4	**Vector Calculus**	**Assignment**	***(15 lectures)***

Vector & Scalar Functions and Fields, Derivatives, Curve, Arc length, Curvature & Torsion, Gradient of Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field, Physical interpretation, solenoidal and irrotational vector fields. Problems.

Line Integrals, Path Independence of Line Integrals, Green`s Theorem in the plane, Surface Integrals, Divergence Theorem of Gauss, Stokes`s Theorem.

Targeted Application & Tools that can be used:

- Solve systems of linear equations using various methods including Gaussian and Gauss Jordan elimination and inverse matrices.
- Perform matrix algebra, invertibility, and the transpose and understand vector algebra in R^n.
- Determine relationship between coefficient matrix invertibility and solutions to a system of linear equations and the inverse matrices.
- Find eigenvalues and eigenvectors and use them in applications.
- Find the dimension of spaces such as those associated with matrices and linear transformations.
- Understand real vector spaces and subspaces and apply their properties.
- Compute inner products in a real vector space and compute angle and orthogonality in inner product spaces.
- Create orthogonal and orthonormal bases: Gram-Schmidt process and use bases and orthonormal bases to solve application problems.
- Prove basic results in linear algebra using appropriate proof-writing techniques such as linear independence of vectors; properties of subspaces; linearity, injectivity and subjectivity of functions; and properties of eigenvectors and eigenvalues.

Assignment:

Preparation of power-point slides, which include videos, animations, pictures, graphics for better erstanding the applications of Linear Algebra and Vector Calculus to engineering applications – The

ılty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus of Linear ebra and Vector Calculus is covered.

Text Book

2. Gilbert Strang, Linear Algebra and its applications, Wellesley-Cambridge Press,U.S.; 6th edition.

3. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.

References:

2. Introduction to Linear Algebra with Application, Jim Defranza, Daniel Gagliardi, Tata McGraw-Hill

3. Elementary Linear Algebra, Applications version, Anton and Rorres, Wiley India Edition.

4. Advanced Engineering Mathematics, Erwin Kreysig, Wiley Publication.

5. Elementary Linear Algebra, Ron Larson, Cengage Learning .

6. Linear Algebra and its Applications, David C. Lay, Pearson Education.

E-resources/ Web links:

2. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_9607

3. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_143156

4. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=CUSTOM_PACKAGE_EBSCO_29052023_270975

5. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_94555

6. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_243864

7. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_224531

8. NPTEL Video Lectures Matrices and Linear Algebra:

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

10. NPTEL Video Lectures Differential Equations:

11. https://nptel.ac.in/courses/111106100/

12. NPTEL Vector Calculus:

13. https://nptel.ac.in/courses/111/105/111105122/

14. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html 15. https://www.scu.edu.au/study-at-scu/units/math1005/2022/
Topics relevant to SKILL DEVELOPMENT: The course focuses on the concepts of Vector calculus and Linear Algebra 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 the course handout.

Course Code: MAT2404	Course Title: Discrete Mathematics Type of Course: Theory - ESC	L-T- P- C	3	1	0	4
Version No.	1.0					
Course Pre-requisites	MAT2302					
Anti-requisites	**NIL**					
Course Description	The course explores the study of mathematical structures that are fundamentally discrete (not continuous), focusing on concepts like set theory, logic, graph theory, 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, functions, counting 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 particular set of mathematical facts and how to apply them. It teaches students how to think logically and mathematically through five important themes: mathematical reasoning, combinatorial analysis, discrete structures, algorithmic thinking, and applications and modeling. A successful discrete mathematics course should carefully blend and balance all five themes.					
Course Outcomes	On successful completion of the course the students shall be able to: CO1 - Explain logical sentences through predicates, quantifiers and logical connectives. CO2 - Deploy the counting techniques to tackle combinatorial problems CO3 - Comprehend the basic principles of set theory and different types of relations. CO4 - Apply different types of structures of trees for developing programming skills					
Course Content:						

Module 1	**Fundamentals of Logic**		**(10 Classes)**
Basic Connectives and Truth Tables, Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.			
Module 2	**Principle of Counting**	**Assignment**	**(15 Classes)**
The Well Ordering Principle – Mathematical Induction 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 Principle, Derangements – Nothing is in its Right Place, Rook Polynomials.			
Module 3	**Relations and Functions**		**(10 Classes)**
Cartesian Products and Relations, Functions, One-to-One, Onto Functions. The Pigeon-hole Principle, Function Composition and Inverse Functions. Relations, Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders, Lattice, Hasse Diagrams, Equivalence Relations and Partitions.			

Module 4	**Recurrence Relations and Generating Functions**		**(10 Classes)**
Homogeneous and inhomogeneous recurrences and their solutions - solving recurrences using generating functions - Repertoire method - Perturbation method - Convolutions - simple manipulations and tricks.			
Module 5	**Graph Theory & Algorithms on Networks**	**Assignment**	**(15 Classes)**
Definitions and basic results - Representation of a graph by a matrix and adjacency list - Trees - Cycles - Properties - Paths and connectedness - Sub graphs - Graph Isomorphism - Operations on graphs - Vertex and edge cuts - Vertex and edge connectivity, Euler and Hamilton Paths, Shortest-Paths. Tree - Definitions, Properties, and Examples, Routed Trees, Binary search tree, Decision tree, spanning tree: BFS, DFS. 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:			
Assignment 1: Logic Equivalences and Predicate calculus. **Assignment 2: Equivalence Relations and Lattices** **Assignment 3: Recurrence Relations**			
Text Book 2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", McGraw-Hill,s 8th Edition,2019. 3. Harary – Graph Theory, Addison-Wesley Publishing Company.			
References: 2. Arthur Gill, "Applied Algebra for Computer Science", Prentice Hall. 3. K.D. Joshi, "Discrete Mathematics", Wiley Eastern Ltd. 4. Ralph. P. Grimaldi., "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia. **E-resources/ Web links:** https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&uniqueEBSCO95_30102024_54588 https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&uniqueEBSCO95_30102024_375 https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html https://www.scu.edu.au/study-at-scu/units/math1005/2022/			

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: PPS4006	**Course Title: LOGICAL & CRITICAL THINKING** **Type of Course: HSMC**	**L- T-P- C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Students should have the basic concepts of Logical reasoning and Critical thinking, along with its applications in real life problems.					
Anti-requisites	Nil					
Course Description	This is a skill-based training program for the engineering students (Undergraduate). This course is designed to enable the students to enhance their skills in Logical reasoning and Critical thinking.					
Course Objective	The objective of the course is to familiarize the learners with concepts in in Logical reasoning and Critical thinking through problem solving techniques suitable for their career development.					
Course Outcomes	On successful completion of the course the students shall be able to:					
	CO1] **Understand** all the concepts.					
	CO2] **Apply** the concepts in problem solving (Bloom's taxonomy Level 3)					
Course Content:						
Module 1	Logical Thinking	Assignment				**16 Hours**
Topics: Syllogisms, Cubes and Dices, Mirror and Water images, Paper cutting and Folding, Embedded figures & Completion of figures, Data Interpretation, Data sufficiency						
Module 2	Critical Thinking	Assignment				**14 Hours**
Topics: Analogy, Symbol and Notations, Statement and assumption, Cause of action, Statement and conclusion, Puzzles						
Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS						
Evaluation	**Continuous Evaluation**					
	· Topic wise evaluation					
	· Mid-Term & End Term					
	Text Book					
	1. A new approach to reasoning verbal, non-verbal & analytical by BS Sijwali					
	2. R S Aggarwal					
	3. Kiran publications					
	References					
	1. www.indiabix.com					
	2. www.testbook.com					
	3. www.youtube.com/c/TheAptitudeGuy/videos					
	Topics relevant to Skill Development Logical reasoning and Critical thinking for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.					

Course Code: CSE7100	Course Title: Mini Project	L- T-P- C	0	0	0	4
Version No.	1.0					
Course Pre-requisites	Knowledge and Skills related to all the courses studied in previous semesters.					
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 learners with the concepts of Professional Practice and attain Employability Skills through Experiential Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: 6. Identify the engineering problems related to local, regional, national or global needs. (Understand) 7. Apply appropriate techniques or modern tools for solving the intended problem. (Apply) 8. Design the experiments as per the standards and specifications. (Analyze) 9. Interpret the events and results for meaningful conclusions. (Evaluate) 10. Appraise project findings and communicate effectively through scholarly publications. (Create)					

Course Code: CSE7300	Course Title: Capstone Project	L- T-P- C	0	0	0	10
Version No.	1.0					
Course Pre-requisites	Knowledge and Skills related to all the courses studied in previous semesters.					
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 learners with the concepts of Professional Practice and attain Employability Skills through Experiential Learning techniques.
Course Outcomes	On successful completion of this course the students shall be able to: 8. Identify problems based on societal /research needs. (Understand) 9. Apply Knowledge and skill to solve societal problems in a group. (Apply) 10. Develop interpersonal skills to work as member of a group or leader. (Apply) 11. Analyze the inferences from available results through theoretical / Experimental / Simulations. (Analyze) 12. Analyze the impact of solutions in societal and environmental context for sustainable development. (Analyze) 13. Improve in written and oral communication. (Create) 14. Demonstrate capabilities of self-learning in a group, which leads to lifelong learning. (Understand)

Course Code: CSE2252	Course Title: Data Communications and Computer Networks Lab Type of Course: Lab / PCC	L- T-P- C	0	0	2	1
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	NIL					
Course Description	This lab-based course provides hands-on experience in the principles and practices of data communications and computer networking. It is designed to complement theoretical concepts covered in the associated lecture course. Through a series of structured experiments and practical exercises, students will gain proficiency in configuring, analyzing, and troubleshooting computer networks. Key topics include network topology design, IP addressing and subnetting, Ethernet and LAN technologies, routing and switching, TCP/IP protocol suite, and basic network security measures. Students will work with industry-standard tools and equipment, including routers, switches, protocol analyzers, and network simulation software such as Cisco Packet Tracer or Wireshark.					
Course Objective	The objective of this lab course is to provide students with practical, hands-on experience in the configuration, operation, and troubleshooting of data communication systems and computer networks. Through guided experiments and real-world scenarios, students will reinforce theoretical knowledge, develop essential technical					

	skills, and gain a deeper understanding of networking concepts, protocols, and devices used in modern communication systems.			
Course Outcomes	On successful completion of the course, the students shall be able to: Design and configure basic network topologies using routers, switches, and end devices to meet specified requirements. Analyze and troubleshoot network connectivity and performance issues using tools such as Wireshark and network simulators. Demonstrate understanding of key networking protocols (e.g., TCP/IP, ARP, ICMP, DHCP) through practical implementation and observation. Apply IP addressing and subnetting techniques to efficiently allocate and manage network resources in various networking scenarios.			
Course Content:				
Module 1,2,3,4	Physical Layer, Network Layer, Transport Laye	Lab Assignment	Problem Solving	24 Sessions

List of Laboratory Tasks:

Lab sheet -1, M-1, 3 [2 Hours]

Experiment No 1:

Level 1: Study of basic network commands and network configuration commands.

Lab sheet -2, M-1[2 Hours]

Experiment No 1:

Level 1: Identify and explore Network devices, models and cables. Introduction to Cisco

packet tracer.

Experiment No. 2:

Level 2 – Create various network topologies using a cisco packet tracer.

Lab sheet -3, M-2,3 [2 Hours]

Experiment No. 1:

Level 2 - Basic Configuration of switch/router using Cisco packet tracer.

Experiment No. 2:

Level 2 -Configure the privilege level password and user authentication in the switch/router.

Lab sheet – 4, M-3 [2 Hours]

Experiment No. 1:

Level 2 - Configure the DHCP server and wireless router and check the connectivity

Lab sheet – 5, M-3 [2 Hours]

Experiment No. 1:

Level 2 - Configure the static routing in the Cisco packet tracer.

Experiment No. 2:

Level 2 - Configure the dynamic routing protocol in the Cisco packet tracer.

Lab sheet – 6, M-4 [2 Hours]

Experiment No. 1: Configuration of DNS Server with Recursive & Integrative approach in

Cisco packet tracer.

Lab sheet – 7, M-4 [2 Hours]

Experiment No. 1:

Configure the telnet protocol in the router using the Cisco packet tracer.

Lab sheet – 8, M-4[2 Hours]

Experiment No. 1:

Level1- Introduction to NS2 and basic TCL program.

Lab sheet – 9, M-4 [2 Hours]

Experiment No. 1:

Level 1: Simulate three node Point to point network using UDP in NS2.

Experiment No. 2:

Simulate transmission of Ping message using NS2.

Lab sheet – 10, M-4[2 Hours]

Experiment No. 1:

Simulate Ethernet LAN using N-node in NS2.

Experiment No. 2:

Simulate Ethernet LAN using N-node using multiple traffic in NS2

Lab sheet –11, M-3,4 [2 Hours]

Experiment No. 1:

Level 1- Introduction to Wire Shark.

Experiment No. 2:

Level 2- Demonstration of packet analysis using wire shark.

Lab sheet –12, M-1,2,3 [2 Hours]

Experiment No. 1:

Level 2- Demonstration of switch and router configuration using real devices

Targeted Application & Tools that can be used: Cisco Packet Tracer, Wireshark, and NS2.

Case Study/Assignment: Choose and analyze a network from any organization/Assignment proposed for this course in CO1-CO4

Problem Solving: Choose and appropriate devices and implement various

network concepts.

Programming: Simulation of any network using NS2.

Text Book(s):

Behrouz A. Forouzan, “Data Communications and Networking 5E”, 5 th Edition, Tata McGraw-Hill, 2017.

Andrew S Tanenbaum, Nick Feamster & David J Wetherall, “Computer Networks” Sixth Edition, Pearson Publication, 2022

Reference(s):

“Computer Networking: A Top-Down Approach”, Eighth Edition, James F. Kurose, Keith W. Ross, Pearson publication, 2021.

William Stallings, Data and Computer Communication, 8th Edition, Pearson Education, 2007.

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

Course Code: CSE2253	Course Title : Data Structures Type of Course: Theory	L-T -P -C	3	0	0	3
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	NIL					
Course Description	This course 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 Objective	The objective of the course is SKILL DEVELOPMENT of student by using EXPERIENTIAL LEARNING 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:						
Module 1	Introduction to Data Structure and Linear Data Structure - Stacks and Queues	Assignment	Program activity	9 Hours		

Introduction -Introduction to Data Structures, Types and concept of Arrays .

Stack -Concepts and representation, Stack operations, stack implementation using array and Applications of Stack.

Queues -Representation of queue, Queue Operations, Queue implementation using array, Types of Queue and Applications of Queue.

Module 2	Linear Data Structure - Linked List	Assignment	Program activity	12 Hours

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 activity	12 Hours

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.

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 objects

Level 2: Programming Exercises on fundamental Data structure - Arrays based on Scenario.

Lab sheet -2

Level 1: Programming Exercises on Stack and its operations

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

Lab sheet -3

Level 1: Programming on Stack application infix to postfix Conversion

Level 2: -

Lab sheet -4

Level 1: Programming 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 post-order(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

Level 1: Program to Implement and Estimate the Time complexity of 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 :

For theory :https://onlinecourses.nptel.ac.in/noc20_cs85/preview

https://puniversity.informaticsglobal.com/login

Topics relevant to development of “Skill Development :”

Linked list and stacks

Topics relevant to development of “Environment and sustainability: Queues

Course Code: CSE2254	Course Title : Data Structures Lab 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 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 Objective	The objective of the course is SKILL DEVELOPMENT of student by using EXPERIENTIAL LEARNING 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:						
Module 1	Introduction to Data Structure and Linear Data Structure - Stacks and Queues	Assignment	Program activity	9 Hours		

Introduction -Introduction to Data Structures, Types and concept of Arrays .

Stack -Concepts and representation, Stack operations, stack implementation using array and Applications of Stack.

Queues -Representation of queue, Queue Operations, Queue implementation using array, Types of Queue and Applications of Queue.

Module 2	Linear Data Structure - Linked List	Assignment	Program activity	12 Hours

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 activity	12 Hours

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.

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 .

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Lab sheet -1

Level 1: Prompt the user, read input and print messages.Programs using class, methods and objects

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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 post-order(and implement BFS and DFS

Lab sheet -12

Level 1: Program to Implement the Linear Search & Binary Search

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Lab sheet -13

Level 1: Program to Implement and Estimate the Time complexity of Selection Sort

Level 2: Program to Implement and Estimate the Time complexity of 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 :

For theory :https://onlinecourses.nptel.ac.in/noc20_cs85/preview

https://puniversity.informaticsglobal.com/login

Topics relevant to development of “Skill Development :”

Linked list and stacks

Topics relevant to development of “Environment and sustainability: Queues

Course Code: CSE2255	Course Title: Object Oriented Programming Using Java Type of Course: Theory - PCC	L-T- P-C	3	0	0	3
Version No.	2.0					
Course Pre-requisites	Nil					
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 Objective	The objective of the course is to familiarize the learners with the concepts of Problem-Solving using JAVA and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING techniques					
Course Out Comes	On successful completion of the course the students shall be able to: CO1: Describe the basic programming concepts. [Understand] CO2: Apply the concept of classes, objects and methods to solve problems. [Application] CO3: Apply the concept of arrays and strings. [Appy] CO4: Implement inheritance and polymorphism building secure applications. [Apply] CO5: Apply the concepts of interface and error handling mechanism. [Apply]					
Course Content:						
Module 1	Basic Concepts of Programming and Java	Assignment	Problem Solving	9 Sessions		
Topics: Introduction to Principles of Programming: Process of Problem Solving, Java program structure, Download Eclipse IDE to run Java programs, Sample program, Data types, Identifiers, Variables, Constants in java, Operators, Assignments and Expression, Basic Input/ Output functions, Control Statements: Branching and Looping.						

Module 2	Classes, objects, methods and Constructors	Assignment	Problem Solving	10 Sessions
Topics: Classes, Objects and Methods: Introduction to object Oriented Principles, defining a class, adding data members and methods to the class, access specifiers, instantiating objects, reference variable, accessing class members and methods. Static Polymorphism: Method overloading, constructors, constructor overloading, this keyword, static keyword, Nested classes, Accessing members in nested classes.				
Module 3	Arrays, String and String buffer	Assignment	Problem Solving	8 Sessions
Topics: Arrays: Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array, Array of objects. String: Creation & Operation. String builder class, methods in String Buffer.				
Module 4	Inheritance and Polymorphism	Assignment	Problem Solving	10 Sessions
Topics: Inheritance: Defining a subclass, Types of Inheritance, super keyword. Dynamic Polymorphism: Method overriding. Final keyword: with data members, with member functions and with class. Abstract keyword: with data members, with member functions and with class, Exception handling.				
Module 5	Input & Output Operation in Java	Assignment	Problem Solving	8 Sessions
Input/output Operation in Java(java.io Package), Streams and the new I/O Capabilities, Understanding Streams, working with File Object, File I/O Basics, Reading and Writing to Files, Buffer and Buffer Management, Read/Write Operations with File Channel, Serializing Objects, Observer and Observable Interfaces.				
Text Book T1 Herbert Schildt, “The Complete Reference Java 2”, Tata McGraw Hill Education, 11th Edition,2019.				
References R1. Cay S Horstmann and Cary Gornell, “CORE JAVA volume I-Fundamentals”, Tenth Edition, Pearson 2015. R2: James W. Cooper, “Java TM Design Patterns – A Tutorial”, Addison-Wesley Publishers.4th Edition, 2000.				

R3. E. Balagurusamy, “Programming with Java”, Tata McGraw Hill Education, 6th Edition, 2019.

E book link R1: http://rmi.yaht.net/bookz/core.java/9780134177373-Vol-1.pdf

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

Web resources

https://youtube.com/playlist?list=PLu0W_9lII9agS67Uits0UnJyrYiXhDS6q

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

Topics relevant to development of “Skill Development”:

Static Polymorphism

Method overloading, constructors

constructor overloading

this keyword

static keyword and Inner classes

Inheritance and Polymorphism.

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

Course Code: CSE2256	Course Title: Object Oriented Programming Using Java Lab Type of Course: Lab - PCC	L-T- P-C	0	0	2	1
Version No.	2.0					
Course Pre-requisites	Nil					
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 Objective	The objective of the course is to familiarize the learners with the concepts of Problem-Solving using JAVA and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING techniques					
Course Out Comes	On successful completion of the course the students shall be able to: CO1: Demonstrate basic programming concepts. [Apply] CO2: Apply the concept of classes, objects and methods to solve problems. [Application] CO3: Apply the concept of arrays and strings. [Appy] CO4: Implement inheritance and polymorphism building secure applications. [Apply] CO5: Apply the concepts of interface and error handling mechanism. [Apply]					
Course Content:						
Module 1	Basic Concepts of Programming and Java	Assignment	Problem Solving	12 Sessions		

Download Eclipse IDE to run Java programs, Sample programs on Data types, Identifiers, Variables, Constants in java, Operators, Assignments and Expression, Basic Input/ Output functions, Control Statements: Branching and Looping.				
Module 2	Classes, objects, methods and Constructors	Assignment	Problem Solving	14 Sessions
Problem solving using Classes, Objects and Methods: defining a class, adding data members and methods to the class, access specifiers, instantiating objects, reference variable, accessing class members and methods. Use Static Polymorphism: Method overloading, constructors, constructor overloading, this keyword, static keyword, Nested classes, Accessing members in nested classes.				
Module 3	Arrays, String and String buffer	Assignment	Problem Solving	10 Sessions
Using Arrays and Strings : Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array, Array of objects. String: Creation & Operation. String builder class, methods in String Buffer.				
Module 4	Inheritance and Polymorphism	Assignment	Problem Solving	12 Sessions
Inheritance: Defining a subclass, Types of Inheritance, super keyword. Dynamic Polymorphism: Method overriding. Final keyword: with data members, with member functions and with class. Abstract keyword: with data members, with member functions and with class, Exception handling.				
Module 5	Input & Output Operation in Java	Assignment	Problem Solving	12 Sessions
Input/output Operation in Java(java.io Package), Streams and the new I/O Capabilities, Understanding Streams, working with File Object, File I/O Basics, Reading and Writing to Files, Buffer and Buffer Management, Read/Write Operations with File Channel, Serializing Objects, Observer and Observable Interfaces.				
P1: Programming Exercises on Basic Concepts. LEVEL 1: Discuss about datatypes and variables. LEVEL 2: Demonstrate a simple java program				

P2: Programming Exercises on Basic Concepts.

LEVEL 1: Discuss about datatypes and variables.

LEVEL 2: Demonstrate a simple java program

P3: Programming Exercises on operators, expressions based on a given scenario.

LEVEL 1: Explain operators, expressions.

LEVEL 2: Demonstrate operators

P4: Programming Exercises Command Line Arguments based on a given scenario.

LEVEL 1: Explain command line arguments

LEVEL 2: Demonstrate command line arguments

P5: Programming Exercises on basic Input/ Output functions and Control Statements: Branching

LEVEL 1: Explain Input/ Output functions

LEVEL 2:Demonstrate Control Statements: Branching

P6: Programming Exercises on Control Statements: Looping

LEVEL 1: Explain variour loops.

LEVEL 2:Demonstrate Control Statements: Looping

P7: Programming Exercises on Creating Objects, classes on a given scenario.

LEVEL 1: Illustrate class, object and methods.

LEVEL 2: Execute java program using class and objects

P8: Programming Exercises on Adding methods and Constructors to the class based on a given scenario.

LEVEL 1: Illustrate methods and constructors

LEVEL 2: Execute java program using methods and constructors

P9: Programming Exercises on methods based on a given scenario.

LEVEL 1: Illustrate method overloading

LEVEL 2: Apply method overloading for the given scenario.

P10: Programming Exercises on methods based on a given scenario.

LEVEL 1: Illustrate constructors overloading

LEVEL 2: Apply constructor overloading for the given scenario

P11: Programming Exercises on methods for static members bassed on a given scenario.

LEVEL 1: Benefits of usage static members

LEVEL 2: Usage of Static Members for the given scenario

P12: Programming Exercises on static methods based on a given scenario.

LEVEL 1: Benefits of usage static methods

LEVEL 2: Usage of Static Methods for the given scenario.

P13: Programming Exercises on nested Classes based on a given scenario.

LEVEL 1: Benefits of usage nested classes

LEVEL 2: Apply the concept of usage of nested classes for the given scenario

P14: Programming Exercises on Arrays and its built-in functions based on a given scenario.

LEVEL 1: Illustrate one dimensional arrays and its functions.

LEVEL 2: Demonstrate programs with single-dimensional arrays and operations.

P15: Programming Exercises on Arrays and its built-in functions based on a given scenario.

LEVEL 1: Illustrate multi dimensional arrays and its functions.

LEVEL 2: Demonstrate programs with multi-dimensional arrays and operations.

P16: Programming Exercises on String Class and its built-in functions based on a given scenario.

LEVEL 1: Explain about String class and String methods.

LEVEL 2: Execute simple java applications for String and StringBuffer operations

P17: Programming Exercises on String Buffer Class and its built-in functions based on a given scenario.

LEVEL 1: Explain about StringBuffer class and String methods.

LEVEL 2: Execute simple java applications for String and StringBuffer operations

P18: Programming Exercises on String Builders and its built-in functions based on a given scenario.

LEVEL 1: Explain about String Builders.

LEVEL 2: Execute java applications for String Builders

P19: Programming Exercises on single, multi level Inheritance and super keyword based on given scenario.

LEVEL 1: Explain single and multi level inheritance.

LEVEL 2: Demonstrate simple applications for the different types of inheritance

P20: Programming Exercises hierarchical Inheritance and super keyword based on given scenario.

LEVEL 1: Explain hierarchical inheritance.

LEVEL 2: Demonstrate simple applications for hierarchical inheritance

P21: Programming Exercises on Overriding.

LEVEL 1: Differentiate method overloading and method overriding.

LEVEL 2: Demonstrate simple program with dynamic method dispatch.

P22: Programming Exercises on Final based on given scenario.

LEVEL 1: Implement programs using concept of final.

LEVEL 2: Use final keyword for the given problem

P23: Programming Exercises on Abstract keyword based on given scenario.

LEVEL 1: Implement programs using concept of Abstract.

LEVEL 2: Use abstract keyword for the given problem

P24: Programming Exercises on Interface based on a given scenario.

LEVEL 1: Differentiate abstract class about interface

LEVEL 2: Implement interfaces in the given problem

P25: Programming Exercises on Exception Handling based on a given scenario.

LEVEL 1: Explain exception handling

LEVEL 2: Solve the given problem using exception handling mechanism.

P26: Programming Exercises on Character Stream Classes based on a given scenario. LEVEL 1: Explain Character Stream Classes LEVEL 2: Solve the given problem using Character Stream Class. P27: Programming Exercises on Read/Write Operations with File Channel based on a given scenario. LEVEL 1: Explain Read/Write Operations with File Channel LEVEL 2: Solve the given problem using Read/Write Operations with File Channel. P28: Programming Exercises on Read/Write Operations with File Channel based on a given scenario. LEVEL 1: Explain Read/Write Operations with File Channel LEVEL 2: Solve the given problem using Read/Write Operations with File Channel. P29: Programming Exercises on Read/Write Operations with File Channel based on a given scenario. LEVEL 1: Explain Read/Write Operations with File Channel LEVEL 2: Solve the given problem using Read/Write Operations with File Channel. P30: Programming Exercises on Read/Write Operations with File Channel based on a given scenario. LEVEL 1: Explain Read/Write Operations with File Channel LEVEL 2: Solve the given problem using Read/Write Operations with File Channel.
Targeted Application & Tools that can be used : JDK /Eclipse IDE/Visual Studio Code / net Beans IDE.
Text Book T1 Herbert Schildt, “The Complete Reference Java 2”, Tata McGraw Hill Education, 11th Edition,2019.
References

R1. Cay S Horstmann and Cary Gornell, “CORE JAVA volume I-Fundamentals”, Tenth Edition, Pearson 2015.

R2: James W. Cooper, “Java TM Design Patterns – A Tutorial”, Addison-Wesley Publishers.4th Edition, 2000.

R3. E. Balagurusamy, “Programming with Java”, Tata McGraw Hill Education, 6th Edition, 2019.

E book link R1: http://rmi.yaht.net/bookz/core.java/9780134177373-Vol-1.pdf

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

Web resources

https://youtube.com/playlist?list=PLu0W_9lII9agS67Uits0UnJyrYiXhDS6q

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

Topics relevant to development of “Skill Development”:

Static Polymorphism

Method overloading, constructors

constructor overloading

this keyword

static keyword and Inner classes

Inheritance and Polymorphism.

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

Course Code: CSE2271	**Course Title: Software Design and Development**		**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 course is to provide the fundamentals concepts of Software Engineering process and principles. The course covers software requirement engineering processes, system analysis, design, implementation and testing aspects of software system development. The course covers software quality, configuration management and maintenance.			
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Software Engineering and attain Skill Development through Participative Learning techniques.			
Course Out Comes	On successful completion of this course the students shall be able to: 1] Describe the Software Engineering principles, ethics and process models(Knowledge) 2] Identify the requirements, analysis and appropriate design models for a given application(Comprehension) 3] Understand the Agile Principles(Knowledge) 4] Apply an appropriate planning, scheduling, evaluation and maintenance principles involved in software(Application)			
Module 1	**Introduction to Software Engineering and Process Models** **(Knowledge level)**	Quiz		**10 Hours**

Introduction: Need for Software Engineering, Professional Software Development, Software Engineering Ethics, Software Engineering Practice-Essence of Practice, General Principles Software Development Life Cycle **Models:** Waterfall Model – Classical Waterfall Model, Iterative Waterfall Model, Evolutionary model-Spiral, Prototype.				
Module 2	**Software Requirements, Analysis and Design** **(Comprehension level)**	Assignment	Development of SRS documents for a given scenario	**12 Hours**
Requirements Engineering: Eliciting requirements, Functional and non- Functional requirements, Software Requirements Specification (SRS), Requirement Analysis and validation. Requirements modelling- Introduction to Use Cases, Activity diagram and Swim lane diagram. CASE support in Software Life Cycle, Characteristics of CASE Tools, Architecture of a CASE Environment. **Design:** Design concepts, Architectural design, Component based design, User interface design.				
Module 3	**Agile Principles & Devops** **(Knowledge level)**	Quiz		**10 Hours**
Agile: Scrum Roles and activities, Sprint Agile software development methods - Scaling, User Stories, Agile estimation techniques, Product backlogs, Stake holder roles, Dynamic System Development Method. **Devops:** Introduction, definition, history, tools.				
Module 4	**Software Testing and Maintenance** **(Application Level)**	Assignment	Apply the testing concepts using Programing	**13 Hours**
Software Testing-verification and validation, Test Strategies - White Box Testing, Black box Testing. Automation Tools for Testing. **Software Quality Assurance**-Elements of software quality assurance, SQA Tasks, Goals and Metrics, Software configuration management- SCM process, SCM Tools (GitHub).				

Maintenance- Characteristics of Software Maintenance, Software Reverse Engineering, Software Maintenance Process Models.
Targeted Application & Tools that can be used: Selenium, GitHub, CASE Tools
Text Book 1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", VII Edition, McGraw-2012] B2. Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", VI Edition, Graw-Hill, 201
References 7. Rajib Mall, "Fundamentals of Software Engineering", VI Edition, PHI learning private limited, 2015. 8. Ian Sommerville, "Software Engineering", IX Edition, Pearson Education Asia, 2011. 9. Agile Software Development Principles, Patterns and Practices.1st Edition, Wiley, 2002
Topics Relevant to "Skill Development: Balck box Testing, White box Testing, Automated Testing for Skill development through Participative Learning Techniques. This is attained through assessment mentioned in the course handout

Course Code: CSE2258	**Course Title: Web Technologies**	**L-T- P- C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	**NIL**					
Course Description	This course highlights the comprehensive introduction to scripting languages that are used for creating web-based applications. The associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills.					

Course Objective		**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 Outcomes		**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)**				
Course Content:						
Module 1		**Introduction to XHTML**	Quizzes and Assignments	Quizzes on various features of XHTML, simple applications		**20 Sessions**
	Basics: Web, WWW, Web browsers, Web servers, Internet. **XHTML:** Origins and Evolution of HTML and XHTML: Basic Syntax, Standard XHTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, Frames, Syntactic Differences between HTML and XHTML, Demonstration of applications using XHTML for Responsive web pages.					
Module 2		**Advanced CSS**	Quizzes and assignments	Comprehension based Quizzes and assignments; Application of CSS in designing webpages		**20 Sessions**
	Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks					
XML: Basics, Demonstration of applications using XML with XSLT.						

Module 3	**PHP – Application Level**	Quizzes and assignments	Application of PHP in web designing	**20 Sessions**

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

Project work/Assignment:

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

Textbook(s):

2] Robert. W. Sebesta, "*Programming the World Wide Web"*, Pearson Education, 9th Edition, 2016.

2]Paul Deitel, Harvey Deitel, Abbey Deital,"Internet & World Wide Web How to Program", Fifth Edition, Pearson Education, 2021.

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

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

Reference Book(s):

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

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

Additional web-based resources

W1. W3schools.com

W2. Developer.mozilla.org/en-US/docs/Learn

W3. docs.microsoft.com **W4.** informit.com/articles/ The Relationship Between Web 2.0 and Social Networking https://presiuniv.knimbus.com/user#/home
Topics related to development of "FOUNDATION": 7. Web, WWW, Web browsers, Web servers, Internet. 8. CSS, PHP. 9. 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: **CSE2259**	**Course Title: Web Technologies Lab**	**L-T-P- C**	0	0	2	1
Version No.		1.0				
Course Pre-requisites						
Anti-requisites		**NIL**				

Course Description		This course highlights the comprehensive introduction to scripting languages that are used for creating web-based applications. The associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills.
Course Objective		**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 Outcomes		**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)**
Course Content:		

Module 1	**Introduction to XHTML Features**	Quizzes and Assignments	Quizzes on various features of XHTML, simple applications		**8 Sessions**
	Standard XHTML Document Structure, Basic Text Markup such as headings, paragraphs, lists, tables, forms, and semantic tags.				

Module 2	**CSS Styling**	Quizzes and assignments	Comprehension based Quizzes and assignments; Application of CSS in designing webpages		**10 Sessions**
	Apply CSS3 to style HTML elements, including layout techniques, color schemes, typography, and responsive design principles.				
XML: Basics, Demonstration of applications using XML with XSLT.					
Module 3	**PHP – Application Level**	Quizzes and assignments	Application of PHP in web designing		**12 Sessions**
PHP: Introduction to server-side Development with PHP, Arrays, Superglobal Arrays, $GET and $ POST, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object Oriented Design, Working with Databases, SQL, Database APIs, Managing a MySQL Database. Accessing MySQL in PHP, Applications.					

List of Laboratory Tasks:

Experiment No. 1: Demonstration of XHTML features

Level 1: Demonstration of various XHTML Tags (Level 1)
Level 2: Design and develop static web pages for an online Book store (Level 2).

Experiment No. 2: Application of CSS in web designing

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

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

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

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

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

Experiment No. 4: Building a website.

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

Targeted Application & Tools that can be used: **Xampp web server to be used to demonstrate PHP.**

Project work/Assignment:

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

Textbook(s):

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

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

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

Reference Book(s):

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

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

Additional web-based resources

W1. W3schools.com

W2. Developer.mozilla.org/en-US/docs/Learn

W3. docs.microsoft.com

W4. informit.com/articles/ The Relationship Between Web 2.0 and Social Networking

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

Topics related to development of "FOUNDATION":

10. Web, WWW, Web browsers, Web servers, Internet.
11. CSS, PHP.
12. 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: CSE2260	**Course Title: Database Management Systems** **Type of Course: Theory only - PCC**		**L-T-P-C**	3	0	0	3
Version No.	1.0						
Course Pre-requisites	Foundational understanding of data types, data structures, basic programming knowledge, familiarity with operating systems and file management. Basic knowledge of set theory, logic, and discrete mathematics to understand relational algebra and query formulation.						
Anti-requisites	NIL						
Course Description	This course introduces the foundational principles of database management systems, including data models, schemas, and architectures. This course provides a solid foundation on the relational model of data and the use of relational algebra. It develops skills in SQL for data definition, manipulation, and control, enabling students to construct and execute complex queries. The course also introduces the concept of object oriented and object relational databases and modern database technologies like **NoSQL.** The also course allows the students to gain insights into data storage structures and indexing strategies for optimizing query performance.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Database Management Systems and attain **Employability** through **Problem Solving** Methodologies.						
Course Out Comes	On successful completion of the course the students shall be able to: 17. Describe the fundamental elements of relational database management systems. [Understand] 18. Examine databases using SQL query processing and Optimization. [Apply] 19. Design simple database systems applying the normalization constraints and demonstrate the database transaction processing, recovery, and security. [Apply] 20. Interpret the concept of advanced databases and its applications. [Apply]						
Course Content:							
Module 1	**Introduction to Database Modelling and Relational Algebra (Understand)**	Assignment	**Problem Solving**			**10 Sessions**	

Topics: **Introduction to Database:** Schema, Instance, 3-shema architecture, physical and logical data independence, Data isolation problem in traditional file system, advantages of database over traditional file systems. Entity Relationship (ER) Model, ER Model to Relational Model, Examples on ER model. **Relational Algebra** with selection, projection, rename, set operations, Cartesian product, joins (inner and outer joins), and division operator. Examples on Relational Algebra Operations.				
Module 2	**Fundamentals of SQL and Query Optimization (Apply)**	Assignment	**Programming**	**11 Sessions**
Topics: **SQL Database Querying,** DDL, DML, Constraints, Operators, Set Operators, Aggregate Functions, Joins, Views, Procedures, Functions and Triggers. **Database programming issues and techniques:** Embedded SQL, Dynamic SQL; SQL / PSM and NoSQL. **Query Optimization:** Purpose, transformation of relational expressions, estimating cost and statistics of expression, choosing evaluation plans, linear and bushy plans, dynamic programming algorithms.				
Module 3	**Relational Database Design & Transaction Management (Apply)**	Assignment	**Problem Solving**	**12 Sessions**
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.

5. Problem Solving: Constructing ER-Diagrams for a given real time requirements, Normalizing the databases, querying the databases using relational algebra.
6. 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

Course Code: CSE2261	**Course Title: Database Management Systems Lab Type of Course: 1) Laboratory - PCC**	**L-T-P-C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Foundational understanding of data types, basic programming knowledge, operating systems and file management.					
Anti-requisites	NIL					
Course Description	The Database Management Systems (DBMS) Laboratory is designed to provide students with hands-on experience in database design, implementation, and management using SQL and database management tools such as MySQL. The lab complements theoretical concepts learned in database courses by allowing students to practice database creation, querying, and optimization techniques. The DBMS Lab enables students to develop industry-relevant skills in database management, preparing them for careers in **software development, data engineering, and database administration**.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of DatabaseManagement Systems and attain **Employability** through **Problem Solving** Methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: 21. Demonstrate the database concepts, practice, and SQL queries. [Apply] 22. Design and implement database schemas while applying normalization techniques to optimize structure. [Apply]] 23. Develop and implement stored procedures, triggers, and views for automation and efficiency. [Apply] 24. To Design and build database applications for real world problems. [Apply]					

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]
8. 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.
7. Problem Solving: Constructing ER-Diagrams for a given real time requirements, Normalizing the databases, querying the databases using relational algebra. 8. 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 designusing ER- Relational mapping, Implementation of given database scenario using MYSQLDB. Topics relevant to development of Employability: Develop, test and implement computer databases, creatingsophisticated, interactive and secure database applications Topics relevant to “HUMAN VALUES &PROFESSIONAL ETHICS”: Nil

Course Code: **CSE2262**	**Course Title:** **Analysis of Algorithms** **Type of Course:** **Theory PCC**	**L- T-P- C**	3	1	0	4
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	Nil					
Course Description	This course introduces techniques for the design and analysis of efficient algorithms and methods of applications. This course discusses the classic approaches for algorithm design such as Divide and 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 various complexity classes is covered in the end.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Analysis of Algorithms** and attain **Skill Development** through **Problem Solving** Methodologies.					

Course Out Comes	On successful completion of the course the students shall be able to: 1. Compute efficiency of a given algorithm.[Apply] 2. Apply divide and conquer technique for searching and sorting Problems.[Apply] 3. Apply the Dynamic Programming technique for a given problem. [Apply] 4. Apply greedy technique for solving a Problem.[Apply] 5. Demonstrate Back tracking technique and limitations of Algorithms.[Apply]			
Course Content:				
Module 1	**Introduction**	Assignment	Simulation/Data Analysis	**10 Sessions**
Introduction, Asymptotic Notations and its properties, Best case, worst case and average case- Sequential search, Sorting; Mathematical analysis for Recursive and Non-recursive algorithms: Substitution method and Master's Theorem.				
Module 2	**Divide-and-conquer**	Assignment	Simulation/Data Analysis	**08 Sessions**
Introduction. Insertion Sort; Merge sort, Quick sort, Binary search.				
Module 3	**Dynamic programming**	Term paper/Assignment	Simulation/Data Analysis	**10 Sessions**
Introduction with examples, Principles of Memoization, 0-1 Knapsack Problem, Bellman-Ford algorithm, Floyd-Warshall's Algorithms. Chain Matrix Multiplication.				
Module 4	**Greedy technique**	Term paper/Assignment	Simulation/Data Analysis	**09 Sessions**
Introduction, Fractional Knapsack Problem, Minimal Spanning Tree: Prim's Algorithm and Kruskal's Algorithm, Single-source Shortest Path: Dijkstra's Algorithm				
Module 5	**Complexity Classes**	Term paper/Assignment	Simulation/Data Analysis	**08 Sessions**
Complexity Classes- P,NP- NP Hard and NP Complete - Boolean Satisfiability Problem (SAT). Branch and Bound: Knapsack problem; Backtracking, - N-Queens problem.				

Text Book

5. Anany Levitin, *"Introduction to the Design and Analysis of Algorithms"*, 3rd edition, Pearson Education, 2018.
6. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, *"Introduction to Algorithms"*, 4th edition, MIT Press, 2022.

References

9. J. Kleinberg and E. Tardos, "*Algorithm Design*", Addison-Wesley, 2005.
10. Tim Roughgarden, *"Algorithms Illuminated"* (books 1 through 3), "Operating Systems Design and Implementation", Soundlikeyourself Publishing, 2017-2019.
11. AV Aho, J Hopcroft, JD Ullman, *"The Design and Analysis of Algorithms"*, Addison-Wesley, 1974.
12. Donald E. Knuth, "*The Art of Computer Programming",* Volumes 1and 3 Pearson.

Web-Resources

9. NPTEL: https://onlinecourses.nptel.ac.in/noc19_cs47/preview
10. Coursera: Analysis of Algorithms by Princeton University
11. Algorithms Specialization in Coursera by Stanford University(Group of 4 courses).
12. 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.

Course Code: **CSE2263**	**Course Title: Analysis of Algorithms Lab** **Type of Course: Lab - PCC**	**L- T-P- C**	0	0	2	1
Version No.	1					
Course Pre-requisites	**Nil**					
Anti-requisites	NIL					
Course Description	This course introduces techniques for the design and analysis of efficient algorithms and methods of applications. This course discusses the classic approaches for algorithm design such as Divide and 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 various complexity classes is covered in the end.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Analysis of Algorithms** and attain **Skill Development** through **Experiential Learning** Methodologies.					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. Compute efficiency of a given algorithm. [Applying] 2. Apply divide and conquer technique for searching and sorting Problems.[Applying] 3. Apply the Dynamic Programming technique for a given problem. [Applying] 4. Apply greedy technique for solving a Problem.[Applying] 5. Demonstrate Back tracking technique and limitations of Algorithms.[Applying]					
Course Content						
Module 1	**Introduction**					**3 Sessions**
Measuring running time of an algorithm, Compare running time of algorithms, Implement sorting algorithms such as bubble sort, selection sort						
Module 2	**Divide-and-conquer**					**3 Sessions**
Compare searching algorithms: Linear Search, Binary Search; Compare Sorting algorithms: Insertion Sort, Merge Sort, QuickSort.						
Module 3	**Dynamic programming**					**3 Sessions**
Introduction and memorization: Factorial; Coin Change Problem ; Floyd-Warshall's Algorithm.						
Module 4	**Greedy technique**					**3 Sessions**
Fractional Knapsack Problem; Minimal Spanning Tree Algorithms-Prim's Algorithm, Kruskal's algorithm						

Module 5	Complexity Classes	3 Sessions

Branch and Bound: Knapsack problem; Backtracking, - N-Queens problem.

List of Laboratory Tasks:

1. Measuring running time of an algorithm

Objective: To experimentally determine the running time of basic algorithms for input size n=10, 100, 1000, etc. by taking difference of starting time and ending time.

2. Compare running time of algorithms

Objective: To execute two algorithms to solve the same problem, and to comparatively evaluate the better algorithm for large values of N.

3. Implement sorting algorithms such as bubble sort, selection sort

Objective: To implement comparison based sorting strategies.

4. Compare searching algorithms

Objective: To implement two searching strategies and compare their performance.

5. Compare Sorting algorithms

Objective: To implement searching strategies that follow top down design approach(Insertion sort, merge 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 3. 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 1and 3 Pearson. Web Based Resources and E-books: W1. NPTEL: https://onlinecourses.nptel.ac.in/noc19_cs47/preview W2. Coursera: Analysis of Algorithms by Princeton University W3. Algorithms Specialization in Coursera by Stanford University(Group of 4 courses). 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

Course Code: CSE2264	**Course Title:** Essentials of AI **Type of Course:** Program Core Course - Theory	**L-T-P-C**	3	0	0	3

Version No.	1.0
Course Pre-requisites	NIL
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 learn about uncertainty in AI, as well as approaches to solve such challenges such as Naïve Bayes Classifier and Hidden Markov Models. Topics: 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 student by using EXPERIENTIAL LEARNING techniques.
Course Out Comes	On successful completion of this course the students shall be able to: 5. Explain different methods of searching, proving, and analysis in AI [Understand] 6. Implement various graphical and adversarial search algorithms. [Apply] 7. Prove, by resolution, different situations using First Order Logic [Apply] 8. Solve sequence labeling problems using HMM [Apply]

Course Content:

Module 1	**Search Methods for Problem-Solving**	**Problem-Solving Tests**	**NPTEL Assignments**	**No. of Sessions: 13**
Introduction – History of AI, Agents and Environment, Types of AI and Learning. State Space Search; General Formulation of Search Problems; Data Structures used in Searching. **Uninformed Search Algorithms** – Breadth First Search, Depth First Search, Uniform Cost Search, Generalized Uniform Cost Search (a.k.a Dijkstra's Single-Source Shortest Path), Iterative Deepening Depth-First Search, Time and Space Complexity Analysis of Uninformed Search Algorithms. **Heuristic Search Algorithms** – Heuristics and Admissibility, Greedy Best-First Search, A* Search and weighted A* Search.				
Module 2	**Advanced Search Methods**	**Problem-Solving Tests**	**NPTEL Assignments**	**No. of Sessions: 12**
Local Search – Local Search, Hill Climbing, Genetic Algorithms, Gradient Descent. **Adversarial Search** – Minimax Search, Alpha-Beta Pruning, Ideal Ordering. **Constraint Satisfaction** – Constraint Satisfaction Problems Definitions and Examples – Map Colouring, N Queens, Cryptarithmetic, Generalized CSP; Back-tracking Heuristics; Arc Consistency and Path Consistency				
Module 3	**Knowledge-Based Logic Representation**	**Automated Theorem Proving using FOL Resolution**	**NPTEL Assignments**	**No. of Sessions: 10**
Propositional Logic – Syntax and Semantics of Propositional Logic. Logical connectives. Inference Rules. Conjunctive and Disjunctive Normal Forms. **First Order Logic** – Syntax and Semantics of Propositional Logic. Logical connectives. Inference Rules. Conjunctive and Disjunctive Normal Forms. **Resolution** – Resolution Principle. Propositional and First Order Resolution. Applications for solving story problems using Resolution				

Module 4	Uncertainty in AI	Representing problems as HMM	NPTEL Assignments	No. of Sessions: 06

Probability – Probability Definitions. Conditional Probability. Bayes Theorem. Naïve Bayes Classifier. Using Naïve Bayes Classifier for Supervised Learning. **Hidden Markov Models** – Definition of HMM. Sequence Labeling and Markov Assumption. Sub-Problems in HMM and their solutions – Forward Probability and Viterbi Algorithm. Applications of Sequence Labeling in Natural Language Processing (Eg. Part-of-Speech Tagging). **Introduction to Deep Learning** – Artificial Neurons, Activation Functions, Multilayer Perceptron.

Targeted Application & Tools that can be used:

5. Implementation of a shortest-path finder using different search algorithms.
6. Implementation of a sequence labeler using Viterbi Algorithm.

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

2. Group project on one of the topics mentioned above (Eg. Adversarial search).

Textbook(s):

6. Stuart Russel and Peter Norvig. *Artificial Intelligence: A Modern Approach*. 4th Edition. Pearson Education. 2022.
7. Lavika Goel. *Artificial Intelligence: Concepts and Applications*. 1st Edition. Wiley. 2021.
8. Elaine Rich, Kevin Knight and Shivashankar B Nair. *Artificial Intelligence*. 4th Edition. MedTech Science Press. 2024.

References:

4. Deepak Khemani. *A First Course in Artificial Intelligence*. 1st Edition. 6th Reprint, 2018.
5. Munesh Chandra Trivedi. *A Classical Approach to Artificial Intelligence*. 2nd Edition. Khanna Publishers. 2018.
6. George Luger. *Artificial Intelligence: Structures and Strategies for Complex Problem Solving*. 6th Edition. Pearson Education. 2021.

Weblinks

6. NPTEL Courses: Mausam (IIT Delhi), “An Introduction to Artificial Intelligence” Link: https://nptel.ac.in/courses/106102220.
7. Shyamanta M. Hazarika (IIT Guwahati), “Fundamentals of Artificial Intelligence”. Link: https://nptel.ac.in/courses/112103280. Useful for the full course.
8. Deepak Khemani (IIT Madras), “Artificial Intelligence: Search Methods for Problem-Solving”. Link: https://nptel.ac.in/courses/106106226. Useful for Module 1 and 2
9. Deepak Khemani (IIT Madras), “Artificial Intelligence: Knowledge Representation and Reasoning”. Link: https://nptel.ac.in/courses/106106140. Useful for Module 3.
10. Deepak Khemani (IIT Madras), “AI: Constraint Satisfaction”. Link: https://nptel.ac.in/courses/106106158. Useful for Module 2.

Course Code: CSE2265	**Course Title:** Essentials of AI Lab **Type of Course:** Program Core Course - Lab	**L-T-P-C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	NIL					
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 learn about uncertainty in AI, as well as approaches to solve such challenges such as Naïve Bayes Classifier and Hidden Markov Models. Topics: 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 student by using EXPERIENTIAL LEARNING techniques.					
Course Out Comes	On successful completion of this course the students shall be able to: 5. Explain different methods of searching, proving, and analysis in AI [Understand] 6. Implement various graphical and adversarial search algorithms. [Apply] 7. Prove, by resolution, different situations using First Order Logic [Apply] 8. Solve sequence labeling problems using HMM [Apply]					

Course Content: **No. of Sessions: 15 (30 hours)**

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:

7. Google Colab
8. 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):

3. Stuart Russel and Peter Norvig. *Artificial Intelligence: A Modern Approach*. 4th Edition. Pearson Education. 2022.
4. Prateek Joshi and Alberto Artasanchez. *Artificial Intelligence with Python*. 2nd Edition. Packt. 2020.

References:

3. Deepak Khemani. *A First Course in Artificial Intelligence*. 1st Edition. 6th Reprint, 2018.
4. Munesh Chandra Trivedi. *A Classical Approach to Artificial Intelligence*. 2nd Edition. Khanna Publishers. 2018.

Course Code: CSE2266	**Course Title:** **Theory** of Computation		**L- T-P-C**	3	**0**	0	**3**
Version No.	2.0					
Course Pre-requisites	nil					
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 on Strings and Language operations	**6 classes**		
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 on DFA, NFA's	13 Sessions		

Topics:

Basic concepts of Finite automata, DFA- definitions of DFA, Deterministic Accepters Transition Graphs and Languages

and DFA's, Regular Languages, NFA- Definition of a Nondeterministic Accepter, Languages and NFA's Why Non- determinism? Equivalence of Deterministic and Nondeterministic Finite Accepters, Reduction of the Number of States in Finite Automata.

Module 3	Regular Expressions & Context Free Grammar	Assignment	Problems on RE, CFG, PT, PL and Ambiguity	12 Sessions

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	Push down Automata	Assignment	Problems on pushdown Automaton	08 Sessions

Topics:

Definition of a Pushdown Automaton, Language Accepted by a Pushdown Automaton, Acceptance by Final State, Acceptance by Empty Stack, From Empty Stack to Final State, From Final State to Empty Stack Equivalence of PDA's and CFG's: From Grammars to Pushdown Automata.

Module 5	Turing Machine	Assignment	Problems on Turning Machine	07 Sessions

Topics:

Definition of a 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://onlinecourses.nptel.ac.in/noc21_cs83/preview

Course Code: CSE2269	**Course Title:** Operating Systems	**L-T- P- C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Nil					

Anti-requisites	**NIL**			
Course Description	This course introduces the concepts of operating system operations, operating system structure and its design and implementation. It covers the classical operating systems internal 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 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] Describe the fundamental concepts of operating Systems and case studies. [**Knowledge**] 2] Demonstrate various CPU scheduling algorithms. .[**Application**] 3] Apply various tools to handle synchronization problems.[**Application**] 4] Demonstrate deadlock detection and recovery methods **[Application]** 5] Illustrate various memory management techniques.[**Application**]			
Course Content:				
Module 1	Introduction to Operating System	Assignment	Programming	**9 Hours**
Topics: Introduction to OS , Operating-System Operations, Operating System Services, , System Calls and its types, Operating System Structure, System Program and its types, Linkers and Loaders, Overview of OS design and implementation, Open-source operating system				
Module 2	Process Management	Assignment/Case Study	Programming/Simulation	**11 Hours**
Topics: Process Concept, Operations on Processes, Inter Process Communication, Communication in client-server systems (sockets, RPC, Pipes), Introduction to threads - Multithreading Models, Thread Libraries, Threading Issues, Process Scheduling– Basic concepts, Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, SRTF, RR and Priority.				
Module 3	Process Synchronization and Deadlocks	Assignment	Programming	**11 Hours**
Topics:				

The Critical-Section Problem- Peterson's Solution, Synchronization hardware, Semaphores, Classic Problems of Synchronization with Semaphore Solution- Producer-Consumer Problem, Reader-Writer problems, Dining Philosopher's Problem, . Introduction to Deadlocks, Necessary conditions for deadlock, Resource allocation Graph, Methods for handling deadlock: Deadlock Prevention and Implementation, Deadlock Avoidance and Implementation, Deadlock detection & Recovery from Deadlock.

Module 4	Memory Management	Assignment	Programming/Simulation	**10 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, "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

Course Code: CSE2270	**Course Title: Operating Systems Lab**	**L-T- P- C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Nil					
Anti-requisites	**NIL**					
Course Description	This laboratory course provides hands-on experience with the core concepts of 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 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.

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

Course Code: MAT2301	**Course Title: Calculus and Differential Equations** **Type of Course: BSC**	**L-T- P- C**	**3**	**1**	**0**	**4**
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	**NIL**					
Course Description	Calculus and differential equations are used ubiquitously throughout mathematics, statistics and operations research. In this course, students can be able to build upon the foundations of calculus established to greatly enhance their repertoire of theory and practice in these areas. The application of calculus and differential equations in the description and modelling of real-world problems will also be considered. This unit will extend the problem-solving skills, range of knowledge and use of techniques in differential and integral calculus. The course focuses on the concepts of Calculus and Differential Equations with reference to specific engineering problems. The course is of both conceptual and analytical type in nature.					
Course Objective	The goal of the course Calculus and Differential Equations is to facilitate the students with a concrete foundation of differential calculus and to solve the first					

	and higher-order ordinary differential equations enabling them to acquire the knowledge of these mathematical tools.
Course Out Comes	On successful completion of the course the students shall be able to: 9. Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve. 10. Apply the principles of integral calculus to evaluate integrals. 11. Learn the notion of partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobian. 12. Solve first-order linear/nonlinear ordinary differential equations analytically using standard methods.
Course Content:	

Module 1	**Differential Calculus**		**(10 Classes)**
Polar Coordinates, polar curves, angle between radius vector and the tangent, angle between two curves, pedal equations, curvature and radius of curvature. Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.			
Module 2	**Integral Calculus**	**Assignment**	**(10 Classes)**
Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.			
Module 3	**Multivariable Calculus**		**(10 lectures)**
Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.			
Module 4	**Differential Equations**	**Assignment**	**(15 lectures)**
Definition, types of Differential Equations, Applications, Variable Separable, Homogeneous, Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. Linear differential equations of second and higher order with constant coefficients - Non-Homogeneous term of the type $Q(x) = e^{ax}$, Sin ax, Cosax, $e^{ax}v(x)$, $x^n v(x)$ - Method of variation of parameters.			
Targeted Application & Tools that can be used: Differential calculus is used extensively in science and engineering. It can solve problems related to motion, velocity, acceleration, angles of incline or curve on a surface, etc. Differential Equations are used to model the behavior of electromagnetic fields, including in the design of antennas, microwave ovens, and other devices. Biology: PDEs are used to model biological processes, such as the spread of diseases and the development of biological tissues. Tools Used: Python.			
Assignment:			

8. 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 5. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition 6. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.
References: 25. Victor Henner, Tatyana Belozerova, Mickhail Khenner, Ordinary and Partial Differential Equations, CRC Press, Edition, 2013. 26. Walter Ledermann, Multiple integrals, Springer, 1st edition 27. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002. 28. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008. **E-resources/ Web links:** 18. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_103205 19. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_106839 20. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_61605 21. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_134719 22. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html 23. https://www.scu.edu.au/study-at-scu/units/math1005/2022/
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: MEC1006	**Course Title: Engineering Graphics** **Type of Course: School Core & Theory Only**	**L- T-P-C**	2	0	0	2
Version No.	1.2					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	The course is designed with the objective of giving an overview of engineering graphics. It is introductory in nature and acquaints thestudents with the techniques used to create engineering drawings. The course emphasizes on projection of points, lines, planes and solids and isometric projections.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "Engineering Graphics" and attain SKILL DEVELOPMENT through Problem solving methodologies.					

Course Outcomes	On successful completion of this course the students shall be able to: 5. Demonstrate competency of Engineering Graphics as per BIS conventions and standards. 6. Comprehend the theory of projection for drawing projections of Points, Lines andPlanes under different conditions. 7. Prepare multiview orthographic projections of Solids by visualizing them indifferent positions. 8. Prepare pictorial drawings using the principles of isometric projections to visualizeobjects in three dimensions.

Course Content:

Module 1	Introduction to Drawing	Assignment	Standard technical drawing	**02 Sessions**
Topics: Introduction, drawing instruments and their uses, relevant BIS conventions and standards, Lettering, Lineconventions, dimensioning, Selection of drawing sheet size and scale.				
Module 2	Orthographic projections of Points, Straight Linesand Plane Surfaces	Assignment	Projection methods Analysis	**10 Sessions**
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.				
Module 3	Orthographic Projections of Solids	Assignment	Multi-view drawing Analysis	**10 Sessions**
Topics: **Introduction, Projection of right regular prisms, pyramids, cone, hexahedron and tetrahedron indifferent positions (Problems resting on HP only and First angle projection).**				
Module 4	Isometric Projections of Solids (Using isometric scale only)	Assignment	Spatial Visualization	**8 Sessions**
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: **4. K.R. Gopalakrishna, "Engineering Graphics", Subhash Publishers, Bangalore.** **5. D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, "Engineering Graphics with AutoCAD," Prentice Hall.** **6. 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.

ENG2501	**Advanced English**	**L- T- P- C**	2	0	0	2
Version No.	2.0					
Course Pre-requisites	ENG1900 - English for Technical Communication					
Anti-requisites	**NIL**					
Course Description	This course is designed to equip students to enhance their communication abilities in Listening, Speaking, Reading, and Writing. The curriculum covers interpersonal communication principles, the art of speech writing and delivery (including impromptu speaking), strategic approaches to critical reading, the identification of logical fallacies, and persuasive writing. Furthermore, the course will introduce students to the potential of AI tools and the techniques of prompt engineering to elevate their communication skills in the digital age. Upon course completion, students will be well-prepared to communicate effectively and critically in both academic and professional environments.					
Course Out Come	On successful completion of the course the students shall be able to: 9. Recognize the elements of interpersonal and cross-cultural communication to address communication challenges effectively. 10. Demonstrate the ability to deliver structured and impromptu speeches using effective speaking techniques. 11. Interpret textual and visual materials using critical reading strategies to evaluate arguments, logic, and persuasion. 12. Produce persuasive and analytical essays using effective argumentation techniques and structured writing strategies.					
Course Content:						
Module 1	**Foundations of Effective Communication**	**Case Studies/ Role play**	**Cross-Cultural Competency**			**12 Classes**

Topics:

- Fundamentals of Interpersonal Communication
- Verbal, Non-verbal, and Paraverbal communication.
- Cultural dimensions theory (Hofstede's Cultural Dimensions).
- Active Listening Techniques
- Common Errors in Communication

Activities:

- Instagram/YouTube Vocabulary Activity
- Charades with a Twist/Tone and Emotion Experiment/Mixed Messages Challenge/Role Reversal Conversations/Observation Exercise

Module 2	**Mastering Speech Delivery**	**JAM**	**Public Speaking Confidence**	**12 Classes**

Topics:

- Introduction to Prompt Engineering
- Speech Preparation and Organization
- Techniques for Effective Impromptu Speaking
- Practice Speech Delivery

Activities:

- Speech Writing
- Impromptu Speech

Module 3	**Critical Reading and Logical Analysis**	**Worksheet**	**Critical Thinking and Analysis**	**12 Classes**

Topics:

- Critical Reading Strategies: Contextualizing, Figurative Language, Evaluating Logic of an Argument, Recognizing Emotional Manipulation, Analysing Visuals
- Recognizing Logical Fallacies: Slippery Slope, False Dilemma, Post Hoc, Hasty Generalization, Ad Hominem, Straw Man, Bandwagon, No True Scotsman, Red Herring, Appeal to Authority, Sunk Cost, Appeal to ignorance

Activities:

- Critical Reading Worksheet/Identifying Bias in News Articles

Module 4	**Writing Effective Arguments**	**Assignment**	**Clear and Coherent Writing**	**9 Classes**

Topics**:**

- Understanding Critical Writing
- Building Arguments (Pathos, Ethos, Logos)
- Techniques for Persuasion

Activities:

- Causes or Effects/Appeal Mash-Up/Debates on Controversial Topics
- Opinion Writing

Targeted Application & Tools that can be used: Quizziz, Chatgpt, Gemini, Youtube, Instagram, Quillbot, Grammarly, Padlet

References

11. Adler, R. B., Rodman, G., & DuPré, A. (2019). *Understanding human communication (14th ed.)*. Oxford University Press.
12. Moore, B. N., & Parker, R. (2020). *Critical thinking* (13th ed.). McGraw-Hill Education.
13. Hamilton, C. (2020). *Communicating for success* (2nd ed.). Routledge.
14. Ting-Toomey, S., & Dorjee, T. (2018). Intercultural competence: A model for teaching and assessing cross-cultural communication. *Journal of Intercultural Communication, 47*(2), 213–229. https://doi.org/10.1016/j.jicc.2018.03.004
15. https://www.ted.com/

Topics Relevant to "employability": Teamwork and Collaboration, Critical Thinking and Problem-Solving

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

Course Code: ECE2022	**Course Title:** Digital Design **Type of Course:** ESC	**L- T-P- C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites	[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.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Digital Design and attain the SKILL DEVELOPMENT through EXPERIENTIAL LEARNING.					
Course Outcomes	On successful completion of this course the students shall be able to: ix. Describe the concepts of number systems, Boolean algebra and logic gates. x. Apply minimization techniques to simplify Boolean expressions. xi. Demonstrate the Combinational circuits for a given logic xii. Demonstrate the Sequential and programmable logic circuits					
Course Content:						
Module 1	Fundamentals of Number systems- Boolean algebra and digital logic	Application Assignment	Data Analysis task			06 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 Analysis task	08 Classes

Topics:

Introduction to Combinational circuits, Analysis, Design procedure, Binary Adder and Subtractor, Magnitude comparator, Parity generator and checker, Multiplexers-Demultiplexers, Decoders, Encoders and Priority Encoders, HDL Models of combinational circuits.

Module 3	Combinational Logic circuits:	Application Assignment	Programming Task & Data Analysis task	08 Classes

Topics:

Introduction to sequential circuits, Storage elements: latches and flip flops, Characteristic tables and equations, excitation table, Analysis of clocked sequential circuits, Mealy & Moore Models of finite state machines - Registers & Counters. HDL Models of Sequential circuits.

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):

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

Reference(s):

Reference Book(s):

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

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

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

15. eBook1: Mano, M. Morris and Ciletti Michael D., *"Digital Design"*, Pearson Education.
16. {[PDF] Digital Design By M. Morris Mano, Michael D Ciletti Book Free Download }
17. eBook2:Floyd "DIGITAL LOGIC DESIGN" fourth edition- ePub, eBook- [PDF] DIGITAL LOGIC DESIGN FOURTH EDITION FLOYD | abri.engenderhealth.org.
18. NPTEL Course- NPTEL :: Electrical Engineering - NOC:Digital Electronic Circuits
19. Digital Logic Design PPT Slide 1 (iare.ac.in)
20. Lab Tutorial: Multisim Tutorial for Digital Circuits - Bing video CircuitVerse - Digital Circuit Simulator online

Learn Logisim➠ Beginners Tutorial | Easy Explanation! - Bing video

Digital Design 5: LOGISIM Tutorial & Demo

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

E-content:

9. 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.
10. 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)
11. 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.
12. A. Matrosova, V. Provkin and E. Nikolaeva, "Masking Internal Node Faults and Trojan Circuits in Logical Circuits," *2019 IEEE East-West Design & Test Symposium (EWDTS)*, 2019, pp. 1-4, doi: 10.1109/EWDTS.2019.8884434.

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

Course Code: PHY2504	**Course Title: Optoelectronics and Quantum Physics Lab** **Type of Course: BSC**	**L-T-P-C**	**0**	**0**	**2**	**1**
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	The 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 shall be able to: CO1: To understand electrical and optical properties of materials CO2: Interpret the results of various experiments to verify the concepts used in optoelectronics and advanced devices.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " Applied Physics for Computer Science Cluster "and attain **Skill Development** through **Experiential Learning** techniques					

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 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. 8: 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. 9: 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. 10: Determination of Stefan's constant and verification of Stefan-Boltzmann Law.
Level 1: Determination of Stefan's constant
Level 2: Verification of Stefan-Boltzmann Law.

Experiment No. 11: Determination of dielectric constant of given materials.
Level 1: Determination of Stefan's constant
Level 2: compare the obtain results with other materials

Experiment No. 12: determine the wavelength of monochromatic light, such as sodium light, using Newton's rings.
Level 1: Determination of wavelength
Level 2: determine the radius of curvature of the Plano-convex lens.

Targeted Application & Tools that can be used:

7. Areas of application are optoelectronics industry, Solar panel technologies, quantum computing software, electronic devices using transistors and diodes, memory devices, endoscopy, SQUIDS in MRI, Advanced material characterizations using SEM and STM.
8. 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.

Course Code: MAT2402	**Course Title:** Probability and Statistics **Type of Course: BSC**	**L-T- P- C**	**3**	**1**	**0**	4
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	**NIL**					
Course Description	The course introduces the concepts of probability theory and statistical analysis, covering how to collect, organize, interpret, and draw inferences from data using mathematical models to understand randomness and uncertainty, with applications across various fields like science, engineering, economics, and social sciences.					
Course Objective	The objective of the course is to equip students with the foundational knowledge of probability theory and statistical methods, enabling them to collect, analyze, interpret data, and make informed decisions based on the likelihood of events occurring in various situations, often applied across different fields like science, engineering, and business.					
Course Out Comes	On successful completion of the course the students shall be able to: 9. Be able to compute conditional probabilities directly and using Bayes' theorem, and check for independence of events. 10. Be able to set up and work with discrete & continuous random variables; in particular, to understand the Bernoulli, binomial, geometric, Poisson distributions, uniform, normal, and exponential distributions.					

	11. Identifying different types of data relationships (linear, polynomial, exponential, logarithmic). 12. Be able to use specific significance tests, including z-test, t-test (one- and two-sample), and chi-squared test

Course Content:

Module 1	**Basic Probability**		**(6 Classes)**
Probability of an Event, multiplication rule, combinations, permutations, Addition Law, Multiplication Law, Conditional Probability, Bayes's Theorem and Problems.			
Module 2	**Random Variables and Bivariate Distributions**	**Assignment**	**(15 Classes)**
Random Variables (discrete and continuous), Probability Mass/Density Functions, Mathematical Expectations, discrete probability distributions - Binomial distribution, Poisson distribution, geometric distribution, Continuous uniform distribution - exponential distribution, normal distribution, gamma distribution. Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.			
Module 3	**Curve Fitting & Statistical Methods**		**(13 Classes)**
Curve Fitting (Straight Line ($y = a + bx$), Parabola ($y = a + bx + cx^2$), Exponential Curves ($y = ae^{bx}$, $y = ab^x$ and $y = ax^b$) Measures of Central tendency, Moments, skewness and Kurtosis, Correlation - Karl Pearson's coefficient of correlation and rank correlation (with & Without repetition, Multiple Correlation - Problems. Regression analysis - lines of regression, Multiple regression - Problems.			
Module 4	**Joint Probability Distribution and Sampling Theory**	**Assignment**	**(15 Classes)**
Joint Probability distribution for two discrete random variables, expectation and covariance. Random sampling, sampling distributions, Standard Error, Type I & Type II errors, Testing of Hypothesis, Test of significance - Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations, Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.			

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: R software (Open Source)

Assignment:

3. 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

5. Ronald .E. Walpole, Raymond. H. Myers, Sharon. L Myers, and Keying E. Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Delhi-9th edition, 2012.

6. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.

References:

7. Miller and Freund, Probability and Statistics for Engineers, Pearson Education Ltd.
8. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition.
9. Douglas C. Montgomery & George Runger, Applied Statistics and Probability for Engineers, , Wiley Publications

E-resources/ Web links:

17. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_10427
18. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_100198
19. https://nptel.ac.in/courses/109104124
20. https://nptel.ac.in/courses/111106051
21. https://nptel.ac.in/courses/111102137
22. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html
23. https://www.scu.edu.au/study-at-scu/units/math1005/2022/
24. Presidency University's Knimbus library URL is: presiuniv.knimbus.com

Topics relevant to SKILL DEVELOPMENT: The course focuses on the concepts of Vector calculus and Linear Algebra 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 the course handout.

Course Code: CIV1200	**Course Title:** **Foundations of Integrated Engineering** **Type of Course: ESC**	**L- T-P-C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	This interdisciplinary course introduces first-year engineering students to foundational principles and practices across key engineering domains, emphasizing real-world problem-solving, sustainability, and ethical innovation. Students explore how civil, mechanical, electrical, and IT systems intersect with emerging technologies like IoT, AI, and geomatics to address global challenges. Through case studies, learners gain deeper understanding of smart infrastructure, prototyping mechanical/electronic systems, and securing IT solutions. Topics include bioinformatics for environmental monitoring, GIS-enabled urban planning, renewable energy integration, and cybersecurity fundamentals. The course cultivates a holistic understanding of engineering's role in sustainable development, safety, and ethical decision-making, preparing students to contribute meaningfully to multidisciplinary projects in a technology-driven world.					
Course Objective	The objective of the course is skill development of student by using Participative Learning techniques.					

Course Code: CHE2501	**Course Title: Chemistry of Smart Materials**		**L-T-P-C**	3	0	0	3
	Type of Course: Theory - BSC						
Version No.	1.0						
Course Pre-requisites							
Anti-requisites	NIL						
Course Description	The objective of the course is to introduce the students to concepts and applications of chemistry of smart materials. The course also aims to enhance the knowledge of smart materials associated with memory system, display devices, , sensors, energy devices and environment. It will also cultivate an ability to identify chemistry in each of smart engineered materials and interpret solutions for the challenges connected to memory, display, energy, smart, green and sustainable technologies. It targets to strengthen the fundamental concepts behind chemistry of smart materials and then builds an interface with their industrial applications. **This course is designed to cater to Environment and Sustainability**						
Course Objective	The objective of the course is 'SKILL DEVELOPMENT' of the student by using Participative learning techniques.						
Course Outcomes	On successful completion of this course the students shall be able to: 6. Relate the knowledge of chemistry to computational approaches to identify materials functionalities and properties 7. Recognize and interpret solutions for the challenges connected to memory, display, smart, green and sustainable technologies. 8. Explain the quality parameters of engineering materials associated with environment and sensors. 9. Interpret the knowledge of sustainable chemistry for E- waste management. 10. Analyse the importance of various electrochemical sources in energy systems.						
Course Content:							
Module 1	**Computational Chemistry**	Assignment	Data Collection and analysis	**09 classes**			
Topics: Fundamental particles of atom – their mass, charge and location – atomic number and mass number, Stabilizing interactions: Bonded and non-bonded interactions. Chemistry of weak interactions – van der Waals force and hydrogen bonding. Density functional theory, 3D co-ordinate generation for small molecules, geometry optimization by Molview. Chemical Databases: Chemoinformatics, MSDS ***Self- learning topics:*** Scope, cost and efficiency of computational modeling.							

Course Outcomes:	On successful completion of this course the students shall be able to: 1] Recall key principles of Agile, DevOps, and bioinformatics used in interdisciplinary engineering contexts. 2] Explain the role of GIS, LiDAR, and sustainable materials in designing smart infrastructure and disaster management systems. 3] Describe core components of mechanical systems and their real-world applications. 4] Describe the functionality of IoT-enabled wearable devices, embedded syst[illegible] 5] cybe[illegible]			
Course Content:				
Module 1	**Founda[illegible] Engine[illegible]**			
Real-world problem-so[illegible] Innovation through mul[illegible] Emerging Fields: Auton[illegible] Sustainability & Safety:[illegible]				
Module 2	**Civil En[illegible] Geoma[illegible]**			
Smart Infrastructure & [illegible] Geospatial data analys[illegible] Sustainable Constructi[illegible] infrastructure monitoring. Green Innovations: Net-zero energy buildings, rainwater harvesting systems.				
Module 3	**Mechanical Engineering in Action**	Assignment & Quiz	Data Collection	**6 Sessions**
Advanced Manufacturing: Collaborative robots (cobots), additive manufacturing and 3D printing, Reverse engineering and prototyping Energy Systems: Solar/wind energy harvesting, piezoelectric applications. Biomechanics: Prosthetics design, ergonomic product lifecycle.				
Module 4	**Electrical & Electronics Engineering**	Assignment & Quiz	Data Collection and visualization	**6 Sessions**
Smart Devices & Systems: Embedded systems, Wearable technology, Edge computing and hardware platforms Energy Innovations: EV charging infrastructure, wireless power transfer, Smart grid integration with renewables.				
Module 5	**Fundamentals of IT**	Assignment & Quiz	Case studies	**6 Sessions**
Core IT Topics: Networking basics, Cloud computing Cybersecurity & Data: Encryption, phishing prevention, zero-trust models, Database management. Emerging Tech: Blockchain fundamentals, AI/ML basics, IoT integration with cloud platforms,				

Module 2	Materials for Memory and Display Systems	Assignment	Data Collection and analysis	09 Classes

Topics: Memory Systems : Introduction, classification of electronic memory devices- Transistor, capacitor, charge transfer and Resistor, types of materials - organic, polymeric and hybrid materials, and applications, manufacturing of semiconductor chips.

Display Systems: photo and electroactive materials , materials for display -Principle, Properties and applications: Liquid crystals for LCD-Liquid crystals display, Basics of LED-OLED-organic light emitting diode and light emitting electrochemical cells.

Self- learning topics: Green computing; Biocomposite based memory devices

Module 3	Nanomaterials based Smart Sensors and Devices	Assignment	Data Collection and analysis	09 Classes

Topics: Nanomaterials- Introduction, classification based on dimensionality, quantum confinement. Size dependent properties, Synthesis, Properties of CNT and Graphene and their application as **Materials for data analysis and packaging** -RFID and IONT.

Sensors: Introduction, types, Principle and applications- electrochemical sensor: nanomaterials for sensing applications - Glucose, VOC sensing.

Self-learning topics: Fullerene, biomolecules in sensing, Strain sensors

Module 4	Sustainable Materials and Development	Quiz/Seminar	Data Collection and analysis	09 Classes

Topics: E waste: Introduction, E waste Hazards, E- waste management, Recovery of precious metal- Cu by Hydrometallurgy.

Green Chemistry: Fundamentals and 12 principles with examples, Carbon footprint and sequestration

Sustainable Chemistry: Introduction to Biomaterials- PLA , polymers in bio-compatible and bio-degradable materials - Poly(3-hydroxybutyrate-co-3-hydroxyvalerate) PHBV, synthesis and applications in drug delivery.

Self-learning topics: circular economy- case studies.

Module 5	Energy Science	Quiz/Seminar	Data Collection and analysis	09 Classes

Topics: Battery technology: Fundamentals of electrochemistry, Introduction to electrochemical storage devices: battery (Lithium-ion battery- $LiMnO_2$, $LiCoO_2$, metal air batteries- LiO_2) and supercapacitors-Introduction, Principle, Types - EDLC, pseudo and asymmetric capacitor.

Photovoltaics: Solar cells - Construction and working principle; types- Inorganic, Organic and quantum dot sensitized (QDSSC's).

Self -learning topics: Battery technology for e-mobility, Green hydrogen

Targeted Application & Tools that can be used:

Targeted Application & Tools that can be used:

Application Areas include Interdisciplinary problem-solving, Smart city planning, disaster management, Robotics prototyping, renewable energy systems, Wearable health tech, smart grids, Secure cloud systems.

Tools: 3D Printers, Autocad, Tinkercad, ArcGIS/QGIS, Arduino/Raspberry Pi

Text Book:

11. William Oakes & Les Leone, "Engineering Your Future: An Introduction to Engineering", Oxford University Press, 9th Edition, 2021
12. Barry F. Kavanagh, "Introduction to Geomatics", Pearson, 9th Edition, 2021
13. Ian Gibson, David Rosen, & Brent Stucker, "Additive Manufacturing Technologies", Springer, 3rd Edition, 2021
14. Sudip Misra, "The Internet of Things: Enabling Technologies, Protocols, and Use Cases", Wiley, 2nd Edition, 2022
15. James Kurose & Keith Ross, "Computer Networking: A Top-Down Approach", Pearson, 8th Edition, 2020

References

15. Supratim Choudhuri, "Bioinformatics for Beginners: Genes, Genomes, and Molecular Evolution", [illegible] 2023,
16. Robert McGinn, "The Ethical Engineer: Contemporary Concepts and Cases", Princeton University Press, 1st Edition, 2020
17. Charles J. Kibert, "Sustainable Construction: Green Building Design and Delivery", Wiley, 5th Edition, 2022
18. Anthony M. Townsend, "Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia", W.W. Norton & Company, 1st Edition, 2020
19. David Buchla, "Renewable Energy Systems: A Smart Energy Systems Approach", Pearson, 2nd Edition, 2023
20. Charles Platt, "Make: Electronics: Learning Through Discovery", Make Community, 3rd Edition, 2021
21. Charles J. Brooks, Christopher Grow, & Philip Craig, "Cybersecurity Essentials", Wiley, 2nd Edition, 2021

Web-resources:

9. [illegible] Design and Construction
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1155197&site=ehost-live
10. Smart Cities : Introducing Digital Innovation to Cities
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=19931[illegible]&site=ehost-live
11. Innovation and Energy: [illegible] Perspectives or Challenges [illegible]
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2323766&site=ehost-live
12. Additive Manufacturing: Opportunities, Challenges, Implications
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1134464&site=ehost-live

Application areas are Data storage and analysis, logistics, Biomedicine, Energy, Environment and sustainability

Tools: Molview, chemdraw, excel 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.)
- Quiz/Student Seminar
- End Term Exam
- Self-learning

Text Book

3. Wiley, “Engineering Chemistry”, Wiley.
4. G.A. Ozin and A.C. Arsenault, Nanochemistry: A chemical approach to nanomaterials, Royal Society of Chemistry, 2009

Reference Books

16. Functional and smart materials, Chander Prakash, Sunpreet Singh, J. Paulo Davim, 2020, CRC Press,
17. ISBN: 978-036-727-510-5.
18. E-waste recycling and management: present scenarios and environmental issues, Khan, Anish, and
19. Abdullah M. Asiri. 2019, Springer, Vol. 33. ISBN: 978-3-030-14186-8.
20. Essentials of computational chemistry: theories and models, Christopher J Cramer, 2013, John Wiley &
21. Sons. ISBN: 978-0-470-09182-1.
22. Energy storage and conversion devices: Supercapacitors, batteries and hydroelectric cells, Anurag Gaur,
23. L. Sharma, Anil Arya. 2021, CRC press, 1st edition, ISBN: 978-1-003-14176-1.
24. Fundamentals of analytical chemistry: An introduction, Douglas A. Skooget etal., 2004 Thomson Asia pte
25. Ltd., 8th, ISBN: 978-0-495-55828-6
26. Functional and smart materials, Chander Prakash, Sunpreet Singh, J. Paulo Davim, 2020, CRC Press,
27. ISBN: 978-036-727-510-5.
28. Electrical and electronic devices, circuits and materials: Technological challenges and solutions. Tripathi,
29. L., Alvi, P. A., & Subramaniam, U, 2021, John Wiley & Sons, ISBN: 978-0367564261.
30. F. Jensen, Introduction to Computational Chemistry, 3rd edition, Wiley, 2017.

E resources

9. https://presiuniv.knimbus.com/user#/searchresult?searchId=computational%20chemistry&_t=1738054970142
10. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_48504
11. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_147967
12. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_130301
13. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_87297
14. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_67006

15. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_137261
16. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_86712

Skill Sets

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

Course Code: CSE2200	**Course Title: Program Solving Using C** **Type of Course: Theory - PCC**		**L- T-P-C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs and applications in C. ACAlso by learning the basic programming constructs they can easily switch over to any other language in future.					
Course Object	The objective of the course is to familiarize the learners with the concepts of Problem SolvingUsing C and attain Employability through Problem Solving Methodologies.					
Course Outcomes	**On successful completion of this course the students shall be able to:** 7. Write algorithms and to draw flowcharts for solving problems 8. Demonstrate knowledge and develop simple applications in C programmingconstructs 9. Develop and implement applications using arrays and strings 10. Decompose a problem into functions and develop modular reusable code 11. Solve applications in C using structures and Union 12. Design applications using Sequential and Random Access File Processing.					
Course Content:						
Module 1	Introduction to C Language	Quiz	Problem Solving	**6 Sessions**		
Topics: Introduction to Programming – Algorithms – Pseudo Code - Flow Chart – Compilation – Execution – Preprocessor Directives (#define, #include, #undef) - Overview of C – Constants, Variables and Data types – Operators and Expressions – Managing Input and Output Operations – Decision Making and Branching - Decision Making and Looping.						
Module 2	Introduction to Arrays and Strings	Quiz	Problem Solving	**6 Sessions**		
Topics: **Arrays:** Introduction – One Dimensional Array – Initialization of One Dimensional Arrays – Example Programs – Sorting (Bubble Sort, Selection Sort) – Searching (Linear Search) - Two Dimensional Arrays – Initialization of Two Dimensional Arrays. Example Programs – Matrix operations. **Strings:** Introduction – Declaring and Initializing String Variables – Reading Strings from Terminal – Writing String to Screen – String Handling Functions.						
Module 3	Functions and Pointers	Quiz	Problem Solving	**6 Sessions**		
Topics: **Functions:** Introduction – Need for User-defined functions – Elements of User-Defined Functions: declaration, definition and function call–Categories of Functions – Recursion. **Pointers:** Introduction – Declaring Pointer Variables – Initialization of Variables – Pointer Operators – Pointer Arithmetic – Arrays and Pointers – Parameter						

Passing: Pass by Value, Pass by Reference.				
Module 4	Structures and Union	Quiz	Problem Solving	**6 Sessions**
Topics: **Structures:** Introduction – Defining a Structure – Declaring Structure Variable – Accessing Structure Members – Array of Structures – Arrays within Structures – **Union:** Introduction – Defining and Declaring Union – Difference Between Union and Structure.				
Module 5	File handling	Case Study	Problem Solving	**6 Sessions**
Topics: Files: Defining and Opening a File – Closing a File – Input / Output Operations on File – Random Access Files				
Text Book(s): **1. E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316- 513-0.**				
Reference Book(s): 16. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020. 17. ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016. 18. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015 19. Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th Edition, 2014. **20.** Stephen G. Kochan, "Programming in C", Addison-Wesley Professional, 4th Edition, 2014.				
Web Links and Video Lectures: **1. https://nptel.ac.in/courses/106/105/106105171/** **2. https://archive.nptel.ac.in/courses/106/104/106104128/**				

Course Code: EEE1200	**Course Title: Basics of Electrical and Electronics Engineering. Type of Course: Theory - ESC**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	**2.0**					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This is a fundamental Course which is designed to know the use of basics of electrical and electronics engineering principles occurs in various fields of Engineering. The course emphasises on the characteristics and applications of electrical and electronic devices. The course also emphasizes on the working, analysis and design of electrical circuits using both active & passive components. Additionally, this course creates a foundation for the future courses such as Electrical machines, power system, power electronics Linear Integrated Circuits, Analog Communication and Digital Communication etc.					
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 Participative Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to:					

	Apply basic laws of Electrical Engineering to compute voltage, currents and other parameters in the circuits. Discuss various fundamental parameters appearing in the characteristics of semiconductor devices and their applications. Summarize the operations of different biasing configurations of BJTs and amplifiers. Discuss the performance characteristics and applications of various electrical Machines.			
Course Content:				
Module 1	Introduction to Electrical Circuits	Assignment/ Quiz	Numerical solving Task	10 Sessions
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, Nodal 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 applications	Assignment/ Quiz	Memory Recall based Quizzes	10 Sessions
Mass Action Law, Charge densities in a semiconductor, Types of SC, Junction diodes -Ideal and practical behaviour, Modelling the Diode Forward Characteristic, and Diode applications like rectifiers, Zener diode, characteristics and its applications like voltage regulator.				
Module 3	Transistors and its Applications	Assignment/ Quiz	Memory Recall-based Quizzes	10 Sessions
Transistor characteristics, Current components, BJT Configurations (CB, CC, CE configurations) and their current gains. Operating point, Biasing, Fixed Bias, and load line analysis. Single Stage amplifier. JFET (Construction, principal of Operation and Volt –Ampere characteristics). Pinch-off voltage, Comparison of BJT and FET. MOSFET (Construction, principal of Operation and symbol), MOSFET characteristics in Enhancement and Depletion modes.				
Module 4	Fundamentals of Electrical Machines	Assignment/ Quiz	Numerical solving Task	10 Sessions
Electrical Machines: Single phase transformers: principle of operation and EMF equation, Numerical examples. DC Motor: principle of operation, Back EMF, torque equation, Numerical examples. AC Motor: Principle operation of Induction Motors and its Applications.				

Self-Learning Topics:

- Clipping and clamping circuits, Stabilization Techniques, Voltage divider bias and its stability factor, Multistage amplifier, Darlington pair.
- Special Machines: Introduction to special electrical machines and its applications.

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: Multisim/ P Spice
- 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..

Project Work/ Assignment:

1. Article review: At the end, of course 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.

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

3. Case Study: - At the end of the course students will be given a 'real-world' application based circuits like Power Amplifier, Signal/Function Generator etc. as a case study. Students will be submitting a report which will include Circuit Diagrams, Design, Working Mechanism and Results etc. in appropriate format

Text Book(s):

- Kothari D. P. & Nagrath I. J., "Basic Electrical and Electronics Engineering", Tata McGraw-Hill
- Education
- 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.
- A.P.Malvino, Electronic Principles,7thEdition, Tata McGraw Hill,2007
- J. Millman, C. C. Halkias and C. D. Parikh, "Millman's Integrated Electronics", McGraw Hill Education, 2nd Edition.
- Basics of Electrical & Electronics Laboratory Manual.

Reference Book (s):

- John Hiley, Keith Brown and Ian McKenzie Smith, "HUGHES Electrical and Electronic 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.
- K Uma Rao, A Jaya Lakshmi, "Basic Electrical engineering" IK International publishing house Pvt. Ltd
- R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education India 7th Edition.
- A K. Maini, V. Agrawal, "Electronic Devices & Circuits", Wiley, 2nd Edition
- A.S Sedra, K. C. Smith, "Microelectronic Circuits", Oxford University Press, 6th Edition
- Online Resources (e-books, notes, ppts, video lectures etc.):

- https://presidencyuniversity.linways.com
- https://www.digimat.in/nptel/courses/video/108105112/L01 "Fundamentals of Electrical Engineering-Basic Concepts, Examples"
- Seminar Topic: https://nptel.ac.in/courses/108/105/108105153/ "Electrical Measurements"
- Video lectures on "Electronic Devices" by Prof. Dr. A. N. Chandorkar, IIT Bombay http://www.satishkashyap.com/2013/03/video-lectures-on-electron-devices-by.html
- Video lectures on "Analog Electronics" by Prof. S.C. Dutta Roy, IIT Delhi https://nptel.ac.in/courses/108/102/108102095/
- Video lectures on "Diodes", by Prof. Chitralekha Mahanta, IIT Guwahati,
- https://nptel.ac.in/courses/117/103/117103063/
- E-content:
- "Introduction to Electrical Machines https://nptel.ac.in/courses/108/102/108102146/"
- M. -Y. Kao, H. Kam and C. Hu, "Deep-Learning-Assisted Physics-Driven MOSFET Current Voltage Modeling," 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
- F. Bonet, O. Aviñó-Salvadó, M. Vellvehi, X. Jordà, P. Godignon and X. Perpiñà, "Carrier
- Concentration Analysis in 1.2 kV SiC Schottky Diodes Under Current Crowding," in IEEE Electron Device Letters, vol. 43, no. 6, pp. 938-941, June 2022, doi: 10.1109/LED.2022.3171112. https://ieeexplore-ieeeorg-presiuniv.knimbus.com/document/9764749
- 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
- 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 electric circuit parameters, performance operation of machines, and operation of semiconductor devices for Skill Development through Participative Learning techniques. This is attained through assessment component mentioned in course plan.

Course Code: CSE2201	**Course Title: Program Solving Using C Lab Type of Course: Lab - PCC**	**L- T-P-C**	0	0	4	2
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs and applications in C. ACAlso by learning the basic programming constructs they can easily switch over to any other language in future.					

Course Object	The objective of the course is to familiarize the learners with the concepts of Problem Solving Using C and attain Employability through Problem Solving Methodologies.
Course Outcomes	**On successful completion of this course the students shall be able to:** 13. Write algorithms and to draw flowcharts for solving problems 14. Demonstrate knowledge and develop simple applications in C programming constructs 15. Develop and implement applications using arrays and strings 16. Decompose a problem into functions and develop modular reusable code 17. Solve applications in C using structures and Union 18. Design applications using Sequential and Random Access File Processing.
Course Content:	

List of Practicals:
Lab Sheet 1: 10 Sessions

Program 1: Sum of Two Numbers
Program 2: Find the Greatest of Three Numbers
Program 3: Check Even or Odd using Conditional Operator
Program 4: Print Multiplication Table using Loop
Program 5: Count Digits in a Number using While Loop
Program 6: Demonstration of Preprocessor Directives
Program 7: Simple Calculator using Switch Case

Lab Sheet 2: 10 Sessions
Program 1: Check Whether a Number is Positive, Negative or Zero
Program 2: Find the Sum of First N Natural Numbers
Program 3: Check Whether a Number is Prime or Not
Program 4: Find Factorial of a Number
Program 5: Reverse a Number
Program 6: Simple Number Guessing Game

Lab Sheet 3: 10 Sessions
Program 1: Linear Search in a One-Dimensional Array
Program 2: Bubble Sort on an Integer Array
Program 3: Matrix Addition (2D Arrays)
Program 4: Count Vowels in a String
Program 6: Selection Sort on an Array

Lab Sheet 4: 10 Sessions
Program 1: Sum of Two Numbers Using User-Defined Function
Program 2: Factorial Using Recursion
Program 3: Swap Two Numbers Using Call by Value (No Swap)
Program 4: Swap Two Numbers Using Call by Reference (With Swap)
Program 5: Pointer Basics - Access and Modify Variable via Pointer
Program 6: Accessing Array Elements Using Pointers

Lab Sheet 5: 10 Sessions
Program 1: Basic Structure Usage

Program 2: Input and Display Array of Structures
Program 3: Array Inside Structure (Student Marks)
Program 4: Structure with Nested Structures (Date of Birth)
Program 5: Union Example and Member Access

Lab Sheet 6: 10 Sessions
Program 1: Write to a File (Text Mode)
Program 2: Read from a File (Text Mode)
Program 3: Append Data to a File
Program 4: Count Characters, Words and Lines in a File
Program 5: Write and Read Structure to/from a Binary File
Program 6: Random Access in File (Update a Record)

Text Book(s):

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

Reference Book(s):

21. **Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.**
22. **ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.**
23. **Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015**
24. **Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th Edition, 2014.**
25. **Stephen G. Kochan, "Programming in C", Addison-Wesley Professional, 4th Edition, 2014.**

Web Links and Video Lectures:

5. https://nptel.ac.in/courses/106/105/106105171/
6. https://archive.nptel.ac.in/courses/106/104/106104128/

Course Code: PPS1026	**Course Title: Industry Readiness Program – II (Audited Course)** Type of Course: Practical Only Course	L- T - P- C	0	0	2	0
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	NIL					
Course Description	This course is designed to enable students learn styles of communication, team building and use empathy in leadership. The course will benefit learners in preparing themselves effectively through various activities and learning methodologies.					
Course Objective	The objective of the course is to **familiarize the learners with the concepts of "Industry Readiness for Young Professionals" and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.**					

Course Out Comes	**On successful completion of this course the students shall be able to:** CO 1 **Apply** different communication skills for success in workplace CO 2 **Practice team building skills** for career success CO3 **Demonstrate** ethical leadership skills in workplace		
Course Content			
Module 1	**Effective Communication**	Classroom activities	**10 Hours**
Topics: Practice effective communication skills (Verbal, Non-verbal, Written and Visual) **Activity:** Use social media prompts to prepare self-introduction videos			
Module 2	**Team Building**	Group Activity	**10 Hours**
Topics: Skills of an effective team player **Activity:** Student group activity to build class networking			
Module 3	**Leadership**	Case study	**10 Hours**
Topics: Types of leadership, using empathy in leadership **Activity:** Individual presentation by students on corporate leaders.			
Faculty : L&D			
Targeted Application & Tools that can be used: 4. TED Talks 5. You Tube Links 6. Activities			
Assignment proposed for this course Assignment 1: One minute reel Assignment 2: Team building assignment			
Continuous Individual Assessment Module 1: L-S-R-W class assessment Module 2: Team Presentation Module 3: Individual Assessment			
The topics related to skill development: Students acquire knowledge on effective communication skills, team building skills and how to prepare themselves to be leaders in workplace using empathy and implement various skill sets during the course of their time in the university.			

Course Code EEE1531	**Course Title:** Basics of Electrical and Electronics Engineering Laboratory	L-T- P- C	0	0	2	1
Version No. 1.0	**Type of Course:** Laboratory - ESC					

Course Code: ECE1511	**Course Title: Design Workshop** **Course Type : ESC**	L- T-P- C	1	0	2	2
Course Pre-requisites	NIL					
Anti-requisites	NIL					

Version No.	1.0
Course Description	This fundamental laboratory provides an opportunity to validate the concepts taught in the basics of electrical and electronics engineering and enhances the ability to visualize real system performance, using both hardware and simulation tools.
Course pre-requisites	NIL
Anti-requisites	NIL
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 Description	This course is designed to provide an in-depth understanding of Arduino, microcontrollers Raspberry pi and their application in various real time projects involving sensors. Throughout the course, students will learn the fundamentals of Arduino and Raspberry Pi programming and gain hands-on experience with a wide range of sensors. Students will explore how to connect and interface sensors with Arduino and Raspberry Pi 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, Raspberry Pi and sensors.
Basic skill sets required for the laboratory:	**The students shall be able to develop:** **27) An attitude of enquiry.**
Course Objective	The objective of the course is **Employability Skills** of student by using **PARTICIPATIVE LEARNING** techniques.
Course Outcomes	**On successful completion of the course the students shall be able to** 9. Explain the main features of the Arduino & the Raspberry Pi prototype board. 10. Demonstrate the interface interfacing of the peripherals to Arduino and Raspberry Pi system. 11. Understand the types of sensors and its functions 12. Demonstrate the functioning of live projects carried out using Arduino and Raspberry Pi system.
Course Content:	**On successful completion of the course the students shall be able to:** 9. Apply basic laws of Electrical Engineering to compute voltage, currents, and other parameters in the circuits. 10. Demonstrate the working of electrical machines to observe performance characteristics. 11. Demonstrate the working of electronic circuits to obtain the V-I Characteristics of various semiconductor devices. 12. Sketch the characteristics and waveforms relevant to standard electrical and electronic circuits

Module 1	**Basic concepts of Microcontrollers**	Hands-on	Interfacing Task and Analysis	**3 Sessions**

Topics:

Introduction to Arduino, ESP and Node MCU Pin configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board, API's , Introduction to Embedded C and Arduino platform, Arduino Datatypes and variables, Arduino i/o Functions, Arduino Communications, Arduino IDE, various Cloud Platforms.

Module 2	**Sensory Devices**	Hands-on	Interfacing Task and Analysis	**3 Sessions**

Topics:

Arduino Sensors: Humidity Sensor, Temperature Sensor, Water Detector / Sensor, PIR Sensor, Ultrasonic Sensor, Connecting Switches and actuators, sensor interface with Arduino.
Introduction to 3D Printer: 3D Printer technology and its working Principles, Applications. Introduction to online Simulators: Working with AutoCAD/Fusion 360 Simulator.

Module 3	**Introduction to MicroPython**	Hands-on	Interfacing Task and Analysis	**4 Sessions**

Topics:

Introduction to MicroPython, Comparison with other programming languages, Setting up the MicroPython development environment, Basics of MicroPython syntax and structure.

List of Laboratory Tasks:

Experiment No 1: Verification of KVL and KCL for a given DC circuit.
Level 1: Study and Verify KVL and KCL for the given electrical Circuit.
Level 2: For the same circuit considered in level 1, perform the simulation using NI LabVIEW/Multisim/MATLAB.

Experiment No 2: Analyse AC series circuits – RL, RC and RLC .
Level 1: Conduct an experiment to perform and verify the impedance, current and power of Series RL and RC circuits

Module 4	**Working with Raspberry pi**	Hands-on	Interfacing Task and Analysis	**5 Sessions**

Introduction to raspberry pi boards, pin-diagram, different types of raspberry pi boards and its application, LED and switch control. Mastering Modules, Setup Raspberry - PuTTY SSH,VNC Viewer to interface with more complicated sensors and actuators. Various Libraries and its functions.

Lab: Name of the Experiments:

31. **Introduction Lab 1:**
    Level 1: Overview on Arduino based Micro-controller, and sensors.
    Level 2: Interfacing of Arduino and ESP boards with sensors and other components.
32. **Lab 2: Smart Plant Monitoring**
    Level 1- Push button-controlled LED.
    Level 2- Automatic irrigation system using Arduino
33. **Lab 3: Robotics with Arduino**
    Level 1- Servo Motor control using Arduino
    Level 2: DC Motor Control Using Arduino for Robotics.
34. **Lab 4: Environmental pollution using ESP.**
    Level 1 - IoT based air Pollution Monitoring System.
    Level 2- IoT Based water pollution system
35. **Introduction Lab for raspberry pi:**
    Level 1: Overview on Different Raspberry Pi Boards, and sensors.
    Level 2: Configuring the Raspberry Pi and Interfacing with sensors and other components.
36. **Lab 7:** Raspberry Pi based Object Detection using TensorFlow and OpenCV.
37. **Lab 8:** Speech Recognition on Raspberry Pi for Voice Controlled Home Automation.
38. **Lab 9:** Design the website using HTML and CSS, and host the website on Raspberry Pi.
39. **Introduction Lab for 3D printing.**
    Overview of 3D printing. Design of 3D structure using the CAD. Understand the steps of fabrication of simple rectangular box using 3D printer.
40. **Lab 10:** Design and print of Hollow Cylindrical structure using 3D CAD and 3D printer.
41. **Lab 11** Demonstration of Jetson nano board and its capability. **(OPTIONAL)**
42. **Lab 12:** Revision
43. **Lab 13:** Revision
44. **Lab 14:** Mini Project
45. **Lab 15:** Mini Project Evaluation

Topics: Types of Arduino boards, Thonny Python, Python IDLE, **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 Interactive Art. These are just a few examples of the many application areas where Arduino, Raspberry Pi and sensors can be applied. The flexibility and affordability of Arduino and Raspberry Pi combined with the wide range of sensors available, allow for endless possibilities in creating innovative projects.

Professionally Used Software: Students can use of SOURCE Software's Arduino IDE and Tinker CAD, Thonny Python, Python IDLE etc.

Project work/Assignment:

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

Experiment No 3: Calculation of power and power factor of the given AC Circuit.

Level 1: Conduct an experiment to measure the power and power factor for given resistive load.

Level 2: Conduct an experiment to measure the power and power factor for given inductive load.

Experiment No 4: Perform the experiments on given Transformer.

Level 1: Verify the EMF equation of a transformer and compute the voltage transformation ratio.

Level 2: Study and effect of load on the secondary side of the transformer and verify the EMF equation under load conditions.

Experiment No 5: Load test on DC shunt motor

Level 1: Conduct load test on DC shunt motor and find its efficiency at different loads

Level 2: Conduct load test on DC shunt motor and plot the performance characteristics.

Experiment 6: Study of PN-Junction Diode Characteristics in Forward and Reverse Bias Conditions.

Level 1: Carry out an experiment to plot VI Characteristics and hence find the cut-in voltage on forward characteristics for the Silicon P-N Junction diode.

Level 2: Carry out an experiment to plot VI Characteristics of Zener diode and hence find the zener voltage on reverse characteristics for the Silicon P-N Junction zener diode.

Experiment No. 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.

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. [Presidency University Library Link](https://presidencyuniversity.linways.com).

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.

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

Professionally Used Software: Multisim/ P Spice

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.

Textbook(s):

5. **Monk Simon "Programming Arduino: Getting Started with Sketches", Mc Graw Hill Publications Second Edition**
6. **Monk Simon "Raspberry Pi Cookbook: Software and Hardware Problems and Solutions", Publisher(s): O'Reilly Media, Inc. ISBN: 9781098130923 fourth Edition.**

Text Book:

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

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.
3. **Charles Bell, Micro Python for the Internet of Things: A Beginner's Guide to Programming with Python on Microcontrollers" by" Edition 1, 2017, ISBN 978-1-4842-3123-4**
4. Stewart Watkiss "Learn Electronics with Raspberry Pi " Apress Berkeley, CA . second edition,2020. ISBN978-1-4842-6348-8
5. Jo Prusa, "Basic of 3D printing", Prusa Research, 3rd edition.
6. [Volker Ziemann](#), **A Hands-On Course in Sensors Using the Arduino and Raspberry Pi (Series in Sensors)", CRC Press, 1st Edition. 2018**

Reference Books:

25. John Hiley, Keith Brown and Ian McKenzie Smith, "HUGHES Electrical and Electronic Technology", 10th Edition (Indian Edition published by Dorling Kindersley), Pearson, 2011
26. Samarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2nd Edition, Prentice Hall India, 2007.
27. K Uma Rao, A Jaya Lakshmi, "Basic Electrical engineering" IK International publishing house Pvt. Ltd
28. R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, India 7th Edition.
29. A.K. Maini, V. Agrawal, "Electronic Devices & Circuits", Wiley, 2nd Edition
30. A.S Sedra, K. C. Smith, "Microelectronic Circuits", Oxford University Press, 6th Edition

Online Learning Resources:

31. https://presidencyuniversity.linways.com
32. https://www.digimat.in/nptel/courses/video/108105112/L01 "Fundamentals of Electrical Engineering-Basic Concepts, Examples"
33. Video lectures on "Diodes", by Prof. Chitralekha Mahanta, IIT Guwahati, https://nptel.ac.in/courses/117103/117103063/

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

11. Arduino trending Projects < https://www. https://projecthub.arduino.cc/>
12. Introduction to Arduino < https://onlinecourses.swayam2.ac.in/aic20_sp04/preview>
13. Case studies on Wearable technology< https://www.hticiitm.org/wearables>
14. Raspberry-pi Projects < https://magpi.raspberrypi.com/articles/category/tutorials/>
15. Introduction to internet of things< https://nptel.ac.in/courses/106105166>

E-content:

Topics relevant to "SKILL DEVELOPMENT": All the experiments which are listed are for **Skill Devel**… comp…

15. Cattle Health Monitoring System Using Arduino and IOT (April 2021| IJIRT | Volume 7 Issue 11 | ISSN: 2349-6002)
16. 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.
17. 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.
18. 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.

19. Basil, Eliza Sawant, S.D. "IoT based traffic light control system using Raspberry Pi " DOI 10.1109/ICECDS.2017.8389604

20. Supriya S, 2Dr. Aravinda " Green leaf disease detection and identification using Raspberry Pi https://www.irjet.net/archives/V9/i8/IRJET-V9I847.

21. Dr. E.N. Ganesh., "Health Monitoring System using Raspberry Pi and IOT" DOI : http://dx.doi.org/10.13005/ojcst12.01.03

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

Course Code: MAT2303	**Course Title:** Linear Algebra & Vector Calculus **Type of Course:BSC**	**L-T- P- C**	**3**	**1**	**0**	**4**

Version No.		1.0
Course Pre-requisites		Basic Concepts of Limits, Differentiation, Integration, Matrices (PU Level)
Anti-requisites		**NIL**
Course Description		This course explores the fundamental concepts of vectors, matrices, and their operations within the context of calculus, including vector differentiation and integration, while applying these tools to solve problems related to linear systems, transformations, and geometric interpretations in higher dimensions, often with applications in fields like physics, engineering, and computer graphics; key topics include vector algebra, matrix operations, determinants, eigenvalues, eigenvectors, gradients, divergence, curl, line integrals, surface integrals, and the fundamental theorems of vector calculus like Green's Theorem, Stokes' Theorem, and the Divergence Theorem.
Course Objective		The course is intended to develop computational proficiency involving procedures in Matrices, Linear Algebra and Vector Calculus which are useful to all engineering disciplines. This course is to equip students with the ability to understand and manipulate vectors in multidimensional space, apply matrix operations to solve systems of linear equations, and utilize concepts like gradients, divergence, and curl to analyze physical phenomena, all while developing a strong foundation for applying these tools in various scientific and engineering fields like physics, mechanics, and computer graphics.
Course Out Comes		On successful completion of the course the students shall be able to: CO1 - Use matrix methods and certain techniques to solve the system of linear equations and to find eigen values, eigen vectors of a matrix to check whether it is diagonalizable. CO2 - Understand the abstract notions of vector space and dimensionality of it. CO3 - find the matrix representation of a linear transformation given bases of the relevant vector spaces.

		CO4 - Learn different notions of vector and scalar fields with their properties. Understanding the major theorems (Green's, Stokes', Gauss') and some applications of these theorems.	
Course Content:			
Module 1	**Systems of Linear Equations**		8. ***Classes)***
Systems of Linear Equations, Matrices and Elementary Row Operations, Echelon forms, Matrix operations, invertible matrices, Determinants and their properties, Cramer's Rule, LU-decomposition, Applications of Systems of Linear Equations.			
Module 2	**Vector Space**	**Assignment**	***(9Classes)***
Linear Combinations and Linear Independence, Vectors in n R^n, Linear Combinations, Linear Independence Vector Spaces, Definition of a Vector Space, Subspaces, Basis and Dimension, Coordinates and Change of Basis, Orthogonal bases and orthogonal projections.			
Module 3	**Linear Transformations**		***(15 lectures)***
Linear Transformations, Algebra of transformations, The Null Space and Range, Isomorphisms, Matrix Representation of Linear Transformations, Similarity Eigenvalues and Eigenvectors, Eigen values and Eigen vectors, Diagonalization. Inner Product Spaces, The Dot Product on R^n and Inner Product Spaces, Orthonormal Bases, Orthogonal Complements, Application: Least Squares Approximation, Diagonalization of Symmetric Matrices, Application: Quadratic Forms. Singular Value Decomposition: Singular values, computing singular value decomposition, and Introduction to principal component analysis.			
Module 4	**Vector Calculus**	**Assignment**	***(15 lectures)***
Vector & Scalar Functions and Fields, Derivatives, Curve, Arc length, Curvature & Torsion, Gradient of Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field, Physical interpretation, solenoidal and irrotational vector fields. Problems. Line Integrals, Path Independence of Line Integrals, Green`s Theorem in the plane, Surface Integrals, Divergence Theorem of Gauss, Stokes`s Theorem.			
Targeted Application & Tools that can be used: • Solve systems of linear equations using various methods including Gaussian and Gauss Jordan elimination and inverse matrices. • Perform matrix algebra, invertibility, and the transpose and understand vector algebra in R^n. • Determine relationship between coefficient matrix invertibility and solutions to a system of linear equations and the inverse matrices. • Find eigenvalues and eigenvectors and use them in applications. • Find the dimension of spaces such as those associated with matrices and linear transformations. • Understand real vector spaces and subspaces and apply their properties. • Compute inner products in a real vector space and compute angle and orthogonality in inner product spaces.			

- Create orthogonal and orthonormal bases: Gram-Schmidt process and use bases and orthonormal bases to solve application problems.
- Prove basic results in linear algebra using appropriate proof-writing techniques such as linear independence of vectors; properties of subspaces; linearity, injectivity and subjectivity of functions; and properties of eigenvectors and eigenvalues.

Assignment:

Preparation of power-point slides, which include videos, animations, pictures, graphics for better erstanding the applications of Linear Algebra and Vector Calculus to engineering applications – The ulty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus of Linear ebra and Vector Calculus is covered.

Text Book

3. Gilbert Strang, Linear Algebra and its applications, Wellesley-Cambridge Press,U.S.; 6th edition.

4. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.

References:

3. Introduction to Linear Algebra with Application, Jim Defranza, Daniel Gagliardi, Tata McGraw-Hill

4. Elementary Linear Algebra, Applications version, Anton and Rorres, Wiley India Edition.

5. Advanced Engineering Mathematics, Erwin Kreysig, Wiley Publication.

6. Elementary Linear Algebra, Ron Larson, Cengage Learning .

7. Linear Algebra and its Applications, David C. Lay, Pearson Education.

E-resources/ Web links:

3. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_9607

4. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_143156

5. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=CUSTOM_PACKAGE_EBSCO_29052023_270975

6. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_94555

7. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_243864

8. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_224531

9. NPTEL Video Lectures Matrices and Linear Algebra:

10. https://nptel.ac.in/courses/111106051/ 11. NPTEL Video Lectures Differential Equations: 12. https://nptel.ac.in/courses/111106100/ 13. NPTEL Vector Calculus: 14. https://nptel.ac.in/courses/111/105/111105122/ 15. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html 16. https://www.scu.edu.au/study-at-scu/units/math1005/2022/
Topics relevant to SKILL DEVELOPMENT: The course focuses on the concepts of Vector calculus and Linear Algebra 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 the course handout.

Course Code: MAT2404	Course Title: Discrete Mathematics Type of Course: Theory - ESC	L-T- P- C	3	1	0	4
Version No.	1.0					
Course Pre-requisites	MAT2302					
Anti-requisites	**NIL**					
Course Description	The course explores the study of mathematical structures that are fundamentally discrete (not continuous), focusing on concepts like set theory, logic, graph theory, 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, functions, counting 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 particular set of mathematical facts and how to apply them. It teaches students how to think logically and mathematically through five important themes: mathematical reasoning, combinatorial analysis, discrete structures, algorithmic thinking, and applications and modeling. A successful discrete mathematics course should carefully blend and balance all five themes.					
Course Outcomes	On successful completion of the course the students shall be able to: CO1 - Explain logical sentences through predicates, quantifiers and logical connectives. CO2 - Deploy the counting techniques to tackle combinatorial problems CO3 - Comprehend the basic principles of set theory and different types of relations. CO4 - Apply different types of structures of trees for developing programming skills					
Course Content:						

Module 1	**Fundamentals of Logic**		**(10 Classes)**
Basic Connectives and Truth Tables, Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.			
Module 2	**Principle of Counting**	**Assignment**	**(15 Classes)**
The Well Ordering Principle – Mathematical Induction 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 Principle, Derangements – Nothing is in its Right Place, Rook Polynomials.			
Module 3	**Relations and Functions**		**(10 Classes)**
Cartesian Products and Relations, Functions, One-to-One, Onto Functions. The Pigeon-hole Principle, Function Composition and Inverse Functions. Relations, Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders, Lattice, Hasse Diagrams, Equivalence Relations and Partitions.			

Module 4	**Recurrence Relations and Generating Functions**		**(10 Classes)**
Homogeneous and inhomogeneous recurrences and their solutions - solving recurrences using generating functions - Repertoire method - Perturbation method - Convolutions - simple manipulations and tricks.			
Module 5	**Graph Theory & Algorithms on Networks**	**Assignment**	**(15 Classes)**
Definitions and basic results - Representation of a graph by a matrix and adjacency list - Trees - Cycles - Properties - Paths and connectedness - Sub graphs - Graph Isomorphism - Operations on graphs - Vertex and edge cuts - Vertex and edge connectivity, Euler and Hamilton Paths, Shortest-Paths. Tree - Definitions, Properties, and Examples, Routed Trees, Binary search tree, Decision tree, spanning tree: BFS, DFS. 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:			
Assignment 1: Logic Equivalences and Predicate calculus. **Assignment 2: Equivalence Relations and Lattices** **Assignment 3: Recurrence Relations**			
Text Book 3. Kenneth H. Rosen, "Discrete Mathematics and its Applications", McGraw-Hill,s 8th Edition,2019. 4. Harary – Graph Theory, Addison-Wesley Publishing Company.			
References: 3. Arthur Gill, "Applied Algebra for Computer Science", Prentice Hall. 4. K.D. Joshi, "Discrete Mathematics", Wiley Eastern Ltd. 5. Ralph. P. Grimaldi., "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia. **E-resources/ Web links:** https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&uniqueEBSCO95_30102024_54588 https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&uniqueEBSCO95_30102024_375 https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html https://www.scu.edu.au/study-at-scu/units/math1005/2022/			

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: PPS4006	**Course Title: LOGICAL & CRITICAL THINKING** **Type of Course: HSMC**	**L- T-P- C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Students should have the basic concepts of Logical reasoning and Critical thinking, along with its applications in real life problems.					
Anti-requisites	Nil					
Course Description	This is a skill-based training program for the engineering students (Undergraduate). This course is designed to enable the students to enhance their skills in Logical reasoning and Critical thinking.					
Course Objective	The objective of the course is to familiarize the learners with concepts in in Logical reasoning and Critical thinking through problem solving techniques suitable for their career development.					
Course Outcomes	On successful completion of the course the students shall be able to:					
	CO1] **Understand** all the concepts.					
	CO2] **Apply** the concepts in problem solving (Bloom's taxonomy Level 3)					
Course Content:						
Module 1	Logical Thinking	Assignment				**16 Hours**
Topics: Syllogisms, Cubes and Dices, Mirror and Water images, Paper cutting and Folding, Embedded figures & Completion of figures, Data Interpretation, Data sufficiency						
Module 2	Critical Thinking	Assignment				**14 Hours**
Topics: Analogy, Symbol and Notations, Statement and assumption, Cause of action, Statement and conclusion, Puzzles						
Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS						
Evaluation	**Continuous Evaluation**					
	· Topic wise evaluation					
	· Mid-Term & End Term					
	Text Book					
	1. A new approach to reasoning verbal, non-verbal & analytical by BS Sijwali					
	2. R S Aggarwal					
	3. Kiran publications					
	References					
	1. www.indiabix.com					
	2. www.testbook.com					
	3. www.youtube.com/c/TheAptitudeGuy/videos					
	Topics relevant to Skill Development Logical reasoning and Critical thinking for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.					

Course Code: CSE7100	Course Title: Mini Project	L- T-P- C	0	0	0	4
Version No.	1.0					
Course Pre-requisites	Knowledge and Skills related to all the courses studied in previous semesters.					
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 learners with the concepts of Professional Practice and attain Employability Skills through Experiential Learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: 11. Identify the engineering problems related to local, regional, national or global needs. (Understand) 12. Apply appropriate techniques or modern tools for solving the intended problem. (Apply) 13. Design the experiments as per the standards and specifications. (Analyze) 14. Interpret the events and results for meaningful conclusions. (Evaluate) 15. Appraise project findings and communicate effectively through scholarly publications. (Create)					

Course Code: CSE7300	Course Title: Capstone Project	L- T-P- C	0	0	0	10
Version No.	1.0					
Course Pre-requisites	Knowledge and Skills related to all the courses studied in previous semesters.					
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 learners with the concepts of Professional Practice and attain Employability Skills through Experiential Learning techniques.
Course Outcomes	On successful completion of this course the students shall be able to: 15. Identify problems based on societal /research needs. (Understand) 16. Apply Knowledge and skill to solve societal problems in a group. (Apply) 17. Develop interpersonal skills to work as member of a group or leader. (Apply) 18. Analyze the inferences from available results through theoretical / Experimental / Simulations. (Analyze) 19. Analyze the impact of solutions in societal and environmental context for sustainable development. (Analyze) 20. Improve in written and oral communication. (Create) 21. Demonstrate capabilities of self-learning in a group, which leads to lifelong learning. (Understand)

Course Code: CSE2252	Course Title: Data Communications and Computer Networks Lab Type of Course: Lab / PCC	L- T-P- C	0	0	2	1
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	NIL					
Course Description	This lab-based course provides hands-on experience in the principles and practices of data communications and computer networking. It is designed to complement theoretical concepts covered in the associated lecture course. Through a series of structured experiments and practical exercises, students will gain proficiency in configuring, analyzing, and troubleshooting computer networks. Key topics include network topology design, IP addressing and subnetting, Ethernet and LAN technologies, routing and switching, TCP/IP protocol suite, and basic network security measures. Students will work with industry-standard tools and equipment, including routers, switches, protocol analyzers, and network simulation software such as Cisco Packet Tracer or Wireshark.					
Course Objective	The objective of this lab course is to provide students with practical, hands-on experience in the configuration, operation, and troubleshooting of data communication systems and computer networks. Through guided experiments and real-world scenarios, students will reinforce theoretical knowledge, develop essential technical					

	skills, and gain a deeper understanding of networking concepts, protocols, and devices used in modern communication systems.			
Course Outcomes	On successful completion of the course, the students shall be able to: Design and configure basic network topologies using routers, switches, and end devices to meet specified requirements. Analyze and troubleshoot network connectivity and performance issues using tools such as Wireshark and network simulators. Demonstrate understanding of key networking protocols (e.g., TCP/IP, ARP, ICMP, DHCP) through practical implementation and observation. Apply IP addressing and subnetting techniques to efficiently allocate and manage network resources in various networking scenarios.			
Course Content:				
Module 1,2,3,4	Physical Layer, Network Layer, Transport Laye	Lab Assignment	Problem Solving	24 Sessions

List of Laboratory Tasks:

Lab sheet -1, M-1, 3 [2 Hours]

Experiment No 1:

Level 1: Study of basic network commands and network configuration commands.

Lab sheet -2, M-1[2 Hours]

Experiment No 1:

Level 1: Identify and explore Network devices, models and cables. Introduction to Cisco

packet tracer.

Experiment No. 2:

Level 2 – Create various network topologies using a cisco packet tracer.

Lab sheet -3, M-2,3 [2 Hours]

Experiment No. 1:

Level 2 - Basic Configuration of switch/router using Cisco packet tracer.

Experiment No. 2:

Level 2 -Configure the privilege level password and user authentication in the switch/router.

Lab sheet – 4, M-3 [2 Hours]

Experiment No. 1:

Level 2 - Configure the DHCP server and wireless router and check the connectivity

Lab sheet – 5, M-3 [2 Hours]

Experiment No. 1:

Level 2 - Configure the static routing in the Cisco packet tracer.

Experiment No. 2:

Level 2 - Configure the dynamic routing protocol in the Cisco packet tracer.

Lab sheet – 6, M-4 [2 Hours]

Experiment No. 1: Configuration of DNS Server with Recursive & Integrative approach in

Cisco packet tracer.

Lab sheet – 7, M-4 [2 Hours]

Experiment No. 1:

Configure the telnet protocol in the router using the Cisco packet tracer.

Lab sheet – 8, M-4[2 Hours]

Experiment No. 1:

Level1- Introduction to NS2 and basic TCL program.

Lab sheet – 9, M-4 [2 Hours]

Experiment No. 1:

Level 1: Simulate three node Point to point network using UDP in NS2.

Experiment No. 2:

Simulate transmission of Ping message using NS2.

Lab sheet – 10, M-4[2 Hours]

Experiment No. 1:

Simulate Ethernet LAN using N-node in NS2.

Experiment No. 2:

Simulate Ethernet LAN using N-node using multiple traffic in NS2

Lab sheet –11, M-3,4 [2 Hours]

Experiment No. 1:

Level 1- Introduction to Wire Shark.

Experiment No. 2:

Level 2- Demonstration of packet analysis using wire shark.

Lab sheet –12, M-1,2,3 [2 Hours]

Experiment No. 1:

Level 2- Demonstration of switch and router configuration using real devices

Targeted Application & Tools that can be used: Cisco Packet Tracer, Wireshark, and NS2.

Case Study/Assignment: Choose and analyze a network from any organization/Assignment proposed for this course in CO1-CO4

Problem Solving: Choose and appropriate devices and implement various

network concepts.

Programming: Simulation of any network using NS2.

Text Book(s):

Behrouz A. Forouzan, “Data Communications and Networking 5E”, 5 th Edition, Tata McGraw-Hill, 2017.

Andrew S Tanenbaum, Nick Feamster & David J Wetherall, “Computer Networks” Sixth Edition, Pearson Publication, 2022

Reference(s):

“Computer Networking: A Top-Down Approach”, Eighth Edition, James F. Kurose, Keith W. Ross, Pearson publication, 2021.

William Stallings, Data and Computer Communication, 8th Edition, Pearson Education, 2007.

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

Course Code: CSE2253	Course Title : Data Structures Type of Course: Theory	L-T -P -C	3	0	0	3
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	NIL					
Course Description	This course 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 Objective	The objective of the course is SKILL DEVELOPMENT of student by using EXPERIENTIAL LEARNING 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:						
Module 1	Introduction to Data Structure and Linear Data Structure - Stacks and Queues	Assignment	Program activity	9 Hours		

Introduction -Introduction to Data Structures, Types and concept of Arrays .

Stack -Concepts and representation, Stack operations, stack implementation using array and Applications of Stack.

Queues -Representation of queue, Queue Operations, Queue implementation using array, Types of Queue and Applications of Queue.

Module 2	Linear Data Structure - Linked List	Assignment	Program activity	12 Hours

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 activity	12 Hours

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.

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 objects

Level 2: Programming Exercises on fundamental Data structure - Arrays based on Scenario.

Lab sheet -2

Level 1: Programming Exercises on Stack and its operations

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

Lab sheet -3

Level 1: Programming on Stack application infix to postfix Conversion

Level 2: -

Lab sheet -4

Level 1: Programming 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 post-order(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

Level 1: Program to Implement and Estimate the Time complexity of 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 :

For theory :https://onlinecourses.nptel.ac.in/noc20_cs85/preview

https://puniversity.informaticsglobal.com/login

Topics relevant to development of “Skill Development :”

Linked list and stacks

Topics relevant to development of “Environment and sustainability: Queues

Course Code: CSE2254	Course Title : Data Structures Lab 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 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 Objective	The objective of the course is SKILL DEVELOPMENT of student by using EXPERIENTIAL LEARNING 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:						
Module 1	Introduction to Data Structure and Linear Data Structure - Stacks and Queues	Assignment	Program activity	9 Hours		

Introduction -Introduction to Data Structures, Types and concept of Arrays .

Stack -Concepts and representation, Stack operations, stack implementation using array and Applications of Stack.

Queues -Representation of queue, Queue Operations, Queue implementation using array, Types of Queue and Applications of Queue.

Module 2	Linear Data Structure - Linked List	Assignment	Program activity	12 Hours

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 activity	12 Hours

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.

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 objects

Level 2: Programming Exercises on fundamental Data structure - Arrays based on Scenario.

Lab sheet -2

Level 1: Programming Exercises on Stack and its operations

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

Lab sheet -3

Level 1: Programming on Stack application infix to postfix Conversion

Level 2: -

Lab sheet -4

Level 1: Programming 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 post-order(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

Level 1: Program to Implement and Estimate the Time complexity of 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 :

For theory :https://onlinecourses.nptel.ac.in/noc20_cs85/preview

https://puniversity.informaticsglobal.com/login

Topics relevant to development of “Skill Development :”

Linked list and stacks

Topics relevant to development of “Environment and sustainability: Queues

Course Code: CSE2255	Course Title: Object Oriented Programming Using Java Type of Course: Theory - PCC	L-T- P-C	3	0	0	3
Version No.	2.0					
Course Pre-requisites	Nil					
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 Objective	The objective of the course is to familiarize the learners with the concepts of Problem-Solving using JAVA and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING techniques					
Course Out Comes	On successful completion of the course the students shall be able to: CO1: Describe the basic programming concepts. [Understand] CO2: Apply the concept of classes, objects and methods to solve problems. [Application] CO3: Apply the concept of arrays and strings. [Appy] CO4: Implement inheritance and polymorphism building secure applications. [Apply] CO5: Apply the concepts of interface and error handling mechanism. [Apply]					
Course Content:						
Module 1	Basic Concepts of Programming and Java	Assignment	Problem Solving	9 Sessions		
Topics: Introduction to Principles of Programming: Process of Problem Solving, Java program structure, Download Eclipse IDE to run Java programs, Sample program, Data types, Identifiers, Variables, Constants in java, Operators, Assignments and Expression, Basic Input/ Output functions, Control Statements: Branching and Looping.						

Module 2	Classes, objects, methods and Constructors	Assignment	Problem Solving	10 Sessions
Topics: Classes, Objects and Methods: Introduction to object Oriented Principles, defining a class, adding data members and methods to the class, access specifiers, instantiating objects, reference variable, accessing class members and methods. Static Polymorphism: Method overloading, constructors, constructor overloading, this keyword, static keyword, Nested classes, Accessing members in nested classes.				
Module 3	Arrays, String and String buffer	Assignment	Problem Solving	8 Sessions
Topics: Arrays: Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array, Array of objects. String: Creation & Operation. String builder class, methods in String Buffer.				
Module 4	Inheritance and Polymorphism	Assignment	Problem Solving	10 Sessions
Topics: Inheritance: Defining a subclass, Types of Inheritance, super keyword. Dynamic Polymorphism: Method overriding. Final keyword: with data members, with member functions and with class. Abstract keyword: with data members, with member functions and with class, Exception handling.				
Module 5	Input & Output Operation in Java	Assignment	Problem Solving	8 Sessions
Input/output Operation in Java(java.io Package), Streams and the new I/O Capabilities, Understanding Streams, working with File Object, File I/O Basics, Reading and Writing to Files, Buffer and Buffer Management, Read/Write Operations with File Channel, Serializing Objects, Observer and Observable Interfaces.				
Text Book T1 Herbert Schildt, “The Complete Reference Java 2”, Tata McGraw Hill Education, 11th Edition,2019.				
References R1. Cay S Horstmann and Cary Gornell, “CORE JAVA volume I-Fundamentals”, Tenth Edition, Pearson 2015. R2: James W. Cooper, “Java TM Design Patterns – A Tutorial”, Addison-Wesley Publishers.4th Edition, 2000.				

R3. E. Balagurusamy, “Programming with Java”, Tata McGraw Hill Education, 6th Edition, 2019.

E book link R1: http://rmi.yaht.net/bookz/core.java/9780134177373-Vol-1.pdf

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

Web resources

https://youtube.com/playlist?list=PLu0W_9lII9agS67Uits0UnJyrYiXhDS6q

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

Topics relevant to development of “Skill Development”:

Static Polymorphism

Method overloading, constructors

constructor overloading

this keyword

static keyword and Inner classes

Inheritance and Polymorphism.

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

Course Code: CSE2256	Course Title: Object Oriented Programming Using Java Lab Type of Course: Lab - PCC	L-T- P-C	0	0	2	1
Version No.	2.0					
Course Pre-requisites	Nil					
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 Objective	The objective of the course is to familiarize the learners with the concepts of Problem-Solving using JAVA and attain SKILL DEVELOPMENT through EXPERIENTIAL LEARNING techniques					
Course Out Comes	On successful completion of the course the students shall be able to: CO1: Demonstrate basic programming concepts. [Apply] CO2: Apply the concept of classes, objects and methods to solve problems. [Application] CO3: Apply the concept of arrays and strings. [Appy] CO4: Implement inheritance and polymorphism building secure applications. [Apply] CO5: Apply the concepts of interface and error handling mechanism. [Apply]					
Course Content:						
Module 1	Basic Concepts of Programming and Java	Assignment	Problem Solving	12 Sessions		

Download Eclipse IDE to run Java programs, Sample programs on Data types, Identifiers, Variables, Constants in java, Operators, Assignments and Expression, Basic Input/ Output functions, Control Statements: Branching and Looping.				
Module 2	Classes, objects, methods and Constructors	Assignment	Problem Solving	14 Sessions
Problem solving using Classes, Objects and Methods: defining a class, adding data members and methods to the class, access specifiers, instantiating objects, reference variable, accessing class members and methods. Use Static Polymorphism: Method overloading, constructors, constructor overloading, this keyword, static keyword, Nested classes, Accessing members in nested classes.				
Module 3	Arrays, String and String buffer	Assignment	Problem Solving	10 Sessions
Using Arrays and Strings : Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array, Array of objects. String: Creation & Operation. String builder class, methods in String Buffer.				
Module 4	Inheritance and Polymorphism	Assignment	Problem Solving	12 Sessions
Inheritance: Defining a subclass, Types of Inheritance, super keyword. Dynamic Polymorphism: Method overriding. Final keyword: with data members, with member functions and with class. Abstract keyword: with data members, with member functions and with class, Exception handling.				
Module 5	Input & Output Operation in Java	Assignment	Problem Solving	12 Sessions
Input/output Operation in Java(java.io Package), Streams and the new I/O Capabilities, Understanding Streams, working with File Object, File I/O Basics, Reading and Writing to Files, Buffer and Buffer Management, Read/Write Operations with File Channel, Serializing Objects, Observer and Observable Interfaces.				
P1: Programming Exercises on Basic Concepts. LEVEL 1: Discuss about datatypes and variables. LEVEL 2: Demonstrate a simple java program				

P2: Programming Exercises on Basic Concepts.

LEVEL 1: Discuss about datatypes and variables.

LEVEL 2: Demonstrate a simple java program

P3: Programming Exercises on operators, expressions based on a given scenario.

LEVEL 1: Explain operators, expressions.

LEVEL 2: Demonstrate operators

P4: Programming Exercises Command Line Arguments based on a given scenario.

LEVEL 1: Explain command line arguments

LEVEL 2: Demonstrate command line arguments

P5: Programming Exercises on basic Input/ Output functions and Control Statements: Branching

LEVEL 1: Explain Input/ Output functions

LEVEL 2:Demonstrate Control Statements: Branching

P6: Programming Exercises on Control Statements: Looping

LEVEL 1: Explain variour loops.

LEVEL 2:Demonstrate Control Statements: Looping

P7: Programming Exercises on Creating Objects, classes on a given scenario.

LEVEL 1: Illustrate class, object and methods.

LEVEL 2: Execute java program using class and objects

P8: Programming Exercises on Adding methods and Constructors to the class based on a given scenario.

LEVEL 1: Illustrate methods and constructors

LEVEL 2: Execute java program using methods and constructors

P9: Programming Exercises on methods based on a given scenario.

LEVEL 1: Illustrate method overloading

LEVEL 2: Apply method overloading for the given scenario.

P10: Programming Exercises on methods based on a given scenario.

LEVEL 1: Illustrate constructors overloading

LEVEL 2: Apply constructor overloading for the given scenario

P11: Programming Exercises on methods for static members bassed on a given scenario.

LEVEL 1: Benefits of usage static members

LEVEL 2: Usage of Static Members for the given scenario

P12: Programming Exercises on static methods based on a given scenario.

LEVEL 1: Benefits of usage static methods

LEVEL 2: Usage of Static Methods for the given scenario.

P13: Programming Exercises on nested Classes based on a given scenario.

LEVEL 1: Benefits of usage nested classes

LEVEL 2: Apply the concept of usage of nested classes for the given scenario

P14: Programming Exercises on Arrays and its built-in functions based on a given scenario.

LEVEL 1: Illustrate one dimensional arrays and its functions.

LEVEL 2: Demonstrate programs with single-dimensional arrays and operations.

P15: Programming Exercises on Arrays and its built-in functions based on a given scenario.

LEVEL 1: Illustrate multi dimensional arrays and its functions.

LEVEL 2: Demonstrate programs with multi-dimensional arrays and operations.

P16: Programming Exercises on String Class and its built-in functions based on a given scenario.

LEVEL 1: Explain about String class and String methods.

LEVEL 2: Execute simple java applications for String and StringBuffer operations

P17: Programming Exercises on String Buffer Class and its built-in functions based on a given scenario.

LEVEL 1: Explain about StringBuffer class and String methods.

LEVEL 2: Execute simple java applications for String and StringBuffer operations

P18: Programming Exercises on String Builders and its built-in functions based on a given scenario.

LEVEL 1: Explain about String Builders.

LEVEL 2: Execute java applications for String Builders

P19: Programming Exercises on single, multi level Inheritance and super keyword based on given scenario.

LEVEL 1: Explain single and multi level inheritance.

LEVEL 2: Demonstrate simple applications for the different types of inheritance

P20: Programming Exercises hierarchical Inheritance and super keyword based on given scenario.

LEVEL 1: Explain hierarchical inheritance.

LEVEL 2: Demonstrate simple applications for hierarchical inheritance

P21: Programming Exercises on Overriding.

LEVEL 1: Differentiate method overloading and method overriding.

LEVEL 2: Demonstrate simple program with dynamic method dispatch.

P22: Programming Exercises on Final based on given scenario.

LEVEL 1: Implement programs using concept of final.

LEVEL 2: Use final keyword for the given problem

P23: Programming Exercises on Abstract keyword based on given scenario.

LEVEL 1: Implement programs using concept of Abstract.

LEVEL 2: Use abstract keyword for the given problem

P24: Programming Exercises on Interface based on a given scenario.

LEVEL 1: Differentiate abstract class about interface

LEVEL 2: Implement interfaces in the given problem

P25: Programming Exercises on Exception Handling based on a given scenario.

LEVEL 1: Explain exception handling

LEVEL 2: Solve the given problem using exception handling mechanism.

P26: Programming Exercises on Character Stream Classes based on a given scenario. LEVEL 1: Explain Character Stream Classes LEVEL 2: Solve the given problem using Character Stream Class. P27: Programming Exercises on Read/Write Operations with File Channel based on a given scenario. LEVEL 1: Explain Read/Write Operations with File Channel LEVEL 2: Solve the given problem using Read/Write Operations with File Channel. P28: Programming Exercises on Read/Write Operations with File Channel based on a given scenario. LEVEL 1: Explain Read/Write Operations with File Channel LEVEL 2: Solve the given problem using Read/Write Operations with File Channel. P29: Programming Exercises on Read/Write Operations with File Channel based on a given scenario. LEVEL 1: Explain Read/Write Operations with File Channel LEVEL 2: Solve the given problem using Read/Write Operations with File Channel. P30: Programming Exercises on Read/Write Operations with File Channel based on a given scenario. LEVEL 1: Explain Read/Write Operations with File Channel LEVEL 2: Solve the given problem using Read/Write Operations with File Channel.
Targeted Application & Tools that can be used : JDK /Eclipse IDE/Visual Studio Code / net Beans IDE.
Text Book T1 Herbert Schildt, “The Complete Reference Java 2”, Tata McGraw Hill Education, 11th Edition,2019.
References

R1. Cay S Horstmann and Cary Gornell, “CORE JAVA volume I-Fundamentals”, Tenth Edition, Pearson 2015.

R2: James W. Cooper, “Java TM Design Patterns – A Tutorial”, Addison-Wesley Publishers.4th Edition, 2000.

R3. E. Balagurusamy, “Programming with Java”, Tata McGraw Hill Education, 6th Edition, 2019.

E book link R1: http://rmi.yaht.net/bookz/core.java/9780134177373-Vol-1.pdf

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

Web resources

https://youtube.com/playlist?list=PLu0W_9lII9agS67Uits0UnJyrYiXhDS6q

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

Topics relevant to development of “Skill Development”:

Static Polymorphism

Method overloading, constructors

constructor overloading

this keyword

static keyword and Inner classes

Inheritance and Polymorphism.

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

Course Code: CSE2271	**Course Title: Software Design and Development**		**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 course is to provide the fundamentals concepts of Software Engineering process and principles. The course covers software requirement engineering processes, system analysis, design, implementation and testing aspects of software system development. The course covers software quality, configuration management and maintenance.			
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Software Engineering and attain Skill Development through Participative Learning techniques.			
Course Out Comes	On successful completion of this course the students shall be able to: 1] Describe the Software Engineering principles, ethics and process models(Knowledge) 2] Identify the requirements, analysis and appropriate design models for a given application(Comprehension) 3] Understand the Agile Principles(Knowledge) 4] Apply an appropriate planning, scheduling, evaluation and maintenance principles involved in software(Application)			
Module 1	**Introduction to Software Engineering and Process Models** **(Knowledge level)**	Quiz		**10 Hours**

Introduction: Need for Software Engineering, Professional Software Development, Software Engineering Ethics, Software Engineering Practice-Essence of Practice, General Principles Software Development Life Cycle **Models:** Waterfall Model – Classical Waterfall Model, Iterative Waterfall Model, Evolutionary model-Spiral, Prototype.				
Module 2	**Software Requirements, Analysis and Design** **(Comprehension level)**	Assignment	Development of SRS documents for a given scenario	**12 Hours**
Requirements Engineering: Eliciting requirements, Functional and non- Functional requirements, Software Requirements Specification (SRS), Requirement Analysis and validation. Requirements modelling- Introduction to Use Cases, Activity diagram and Swim lane diagram. CASE support in Software Life Cycle, Characteristics of CASE Tools, Architecture of a CASE Environment. **Design:** Design concepts, Architectural design, Component based design, User interface design.				
Module 3	**Agile Principles & Devops** **(Knowledge level)**	Quiz		**10 Hours**
Agile: Scrum Roles and activities, Sprint Agile software development methods - Scaling, User Stories, Agile estimation techniques, Product backlogs, Stake holder roles, Dynamic System Development Method. **Devops:** Introduction, definition, history, tools.				
Module 4	**Software Testing and Maintenance** **(Application Level)**	Assignment	Apply the testing concepts using Programing	**13 Hours**
Software Testing-verification and validation, Test Strategies - White Box Testing, Black box Testing. Automation Tools for Testing. **Software Quality Assurance**-Elements of software quality assurance, SQA Tasks, Goals and Metrics, Software configuration management- SCM process, SCM Tools (GitHub).				

Maintenance- Characteristics of Software Maintenance, Software Reverse Engineering, Software Maintenance Process Models.
Targeted Application & Tools that can be used: Selenium, GitHub, CASE Tools
Text Book 1. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, VII Edition, McGraw-2012] B2. Bob Hughes, Mike Cotterell, Rajib Mall, “Software Project Management”, VI Edition, Graw-Hill, 201
References 10. Rajib Mall, “Fundamentals of Software Engineering”, VI Edition, PHI learning private limited, 2015. 11. Ian Sommerville, “Software Engineering”, IX Edition, Pearson Education Asia, 2011. 12. Agile Software Development Principles, Patterns and Practices.1st Edition, Wiley, 2002
Topics Relevant to “Skill Development: Balck box Testing, White box Testing, Automated Testing for Skill development through Participative Learning Techniques. This is attained through assessment mentioned in the course handout

Course Code: CSE2258	**Course Title: Web Technologies**	**L-T- P- C**	2	0	0	2
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	**NIL**					
Course Description	This course highlights the comprehensive introduction to scripting languages that are used for creating web-based applications. The associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills.					

Course Objective		**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 Outcomes		**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)**				
Course Content:						
Module 1		**Introduction to XHTML**	Quizzes and Assignments	Quizzes on various features of XHTML, simple applications		**20 Sessions**
	Basics: Web, WWW, Web browsers, Web servers, Internet. **XHTML:** Origins and Evolution of HTML and XHTML: Basic Syntax, Standard XHTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, Frames, Syntactic Differences between HTML and XHTML, Demonstration of applications using XHTML for Responsive web pages.					
Module 2		**Advanced CSS**	Quizzes and assignments	Comprehension based Quizzes and assignments; Application of CSS in designing webpages		**20 Sessions**
	Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks					
XML: Basics, Demonstration of applications using XML with XSLT.						

Module 3	**PHP – Application Level**	Quizzes and assignments	Application of PHP in web designing	**20 Sessions**

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

Project work/Assignment:

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

Textbook(s):

3] Robert. W. Sebesta, "*Programming the World Wide Web"*, Pearson Education, 9th Edition, 2016.

2]Paul Deitel, Harvey Deitel, Abbey Deital,"Internet & World Wide Web How to Program", Fifth Edition, Pearson Education, 2021.

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

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

Reference Book(s):

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

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

Additional web-based resources

W1. W3schools.com

W2. Developer.mozilla.org/en-US/docs/Learn

W3. docs.microsoft.com **W4.** informit.com/articles/ The Relationship Between Web 2.0 and Social Networking https://presiuniv.knimbus.com/user#/home
Topics related to development of "FOUNDATION": 13. Web, WWW, Web browsers, Web servers, Internet. 14. CSS, PHP. 15. 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: **CSE2259**	**Course Title: Web Technologies Lab**	**L-T-P- C**	0	0	2	1
Version No.		1.0				
Course Pre-requisites						
Anti-requisites		**NIL**				

Course Description		This course highlights the comprehensive introduction to scripting languages that are used for creating web-based applications. The associated laboratory provides an opportunity to implement the concepts and enhance critical thinking and analytical skills.
Course Objective		**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 Outcomes		**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)**
Course Content:		

Module 1	**Introduction to XHTML Features**	Quizzes and Assignments	Quizzes on various features of XHTML, simple applications		**8 Sessions**
	Standard XHTML Document Structure, Basic Text Markup such as headings, paragraphs, lists, tables, forms, and semantic tags.				

Module 2	**CSS Styling**	Quizzes and assignments	Comprehension based Quizzes and assignments; Application of CSS in designing webpages		**10 Sessions**
	Apply CSS3 to style HTML elements, including layout techniques, color schemes, typography, and responsive design principles.				
XML: Basics, Demonstration of applications using XML with XSLT.					
Module 3	**PHP – Application Level**	Quizzes and assignments	Application of PHP in web designing		**12 Sessions**
PHP: Introduction to server-side Development with PHP, Arrays, Superglobal Arrays, $GET and $ POST, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object Oriented Design, Working with Databases, SQL, Database APIs, Managing a MySQL Database. Accessing MySQL in PHP, Applications.					

List of Laboratory Tasks:

Experiment No. 1: Demonstration of XHTML features

Level 1: Demonstration of various XHTML Tags (Level 1)
Level 2: Design and develop static web pages for an online Book store (Level 2).

Experiment No. 2: Application of CSS in web designing

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

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

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

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

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

Experiment No. 4: Building a website.

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

Targeted Application & Tools that can be used: **Xampp web server to be used to demonstrate PHP.**

Project work/Assignment:

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

Textbook(s):

3] Robert. W. Sebesta, "*Programming the World Wide Web"*, Pearson Education, 9th Edition, 2016.

2]Paul Deitel, Harvey Deitel, Abbey Deital,"Internet & World Wide Web How to Program", Fifth Edition, Pearson Education, 2021.

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

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

Reference Book(s):

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

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

Additional web-based resources

W1. W3schools.com

W2. Developer.mozilla.org/en-US/docs/Learn

W3. docs.microsoft.com

W4. informit.com/articles/ The Relationship Between Web 2.0 and Social Networking

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

Topics related to development of "FOUNDATION":

16. Web, WWW, Web browsers, Web servers, Internet.
17. CSS, PHP.
18. 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: CSE2260	**Course Title: Database Management Systems** **Type of Course: Theory only - PCC**		**L-T-P-C**	3	0	0	3
Version No.	1.0						
Course Pre-requisites	Foundational understanding of data types, data structures, basic programming knowledge, familiarity with operating systems and file management. Basic knowledge of set theory, logic, and discrete mathematics to understand relational algebra and query formulation.						
Anti-requisites	NIL						
Course Description	This course introduces the foundational principles of database management systems, including data models, schemas, and architectures. This course provides a solid foundation on the relational model of data and the use of relational algebra. It develops skills in SQL for data definition, manipulation, and control, enabling students to construct and execute complex queries. The course also introduces the concept of object oriented and object relational databases and modern database technologies like **NoSQL.** The also course allows the students to gain insights into data storage structures and indexing strategies for optimizing query performance.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Database Management Systems and attain **Employability** through **Problem Solving** Methodologies.						
Course Out Comes	On successful completion of the course the students shall be able to: 25. Describe the fundamental elements of relational database management systems. [Understand] 26. Examine databases using SQL query processing and Optimization. [Apply] 27. Design simple database systems applying the normalization constraints and demonstrate the database transaction processing, recovery, and security. [Apply] 28. Interpret the concept of advanced databases and its applications. [Apply]						
Course Content:							
Module 1	**Introduction to Database Modelling and Relational Algebra (Understand)**	Assignment	**Problem Solving**			**10 Sessions**	

Topics: **Introduction to Database:** Schema, Instance, 3-shema architecture, physical and logical data independence, Data isolation problem in traditional file system, advantages of database over traditional file systems. Entity Relationship (ER) Model, ER Model to Relational Model, Examples on ER model. **Relational Algebra** with selection, projection, rename, set operations, Cartesian product, joins (inner and outer joins), and division operator. Examples on Relational Algebra Operations.				
Module 2	**Fundamentals of SQL and Query Optimization (Apply)**	Assignment	**Programming**	**11 Sessions**
Topics: **SQL Database Querying,** DDL, DML, Constraints, Operators, Set Operators, Aggregate Functions, Joins, Views, Procedures, Functions and Triggers. **Database programming issues and techniques:** Embedded SQL, Dynamic SQL; SQL / PSM and NoSQL. **Query Optimization:** Purpose, transformation of relational expressions, estimating cost and statistics of expression, choosing evaluation plans, linear and bushy plans, dynamic programming algorithms.				
Module 3	**Relational Database Design & Transaction Management (Apply)**	Assignment	**Problem Solving**	**12 Sessions**
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.

9. Problem Solving: Constructing ER-Diagrams for a given real time requirements, Normalizing the databases, querying the databases using relational algebra.
10. 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

Course Code: CSE2261	**Course Title: Database Management Systems Lab Type of Course: 1) Laboratory - PCC**	**L-T-P-C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Foundational understanding of data types, basic programming knowledge, operating systems and file management.					
Anti-requisites	NIL					
Course Description	The Database Management Systems (DBMS) Laboratory is designed to provide students with hands-on experience in database design, implementation, and management using SQL and database management tools such as MySQL. The lab complements theoretical concepts learned in database courses by allowing students to practice database creation, querying, and optimization techniques. The DBMS Lab enables students to develop industry-relevant skills in database management, preparing them for careers in **software development, data engineering, and database administration**.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of DatabaseManagement Systems and attain **Employability** through **Problem Solving** Methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: 29. Demonstrate the database concepts, practice, and SQL queries. [Apply] 30. Design and implement database schemas while applying normalization techniques to optimize structure. [Apply]] 31. Develop and implement stored procedures, triggers, and views for automation and efficiency. [Apply] 32. To Design and build database applications for real world problems. [Apply]					

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]
8. 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.
11. Problem Solving: Constructing ER-Diagrams for a given real time requirements, Normalizing the databases, querying the databases using relational algebra. 12. 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 designusing ER- Relational mapping, Implementation of given database scenario using MYSQLDB. Topics relevant to development of Employability: Develop, test and implement computer databases, creatingsophisticated, interactive and secure database applications Topics relevant to “HUMAN VALUES &PROFESSIONAL ETHICS”: Nil

Course Code: CSE2262	**Course Title:** Analysis of Algorithms **Type of Course:** Theory PCC	**L- T-P- C**	3	1	0	4
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	Nil					
Course Description	This course introduces techniques for the design and analysis of efficient algorithms and methods of applications. This course discusses the classic approaches for algorithm design such as Divide and 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 various complexity classes is covered in the end.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Analysis of Algorithms** and attain **Skill Development** through **Problem Solving** Methodologies.					

Course Out Comes	On successful completion of the course the students shall be able to: 1. Compute efficiency of a given algorithm.[Apply] 2. Apply divide and conquer technique for searching and sorting Problems.[Apply] 3. Apply the Dynamic Programming technique for a given problem. [Apply] 4. Apply greedy technique for solving a Problem.[Apply] 5. Demonstrate Back tracking technique and limitations of Algorithms.[Apply]			
Course Content:				
Module 1	**Introduction**	Assignment	Simulation/Data Analysis	**10 Sessions**
Introduction, Asymptotic Notations and its properties, Best case, worst case and average case- Sequential search, Sorting; Mathematical analysis for Recursive and Non-recursive algorithms: Substitution method and Master's Theorem.				
Module 2	**Divide-and-conquer**	Assignment	Simulation/Data Analysis	**08 Sessions**
Introduction. Insertion Sort; Merge sort, Quick sort, Binary search.				
Module 3	**Dynamic programming**	Term paper/Assignment	Simulation/Data Analysis	**10 Sessions**
Introduction with examples, Principles of Memoization, 0-1 Knapsack Problem, Bellman-Ford algorithm, Floyd-Warshall's Algorithms. Chain Matrix Multiplication.				
Module 4	**Greedy technique**	Term paper/Assignment	Simulation/Data Analysis	**09 Sessions**
Introduction, Fractional Knapsack Problem, Minimal Spanning Tree: Prim's Algorithm and Kruskal's Algorithm, Single-source Shortest Path: Dijkstra's Algorithm				
Module 5	**Complexity Classes**	Term paper/Assignment	Simulation/Data Analysis	**08 Sessions**
Complexity Classes- P,NP- NP Hard and NP Complete - Boolean Satisfiability Problem (SAT). Branch and Bound: Knapsack problem; Backtracking, - N-Queens problem.				

Text Book

7. Anany Levitin, *"Introduction to the Design and Analysis of Algorithms"*, 3rd edition, Pearson Education, 2018.
8. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, *"Introduction to Algorithms"*, 4th edition, MIT Press, 2022.

References

13. J. Kleinberg and E. Tardos, "*Algorithm Design*", Addison-Wesley, 2005.
14. Tim Roughgarden, *"Algorithms Illuminated"* (books 1 through 3), "Operating Systems Design and Implementation", Soundlikeyourself Publishing, 2017-2019.
15. AV Aho, J Hopcroft, JD Ullman, *"The Design and Analysis of Algorithms"*, Addison-Wesley, 1974.
16. Donald E. Knuth, "*The Art of Computer Programming",* Volumes 1and 3 Pearson.

Web-Resources

13. NPTEL: https://onlinecourses.nptel.ac.in/noc19_cs47/preview
14. Coursera: Analysis of Algorithms by Princeton University
15. Algorithms Specialization in Coursera by Stanford University(Group of 4 courses).
16. 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.

Course Code: **CSE2263**	**Course Title: Analysis of Algorithms Lab** **Type of Course: Lab - PCC**	**L- T-P- C**	0	0	2	1
Version No.	1					
Course Pre-requisites	**Nil**					
Anti-requisites	NIL					
Course Description	This course introduces techniques for the design and analysis of efficient algorithms and methods of applications. This course discusses the classic approaches for algorithm design such as Divide and 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 various complexity classes is covered in the end.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Analysis of Algorithms** and attain **Skill Development** through **Experiential Learning** Methodologies.					
Course Out Comes	**On successful completion of the course the students shall be able to:** 1. Compute efficiency of a given algorithm. [Applying] 2. Apply divide and conquer technique for searching and sorting Problems.[Applying] 3. Apply the Dynamic Programming technique for a given problem. [Applying] 4. Apply greedy technique for solving a Problem.[Applying] 5. Demonstrate Back tracking technique and limitations of Algorithms.[Applying]					
Course Content						
Module 1	**Introduction**					**3 Sessions**
Measuring running time of an algorithm, Compare running time of algorithms, Implement sorting algorithms such as bubble sort, selection sort						
Module 2	**Divide-and-conquer**					**3 Sessions**
Compare searching algorithms: Linear Search, Binary Search; Compare Sorting algorithms: Insertion Sort, Merge Sort, QuickSort.						
Module 3	**Dynamic programming**					**3 Sessions**
Introduction and memorization: Factorial; Coin Change Problem ; Floyd-Warshall's Algorithm.						
Module 4	**Greedy technique**					**3 Sessions**
Fractional Knapsack Problem; Minimal Spanning Tree Algorithms-Prim's Algorithm, Kruskal's algorithm						

Module 5	Complexity Classes	3 Sessions

Branch and Bound: Knapsack problem; Backtracking, - N-Queens problem.

List of Laboratory Tasks:

1. Measuring running time of an algorithm

Objective: To experimentally determine the running time of basic algorithms for input size n=10, 100, 1000, etc. by taking difference of starting time and ending time.

2. Compare running time of algorithms

Objective: To execute two algorithms to solve the same problem, and to comparatively evaluate the better algorithm for large values of N.

3. Implement sorting algorithms such as bubble sort, selection sort

Objective: To implement comparison based sorting strategies.

4. Compare searching algorithms

Objective: To implement two searching strategies and compare their performance.

5. Compare Sorting algorithms

Objective: To implement searching strategies that follow top down design approach(Insertion sort, merge 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 4. 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 1and 3 Pearson. Web Based Resources and E-books: W1. NPTEL: https://onlinecourses.nptel.ac.in/noc19_cs47/preview W2. Coursera: Analysis of Algorithms by Princeton University W3. Algorithms Specialization in Coursera by Stanford University(Group of 4 courses). 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

Course Code: CSE2264	**Course Title:** Essentials of AI **Type of Course:** Program Core Course - Theory	**L-T-P-C**	3	0	0	3

Version No.	1.0
Course Pre-requisites	NIL
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 learn about uncertainty in AI, as well as approaches to solve such challenges such as Naïve Bayes Classifier and Hidden Markov Models. Topics: 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 student by using EXPERIENTIAL LEARNING techniques.
Course Out Comes	On successful completion of this course the students shall be able to: 9. Explain different methods of searching, proving, and analysis in AI [Understand] 10. Implement various graphical and adversarial search algorithms. [Apply] 11. Prove, by resolution, different situations using First Order Logic [Apply] 12. Solve sequence labeling problems using HMM [Apply]

Course Content:

Module 1	**Search Methods for Problem-Solving**	**Problem-Solving Tests**	**NPTEL Assignments**	**No. of Sessions: 13**
Introduction – History of AI, Agents and Environment, Types of AI and Learning. State Space Search; General Formulation of Search Problems; Data Structures used in Searching. **Uninformed Search Algorithms** – Breadth First Search, Depth First Search, Uniform Cost Search, Generalized Uniform Cost Search (a.k.a Dijkstra's Single-Source Shortest Path), Iterative Deepening Depth-First Search, Time and Space Complexity Analysis of Uninformed Search Algorithms. **Heuristic Search Algorithms** – Heuristics and Admissibility, Greedy Best-First Search, A* Search and weighted A* Search.				
Module 2	**Advanced Search Methods**	**Problem-Solving Tests**	**NPTEL Assignments**	**No. of Sessions: 12**
Local Search – Local Search, Hill Climbing, Genetic Algorithms, Gradient Descent. **Adversarial Search** – Minimax Search, Alpha-Beta Pruning, Ideal Ordering. **Constraint Satisfaction** – Constraint Satisfaction Problems Definitions and Examples – Map Colouring, N Queens, Cryptarithmetic, Generalized CSP; Back-tracking Heuristics; Arc Consistency and Path Consistency				
Module 3	**Knowledge-Based Logic Representation**	**Automated Theorem Proving using FOL Resolution**	**NPTEL Assignments**	**No. of Sessions: 10**
Propositional Logic – Syntax and Semantics of Propositional Logic. Logical connectives. Inference Rules. Conjunctive and Disjunctive Normal Forms. **First Order Logic** – Syntax and Semantics of Propositional Logic. Logical connectives. Inference Rules. Conjunctive and Disjunctive Normal Forms. **Resolution** – Resolution Principle. Propositional and First Order Resolution. Applications for solving story problems using Resolution				

Module 4	Uncertainty in AI	Representing problems as HMM	NPTEL Assignments	No. of Sessions: 06

Probability – Probability Definitions. Conditional Probability. Bayes Theorem. Naïve Bayes Classifier. Using Naïve Bayes Classifier for Supervised Learning. **Hidden Markov Models** – Definition of HMM. Sequence Labeling and Markov Assumption. Sub-Problems in HMM and their solutions – Forward Probability and Viterbi Algorithm. Applications of Sequence Labeling in Natural Language Processing (Eg. Part-of-Speech Tagging). **Introduction to Deep Learning** – Artificial Neurons, Activation Functions, Multilayer Perceptron.

Targeted Application & Tools that can be used:

9. Implementation of a shortest-path finder using different search algorithms.
10. Implementation of a sequence labeler using Viterbi Algorithm.

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

3. Group project on one of the topics mentioned above (Eg. Adversarial search).

Textbook(s):

9. Stuart Russel and Peter Norvig. *Artificial Intelligence: A Modern Approach*. 4th Edition. Pearson Education. 2022.
10. Lavika Goel. *Artificial Intelligence: Concepts and Applications*. 1st Edition. Wiley. 2021.
11. Elaine Rich, Kevin Knight and Shivashankar B Nair. *Artificial Intelligence*. 4th Edition. MedTech Science Press. 2024.

References:

7. Deepak Khemani. *A First Course in Artificial Intelligence*. 1st Edition. 6th Reprint, 2018.
8. Munesh Chandra Trivedi. *A Classical Approach to Artificial Intelligence*. 2nd Edition. Khanna Publishers. 2018.
9. George Luger. *Artificial Intelligence: Structures and Strategies for Complex Problem Solving*. 6th Edition. Pearson Education. 2021.

Weblinks

11. NPTEL Courses: Mausam (IIT Delhi), “An Introduction to Artificial Intelligence” Link: https://nptel.ac.in/courses/106102220.
12. Shyamanta M. Hazarika (IIT Guwahati), “Fundamentals of Artificial Intelligence”. Link: https://nptel.ac.in/courses/112103280. Useful for the full course.
13. Deepak Khemani (IIT Madras), “Artificial Intelligence: Search Methods for Problem-Solving”. Link: https://nptel.ac.in/courses/106106226. Useful for Module 1 and 2
14. Deepak Khemani (IIT Madras), “Artificial Intelligence: Knowledge Representation and Reasoning”. Link: https://nptel.ac.in/courses/106106140. Useful for Module 3.
15. Deepak Khemani (IIT Madras), “AI: Constraint Satisfaction”. Link: https://nptel.ac.in/courses/106106158. Useful for Module 2.

Course Code: CSE2265	**Course Title:** Essentials of AI Lab **Type of Course:** Program Core Course - Lab	**L-T-P-C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	NIL					
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 learn about uncertainty in AI, as well as approaches to solve such challenges such as Naïve Bayes Classifier and Hidden Markov Models. Topics: 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 student by using EXPERIENTIAL LEARNING techniques.					
Course Out Comes	On successful completion of this course the students shall be able to: 9. Explain different methods of searching, proving, and analysis in AI [Understand] 10. Implement various graphical and adversarial search algorithms. [Apply] 11. Prove, by resolution, different situations using First Order Logic [Apply] 12. Solve sequence labeling problems using HMM [Apply]					

Course Content: **No. of Sessions: 15 (30 hours)**

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:

11. Google Colab
12. 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):

5. Stuart Russel and Peter Norvig. *Artificial Intelligence: A Modern Approach*. 4th Edition. Pearson Education. 2022.
6. Prateek Joshi and Alberto Artasanchez. *Artificial Intelligence with Python*. 2nd Edition. Packt. 2020.

References:

5. Deepak Khemani. *A First Course in Artificial Intelligence*. 1st Edition. 6th Reprint, 2018.
6. Munesh Chandra Trivedi. *A Classical Approach to Artificial Intelligence*. 2nd Edition. Khanna Publishers. 2018.

Course Code: CSE2266	**Course Title:** **Theory** of Computation		**L- T-P-C**	3	**0**	0	**3**
Version No.	2.0					
Course Pre-requisites	nil					
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 on Strings and Language operations	**6 classes**		
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 on DFA, NFA's	13 Sessions		

Topics:

Basic concepts of Finite automata, DFA- definitions of DFA, Deterministic Accepters Transition Graphs and Languages

and DFA's, Regular Languages, NFA- Definition of a Nondeterministic Accepter, Languages and NFA's Why Non- determinism? Equivalence of Deterministic and Nondeterministic Finite Accepters, Reduction of the Number of States in Finite Automata.

Module 3	Regular Expressions & Context Free Grammar	Assignment	Problems on RE, CFG, PT, PL and Ambiguity	12 Sessions

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	Push down Automata	Assignment	Problems on pushdown Automaton	08 Sessions

Topics:

Definition of a Pushdown Automaton, Language Accepted by a Pushdown Automaton, Acceptance by Final State, Acceptance by Empty Stack, From Empty Stack to Final State, From Final State to Empty Stack Equivalence of PDA's and CFG's: From Grammars to Pushdown Automata.

Module 5	Turing Machine	Assignment	Problems on Turning Machine	07 Sessions

Topics:

Definition of a 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://onlinecourses.nptel.ac.in/noc21_cs83/preview

Course Code: CSE2269	**Course Title:** Operating Systems	**L-T- P- C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Nil					

Anti-requisites	**NIL**			
Course Description	This course introduces the concepts of operating system operations, operating system structure and its design and implementation. It covers the classical operating systems internal 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 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] Describe the fundamental concepts of operating Systems and case studies. [**Knowledge**] 2] Demonstrate various CPU scheduling algorithms. .[**Application**] 3] Apply various tools to handle synchronization problems.[**Application**] 4] Demonstrate deadlock detection and recovery methods **[Application]** 5] Illustrate various memory management techniques.[**Application**]			
Course Content:				
Module 1	Introduction to Operating System	Assignment	Programming	**9 Hours**
Topics: Introduction to OS , Operating-System Operations, Operating System Services, , System Calls and its types, Operating System Structure, System Program and its types, Linkers and Loaders, Overview of OS design and implementation, Open-source operating system				
Module 2	Process Management	Assignment/Case Study	Programming/Simulation	**11 Hours**
Topics: Process Concept, Operations on Processes, Inter Process Communication, Communication in client-server systems (sockets, RPC, Pipes), Introduction to threads - Multithreading Models, Thread Libraries, Threading Issues, Process Scheduling– Basic concepts, Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, SRTF, RR and Priority.				
Module 3	Process Synchronization and Deadlocks	Assignment	Programming	**11 Hours**
Topics:				

The Critical-Section Problem- Peterson's Solution, Synchronization hardware, Semaphores, Classic Problems of Synchronization with Semaphore Solution- Producer-Consumer Problem, Reader-Writer problems, Dining Philosopher's Problem, . Introduction to Deadlocks, Necessary conditions for deadlock, Resource allocation Graph, Methods for handling deadlock: Deadlock Prevention and Implementation, Deadlock Avoidance and Implementation, Deadlock detection & Recovery from Deadlock.

Module 4	Memory Management	Assignment	Programming/Simulation	**10 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, "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

Course Code: CSE2270	**Course Title: Operating Systems Lab**	**L-T- P- C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Nil					
Anti-requisites	**NIL**					
Course Description	This laboratory course provides hands-on experience with the core concepts of 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 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.

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

Course Code: APT4002	**Course Title: Introduction to Aptitude (Audited)**	**L-T-P- C**	0	0	2	0
Version No.	1.0					
Course Pre-equisites						
Anti-requisites	Nil					
Course Description	The objective of this course is to prepare the trainees to tackle the questions on various topics and various difficulty levels based on Quantitative Ability, and Logical Reasoning asked during the placement drives. There will be sufficient focus on building the fundamentals of all the topics, as well as on solving the higher order thinking questions. The focus of this course is to teach the students to not only get to the correct answers, but to get there faster than ever before, which will improve their employability factor.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Aptitude and attain Skill Development through Problem Solving techniques.					

Course Outcomes	On successful completion of the course the students shall be able to: CO1] **Recall** all the basic mathematical concepts they learnt in high school. CO2] **Identify** the principle concept needed in a question. CO3] **Solve** the quantitative and logical ability questions with the appropriate concept. CO4] **Analyze** the data given in complex problems. CO5] **Rearrange** the information to simplify the question			
Course Content:				
Module 1	Quantitative Ability	Assignment	Bloom's Level : Application	**12 Hours**
Topics: Introduction to Aptitude, working of Tables, Squares, Cubes				
Module 2	Logical Reasoning	Assignment	Bloom's Level : Application	**18 Hours**
Topics: Linear & Circular Arrangement Puzzle, Coding & Decoding, Blood Relations, Directions, Ordering and Ranking, Clocks and Calendars, Number Series, Wrong number series, Visual Reasoning				
Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS				
Text Book 1. Quantitative Aptitude by R S Aggarwal 2. Verbal & Non-Verbal Reasoning by R S Aggarwal				
References 1. www.indiabix.com 2. www.youtube.com/c/TheAptitudeGuy/videos				
Topics relevant to Skill development: Quantitative and reasoning aptitude for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.				

Course Code: **APT4004**	**Course Title: Aptitude Training-Intermediate** Type of Course: Practical Only Course	**L- T - P- C**	0	0	2	0
Version No.						
Course Pre-requisites	Students should have the basic concepts of Quantitative aptitude along with its applications in real life problems.					
Anti-requisites	NIL					
Course Description	This is a skill-based training program for the students. This course is designed to enable the students to enhance their skills in Quantitative Aptitude.					
Course Objective	**The objective of the course is to familiarize the learners with the concepts of Aptitude and attain Skill Development through Problem Solving techniques.**					
Course Out Comes	**On successful completion of this course the students shall be able to:** CO1: Recall all the basic mathematical concepts. CO2: Identify the principle concept needed in a question. CO3: Solve the quantitative and logical ability questions with the appropriate concept. CO4: Analyze the data given in complex problems.					
Course						

Content:			
Module 1	**Quantitative Ability 1**	Assignment	**16 Hours**
Topics: Number System, Percentage, Ratio and Proportion, Average, Mixture and Allegation, Time and Work, Profit and Loss			
Module 2	Quantitative Ability 2	Assignment	**14 Hours**
Topics: Time Speed and Distance, Boats and Streams, Simple Interest, Compound Interest, Probability, Permutation and Combination			
Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS			
Continuous Evaluation:			
CA1 – Online Test CA2 – Online Test CA3 – Online Test Assignment			
Text Book: 1.Fast Track Objective by Rajesh Verma 2. R S Aggarwal 3. Rakesh Yadav **References:** 1. www.indiabix.com 2. www.testbook.com 3. www.youtube.com/c/TheAptitudeGuy/videos			
Topics relevant to Skill Development: Quantitative aptitude for Skill Development through Problem solving Techniques. This is attained through components mentioned in course handout.			

Course ode: APT4005	**Course Title: Aptitude For Employability** **Type of Course: Practical Only**	**L- T-P- C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Students should have the basic concepts of Quantitative aptitude, Verbal ability along with its applications in real life problems.					
Anti-requisites	Nil					
Course Description	This course is designed to enable the students to enhance their skills in quantitative aptitude and verbal ability skills.					
Course Objective	The objective of the course is to familiarize the learners with concepts in Quantitative Aptitude and Verbal ability through problem solving techniques suitable for their career development.					
Course Outcomes	On successful completion of the course the students shall be able to: CO1] **Recall** all the basic mathematical concepts CO2] **Identify** the principle concept needed in a question CO3] **Solve** the quantitative and logical ability questions with the appropriate concept.					

Course Content:					
Module 1	Quantitative Ability	Lab-10hrs		Platform Assessment-10hrs	**20 Hours**

Topics: Number System, Percentage, Ratio and Proportion, Average, Mixture and Allegation, Time and Work, Profit and Loss, Time Speed and Distance, Simple Interest and Compound Interest, Probability, Permutation and Combination.					
Module 2	Verbal Ability	Lab-5hrs		Platform Assessment-5hrs	**10 Hours**
Topics: - Parts of Speech, Subject Verb Agreement, Spotting Error, Cloze Test, Verbal Analogies, Reading Comprehension, Idioms & Phrases, Para Jumbles					
Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS					
Evaluation	**Continuous Evaluation** Topic wise evaluation				
Text Book 1. Fast track objective by Rajesh Verma 2. R S Aggarwal 3. S.P Bakshi					
References 1. www.indiabix.com 2. www.testbook.com 3. www.youtube.com/c/TheAptitudeGuy/videos					
Topics relevant to Skill development: Quantitative and reasoning aptitude for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.					

Course Code: CIV7601	Course Title: Universal Human Values and Ethics Type of Course: MAC course	L-T-P-C	-	-	-	0
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The purpose of the course is to develop a holistic perspective in students' life. The course adopts a self-reflective methodology of teaching and is designed to equip the students to explore their role in all aspects of living as a part of the society. It presents a universal approach to value education by developing the right understanding of reality through the process of self-exploration. This self-exploration develops more confidence and commitment in students enabling them to critically evaluate their pre-conditioning and present beliefs. As an outcome of the holistic approach, the students will be able to practice the ethical conduct in the social and professional life. The prime focus throughout the course is toward affecting a qualitative transformation in the life of the student rather than just a transfer of information. This course is designed to cater to Human Values and Professional Ethics.					
Course Objective	The objective of the course is 'SKILL DEVELOPMENT' of the student by using 'SELF LEARNING' techniques					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Recognize the importance of Value Education through the process of self-exploration CO.2 Explain the human being as the co-existence of the self and the body in harmony. CO.3 Describe the role of foundational values in building harmonious relationships. CO.4 Summarize the importance of a holistic perspective in developing ethical professional behavior.					
Course Content:						

Module 1	Introduction to Value Education	Online Assessment	MCQ Quiz	5 Sessions
Topics: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations.				
Module 2	Harmony in the Human Being	Online Assessment	MCQ Quiz	5 Sessions
Topics: Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health				
Module 3	Harmony in the Family and Society	Online Assessment	MCQ Quiz	5 Sessions
Topics: Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.				
Module 4	Implications of the Holistic Understanding – A Look at Professional Ethics	Online Assessment	MCQ Quiz	5 Sessions
Topics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Strategies for Transition towards Value-based Life and Profession				
Targeted Application & Tools that can be used: Application areas are Personal life, Education and Career, Workplace , Society and Environmental Responsibility Tools: Online Tools – NPTEL and Swayam.				
Project work/Assignment:				
Assessment Type • Online exams (MCQs) will be conducted by the Department of Civil Engineering through Linways.				

Online Link*:

1) UHV II - https://www.youtube.com/watch?v=NhFBzn5qKIM&list=PLWDeKF97v9SO8vvjC1KyqteziTbTjN1So&pp=0gcJCWMEOCosWNin
2) Lecture by Dr. Kumar Sambhav, NPTEL course: Universal Human Values, https://onlinecourses.swayam2.ac.in/aic22_ge23/preview
3) Lecture by Dr. Padmavati, Dr Narendran Thiruthy, NPTEL Course: Biodiversity Protection, Farmers and Breeders Rights, https://nptel.ac.in/courses/129105008, 2024.

* Other source links are available in below Resources link.

Text Book

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2019.
3. Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022.

Reference Books

1. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
2. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986.
3. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
4. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
5. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
6. A N Tripathy, 2003, Human Values, New Age International Publishers.
7. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
8. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

9. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
10. William P. Cunningham and Mary Ann Cunningham (2020), Principles of Environmental Science: Inquiry & Applications, 9th Edition, McGraw-Hill Education, USA.

Resources:

1. https://onlinecourses.swayam2.ac.in/imb25_mg195/preview
2. https://onlinecourses.nptel.ac.in/noc25_mg141/preview
3. https://onlinecourses.swayam2.ac.in/ini25_hs52/preview
4. https://onlinecourses.nptel.ac.in/noc25_hs219/preview
5. https://onlinecourses.swayam2.ac.in/cec25_mg14/preview
6. https://onlinecourses.swayam2.ac.in/imb25_mg195/preview
7. https://onlinecourses.swayam2.ac.in/imb25_mg196/preview

Topics relevant to Skill Development:

1. An attitude of enquiry.
2. Write reports

The topics related to Human values and Professional ethics:

All topics in are relevant to Human values and Professional ethics.

Course Code: APT4006	**Course Title: Logical and Critical Thinking** **Type of Course:** Audited	**L- T-P- C**	0	0	2	0
Version No.	1.0					
Course Pre-requisites	Students should have the basic concepts of Logical reasoning and Critical thinking, along with its applications in real life problems.					
Anti-requisites	Nil					
Course Description	This is a skill-based training program for the engineering students (Undergraduate). This course is designed to enable the students to enhance their skills in Logical reasoning and Critical thinking.					
Course Objective	The objective of the course is to familiarize the learners with concepts in Logical reasoning and Critical thinking through problem solving techniques suitable for their career development.					
Course Outcomes	On successful completion of the course the students shall be able to: CO1] **Understand** all the concepts. CO2] **Apply** the concepts in problem solving. CO3] **Analyze** and structure the reasoning techniques and spatial visualization skills					

Course Content:

Module 1	Logical Thinking	Assignment		**16 Hours**

Topics:

Syllogisms, Cubes and Dices, Mirror and Water images, Paper cutting and Folding, Embedded figures & Completion of figures, Data Interpretation, Data sufficiency

Module 2	Critical Thinking	Assignment		**14 Hours**

Topics:

Analogy, Symbol and Notations, Statement and assumption, Cause of action, Statement and conclusion, Puzzles

Targeted Application & Tools that can be used:

Application area: Placement activities and Competitive examinations. Tools: LMS

Evaluation	**Continuous Evaluation**
	Topic wise evaluation

	Internal Assessments

Text Book

1. A new approach to reasoning verbal, non-verbal & analytical by BS Sijwali
2. R S Aggarwal
3. Kiran publications

References

1. www.indiabix.com
2. www.testbook.com
3. www.youtube.com/c/TheAptitudeGuy/videos

Topics relevant to Skill Development Logical reasoning and Critical thinking for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.

Course Code: FIN1002	**Course Title: Essentials of Finance** **Type of Course: HSMC**	**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	This course is designed to be accessible to all students, regardless of their prior financial knowledge.					
Anti-requisites						
Course Description	This course is designed to equip students with a **foundational understanding of key financial concepts and principles**. It will enable them to comprehend the **core functions of finance**, delve into the intricacies of **financial management within organizations**, and gain insights into the **fundamental aspects of taxation**. The course aims to develop students' abilities to **interpret financial statements, evaluate investment opportunities, understand capital structure decisions**, and navigate the **basics of tax implications**.					
Course Objective	Upon successful completion of this course, students will be able to: • **Understand the basic forms of business organization and their financial implications.** • **Understand the fundamental principles and concepts** that influence financial decision-making in various contexts. • **Analyse and interpret financial statements** to assess the financial health and performance of an organization. • **Identify income under various heads of income as per Income Tax Act, 1961 and determine the tax liability.**					
Course Outcomes	**List the course outcomes** **On successful completion of this course the students shall be able to:** 1. **Understand the basic concepts of finance and financial markets and organizations.** 2. **Apply and interpret financial information for business**					

	decision making. 3. **Identify various heads of income and deduction under Income Tax Act, 1961.**			
Course Content:				
Module 1	**Introduction to Finance**	Assignment/ Quiz	Numerical solving Task	**10 Sessions**
Definition and Scope of Finance, Areas of Finance: Corporate Finance, Investments, Financial Institutions, International Finance; Types of Financial Markets: Money Markets vs. Capital Markets, Primary vs. Secondary Markets; Forms of Business Organization and Financial Goals: Shareholder Wealth Maximization vs. Profit Maximization; Understanding Financial Statements: Balance Sheet and Income Statement- Simple Numerical.				
Module 2	**Financial Management**	Assignment/ Quiz	Numerical solving Task	**18 Sessions**
Capital Budgeting Decisions: Payback Period, Net Present Value (NPV), Profitability Index (PI), Internal Rate of Return (IRR); Leverage- Basic Numerical; Capital Structure Decisions: Optimal Capital Structure, Trade-off Theory of Capital Structure; Cost of Capital: Equity, Debt, WACC; Dividend Policy: Factors influencing Dividend Policy.				
Module 3	**Taxation**	Assignment/ Quiz	Numerical solving Task	**17 Sessions**
Principles of a Good Tax System: Equity, Certainty, Convenience, Economy; Direct vs. Indirect Taxes; Residential Status of an Individual- Basic Problems; Heads of Income; Salary, House Property- Basic Numerical; Deductions under Chapter VI-A; Computation of Taxable Income and Tax Liability; E-Filing procedure.				
Targeted Application & Tools that can be used: Textbooks, PPT, Spreadsheet Software (e.g., Microsoft Excel), Official Website of Income Tax Department.				
Project Work/ Assignment:				
1. Presentation: There will be a group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same. 2. Case Study: - At the end of the course students will be given a 'real-world' cases like business models of successful companies or tax evasion by reputed companies on which they have to come up with detailed analysis and assessment.				
Text Book(s): 1. Dr. Vinod K. Singhania & Dr. Monica Singhania. (Latest Assessment Year Edition). *Students' Guide to Income Tax including GST*. Taxmann Publications.				

2. Pandey, I. M. (2025). *Financial Management*. Vikas Publishing House.

Reference Book (s):

1. Bhole, L.M., & Mahakud, J. (Current Edition). *Financial Institutions and Markets: Structure, Growth and Innovations*. McGraw Hill Education India.
2. Mehrotra, H.C., & Goyal, S.P. (Latest Assessment Year Edition). *Income Tax Law & Practice*. Sahitya Bhawan Publications.
3. Gordon, E., & Natarajan, K. (Current Edition). *Financial Markets and Services*. Himalaya Publishing House.

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

1. https://presidencyuniversity.linways.com
2. https://onlinecourses.nptel.ac.in/noc24_ec01/preview
3. https://www.incometax.gov.in/iec/foportal/

Topics relevant to "**SKILL DEVELOPMENT**": This course is designed to provide practical financial skills through participative learning techniques. Students will engage in performing suitable calculations to determine financial parameters (e.g., time value of money, investment returns, tax liabilities) and analysing financial statements to assess organizational performance and make informed decisions.