R23 ACADEMIC REGULATIONS

COURSE STRUCTURE AND SYLLABI

of

B.TECH. COMPUTER SCIENCE AND ENGINEERING

FOR

B.TECH. REGULAR FOUR YEAR DEGREE PROGRAM

(For the batches admitted from 2023-24)

&

B.TECH. LATERAL ENTRY PROGRAM

(For the batches admitted from 2024-25)

CHOICE BASED CREDIT SYSTEM

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SRI VENKATESWARA COLLEGE OF ENGINEERING

(AUTONOMOUS)

(Affiliated to J.N.T. University Anantapur, Ananthapuramu, Accredited by NBA & NAAC "A")

Karakambadi Road, Tirupati - 517 507

Vision

To be a centre of excellence focusing on high quality technical education, research and technical services with global leadership competence to succeed in employment and higher education with ethical, social, entrepreneurial aspects updating to the real time requirements.

Mission

M 1: To impart high quality technical education by providing the state-of-the art infrastructure, core instruction.

M 2: Advanced research and technical consultancy services with qualified and senior faculty.

M 3: To prepare the students professionally deft and intellectually adept possessing excellent skill, knowledge and behavior with global competence.

Department of Computer Science and Engineering

Vision

To produce globally competent, dynamic and multi-talented young leaders with skill& knowledge in Computer science and Engineering to cater the contemporary demands of the software industry, thereby making them industry ready while at the institution and also to pursue higher education imbibing holistic approach.

Mission

M 1: To impart high quality technical education in Computer Science and Engineering by providing core values and well-equipped infrastructure.

M 2: To provide advanced research and technical consultancy services with qualified and senior faculty.

M 3: To prepare the learners professionally deft and intellectually dept. possessing excellent skill, knowledge and behaviour.

M 4: To inculcate the leadership capabilities in learners to face the dynamic and challenging global work of the Computer Science and Engineering field.

PROGRAM EDUCATIONAL OBJECTIVES

PEO1: To impart foundations of applied science and engineering subjects in order to apply, analyze and solve problems in computational aspects.

PEO2: To inculcate ability in creativity and design of computer support systems and impart knowledge and skills to analyze, design, test and implement various software applications.

PEO3: To strengthen higher education, research, prepare for globally acclaimed competitions, imbibe in civic-leadership qualities and to trigger social, ethical, holistic and behavioral approach.

PROGRAM OUTCOMES

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 analyze 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 lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO 1: **Problem Solving Skills:** Ability to design and develop computing tools with moderate complexity in the areas pertaining to database, data analytics, networking, web and app design, IoT and information security with integration.

PSO 2: **Professional Skills:** Ability to apply standard practices and methods in software project management and software development using suitable programming environments to deliver quality products to the industry.

PRELIMINARY DEFINITIONS AND NOMENCLATURE

AICTE: Means All India Council for Technical Education, New Delhi.

Autonomous Institute: Means an institute designated as Autonomous by University Grants Commission (UGC), New Delhi in concurrence with affiliating University (**Jawaharlal Nehru Technological University Anantapur**).

Academic Autonomy: Means freedom to an institute in all aspects of conducting its academic programs granted by UGC for promoting excellence.

Academic Council: The Academic Council is the highest academic body of the institute and is responsible for the maintenance of standards of instruction, education and examination within the institute. Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.

Branch: Means specialization in a program like B.Tech. degree program in Civil Engineering, B.Tech. degree program in Computer Science and Engineering etc.

Board of Studies (BOS): BOS is an authority as defined in UGC regulations, constituted by Head of the Organization for each of the departments separately. They are responsible for curriculum design and updation in respect of all the programs offered by a department.

Backlog Course: A course is considered to be a backlog course, if the student has obtained a failure grade in that course.

Commission: Means University Grants Commission (UGC), New Delhi.

Certificate Course: It is a course that makes a student to have hands-on expertise and skills required for holistic development in a specific area/field.

Internal Examination: It is an examination conducted towards sessional assessment.

Core: The courses that are the essential constituents of each engineering discipline are categorized as professional core courses for that discipline.

Course: A course is a subject offered by a department for learning in a particular semester.

Course Outcomes: The essential skills that need to be acquired by every student through a course.

Credit: A credit is a unit that gives weight to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value.

Credit Point: It is the product of grade point and number of credits for a course.

Cumulative Grade Point Average (CGPA): It is a measure of cumulative performance of a student overall the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

Curriculum: Curriculum incorporates the planned interaction of students with instructional content, materials & resources.

Department: An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff, and other resources in the process of study for a degree.

Detention in a Semester: Student who does not obtain minimum prescribed attendance in a Semester shall be detained in that particular Semester. A Student can also be detained for lack of required number of credits at the end of IV semester or VI semester respectively.

Elective Course: A course that can be chosen from a set of courses. An elective can be Professional Elective and/or Open Elective.

Evaluation: Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal examinations and semester end examinations.

Grade: It is an index of the performance of the students in a said course. Grades are indicated by alphabets.

Grade Point: It is a numerical weight allotted to each letter grade on a 10 - point scale.

Institute: Represents Sri Venkateswara College of Engineering, Tirupati unless indicated otherwise by the context.

Massive Open Online Courses (MOOC): MOOCs inculcate the habit of self-learning. MOOCs would be additional choices in all the elective group courses.

Minor: Minor are coherent sequences of courses which may be taken in addition to the courses required for the B.Tech. degree.

Pre-requisite: A specific course or subject, the knowledge of which is required to complete before student register another course at the next grade level.

Professional Elective: It indicates a course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

Program: Denotes UG degree program: Bachelor of Technology (B.Tech.).

Project work: It is a design or research-based work to be taken up by a student during his / her VIII semester to achieve a particular aim. It is a credit-based course and is to be planned carefully by the student.

Registration: Process of enrolling into a set of courses in a semester of a program.

Regulations: The regulations, common to all B.Tech. programs offered by Institute, are designated as "SVCE – R23" and are binding on all the stakeholders.

Semester: It is a period of study consisting of 90 working/instructional days. Odd semester commences usually in July and even semester in December of every year.

Semester End Examinations: It is an examination conducted for all courses offered in a semester at the end of the semester.

University: Represents Jawaharlal Nehru Technological University Anantapur (JNTUA), Ananthapuramu.

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1. About the College

Sri Venkateswara College of Engineering (SVCE), Tirupati (Main Campus) is part of the SV Colleges group established in the year 2007 with a vision to become a leader in providing quality educational services. College is affiliated to JNTUA & Approved by AICTE, recognized under sections 2(f) & 12(B) of UGC act 1956, Accredited by NAAC with 'A' Grade. Six B.Tech. Programs CSE, ECE, EEE, IT, ME & CE are accredited by NBA, New Delhi. The College offers UG Programs [CE, CSE, CSE (AI & ML), CSE (CS), CSE (DS), ECE, EEE, IT & ME], PG Programs [M.Tech. (VLSI Design), M.Tech. (CSE), MCA & MBA]. The Institution conferred 'Autonomy' by UGC, New Delhi in the year 2020.

The Campus is equipped with state of art laboratories of centre of excellence through advanced tools and technologies. Learning at Sri Venkateswara College of Engineering has a pragmatic approach with a clear focus, valuing individual vision, intellectual discipline, and a sense of teamwork. We aim at developing our students to their full potential, preparing them to take the next step towards career success.

Sri Venkateswara College of Engineering is committed to its role in creating leaders through its innovative programs, outstanding faculty and thought leadership. Sri Venkateswara College of Engineering nurtures global leaders who can speak their minds and work well with others in a wide range of cultural contexts. It will develop their ability to manage a career successfully in the global economy.

Our teaching modes and methods of assessment vary between courses to ensure that you gain the most benefit from the interactive course content, faculty members, fellow students, and invited guests. Lectures comprise only a portion of course delivery, with the remaining taken up by discussions, seminars, case analysis, simulation, individual and group projects, and presentations.

From the academic year 2025–26, SV Colleges has also converted **Sri Venkateswara College of Engineering, Kadapa** as **Off Campus** to **Sri Venkateswara College of Engineering (SVCE), Tirupati (Main Campus)**. The College at off campus offers UG Programs [ECE, CSE, CSE (AI & ML)]. While **SVCE Tirupati continues to be the main campus**, both campuses adhere to the same academic framework, quality standards, and regulatory guidelines of JNTUA, AICTE, UGC, and other statutory bodies.

The academic programs of the College are governed by the rules and regulations approved by the Academic Council, which is the highest academic body of the College. These rules and regulations are effective from the academic year 2023–24 for students admitted into the four-year Undergraduate B.Tech. program offered at the SVCE Main Campus, and from the academic year 2025–26 for students admitted at the SVCE Off-Campus (SVCE Kadapa)

2. Applicability

All the rules specified herein, approved by the Academic Council, shall be in force and applicable to students admitted from the academic year 2023 – 24 onwards. Any reference to "College" in these rules and regulations stands for Sri Venkateswara College of Engineering.

3. Extent

All the rules and regulations, specified hereinafter shall be read as a whole for the purpose of interpretation and as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. It shall be ratified by the Academic Council in the forthcoming meeting. As per the requirements of statutory bodies, Principal, **Sri Venkateswara College of Engineering** shall be the Chairman, Academic Council.

4. Vision and Mission:

Vision

To be a centre of excellence focusing on high quality technical education, research and technical services with global leadership competence to succeed in employment and higher education with ethical, social, entrepreneurial aspects updating to the real time requirements.

Mission

To impart high quality technical education by providing the state-of-the art infrastructure, core instruction. Advanced research and technical consultancy services are carried with qualified and senior faculty to prepare the students professionally deft and intellectually adept possessing excellent skill, knowledge and behaviour with global competence.

5. Programs Offered

Following programs are offered in various branches at **Sri Venkateswara College of Engineering** leading to the award of B.Tech. Degree

S. No.	Branch
1	Civil Engineering
2	Computer Science and Engineering
3	Computer Science and Engineering (Artificial Intelligence and Machine Learning)
4	Computer Science and Engineering (Cyber Security)
5	Computer Science and Engineering (Data Science)
6	Electronics and Communication Engineering
7	Electrical and Electronics Engineering
8	Information Technology
9	Mechanical Engineering

6. Award of the Degree

a) Award of the B.Tech. Degree if he/she fulfils the following:
   (i) Pursues a course of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Eight years).
   (ii) Registers for 163 credits and secures all 163 credits.

b) Award of B.Tech. degree with Minors/Honors if he/she fulfils the following:
   (i) Student secures additional 18 credits fulfilling all the requisites of a B.Tech. program i.e., 163 credits.
   (ii) Registering for Minors/Honors is optional.
   (iii) Minors/Honors is to be completed simultaneously with B.Tech. program.

c) Students, who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled. This clause shall be read along with **clause 6 a) i)**.

7. Admissions:

Admission to the B.Tech. Program shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either based on the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

8. Program Related Terms

Credit: A unit by which the course work is measured. It determines the number of hours of instruction required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.

Credit Definition:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hr. Practical (P) per week	1 credit

***Academic Year*:** Two consecutive (one odd + one even) semesters constitute one academic year.

***Choice Based Credit System (CBCS)*:** The CBCS provides a choice for students to select from the prescribed courses. Choice Based Credit System (CBCS) is introduced in line with UGC guidelines in order to promote:

i. Student centered learning
ii. Students to learn courses of their choice
iii. Interdisciplinary learning

9. Semester/Credits:

i. A semester comprises 90 working/instructional days and an academic year is divided into two semesters.
ii. The summer term is for eight weeks during summer vacation. Internship/ apprenticeship / work-based vocational education and training can be carried out during the summer term, especially by students who wish to exit after two semesters or four semesters of study.
iii. Regular courses may also be completed well in advance through MOOCs satisfying prerequisites.

10. Structure of the Undergraduate Program

All courses offered for the undergraduate program (B.Tech.) are broadly classified as follows:

S. No.	Category	Breakup of Credits (Total 163)	Percentage of Total Credits	AICTE Recommenda-tions
1	Humanities and Social Science including Management (HS)	13	8%	8-9%
2	Basic Sciences (BS)	20	12%	12-16%
3	Engineering Sciences (ES)	26.5	16%	10-18%
4	Professional Core (PC)	54.5	33%	30-36%
5	Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SC)	33	20%	19-23%
6	Internships (IP), Community Service (CS) & Project Work (PW)	16	10%	8-11%
7	Mandatory Courses (MC) / Audit Courses (AC)	Non-Credit	Non-Credit	-

11. Course Classification

All subjects/ courses offered for the undergraduate program in Engineering & Technology (B.Tech. degree programs) are broadly Classified as follows:

S. No.	Broad Course Classification	Course Category	Description
1	Foundation Course	Basic Science (BS) Courses	Includes Mathematics, Physics and Chemistry.
		Engineering Science (ES) Courses	Includes Fundamental Engineering courses
		Humanities and Science including Management (HS) Courses	Includes Humanities, Social Sciences and Management courses.
2	Core Courses	Professional Core Courses (PC)	Includes courses related to the parent discipline / department / branch of Engineering
3	Elective Courses	Professional Elective Courses (PE)	Includes elective courses related to the parent discipline / department / branch of Engineering

S. No.	Broad Course Classification	Course Category	Description
		Open Elective Courses (OE)	Elective courses which include interdisciplinary courses or courses in an area outside the parent discipline / department / branch of Engineering
4	Domain Specific Skill Enhancement Courses	Skill Courses (SC)	Interdisciplinary / job-oriented / domain courses which are relevant to the industry
5	Projects and Internships	Project Work (PW)	B.Tech. Project or Major Project
		Community Service (CS)	Community Service Projects during summer vacation
		Internships (IP)	Summer Industry Internship Programs; Industry oriented Full Semester Internship Programs
6	Mandatory and Audit Courses	Mandatory Courses (MC) *(Non-credit Courses with Internal Examination)*	Covering courses of developing desired attitude and awareness among the learners
		Audit Courses (AC) *(Non-credit Courses without Internal Examination but with Formative Assessments)*	Covering value added courses

12. Program Pattern

i. Total duration of the of B.Tech (Regular) Program is four academic years.
ii. Each academic year of study is divided into two semesters.
iii. Minimum number of instructional days in each semester is 90 days.
iv. There shall be mandatory student induction program for freshers, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, visits to local Areas, Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.
v. Health/wellness/yoga/sports and NSS / NSS / Scouts & Guides / Community service activities are made mandatory as credit courses for all the under graduate students.
vi. Courses like Environmental Sciences, Indian Constitution, Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the undergraduate students.
vii. Audit courses are offered as non-credit mandatory courses covering value added courses, without internal examination but with formative assessments.
viii. Design Thinking for Innovation & Tinkering Labs are made mandatory as credit courses for all the undergraduate students.
ix. A mandatory one-week domain-specific workshop shall be organized during VI semester
x. It is mandatory for every student to undertake a minimum of one industrial visit during any semester between the V and VIII semesters
xi. Department should conduct one domain-specific expert lecture in every semester from the V semester to VII semester.
xii. Increased flexibility for students through an increase in the elective component of the curriculum, with 05 Professional Elective courses and 04 Open Elective courses.
xiii. Professional Elective Courses, include the elective courses relevant to the chosen specialization/branch. Proper choice of professional elective courses can lead to students specializing in emerging areas within the chosen field of study.

xiv. While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to courses already pursued.
xv. A pool of interdisciplinary/job-oriented/domain skill courses which are relevant to the industry are integrated into the curriculum of all disciplines. There shall be a minimum of 05 skill-oriented courses offered during III to VII semesters. Among them, one course shall be a soft skills course.
xvi. Students shall undergo mandatory summer internships, for a minimum of eight weeks' duration at the end of second and third year of the program. The internship at the end of second year shall be community oriented and industry internship at the end of third year.
xvii. There shall also be mandatory full internship in the final semester of the program along with the project work.
xviii. Undergraduate degree with Honors / Minors is introduced by the college for the students having good academic record.
xix. Each college shall take measures to implement Virtual Labs (https://www.vlab.co.in) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concepts through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.
xx. Each college shall assign a faculty advisor/mentor after admission to a group of students from same department to provide guidance in courses registration/career growth/placements/opportunities for higher studies/GATE/other competitive exams etc.
xxi. Preferably 25% of course work for the theory courses in every semester shall be conducted in the blended mode of learning.

13. Evaluation Process

i. The performance of a student in each semester shall be evaluated course wise with a maximum of 100 marks for theory and 100 marks for practical course. Summer Internships shall be evaluated for 50 marks, Full Internship & Project Work in final semester shall be evaluated for 100 marks and 200 marks respectively, mandatory courses with no credits shall be evaluated for 30 mid semester marks.
ii. A student has to secure not less than 35% of marks in the semester end examination and a minimum of 40% of marks in the sum total of the mid semester and semester end examination marks taken together for the theory, practical, design, drawing course or project etc. In case of a mandatory courses, he/she should secure 40% of the total marks. In case of audit courses, he/she should submit formative assessments only.

13.1 Theory Courses

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	**100**

i. For theory course, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the Semester End Examination.
ii. For practical course, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the Semester End Examination.
iii. If any course contains two different branch courses, the syllabus shall be written in two parts with 3 units each (Part-A and Part-B) and semester end examination question paper shall be set with two parts each for 35 marks.

a) Continuous Internal Evaluation

i. For theory courses, during the semester, there shall be two midterm examinations. Each midterm examination shall be evaluated for 30 marks of which 10 marks for objective paper (20 minutes duration), 15 marks for subjective paper (90 minutes duration) and 5 marks for assignment.
ii. Objective paper shall contain for 05 short answer questions with 2 marks each or

maximum of 20 bits for 10 marks. Subjective paper shall contain 3 either or type questions (totally six questions from 1 to 6) of which student has to answer one from each either-or type of questions. Each question carries 10 marks. The marks obtained in the subjective paper are condensed to 15 marks.

Note:

- The objective paper shall be prepared in line with the quality of competitive examinations' questions.
- The subjective paper shall contain 3 either or type questions of equal weightage of 10 marks. Any fraction shall be rounded off to the next higher mark.
- The objective paper shall be conducted on the day of subjective paper test itself.

iii. Assignments shall be in the form of problems, mini projects, design problems, slip tests, quizzes etc., depending on the course content. It should be continuous assessment throughout the semester and the average marks shall be considered.

iv. The internal evaluation for the course on "Design Thinking and Innovation" shall be activity based, in the form of presentations / reports as per the curriculum and shall be evaluated for 15 marks by the concerned teacher and 15 marks for internal tests. There shall be two internal tests. The internal test shall be of 20 marks for subjective paper and 10 marks for objective paper, total shall be condensed to 15 marks.

v. If the student is absent for the mid semester examination, no re-exam shall be conducted and mid semester marks for that examination shall be considered as zero.

vi. First midterm examination shall be conducted for I, II units of syllabus with one either or type question from each unit and third either or type question from both the units. The second midterm examination shall be conducted for III, IV and V units with one either or type question from each unit.

vii. Final mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

For Example:

Marks obtained in first mid: 25
Marks obtained in second mid: 20
Final mid semester Marks: (25x0.8) + (20x0.2) = 24

If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other.

For Example:

Marks obtained in first mid: Absent
Marks obtained in second mid: 25
Final mid semester Marks: (25x0.8) + (0x0.2) =20

b) Semester End Examination Evaluation

Semester End Examination of theory courses shall have the following pattern:

i. There shall be 6 questions and all questions are compulsory.

ii. Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks.

iii. There shall be 2 short answer questions from each unit. In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.

iv. The questions from 2 to 6 shall be set by covering one unit of the syllabus for each question.

v. Semester end examination of theory courses consisting of two parts of different courses, for Example: Basic Electrical & Electronics Engineering shall have the following pattern:

a. Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.

b. In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1mark.

c. In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
d. The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

13.2 Practical Courses

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	100

i. For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks and semester end examination shall be for 70 marks.
ii. Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the record/viva and 15 marks for the internal test.
iii. The semester end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a senior expert in the course from the same department.
   - Procedure: 20 marks
   - Experimental work & Results: 30 marks
   - Viva voce: 20 marks.

   In a practical course consisting of two parts (Eg: Basic Electrical & Electronics Engineering Lab), the semester end examination shall be conducted for 70 marks as a single laboratory in 3 hours. Mid semester examination shall be evaluated as above for 30 marks in each part and final mid semester marks shall be arrived by considering the average of marks obtained in two parts.
iv. For the course having design and/or drawing, such as Engineering Drawing, the distribution of marks shall be 30 for mid semester evaluation and 70 for semester end examination.

   Day-to-day work shall be evaluated for 15 marks by the concerned course teacher based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2 hours each for 15 marks with weight age of 80% to better mid marks and 20% for the other. The subjective paper shall contain 3 either or type questions of equal weightage of 5 marks. There shall be no objective paper in mid semester examination. The sum of day- to-day evaluation and the mid semester marks will be the final sessional marks for the course.

   The semester end examination pattern for Engineering Graphics, shall consists of 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the semester end examination. However, the semester end examination pattern for other courses related to design/drawing, multiple branches, etc is mentioned along with the syllabus.
v. The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the institution as per the institutional norms and shall be produced to the Statutory Committees as and when the same are asked for.

14. Health and Wellness, Yoga & Sports; and NSS/NCC/Scout & Guides/Community Service Courses

Courses like HEALTH AND WELLNESS, YOGA & SPORTS; AND NSS/NCC/SCOUT & GUIDES/ COMMUNITY SERVICE are evaluated as follows.

- Evaluated for a total of 100 marks.
- A Student can select 6 activities of his/her choice with a minimum of 1 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totally to 90 marks.
- The student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the course.

15. Mandatory Courses

There shall be no semester end examination for mandatory courses with zero credits. However, attendance shall be considered while calculating aggregate attendance and student

shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examination. In case, the student fails, a re-examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in **item 6** of the regulations. The performance of the student shall be indicated in the grade sheet as **"Satisfactory"** or **"Not Satisfactory"**, as specified in **Clause 26** and this will not be counted for the computation of SGPA/CGPA/Percentage. The student shall pass all the mandatory courses, for the award of B.Tech. degree.

16. Audit Courses

Audit courses carry "zero" credits. There shall be no internal and semester end examinations. However, formative assessments shall be submitted, and attendance shall be considered while calculating the aggregate attendance. The student shall complete all the audit courses, and their performance shall be indicated in the GRADE Sheet as **"Satisfactory"** or **"Not Satisfactory"**, as specified in **Clause 26**.

17. Skill Oriented Courses

i. There shall be a minimum five skill-oriented courses offered during III to VII semesters.
ii. Out of the five skill courses two shall be skill-oriented courses from the same domain. Of the remaining three skill courses, one shall be a soft skill course and the remaining two shall be skill-advanced courses from the same domain/Interdisciplinary/Job oriented.
iii. The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and semester end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The semester end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the course nominated by the principal.
iv. The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The marks/grades shall be assigned to the students by the above committee based on their performance.
v. The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency. A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.
vi. The recommended courses offered by external agencies, conversions and appropriate grades/marks are to be approved by the College at the beginning of the semester.
vii. If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the College.

18. Massive Open Online Courses (MOOCs)

In accordance with the University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulations, 2021, the college permits students to undertake up to 40% of the total courses offered in a specific program in a semester through SWAYAM / SWAYAM plus (www.swayam.gov.in) / Institution Approved MOOC Platforms for credit transfer.

Students may pursue any course (i.e., professional core, professional electives or open elective courses) of curriculum (excluding laboratory courses), as approved by the College, through SWAYAM / SWAYAM plus MOOCs / Institution Approved MOOC Platforms. **Completion of at least one MOOC (Massive Open Online Course) is mandatory for the award of the degree.**

At the beginning of each semester, the College shall notify the list of approved courses from

SWAYAM/ SWAYAM plus / Institution Approved MOOC Platforms eligible for credit transfer. Students must register for the courses offered through MOOC platform with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the students' progress in the MOOC.

A student must complete at least 75% of the assignments and quizzes on the SWAYAM / SWAYAM plus / Institution Approved MOOC Platforms to be eligible for the semester end examination. The semester end exam may be conducted by the National Testing Agency (NTA), the National Program on Technology Enhanced Learning (NPTEL), Institution Approved MOOC Service Provider or the College during the regular end-term exams. Evaluation shall comprise 70% weightage for the semester end examination and 30% for assignments and quizzes conducted by the SWAYAM / SWAYAM plus / Institution Approved MOOC Platforms course coordinator.

Students must earn a certificate by passing the SWAYAM/ SWAYAM plus/ Institution Approved MOOC Platforms examination and submit the same to the College to receive the credits as specified in the curriculum. Examination fees, if applicable, shall be borne by the student. Pass marks and grading will be as per the SVCE academic regulations. No relaxation is permitted. Credits will be awarded only after submission of the completion certificate.

Students who fail or are unable to appear in SWAYAM / SWAYAM plus / Institution Approved MOOC Platforms exams conducted by NTA / NPTEL / Intuitional Approved MOOC Service Provider may write the College-conducted exam during the next subsequent semesters. Students who qualify through NTA / NPTEL / Intuitional Approved MOOC Service Provider, but miss College registration for credit transfer may apply during the next supplementary notification.

Students who qualify in the proctored SWAYAM / SWAYAM plus exams are eligible for direct credit transfer and are exempted from both internal and external assessments for the equivalent College course.

In case of delays in result declaration by NTA / NPTEL, the College shall issue revised marks memos once results are available.

The College reserves the right to make amendments to these guidelines from time to time in alignment with UGC directives.

19. Credit Transfer Policy

Adoption of Massive Open Online Courses (MOOCs) is mandatory, to enable Blended model of teaching-learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the College shall allow up to a maximum of 40% of the total courses being offered in a particular program i.e., maximum of **64** credits through MOOCs platform (SWAYAM) / Institution Approved MOOC Platforms.

i. The College shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses, as detailed in Table 1.

Table 1: Duration of the MOOC and Number of Credits

S. No.	No. of Weeks	No. of Credits
1.	4	1
2.	8	2
3.	12	3
4.	16	4

ii. The Student registration for the MOOCs shall be only through the respective department of the institution, it is mandatory for the student to share necessary information with the department.
iii. Credit transfer policy will be applicable to the theory courses only.
iv. The concerned department shall identify the courses permitted for credit transfer.
v. The College shall notify at the beginning of semester the list of online learning courses equivalent to the curriculum theory courses eligible for credit transfer.
vi. The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
vii. The College shall ensure no overlap of MOOC exams with that of the College

examination schedule. In case of delay in results, the College will re-issue the marks sheet for such students.

viii. Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.

ix. The departments shall submit the following to the examination section of the College:
   a) List of students who have passed MOOC courses in the current semester along with the certificate of completion.
   b) Undertaking form filled by the students for credit transfer.

x. If a student fails to attain credits through MOOCs, he shall have the option to attend the exam in conventional (pen & paper) mode at the end of the same semester along with Regular Examinations, or he can again re-register for the same MOOC course in the next academic year.

xi. The institute shall ensure that students who have completed the entire MOOC and submitted a minimum of 75% of the assignments and quizzes on MOOC Platform shall only be allowed to appear for the semester end examination conducted by the institute. The MOOC Coordinator / SWAYAM Nodal Officer shall verify this from the MOOC Platform Admin dashboard.

xii. Evaluation shall comprise 70% weightage for the semester end examination and 30% for assignments and quizzes conducted by the SWAYAM / SWAYAM plus / Institution Approved MOOC Platforms course coordinator.

Evaluation of MOOC in Conventional Mode:

- There shall be no internal evaluation
- The Semester End Examination of MOOCs shall have the following pattern:
  - ✓ There shall be 6 questions and all questions are compulsory, Part-A and Part-B, totaling 70 Marks.
  - ✓ ***Part-A:*** Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. There shall be 2 short answer questions from each unit.
  - ✓ ***Part-B:*** In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each, totaling 50 Marks. Student shall answer any one of them. The questions from 2 to 6 shall be set by covering one unit of the syllabus for each question.
  - ✓ The student will be considered to have passed only if he/she scores a minimum of 35% of marks in the semester end examination and a minimum of 40% of marks in the sum total of the mid semester and semester end examination marks taken together for theory courses. In case of a mandatory course, he/she should secure 40% of the total marks.

xiii. The College shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

Note: Students shall be permitted to register for MOOCs offered through online platforms approved by the College from time to time.

20. Academic Bank of Credits (ABC)

The College has implemented Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

i. Provide option of mobility for learners across the universities of their choice.
ii. Provide option to gain the credits through MOOCs from approved digital platforms.
iii. Facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC.
iv. Execute Multiple Entry and Exit system with credit count, credit transfer and credit acceptance from students' account.

21. Mandatory Internships

21.1 Summer Internships

Two summer internships either onsite or virtual each with a minimum of 08 weeks duration, done at the end of second and third years, respectively are mandatory. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Power

projects, software MNCs or any industries in the areas of concerned specialization of the Undergraduate Program. One of the two summer internships at the end of second year (Community Service Project) shall be society oriented and shall be completed in collaboration with government organizations/NGOs & others. The other internship at the end of third year is Industry Internship and shall be completed in collaboration with Industries. The student shall register for the internship as per course structure after commencement of academic year. The guidelines issued by the APSCHE / College shall be followed for carrying out and evaluation of Community Service Project and Industry Internship.

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A Certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% weightage each. It shall be evaluated for 50 external marks. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the College.

21.2 Full Semester Internship and Project Work

In the final semester, the student should mandatorily register and undergo internship (onsite/virtual) and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The college shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

Full Semester Internship

The student shall undergo a Full Semester Internship in an Industry/National Laboratories/ Academic institutions relevant to the branch specific or interdisciplinary through offline / online / blended mode. The Internship shall be submitted in a report form, and a presentation of the same shall be made before an Internship Evaluation Committee (IEC) and it shall be evaluated for 100 marks. The report and the oral presentation shall carry 40% and 60% weightage respectively. The IEC shall consist the concerned Supervisor and a Senior Faculty Member of the Department nominated by Head of the Department with the approval of the Principal. If required, multiple IECs shall be constituted for multiple sections with prior approval.

Project Work

The project report shall be evaluated with an external examiner. The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). The evaluation of remaining 30 marks shall be done by departmental Project Evaluation Committee (PEC) consisting of concerned supervisor, and 2 senior faculty members. At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner nominated by Head of the Department with the approval of the Principal and is evaluated for 140 marks.

22. Guidelines for offering a Minor

The main objective of Minor in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional feature of the B.Tech. program. Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department and as defined by the respective department offering Minor program.

i. Minor is introduced in the curriculum of all B.Tech. programs offering a major degree and is applicable to all B.Tech. (Regular and Lateral Entry) students admitted in Engineering & Technology.

ii. Minor programs shall be offered in emerging technologies by the respective departments or in collaboration with the relevant industries/agencies.
iii. A student shall earn additional 18 credits in the specified area to be eligible for the award of B.Tech. degree with Minor. This is in addition to the credits essential for obtaining the Undergraduate Degree in Major Discipline (i.e., 163 credits).
iv. A student shall study five theory courses each carrying three credits, along with either two laboratory courses of 1.5 credits each or a project course of three credits
v. A student is permitted to register for a Minor offered by a department other than the parent department and as defined by the respective department offering Minor program.
vi. Minor in Quantum Computing/Quantum Technologies/Internet of Things (IoT) can be studied by any branch of student.
vii. A student is permitted to register for Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two courses per semester pertaining to their Minor from V Semester onwards.
viii. The courses offered under Minor can have theory as well as laboratory component. If a course comes with a lab component, that component is to be cleared separately.
ix. The Concerned HODs shall arrange separate class work and timetable of the courses offered under various Minor programs.
x. Courses that are used to fulfil the student's primary major may not be double counted towards the Minor. Courses with content substantially equivalent to courses in the student's primary major may not be counted towards the Minor.
xi. Students can complete the courses offered under Minor either in the college or in online platforms like SWAYAM/ SWAYAM plus with a minimum duration of 12 weeks for a 3-credit course and 8 weeks duration for a 2-credit course satisfying the criteria defined for credit mobility, as mentioned in **Clause 19**. If the courses under Minor are offered in conventional mode, then the teaching and evaluation procedure shall be similar to regular B.Tech. courses.
xii. **Minor Capstone Project** Report shall be evaluated with an external examiner. The total marks for Minor Capstone Project Work shall be 100 marks and distribution shall be 50 marks for internal and 50 marks for external evaluation. The Project Review Committee consisting of supervisor, a senior faculty and HOD assesses the student for 50 marks (Report: 30 marks, Seminar: 20 marks). The external evaluation of Minor Capstone Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the College and is evaluated for 50 marks.
xiii. The attendance for the registered courses under Minor and regular courses offered for Major degree in a semester are to be considered separately.
xiv. A student shall maintain an attendance of 75% in all registered courses of Minor to be eligible for attending semester end examinations.
xv. A student registered for Minor in a discipline shall pass in all courses that constitute the requirement for the Minor degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Minor degree program.
xvi. If a student drops or is terminated from the Minor program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
xvii. The Minor in a discipline will be mentioned in the degree certificate as Bachelor of Technology in XXX with Minor in YYY. For example, Bachelor of Technology in Mechanical Engineering with Minor in Machine Learning.

Enrolment into a Minor:

i. Students without any backlog courses up to III semester will be permitted to register for a Minor.
ii. If a student is detained due to lack of attendance in either Major or Minor program, registration shall be cancelled
iii. Transfer of credits from a particular Minor to regular B.Tech. and vice-versa shall not be permitted
iv. Minor is to be completed simultaneously with Major degree program.

Registration for Minor:

i. The institution will announce specialization, eligibility and courses offered by the departments under Minor and seek registrations in IV Semester, after the results of III Semester are announced.
ii. The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register the courses under Minor.
iii. The selected students shall submit their willingness to the principal through his/her parent department which shall be forwarded to the concerned departments offering Minor. Both parent department and department offering minor shall maintain the record of student pursuing the Minor.
iv. The students enrolled in the minor courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.

23. Guidelines for offering Honors

The objective of introducing B.Tech. (Hons.) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area in the UG level. The program is a best choice for academically excellent students having good academic record and interest towards higher studies and research.

i. Honors is introduced in the curriculum of all B.Tech. programs offering a major degree and is applicable to all B.Tech. (Regular and Lateral Entry) students admitted in Engineering & Technology.
ii. A student shall earn additional 18 credits for award of B.Tech. (Honors) degree from same branch/department/discipline registered for major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major Discipline (i.e., 163 credits).
iii. A student shall study 05 theory courses each carrying 3 credits, along with either two practical courses of 1.5 credits each or a project course of 3 credits.
iv. A student is permitted to register for Honors in IV semester after the results of III Semester are declared and students may be allowed to take maximum two courses per semester pertaining to the Honors from V Semester onwards.
v. The concerned HOD shall arrange separate classwork and timetable of the courses offered under Honors program.
vi. Courses that are used to fulfil the student's primary major may not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors.
vii. Students can complete the courses offered under Honors either in the college or in online platforms like SWAYAM/SWAYAM Plus with a minimum duration of 12 weeks for a 3-credit course and 8 weeks duration for a 2-credit course satisfying the criteria for credit mobility. If the courses under Honors are offered in conventional mode, then the teaching and evaluation procedure shall be similar to regular B.Tech. courses.
viii. The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.
ix. A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.
x. A student registered for Honors shall pass in all courses that constitute the requirement for the Honors degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors degree program.
xi. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
xii. The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering.

Enrolment into Honors

i. Students of a Department/Discipline are eligible to opt for Honors program offered by the same Department/Discipline.
ii. The enrolment of student into Honors is based on the CGPA obtained in the major degree program. CGPA shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students. Students having 7 CGPA without any backlog courses will be permitted to register for Honors.
iii. If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.
iv. Transfer of credits from Honors to regular B.Tech. degree and vice-versa shall not be permitted.
v. Honors are to be completed simultaneously with a Major degree program.

Registration for Honors:

i. The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register the courses under Honors.
ii. The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of student pursuing the Honors.
iii. The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.

24. Attendance Requirements:

i. A student shall be eligible to appear for the College semester end examinations if he/she acquires a minimum of 40% attendance in each course and 75% of attendance in aggregate of all the courses. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
ii. Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.
iii. A stipulated fee shall be payable towards Condonation of shortage of attendance to the College.
iv. Students whose shortage of attendance is not condoned in any semester are not eligible to take their semester end examination of that class and their registration shall stand cancelled.
v. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester from the date of commencement of class work.
vi. If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
vii. If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.
viii. For induction program attendance shall be maintained as per AICTE norms.

25. Promotion Rules:

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in **section 24**.

i. A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per College norms.
ii. A student will be promoted from II to III year if he/she fulfils the academic requirement of securing 40% of the credits (any ***decimal*** fraction should be ***rounded off*** to ***lower*** digit) up to in the courses that have been studied up to III semester
iii. A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any ***decimal*** fraction should be ***rounded off*** to ***lower*** digit) in the courses that have been studied up to V semester. And in case a student is detained for want of credits for a particular academic year by ii) & iii) above, the student may make up the credits through supplementary examinations

and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be.

iv. When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfillment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

26. Grading:

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:

After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

Range in which the marks in the course fall	Grade	Grade points Assigned
90 & above	S (Superior)	10
80 - 89	A (Excellent)	9
70 - 79	B (Very Good)	8
60 - 69	C (Good)	7
50 - 59	D (Average)	6
40 - 49	E (Pass)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0
Mandatory Courses		
>= 12	Satisfactory (Y)	-
< 12	Not Satisfactory (N)	-
Audit Courses		
-	Satisfactory (Y)	-
-	Not Satisfactory (N)	-

i). A student obtaining Grade 'F' or Grade 'Ab' in a course shall be considered failed and will be required to reappear for that course when it is offered the next supplementary examination.

ii). For non-credit mandatory courses and audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

Semester Grade Point Average (SGPA)

The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade point scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \sum_{i=1}^{n}(C_i \times G_i) \Big/ \sum_{i=1}^{n} C_i$$

Where, C_i is the number of credits of the i^{th} course, G_i is the grade point scored by the student in the i^{th} course and n is the no. of courses.

Cumulative Grade Point Average (CGPA)

The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

$$CGPA = \sum_{i=1}^{n}(C_i \times S_i) \Big/ \sum_{i=1}^{n} C_i$$

Where S_i is the SGPA of the i^{th} semester, C_i is the total number of credits in that semester and n is the no. of semesters.

Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts **(Annexure – I)**. While computing the SGPA the courses in which the student is awarded Zero grade points will also be included.

Grade Point

It is a numerical weight allotted to each letter grade on a 10- point scale. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by the letters S, A, B, C, D, E and F.

27. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B.Tech. Degree, he/she shall be placed in one of the following four classes:

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5
First Class	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 5.0 < 5.5

CGPA to Percentage of Marks Conversion

There shall be no formula prescribed for the conversion of CGPA into percentage of marks. Both the CGPA and the percentage of marks obtained by the student shall be printed on the Consolidated Marks Memo (CMM) at the time of its issuance.

28. Recounting / Revaluation:

Students shall be permitted to apply for Recounting / Revaluation of the semester end examination answer scripts within a stipulated period after payment of the prescribed fee. After completion of the process of Recounting / Revaluation, the records are updated with changes if any, and the student shall be issued a revised grade sheet. If there are no changes, the student shall be intimated the same through a notice.

The Revaluation shall be carried out by an expert not less than Associate Professor cadre, as per the scheme of evaluation supplied by the examination branch in the presence of Principal/Controller of Examinations. Neither the students nor his parents shall be permitted to the present during the valuation.

29. Supplementary Examinations:

In addition to the regular semester end examinations conducted, the college may also schedule and conduct supplementary examinations for all the courses of other semesters when feasible for the benefit of students. Such candidates writing supplementary examinations may have to write more than one examination per day. For eighth semester advanced supplementary examinations will be conducted.

30. Withholding of Results:

If the candidate has any dues not paid to the college or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld in such cases, and he/she shall not be allowed/promoted to the next higher semester.

31. Re-Registration for Improvement of Internal Marks:

Following are the conditions to avail the benefit of improvement of internal marks.

i. The candidate should have completed the 4 years of B.Tech. course work and obtained examinations results from I semester to VIII semester.
ii. He/she should have passed all the courses for which the internal evaluation marks secured are more than 50%
iii. Out of the courses the candidate has failed in the examinations due to internal evaluation marks secured being less than 50%, the candidate shall be given a chance

for Theory courses and for a maximum of **three** theory courses for improvement of internal evaluation marks.

iv. This provision is only for Theory courses. The candidate has to re-register for the chosen courses and fulfil the academic requirements (i.e., a student has to attend the classes regularly and appear for the mid-examinations and satisfy the attendance requirements to become eligible for appearing at the semester end examinations).

v. For each course, the candidate has to pay a prescribed fee. In the event of availing the provision of Improvement of Internal evaluation marks, the internal evaluation marks as well as the Semester End Examinations marks secured in the previous attempt(s) for the re-registered courses shall stand cancelled.

32. Multiple Entry / Exit Option:

a) Exit Policy:

The students can choose to exit the four-year program at the end of first/second/third year.

i). **UG Certificate in (Field of study/discipline)** - Program duration: First year (first two semesters) of the undergraduate program, 40 credits followed by an additional exit 10-credit bridge / Skill oriented course(s) lasting two months, including at least 6-credit job-specific internship / apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

ii). **UG Diploma (in Field of study/discipline)** - Program duration: First two years (first four semesters) of the undergraduate program, 80 credits followed by an additional exit 10-credit bridge / Project oriented course(s) lasting two months, including at least 6- credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

iii). **Bachelor of Science (in Field of study/discipline)** i.e., **B.Sc. Engineering in (Field of study/discipline)** - Program duration: First three years (first six semesters) of the undergraduate program, 120 credits.

b) Entry Policy:

Modalities on multiple entry by the student into the B.Tech. program will be provided in due course of time.

Note: The college shall resolve any issues that may arise in the implementation of Multiple Entry and Exit policies from time to time and shall review the policies in the light of periodic changes brought by UGC, AICTE and State government.

33. Gap Year Concept:

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship program/to establish start-ups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The principal of the respective college shall forward such proposals submitted by the students to the College. An evaluation committee constituted by the College shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not.

34. Transitory Regulations:

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfillment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent courses as and when courses are offered, subject to **section 6. (c)** and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for re-joining into the succeeding year of their B.Tech. from the date of commencement of class work, subject to **section 6. (c)** and they will follow the academic regulations into which they are readmitted.

35. Minimum Instructional Days for a Semester:
The minimum instructional days including exams for each semester shall be 90 days.

36. Medium of Instruction:
The medium of instruction of the entire B.Tech. undergraduate program in Engineering & Technology (including examinations and project reports) will be in English only.

37. Student Transfers:
Student transfers across institutions shall be as per the guidelines issued by the Government of Andhra Pradesh and the Universities from time to time.

38. General Instructions:
The academic regulations should be read as a whole for purpose of any interpretation.

i. Malpractices **rules-nature** and punishments are appended.
ii. Where the words "he", "him", "his", occur in the regulations, they also include "she", "her", "hers", respectively.
iii. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Head of the institution is final.
iv. In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Head of the institution is final.

39. Amendments to Regulations:
The Academic Council of **Sri Venkateswara College of Engineering (Autonomous)** reserves the right to revise, amend, or change the Regulations, Scheme of Examinations, and / or Syllabi or any other policy relevant to the needs of the society or industrial requirements etc., with the recommendations of the concerned Board(s) of Studies. The changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the College.

NOTE: FAILURE TO READ AND UNDERSTAND THE RULES & REGULATIONS IS NOT AN EXCUSE

40. Rules for Disciplinary Action for Malpractices / Improper Conduct in Examinations

S. No.	Nature of Malpractices/ Improper Conduct	Punishment
	If the candidate	
1. (a)	Possesses or keeps accessible in Examination Hall, any paper, note book, programmable calculators, Cell phones, Pager, Palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he/she is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination).	Expulsion from the examination hall and cancellation of the performance in that course only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the Exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he/she will be handed over to the police and a case is registered against him/her.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the notice of Principal.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred for four consecutive semesters from class work and all Semester End Examinations. The continuation of the course by the candidate is subject to the Academic regulations in connection with forfeiture of seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the courses of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for four consecutive semesters from class work and all semester end examinations, if his/her involvement is established. Otherwise, the candidate is debarred for

S. No.	Nature of Malpractices/ Improper Conduct	Punishment
		two consecutive semesters from class work and all Semester End Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him/her.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester End Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in Cancellation of the performance in that course only. The answer paper or in letters to the examiners or writes to the examiner requesting him/her to award pass marks.	Cancellation of the performance in that course only.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant- Superintendent / any Officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-In charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-In-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. If the candidate physically assaults the invigilator/ officer-In-charge of the Examinations, then the candidate is also debarred and forfeits his/her seat. In case of outsiders, they will be handed over to the police and a police case is registered against them.

S. No.	Nature of Malpractices/ Improper Conduct	Punishment
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in **clause 6** to **8**.	Student of the college's expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat. Person (s) who do not belong to the College will be handed over to police and, a police case will be registered against them .
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year.
11.	Copying detected on the basis of internal evidence, such as during valuation or during special scrutiny.	Cancellation of the performance in that course only or in that course and all other courses the candidate has appeared including practical examinations and project work of that semester / year examinations, depending on the recommendation of the committee.

S. No.	Nature of Malpractices/ Improper Conduct	Punishment
12.	If any malpractice is detected which is not covered in the above **clauses 1** to **11** shall be reported to the Principal for further action and suitable punishment.	

Note: Whenever the performance of a student is cancelled in any course/courses due to malpractice, he has to register for Semester End Examinations in that course/courses consequently and has to fulfill all the norms required for the award of Degree.

ACADEMIC REGULATIONS (R23)
FOR B.TECH. (LATERAL ENTRY SCHEME)

(Effective for the students admitted into II year through Lateral Entry Scheme from the Academic Year **2024-25** onwards)

1. Award of the Degree

(a) Award of the B.Tech. Degree if he/she fulfils the following:

i. Pursues a course of study for not less than three academic years and not more than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years).
ii. Registers for 123 credits and secures all 123 credits.

(b) Award of B.Tech. Degree with Minors/Honors if he/she fulfils the following:

i. Student secures additional 18 credits fulfilling all the requisites of a B.Tech. program i.e., 123 credits.
ii. Registering for Minors/Honors optional.
iii. Minors/Honors is to be completed simultaneously with B.Tech. program.

2. Students, who fail to fulfil the requirement for the award of the degree within six consecutive academic years from the year of admission, shall forfeit their seat. in B.Tech. course and their admission stands cancelled. This clause shall be read along with **clause 1 a) i).**

3. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the requirements mentioned in item no.**2**

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing course or project if he secures not less than 35% of marks in the semester end examination and a minimum of 40% of marks in the sum total of the mid semester evaluation and semester end examination taken together.
ii. A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the courses that have been studied up to V semester.
And in case if student is already detained for want of credits for a particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

4. Course Pattern:

i. The entire course of study is three academic years on semester pattern.
ii. A student eligible to appear for the semester end examination in a course but absent at it or has failed in the semester end examination may appear for that course at the next supplementary examination offered.
iii. When a student is detained due to lack of credits/shortage of attendance the student may be re-admitted when the semester is offered after fulfillment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.

5. All other regulations as applicable for B.Tech. Four-year degree course (Regular) will hold good for B.Tech. (Lateral Entry Scheme).

NOTE: FAILURE TO READ AND UNDERSTAND THE RULES & REGULATIONS IS NOT AN EXCUSE

SGPA and CGPA Calculations: An Illustrative Example for One Academic Year - B.Tech. Program (SVCE R23 Regulations)

(a) SGPA Calculations: One Academic Year

Semester (Odd :I, Even: II)	Course Code	Credits (C_i)	Marks	Grade	Grade Points (G_i)	Credit Points ($C_i \times G_i$)	SGPA (S_i)
I	BB23AES101	3	78	B	8	3 × 8 = 24	$SGPA = \sum_{i=1}^{n}(C_i \times G_i) \Big/ \sum_{i=1}^{n} C_i$
I	BB23AHS101	2	90	S	10	2 × 10 = 20	
I	BB23ABS101	3	44	E	5	3 × 5 = 15	
I	BB23AES101	3	61	C	7	3 × 7 = 21	
I	BB23ABS101	3	67	C	7	3 × 7 = 21	
I	BB23AHS102	1	95	S	10	1 × 10 = 10	
I	BB23AES102	1.5	89	A	9	1.5 × 9 = 13.5	
I	BB23ABS102	1	62	C	7	1 × 7 = 7	$S_1 = \frac{145}{19.5} = 7.44$
I	BB23AES103	1.5	58	D	6	1.5 × 6 = 9	
I	BB23ABS105	0.5	34	A	9	0.5 × 9 = 4.5	
	$\sum_{i=1}^{n} C_i$	**19.5 (19.5*)**	**678#**	**Total**		$\sum_{i=1}^{n}(C_i \times G_i) = 145$	
II	BB23AES101	3	92	S	10	3 × 10 = 30	
II	BB23ABS201	3	71	B	8	3 × 8 = 24	
II	BB23ABS201	3	42	E	5	3 × 5 = 15	
II	BB23AES102	3	84	A	9	3 × 9 = 27	
II	BB23APC201	3	64	C	7	3 × 7 = 21	
II	BB23ABS202	1	23	F	0	1 × 0 = 0	
II	BB23AES102	1.5	AB	F	0	1.5 × 0 = 0	$S_2 = \frac{136.5}{20.5} = 6.66$
II	BB23APC201	1.5	53	D	6	1.5 × 6 = 9	
II	BB23AES103	1	56	D	6	1 × 6 = 6	
II	BB23ABS106	0.5	35	A	9	0.5 × 9 = 4.5	
	$\sum_{i=1}^{n} C_i$	**20.5 (17*)**	**520#**	**Total**		$\sum_{i=1}^{n}(C_i \times G_i) = 136.5$	
*** Total credits obtained in the current semester (without backlog courses)** **# Total marks obtained without considering mandatory courses**							
AFTER CLEARING BACKLOG COURSES							
II	BB23ABS202	1	49	E	5	1 × 5 = 5	$S_2 = \frac{150.5}{20.5} = 7.34$
II	BB23AES102	1.5	59	D	6	1.5 × 6 = 9	
	$\sum_{i=1}^{n} C_i$	**20.5 (20.5*)**	**605$**	**Total**		**150.5**	
$ Total marks obtained after clearing all backlog courses							

(b) CGPA Calculation of the Program									
Semester	I	II	III	IV	V	VI	VII	VIII	TOTAL
Semester Credits (C_i)	19.5	20.5	20	21	23	26	21	12	163
Total Max. Marks	1000	1000	800	900	1000	1000	750	300	6750
Total Marks Obtained	678	605	755	735	678	628	638	187	4904
SGPA (S_i)	7.44	7.32	8.67	8.63	7.59	7.67	7.65	8.5	----
$\sum_{i=1}^{n}(C_i \times S_i)$	145	150.5	173	181	175	199	161	102	1286.50
For Regular Students	$CGPA = \sum_{i=1}^{n}(C_i \times S_i) \Big/ \sum_{i=1}^{n} C_i = \frac{\mathbf{1286.50}}{\mathbf{163}} = \mathbf{7.89}$						$Percentage\ of\ Marks = \frac{Total\ Marks\ Obtained}{Total\ Max.Marks} * 100 = \frac{\mathbf{4904}}{\mathbf{6750}} * \mathbf{100} = \mathbf{72.65}$		
For Lateral Entry Students	$CGPA = \sum_{i=1}^{n}(C_i \times S_i) \Big/ \sum_{i=1}^{n} C_i = \frac{\mathbf{991}}{\mathbf{123}} = \mathbf{8.06}$						$Percentage\ of\ Marks = \frac{Total\ Marks\ Obtained}{Total\ Max.Marks} * 100 = \frac{\mathbf{3621}}{\mathbf{4750}} * \mathbf{100} = \mathbf{76.23}$		

In Course Code:
For Example: BB23APC501
BB- Correspond to Branch

Branch	Short Code (BB)
Civil Engineering	CE
Electrical & Electronics Engineering	EE
Mechanical Engineering	ME
Electronics & Communication Engineering	EC
Computer Science and Engineering	CS
Information Technology	IT
CSE (Data Science)	DS
CSE (Artificial Intelligence & Machine Learning)	AM
CSE (Cyber Security)	CY
English	EG
Mathematics	MA
Physics	PH
Chemistry	CH
MBA	BA
MCA	CA

COURSE STRUCTURE

B.Tech. – I Year I Semester

S. No	Course Code	Course Name	Category	Contact Periods per Week				Credits	Scheme of Examination Max. Marks		
				L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1	ME23AES101	Basic Civil & Mechanical Engineering	ES	3	-	-	3	3	30	70	100
2	ME23AES102	Engineering Graphics	ES	1	-	4	5	3	30	70	100
3	PH23ABS101	Engineering Physics	BS	3	-	-	3	3	30	70	100
4	CS23AES101	Introduction to Programming	ES	3	-	-	3	3	30	70	100
5	MA23ABS101	Linear Algebra & Calculus	BS	3	-	-	3	3	30	70	100
6	CS23AES102	Computer Programming Lab	ES	-	-	3	3	1.5	30	70	100
7	PH23ABS102	Engineering Physics Lab	BS	-	-	2	2	1	30	70	100
8	ME23AES103	Engineering Workshop	ES	-	-	3	3	1.5	30	70	100
9	CS23AES103	IT Workshop	ES	-	-	2	2	1	30	70	100
10	CH23ABS105	Health and Wellness, Yoga and Sports	BS	-	-	1	1	0.5	100	--	100
Total				**13**	**-**	**15**	**28**	**20.5**	**370**	**630**	**1000**

B.Tech. – I Year II Semester

S. No	Course Code	Course Name	Category	Contact Periods per Week				Credits	Scheme of Examination Max. Marks		
				L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1	EE23AES101	Basic Electrical & Electronics Engineering	ES	3	-	-	3	3	30	70	100
2	EG23AHS101	Communicative English	HS	2	-	-	2	2	30	70	100
3	CS23APC201	Data Structures	PC	3	-	-	3	3	30	70	100
4	MA23ABS201	Differential Equations & Vector Calculus	BS	3	-	-	3	3	30	70	100
5	CH23ABS101	Chemistry	BS	3	-	-	3	3	30	70	100
6	EG23AHS102	Communicative English Lab	HS	-	-	2	2	1	30	70	100
7	CS23APC202	Data Structures Lab	PC	-	-	3	3	1.5	30	70	100
8	CH23ABS102	Chemistry Lab	BS	-	-	2	2	1	30	70	100
9	EE23AES102	Electrical and Electronics Engineering Workshop	ES	-	-	3	3	1.5	30	70	100
10	CH23ABS106	NSS/NCC/Scouts & Guides/Community Service	BS	-	-	1	1	0.5	100	--	100
Total				**14**	**-**	**11**	**25**	**19.5**	**370**	**630**	**1000**

B.Tech. – II Year I Semester

S. No	Course Code	Course Name	Category	Contact Periods per Week				Credits	Scheme of Examination Max. Marks		
				L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1	MA23ABS306	Probability and Statistics	BS	3	-	-	3	3	30	70	100
2	EC23AES301	Digital Logic and Computer Organization	ES	3	-	-	3	3	30	70	100
3	BA23AHS301	Organizational Behavior	HS	2	-	-	2	2	30	70	100
4	CS23APC301	Advanced Data Structures and Algorithm Analysis	PC	3	-	-	3	3	30	70	100
5	CS23APC302	Object Oriented Programming Through JAVA	PC	3	-	-	3	3	30	70	100
6	CS23AES301	Design Thinking and Innovation	ES	1	-	2	3	2	30	70	100
7	CS23APC304	Object Oriented Programming Through JAVA Lab	PC	-	-	3	3	1.5	30	70	100
8	CS23APC303	Advanced Data Structures and Algorithm Analysis Lab	PC	-	-	3	3	1.5	30	70	100
9	CS23ASC302	Python Programming	SC	-	1	2	3	2	30	70	100
Total				**15**	**1**	**10**	**26**	**21**	**270**	**630**	**900**

B.Tech. – II Year II Semester

S. No	Course Code	Course Name	Category	Contact Periods per Week				Credits	Scheme of Examination Max. Marks		
				L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1	MA23ABS302	Discrete Mathematics and Graph Theory	BS	3	-	-	3	3	30	70	100
2	BA23AHS302	Universal Human Values	HS	3	-	-	3	3	30	70	100
3	CS23APC401	Database Management Systems	PC	3	-	-	3	3	30	70	100
4	CS23APC402	Operating Systems	PC	3	-	-	3	3	30	70	100
5	AM23APC301	Artificial Intelligence	PC	3	-	-	3	3	30	70	100
6	CS23APC403	Database Management Systems Lab	PC	-	-	2	2	1	30	70	100
7	CS23APC404	Operating Systems Lab	PC	-	-	2	2	1	30	70	100
8	AM23APC302	Artificial Intelligence Lab	PC	-	-	2	2	1	30	70	100
9	CS23ASC401	Full Stack Development-I	SC	-	1	2	3	2	30	70	100
10	CH23AMC301	Environmental Science	MC	2	-	-	2	-	30	--	30
Total				**17**	**1**	**8**	**26**	**20**	**300**	**630**	**930**
Mandatory Community Service Project Internship of 08 Weeks Duration during Summer Vacation											

B.Tech.–III Year I Semester

S. No	Course Code	Course Name	Category	Contact Periods per Week				Credits	Scheme of Examination Max. Marks		
				L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1	CS23APC501	Automata Theory and Compiler Design	PC	3	-	-	3	3	30	70	100
2	CY23APC301	Computer Networks	PC	3	-	-	3	3	30	70	100
3	CS23APC502	Data Warehousing and Data Mining	PC	3	-	-	3	3	30	70	100
4	 IT23APC401 EC23APC504 IT23APE502 AM23APE501	**Professional Elective-I** Software Engineering Microprocessors and Microcontrollers Object Oriented Analysis and Design Soft Computing	PE	3	-	-	3	3	30	70	100
5		**Open Elective-I**	OE	3	-	-	3	3	30	70	100
6	CY23APC302	Computer Networks Lab	PC	-	-	3	3	1.5	30	70	100
7	CS23APC503	Data Warehousing and Data Mining Lab	PC	-	-	3	3	1.5	30	70	100
8	CS23ASC501	Full Stack Development-II	SC	-	1	2	3	2	30	70	100
9	EC23AES501	Tinkering Lab	ES	-	-	2	2	1	30	70	100
10	BA23AMC501	Business Economics and Financial Management	MC	3	-	-	3	-	30	--	30
11	CS23ACS501	Community Service Project	CS	-	-	-	-	2	--	100	100
Total				**18**	**1**	**10**	**29**	**23**	**300**	**730**	**1030**
Note: One Domain Specific Expert Lecture and One Industrial Visit are mandatory requirements for the Semester											

B.Tech. – III Year II Semester

S. No	Course Code	Course Name	Category	Contact Periods per Week				Credits	Scheme of Examination Max. Marks		
				L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1	CS23AES501	Introduction to Quantum Technology and Applications	ES	3	-	-	3	3	30	70	100
2	IT23APC501	Cloud Computing	PC	3	-	-	3	3	30	70	100
3	CY23APC601	Cryptography and Network Security	PC	3	-	-	3	3	30	70	100
4	AM23APC401	Machine Learning	PC	3	-	-	3	3	30	70	100
5	 CY23APC501 CS23APE601 EC23APE603 IT23APE603	**Professional Elective-II** Cyber Security DevOps Embedded System Design Software Testing Methodologies	PE	3	-	-	3	3	30	70	100
6	 CS23APE603 CY23APE604 AM23APC502 CS23APE605	**Professional Elective-III** Distributed Operating Systems Mobile Adhoc Networks Natural Language Processing Software Project Management	PE	3	-	-	3	3	30	70	100
7		**Open Elective-II**	OE	3	-	-	3	3	30	70	100
8	CY23APC603	Cryptography and Network Security Lab	PC	-	-	3	3	1.5	30	70	100
9	AM23APC402	Machine Learning Lab	PC	-	-	2	2	1	30	70	100
10	EG23ASC401	Soft Skills	SC	-	1	2	3	2	30	70	100
11	CS23AMC601	Technical Paper Writing and IPR	MC	2	-	-	2	-	30	--	30
Total				**23**	**1**	**7**	**31**	**25.5**	**330**	**700**	**1030**

Mandatory Industry Internship of 08 Weeks Duration During Summer Vacation

Note: One Domain Specific Expert Lecture and One Domain Specific Workshop are mandatory requirements for the Semester

B. Tech.–IV Year I Semester

S. No	Course Code	Course Name	Category	Contact Periods per Week				Credits	Scheme of Examination Max. Marks		
				L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1	BA23AHS701 BA23AHS702 BA23AHS703	**Management Course** Business Ethics and Corporate Governance E-Business Management Science	HS	2	-	-	2	2	30	70	100
2	AM23APC602	Deep Learning	PC	3	-	-	3	3	30	70	100
3	AM23APE701 CY23APC701 IT23APE501 CS23APE701	**Professional Elective-IV** Augmented Reality and Virtual Reality Blockchain Technology Internet of Things Software Architecture and Design Patterns	PE	3	-	-	3	3	30	70	100
4	CS23APE702 CS23APE602 CY23APE703 AM23APE707	**Professional Elective-V** Agile Methodologies Computer Vision Cyber Physical systems Metaverse	PE	3	-	-	3	3	30	70	100
5		**Open Elective-III**	OE	3	-	-	3	3	30	70	100
6		**Open Elective-IV**	OE	3	-	-	3	3	30	70	100
7	AM23ASC701	Prompt Engineering	SC	-	1	2	3	2	30	70	100
8	CS23ASC701	Introduction to R Programming	SC	-	-	1	1	0.5	30	70	100
9	BA23AAC701	Gender Sensitization	AC	2	-	-	2	-	--	--	--
10	CS23AIP701	Industry Internship	IP	-	-	-	-	2	--	50	50
Total				**19**	**1**	**3**	**23**	**21.5**	**240**	**610**	**850**
Note: One Domain Specific Expert Lecture is mandatory requirement for the Semester											

B. Tech. – IV Year II Semester

S. No	Course Code	Course Name	Category	Contact Periods per Week				Credits	Scheme of Examination Max. Marks		
				L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1	CS23AIP801	Internship	IP	-	-	-	-	4	--	100	100
2	CS23APW801	Project	PW	-	-	-	-	8	60	140	200
Total				**-**	**-**	**-**	**-**	**12**	**60**	**240**	**300**

LIST OF OPEN ELECTIVE COURSES

Open Elective-I

Course Code	Course Name	Offering Dept.
CE23AOE501	Construction Technology and Management	CE
CE23AOE502	Green Buildings	CE
CS23AOE501	Principles of Operating Systems	CSE
AM23AOE501	Artificial Intelligence Tools and Techniques	CSM
AM23AOE502	Introduction to Artificial Intelligence	CSM
CY23APC301	Computer Networks	CSC
DS23AOE501	Data Analysis with R Programming	CSD
IT23AOE501	Web Programming Concepts	IT
EC23AOE501	Electronic Circuits	ECE
EE23AOE501	Electrical Safety Practices and Standards	EEE
ME23AOE501	Sustainable Energy Technologies	ME
BA23AOE501	Entrepreneurship and Venture Creation	MBA
EG23AOE501	Academic Writing and Public Speaking	English
MA23AOE501	Mathematics for Machine Learning and AI	Mathematics
PH23AOE501	Materials Characterization Techniques	Physics
CH23AOE501	Chemistry of Energy Systems	Chemistry

Open Elective-II

Course Code	Course Name	Offering Dept.
CE23AOE601	Disaster Management	CE
CE23AOE602	Sustainability in Civil Engineering Practice	CE
CS23AOE601	Fundamentals of Object Oriented Analysis and Design	CSE
CS23AOE602	Java Programming	CSE
AM23AOE601	Machine Learning Concepts	CSM
CY23AOE601	Introduction to Cryptography and Network Security	CSC
DS23AOE601	Introduction to Social Media Mining	CSD
IT23APC401	Software Engineering	IT
EC23AOE601	Digital Electronics	ECE
EE23AOE601	Renewable Energy Sources	EEE
ME23AOE601	Drone Technology	ME
ME23AOE602	System Design for Sustainability	ME
BA23AOE601	Business Communication Skills	MBA
EG23AOE601	English for Competitive Examinations	English
MA23AOE601	Mathematical Foundation of Quantum Technologies	Mathematics
MA23ABS403	Optimization Techniques	Mathematics
PH23AOE601	Physics of Electronic Materials and Devices	Physics
CH23AOE601	Chemistry of Polymers and Applications	Chemistry

Open Elective-III and IV

Course Code	Course Name	Offering Dept.
CE23AOE701	Building Materials and Services	CE
CE23APE502	Environmental Impact Assessment	CE
CE23AOE702	Geospatial Technologies	CE
CE23AOE703	Smart Cities	CE
CE23AOE704	Solid Waste Management	CE
CS23AOE701	Introduction to Data Base Management Systems	CSE
CS23APE604	Quantum Computing	CSE
AM23AOE701	AI Prompt Engineering	CSM
AM23AOE702	Artificial Intelligence and Machine Learning	CSM
AM23AOE703	Introduction to Deep Learning	CSM
CY23AOE701	Fundamentals of Blockchain Technology	CSC
CY23AOE702	Fundamentals of Cyber Security	CSC
CY23AOE703	Fundamentals of Ethical Hacking	CSC
DS23AOE701	Data Analysis and Visualization	CSD
DS23AOE702	Fundamentals of Data Science	CSD
IT23APC501	Cloud Computing	IT
IT23APE501	Internet of Things	IT
EC23AOE701	Fundamentals of Digital Image Processing	ECE
EC23APC504	Microprocessors and Microcontrollers	ECE
EC23AOE702	Transducers and Sensors	ECE
EE23AOE701	Electric Vehicles	EEE
EE23AOE702	Energy Audit, Conservation and Management	EEE
EE23AOE703	Smart Grid Technologies	EEE
ME23AOE701	3D Printing Technologies	ME
ME23APE706	Automation and Robotics	ME
ME23APE710	Total Quality Management	ME
BA23AOE701	Business Development	MBA
BA23AOE702	Techno Marketing	MBA
EG23AOE701	Employability Skills	English
EG23AOE702	Life Skills	English
EG23AOE703	Literary Vibes	English
MA23AOE701	Financial Mathematics	Mathematics
MA23AOE702	Wavelet Transforms: Theory and Applications	Mathematics
PH23AOE701	Introduction to Quantum Mechanics	Physics
PH23AOE702	Sensors and Actuators for Engineering Applications	Physics
PH23AOE703	Smart Materials and Devices	Physics
CH23AOE701	Biology for Engineers	Chemistry
CH23AOE702	Chemistry of Nanomaterials and Applications	Chemistry
CH23AOE703	Green Chemistry and Catalysis for Sustainable Environment	Chemistry

HONORS DEGREE and MINOR DEGREE

In addition to the Major Degree, Students have an opportunity to pursue either Minor or Honors Degrees, subject to the eligibility criteria specified in Academic Regulations, Point No.: 22 & 23.

Honors Degree: An Honors degree is awarded to students who complete an additional 18 credits of coursework within the same discipline, reflecting extended learning and academic depth.

HONOR DEGREE IN COMPUTER SCIENCE AND ENGINEERING

S. No	Year & Sem.	Course Code	Course Name	Contact Periods per Week				Credits	Scheme of Examination Max. Marks		
				L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1	III-I (2 Theory)	CS23AHN501	Computational Geometry	3	-	-	3	3	30	70	100
2		CS23AHN502	Graph Theory and Network Algorithms	3	-	-	3	3	30	70	100
3		CS23AHN503	No SQL Databases	3	-	-	3	3	30	70	100
4	III-II (2 Theory)	CS23AHN601	Cloud Security	3	-	-	3	3	30	70	100
5		CS23AHN602	Distributed Databases	3	-	-	3	3	30	70	100
6		CS23AHN603	Software Defined Data Centre	3	-	-	3	3	30	70	100
7	IV-I (1 Theory)	CS23AHN701	Quantum Computing	3	-	-	3	3	30	70	100
8		CS23AHN702	Robotics and Intelligent Systems	3	-	-	3	3	30	70	100
9	IV-I	CS23AHN703	Capstone Project in Computer Science and Engineering	-	-	-	-	3	50	50	100
Total				**15**	**-**	**-**	**15**	**18**	**200**	**400**	**600**

Minor Degree: A Minor degree is awarded to students who complete an additional 18 credits of coursework in a discipline other than their parent discipline, demonstrating interdisciplinary learning.

Award of Degree:
B.Tech. in [Major Discipline] with Minor in [Other than Major Discipline/Emerging Technology Area]

MINOR DEGREES OFFERED UNDER SVCE R23 REGULATIONS

S. No	Host Department	Title of the Minor	Eligible Branches
1	CE	Civil Engineering	All branches except CE
2		Building Planning and Construction Technology	All branches except CE
3	CSE	Computer Science and Engineering	EEE, ECE, CE, ME
4		Programming and Computational Intelligence	All branches except CSE
5		Quantum Computing	All branches
6		Quantum Technologies	All branches
7	CSM	Artificial Intelligence and Machine Learning	All branches except CSM
8		AI Applications and Emerging Technologies	All branches except CSM
9	CSC	Cyber Security	All branches except CSC
10	CSD	Data Science	All branches except CSD
11		Data Analytics	All branches except CSD
12		Data Science and Analytics	All branches except CSD
13	ECE	Electronics and Communication Engineering	All branches except ECE
14		Embedded Systems and IoT	All branches except ECE
15		Electronic Systems	All branches except ECE
16	EEE	Electrical and Electronics Engineering	All branches except EEE
17		Energy Systems and Microgrid Technologies	All branches except EEE
18	IT	Information Technology	EEE, ECE, CE, ME
19		Internet of Things	All branches
20	ME	Mechanical Engineering	All branches except ME
21		3D Printing	All branches except ME
22		Industrial Engineering	All branches except ME
23	Management Studies	Business Management and Entrepreneurship	All branches

Note: Students who have already completed any course listed under the Minor Degree as part of their regular curriculum are not eligible to opt for the same course(s) again under the Minor Degree program. It is the student's responsibility to ensure that all necessary prerequisites are completed prior to registering for a course under the Minor Degree.

I Year B.Tech. – I Semester

L	T	P	C
3	-	-	3

(ME23AES101) BASIC CIVIL & MECHANICAL ENGINEERING

PART A: BASIC CIVIL ENGINEERING

COURSE OBJECTIVES:
The objectives of this course are to:
- Get familiarized with basic Construction Materials; the scope and importance of Civil Engineering specializations.
- Introduce the preliminary concepts of Structural and Geotechnical Engineering.
- Acquire preliminary knowledge on Surveying and Transportation Engineering.
- Get familiarized with the importance of Water Resources and Environmental Engineering.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:
- **CO 1:** Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society and the basic characteristics of Construction Materials.
- **CO 2:** Gain knowledge regarding Structural and Geotechnical Engineering.
- **CO 3:** Explain the concepts of surveying and Transportation Engineering, Water Resources and Environmental Engineering.

UNIT I: (8 Periods)
Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-Technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering- Scope of each discipline.
Construction Materials - Cement – Sand - Aggregate - Bricks- Cement concrete – Steel - Timber.

UNIT II: (7 Periods)
Structural Engineering: Importance- Types of Structures and structural Members- Building Components –Building Planning principles.
Geotechnical Engineering: Types of Foundations-Functions and Requirement of a good foundation

UNIT III: (8 Periods)
Surveying & Transportation Engineering: Objectives and Principles of Surveying- Instruments used in Surveying-Importance of Transportation in Nation's economic development- Modes of Transportation- Types of Highway Pavements- Flexible Pavements and Rigid Pavements -Traffic signals and signs.
Water Resources and Environmental Engineering: Introduction to Hydrology– hydrological cycle- Sources of water- Quality of water- Specifications- Rainwater Harvesting- Water Storage and Conveyance Structures- Dams and Reservoirs-types and components.

TEXT BOOKS:
1. M.S. Palanichamy, Basic Civil Engineering, Tata McGraw Hill Education Pvt. Ltd., 4th Edition, 2011.
2. S.S. Bhavikatti, Introduction to Civil Engineering, New Age International Publishers, 1st Edition , 2022.

REFERENCES:
1. S.K. Duggal, Surveying, Vol I & Vol II, Tata McGraw Hill Publishers, 5th Edition, 2019.
2. Santosh Kumar Garg, Hydrology and Water Resources Engineering, Khanna Publishers, Delhi, 1st Edition, 2016.

3. Santosh Kumar Garg, Irrigation Engineering and Hydraulic Structures, Khanna Publishers, Delhi, 38th Edition, 2023.
4. S.K. Khanna, C.E.G. Justo, Veeraraghavan, Highway Engineering, Nemchand & Brothers Publications, 10th Edition, 2019.
5. Bureau of Indian Standards (BIS), IS 10500:2012 – Indian Standard Drinking Water Specification, 2012.
6. Satheesh Gopi, Basic Civil Engineering, Pearson Publications, 1st Edition, 2009.

PART B: BASIC MECHANICAL ENGINEERING

COURSE OBJECTIVES:

The objectives of this course are to:

- Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
- Understand and familiarize the different engineering materials and different manufacturing processes.
- Get an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand the different manufacturing processes.
CO 2: Explain the basics of thermal engineering and its applications.
CO 3: Describe the working of different mechanical power transmission systems and power plants and describe the basics of robotics and its applications.

UNIT I: (7 Periods)

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in Different Sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine Sectors.

Engineering Materials: Metals-Ferrous and Non-Ferrous, Ceramics, Composites, Smart Materials.

UNIT II: (8 Periods)

Manufacturing Processes: Principles of Casting, Forming, Joining Processes, Machining, Introduction to CNC Machines, 3D Printing, and Smart Manufacturing.

Thermal Engineering – Working Principle of Boilers, Otto Cycle, Diesel Cycle, Refrigeration and Air-Conditioning Cycles, IC Engines, 2-Stroke and 4-Stroke Engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT III: (7 Periods)

Power Plants – Working Principle of Steam, Diesel, Hydro, Nuclear Power Plants.

Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

Introduction to Robotics - Joints & Links, Configurations and Applications of Robotics.

Total Periods: 45

TEXT BOOKS:

1. V. Ganesan, Internal Combustion Engines, Tata McGraw-Hill Education Pvt. Ltd., 4th Edition, 2012.
2. S.S. Rattan, A Textbook of Theory of Machines, Tata McGraw Hill Publications (India) Pvt. Ltd., 4th Edition, 2017.

REFERENCES:

1. Appuu K.K., Robotics, I.K. International Publishing House Pvt. Ltd., 3rd Edition, 2007.
2. L. Jyothish Kumar, Pulak M. Pandey, David Ian Wimpenny, 3D Printing and Additive Manufacturing Technologies, Springer Singapore, 1st Edition, 2019.

3. Mahesh M. Rathore, Thermal Engineering, Tata McGraw-Hill Education, 1st Edition, 2010.
4. G. Shanmugam and M.S. Palanisamy, Basic Civil and Mechanical Engineering, Tata McGraw Hill Education (India) Pvt. Ltd., 4th Edition, 2018.

I Year B.Tech. – I Semester

L	T	P	C
1	-	4	3

(ME23AES102) ENGINEERING GRAPHICS

COURSE OBJECTIVES:
The objectives of this course are to:

- Enable with various concepts like dimensioning, conventions and standards related to engineering drawing.
- Impart knowledge on the projection of points, lines and plane surfaces.
- Improve the visualization skills for better understanding of projection of solids.
- Develop the imaginative skills required to understand section of solids and developments of surfaces.
- Draw the viewing perception of a solid object in isometric and orthographic projections.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:

CO 1: Draw various engineering curves, scales.
CO 2: Draw and Interpret orthographic projections of points, lines, planes.
CO 3: Draw the projection of solids in various positions.
CO 4: Draw and Explore the sections of solids and development of surfaces.
CO 5: Draw an isometric and orthographic views of simple solids.

UNIT I: (2 Periods and 8 Practical's)
Introduction to Engineering Drawing: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing Regular Polygons by General Methods.
Curves: Construction of Ellipse, Parabola and Hyperbola by General Method, Cycloids, Involutes, Normal and Tangent to Curves.
Scales: Plain Scales, Diagonal Scales and Vernier Scales.

UNIT II: (3 Periods and 12 Practical's)
Orthographic Projections: Reference Plane, Importance of Reference Lines or Plane, Projections of a Point Situated in any One of the Four Quadrants.
Projections of Straight Lines: Projections of Straight Lines Parallel to both Reference Planes, Perpendicular to One Reference Plane and Parallel to other Reference Plane, Inclined to one Reference Plane and Parallel to the other Reference Plane. Projections of Straight Line Inclined to both the Reference Planes.
Projections of Planes: Regular Planes Perpendicular to both Reference Planes, Parallel to One Reference Plane and Inclined to the other Reference Plane; Plane Inclined to both the Reference Planes.

UNIT III: (3 Periods and 12 Practical's)
Projections of Solids: Types of Solids: Polyhedra and Solids of Revolution. Projections of Solids in Simple Positions: Axis Perpendicular to Horizontal Plane, Axis Perpendicular to Vertical Plane and Axis Parallel to both the Reference Planes, Projection of Solids with Axis Inclined to One Reference Plane and Parallel to another Plane, Projection of Solids Inclined to both the Reference Planes.

UNIT IV: (3 Periods and 12 Practical's)
Sections of Solids: Perpendicular and Inclined Section Planes, Sectional Views and True Shape of Section, Sections of Solids in Simple Position only.
Development of Surfaces: Methods of Development: Parallel Line Development and Radial Line Development. Development of a Cube, Prism, Cylinder, Pyramid and Cone.

UNIT V: (4 Periods and 16 Practical's)
Conversion of Views: Conversion of Isometric Views to Orthographic Views of Simple Solids;

Conversion of Orthographic Views to Isometric views of Simple Solids.
Computer Graphics: Creating 2D&3D Drawings of Objects Including Domain Specific Engineering Applications using Auto CAD (Not for end examination).

Total Periods: 15 Periods and 60 Practical's

TEXT BOOKS:

1. K.L. Narayana and P. Kannaiah, Engineering Drawing, Tata McGraw Hill, 1st Edition, 2013.
2. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 54th Edition, 2023.

REFERENCES:

1. M.B.Shah and B.C. Rana, Engineering Drawing, Pearson Education Inc, 1st Edition, 2009.
2. Dhananjay Jolhe, Engineering Drawing with an Introduction to AutoCAD, Tata McGraw-Hill, 2017.
3. K. Venugopal, Engineering Drawing and Graphics, New Age Publishers, 4th Edition, 2004.
4. Basant Agarwal, C.M. Agarwal, Engineering Drawing, Tata McGraw-Hill, 2nd Edition, 2013.

I Year B.Tech. – I Semester

L	T	P	C
3	-	-	3

(PH23ABS101) ENGINEERING PHYSICS

COURSE OBJECTIVES:
The objectives of this course is to:

- Bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:

CO 1: Understand the intensity variation of light due to interference, diffraction and polarization.
CO 2: Apply the basic concepts of crystal structures and X-ray diffraction to study the behavior of materials for engineering applications.
CO 3: Summarize the fundamental properties of dielectric and magnetic materials for engineering applications.
CO 4: Analyze the properties of quantum particles to interpret the energy band formation and classification of solids
CO 5: Assess the current flow mechanism to understand the transport phenomenon of charge carriers in semiconductors.

UNIT I: (10 Periods)
Wave Optics Interference: Introduction - Principle of superposition –Interference of light Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index. Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).
Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT II: (8 Periods)
Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.
X- ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods.

UNIT III: (10 Periods)
Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative)
- Lorentz internal field - Clausius- Mossotti equation – Frequency dependence of polarization – dielectric loss.
Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization- Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro &Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Applications of magnetic materials.

UNIT IV: (9 Periods)
Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle –

Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.
Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution
- Density of states - Fermi energy

UNIT V: (8 Periods)
Semiconductors: Formation of energy bands – classification of solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers (Qualitative) – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effect and its applications - Direct and indirect bandgap semiconductors and its applications.

Total Periods: 45

TEXT BOOKS:
1. M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, A Text book of Engineering Physics, S. Chand Publications, 11th Edition 2019.
2. D.K. Bhattacharya, Poonam Tandon, Engineering Physics, Oxford University Press, 1st Edition, 2015.

REFERENCES:
1. B.K. Pandey, S. Chaturvedi, Engineering Physics, Cengage Learning, 1st Edition, 2021.
2. Shatendra Sharma, Jyotsna Sharma, Engineering Physics, Pearson Education, 1st Edition, 2018.
3. Sanjay D. Jain, D. Sahasrabudhe, Girish, Engineering Physics, University Press, 1st Edition, 2010
4. M.R. Srinivasan, Engineering Physics, New Age International Publishers, 1st Edition, 2009.

ONLINE RESOURCES:
1. https://www.loc.gov/rr/scitech/selected-ternet/physics.html

I Year B.Tech. – I Semester

L	T	P	C
3	-	-	3

(CS23AES101) INTRODUCTION TO PROGRAMMING

COURSE OBJECTIVES:
The objectives of this course are to:
- Learn how to solve a given problem.
- Illustrate the basic concepts of C programming language.
- Discuss the concepts of Functions, Arrays, Pointers and Structures.
- Familiarize with dynamic memory allocation concepts.
- Apply concepts of structures and files to solve real word problems.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:
CO 1: Solve computational problems.
CO 2: Select the features of C language appropriate for solving a problem.
CO 3: Design computer programs for real world problems.
CO 4: Organize the data which is more appropriated for solving a problem.
CO 5: Understanding the basic concept of structures and file handling.

UNIT I: (10 Periods)
Introduction to Problem Solving: Problem Solving Aspect, Problem Identification, Problem Understanding, Algorithm Development, Solution Planning, characteristics of algorithm, Top-down approach, Bottom-up approach, Time and space complexities of algorithms, Flowchart. Overview of C: History of C, C Language Elements, Basic Structure of C Program, C Tokens-Variables and Data Types, Operators, Expressions and Type Conversions.

UNIT II: (8 Periods)
Control Statements: Selection Statements- if and switch statements.
Iterative Statements: for, while and do-while statements.
Jump Statements: break, continue, go to statements.

UNIT III: (8 Periods)
Arrays: Declaration, accessing array elements, Storing values, Operations on arrays, multi-dimensional arrays.
Functions: Introduction, Using Functions, Function declaration, Function definition and Function call, Parameter passing, Passing arrays to functions, Recursion, Storage classes.

UNIT IV: (10 Periods)
Pointers: Declaration and Initialization of pointer variables, Pointer arithmetic, Pointers and arrays, Pointer to pointer, Array of pointers, Pointers and functions, Dynamic Memory Allocation.
Strings: Introduction to Strings, String handling functions, Preprocessor Directives.

UNIT V: (9 Periods)
Structures: Introduction, Nested Structures, Array of Structures, Structures and Functions, Unions.
Files in C: Using Files in C, read data from Files, Writing data to Files, Random access to files, Command-line Arguments

Total Periods: 45

TEXT BOOKS:
1. B. A. Forouzan and R. F. Gilberg, Computer Science: A Structured Programming Approach Using C, 3/e, Cengage Learning, 2007.

2. M.T. Somashekara, D.S. Guru, K.S. Manjunatha, Problem Solving with C, PHI Learning Pvt. Ltd., 2nd Edition, 2018.

REFERENCES:

1. Jeri R. Hanly, Ellot B. Koffman, Problem Solving and Program Design in C, 5/e, Pearson
2. Brian W Kernighan and Dennis M Ritchie, The C Programming Language, Second Edition, Prentice Hall Publication.
3. Reema Thareja, Programming in C, Oxford University Press, AICTE Edition, 2018.
4. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.

I Year B.Tech. – I Semester

L	T	P	C
3	-	-	3

(MA23ABS101) LINEAR ALGEBRA & CALCULUS

COURSE OBJECTIVES:
The objectives of this course are to:

- Illuminate the students in the concepts of calculus and linear algebra.
- Equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:

CO 1: Understanding the concepts of matrix algebra techniques to solve the system of linear equations.
CO 2: Develop the use of matrix algebra techniques that is needed by engineers for practical applications.
CO 3: Apply mean value theorems to solve real life problems in engineering.
CO 4: Make use of partial differentiation to solve optimization problems.
CO 5: Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.

UNIT I: (8 Periods)
Matrices: Rank of a matrix by echelon form, normal form, Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

UNIT II: (10 Periods)
Eigenvalues, Eigenvectors and Orthogonal Transformation: Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley- Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley- Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT III: (7 Periods)
Calculus: Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

UNIT IV: (10 Periods)
Partial differentiation and Applications (Multi variable calculus): Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT V: (10 Periods)
Multiple Integrals (Multi variable Calculus): Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Total Periods: 45

TEXT BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers,2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

REFERENCES:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. GlynJames, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.
4. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education
5. H. k Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand.
6. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press.

I Year B.Tech. – I Semester

L	T	P	C
-	-	3	1.5

(CS23AES102) COMPUTER PROGRAMMING LAB

COURSE OBJECTIVES:
The objectives of this course are to:

- Use basic data types, operators, expressions and expression evaluation mechanisms using C Programming Language.
- Implement control flows, construct in C Programming Language and understand the syntax, semantics and usability contexts of these different constructs.
- Develop composite data types in C and constructs available to develop their datatypes, utilize them to model things and dealing with data from and to external files.
- Design programs with different variations of the constructs available for practicing modular programming and understand the pros and cons of using different variants and apply optimization.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:

CO 1: Read, understand and trace the execution of programs written in C language.
CO 2: Select the right control structure for solving the problem.
CO 3: Develop C programs which utilize the memory efficiently using programming constructs like pointers.
CO 4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

WEEK 1:
Objective: Getting familiar with the programming environment on the computer and writing the first program.
Activities:
Tutorial 1: Problem-solving using Computers.
Lab1: Familiarization with programming environment

- Basic Linux environment and its editors like Vi, Vim & Emacs etc.
- Exposure to Turbo C, gcc.
- Writing simple programs using printf (), scanf ()

WEEK 2:
Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.
Activities:
Tutorial 2: Problem-solving using Algorithms and Flow charts.
Lab 1: Converting algorithms/flow charts into C Source code. Developing the algorithms/flowcharts for the following sample programs

- Sum and average of 3 numbers
- Conversion of Fahrenheit to Celsius and vice versa
- Simple interest calculation

WEEK 3:
Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.
Activities:
Tutorial 3: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions.

- Finding the square root of a given number
- Finding compound interest

- Area of a triangle using heron's formulae
- Distance travelled by an object

WEEK 4:
Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.
Activities:
Tutorial 4: Operators and the precedence and as associativity:
Lab 3: Simple computational problems using the operator precedence and associativity

i) Evaluate the following expressions.
   a. A+B*C+(D*E) + F*G
   b. A/B*C-B+A*D/3
   c. A+++B---A
   d. J= (i++) + (++i)

ii) Find the maximum of three numbers using conditional operator.
iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5:
Objective: Explore the full scope of different variants of "if construct" namely if- else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".
Suggested Experiments/Activities:
Tutorial 5: Branching and logical expressions:
Lab 4: Problems involving if-then-else structures.

i. Write a C program to find the max and min of four numbers using if-else.
ii. Write a C program to generate electricity bill.
iii. Find the roots of the quadratic equation.
iv. Write a C program to simulate a calculator using switch case.
v. Write a C program to find the given year is a leap year or not.

WEEK 6:
Objective: Explore the full scope of iterative constructs namely while loop, do- while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.
Activities:
Tutorial 6: Loops, while and for loops
Lab 5: Iterative problems e.g., the sum of series

i. Find the factorial of given number using any loop.
ii. Find the given numberis a prime or not.
iii. Compute sine and cos series.
iv. Checking a number palindrome.
v. Construct a pyramid of numbers.

WEEK 7:
Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.
Activities:
Tutorial 7: 1 D Arrays: searching.
Lab 6:1D Array manipulation, linear search

i. Find the min and max of a 1-D integer array.
ii. Perform linear search on1Darray.
iii. The reverse of a 1D integer array
iv. Find 2's complement of the given binary number.
v. Eliminate duplicate elements in an array.

WEEK 8:
Objective: Explore the difference between other arrays and character arrays that can be

used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

Lab 7: Matrix problems, String operations, Bubble sort

i. Addition of twomatrices
ii. Multiplication two matrices
iii. Sort array elements using bubble sort
iv. Concatenate two strings without built-in functions
v. Reverse a string using built-in and without built-in string functions

WEEK 9:

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration Activities:

Tutorial 9: Functions, call by value, scope and extent,

Lab 8: Simple functions using call by value, solving differential equations using Eulers theorem

i. Write a C function to calculate NCR value
ii. Write a C function to find the length of a string
iii. Write a C function to transpose of a matrix
iv. Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 10:

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Activities:

Tutorial 10: Recursion, the structure of recursive calls

Lab 9: Recursive functions

i. Write a recursive function to generate Fibonacci series
ii. Write a recursive function to find the lcm of two numbers
iii. Write arecursive function to find the factorial of a number
iv. Write a C Program to implement Ackermann function using recursion
v. Write a recursive function to find the sum of series.

WEEK 11:

Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers
Activities:

Tutorial 11: Call by reference, dangling pointers

Lab 10: Simple functions using Call by reference, Dangling pointers

i. Write a C program to swap two numbers using call by reference
ii. Demonstrate Dangling pointer problem using a C program
iii. Write a C program to copy one string into another using pointer
iv. Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

WEEK 12:

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C.

Suggested Experiments/Activities:

Tutorial 12: Pointers, structures and dynamic memory allocation

Lab 11: Pointers and structures, memory dereference.

i. Write a C program to find the sum of a 1D array using malloc()

ii. Write a C program to find the total, average of n students using structures
iii. Enter n students data using calloc() and display failed students list
iv. Read student name and marks from the command line and display the student details along with the total.
v. Write a C program to implement realloc()

WEEK 13:
Objective: Experiment with C Structures, Unions, bit fields and nested structures
Activities:
Tutorial 13: Bit fields, Self-Referential Structures, Linked lists
Lab 12: Bit fields, linked lists Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

i. Demonstrate the differences between structures and unions using a C program
ii. Write a C program to shift/rotate using bitfields.
iii. Write a C program to copy one structure variable to another structure of the same type.

WEEK14:
Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.
Activities:
Tutorial 14: File handling
Lab 13: File operations

i. Write a C program to write and read text into a file.
ii. Write a C program to write and read text into a binary file using fread() and fwrite().
iii. Copy the contents of one file to another file.
iv. Write a C program to merge two files into the third file using command-line arguments.
v. Find no. of lines, words and characters in a file
vi. Write a C program to print last n characters of a given file.

TEXT BOOKS:

1. Ajay Mittal, Programming in C: A Practical Approach, Pearson, 1st Edition, 2007.
2. Byron S. Gottfried, Schaum's Outline of Programming with C, McGraw Hill, 2nd Edition, 1996.

REFERENCES:

1. Brian W. Kernighan, Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India, 2nd Edition, 1988.
2. Behrouz A. Forouzan, Richard F. Gilberg, Anita Prasad, C Programming: A Problem-Solving Approach, Cengage Learning, 1st Edition, 2008.

I Year B.Tech. – I Semester

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(PH23ABS102) ENGINEERING PHYSICS LAB

COURSE OBJECTIVES:

The objective of this course is to:

- Study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity, Hall effect in semiconductors, study the parameters and applications of dielectric and magnetic materials by conducting experiments.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Compare the wavelengths of different colours using diffraction grating.
CO 2: Utilize optical instruments like travelling microscope and spectrometer.
CO 3: Analyze the intensity of the magnetic field of circular coil carrying current with distance.
CO 4: Evaluate dielectric constant for a dielectric material.
CO 5: Estimate the band gap of a given semiconductor and the type of semiconductor using Hall effect.

List of Experiments:

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Determination of dielectric constant using charging and discharging method.
4. Study the variation of B versus H by magnetizing the magnetic material (B- H curve).
5. Determination of wavelength of Laser light using diffraction grating.
6. Estimation of Planck's constant using photoelectric effect.
7. Determination of the resistivity of semiconductors by four probe methods.
8. Determination of energy gap of a semiconductor using p-n junction diode.
9. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
10. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
11. Determination of temperature coefficients of a thermistor.
12. Sonometer: Verification of laws of stretched string.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

TEXT BOOKS:

1. S. Balasubramanian, M.N. Srinivasan, A Textbook of Practical Physics, S. Chand Publishers, 1st Edition, 2017.
2. D.K. Bhattacharya, Poonam Tandon, Engineering Physics, Oxford University Press, 1st Edition, 2015.

REFERENCES:

1. M.R. Srinivasan, Engineering Physics, New Age International Publishers, 1st Edition, 2009.
2. Sanjay D. Jain, D. Sahasrabudhe, Girish, Engineering Physics, University Press, 1st Edition, 2010.

ONLINE RESOURCES:

1. www.vlab.co.inhttps://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

I Year B.Tech. – I Semester

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(ME23AES103) ENGINEERING WORKSHOP

COURSE OBJECTIVES:

The objectives of this course are to:

- Identify and explain safety practices and precautions relevant to workshop activities.
- Recognize and differentiate various types of woods and tools used in woodwork.
- Demonstrate the ability to create different wood joints, including half-lap, mortise and tenon, and dovetail joints.
- Familiarize students with sheet metal working tools and techniques.
- Enable students to develop sheet metal projects such as tapered trays, conical funnels, elbow pipes and brazing.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Fabricate sheet metal components manually.
CO 2: Construct wood joints such as half-lap, mortise, and tenon.
CO 3: Assemble the components to create joints like a V-fit.
CO 4: Demonstrate the plumbing, welding, foundry, and fitting jobs to form the components.
CO 5: Connect & Check the basic house wiring circuit connections for various applications.

1. **Demonstration**: Safety Practices and Precautions to be Observed in the Workshop.
2. **Wood Working:** Familiarity with Different Types of Woods and Tools used in Wood Working and Making Following Joints.
    a) Half – Lap Joint
    b) Mortise and Tenon Joint
    c) Corner Dovetail Joint or Bridle Joint
3. **Sheet Metal Working**: Familiarity with Different Types of Tools used in Sheet Metal Working, Developments of Following Sheet Metal Job from GI Sheets.
    a) Tapered Tray
    b) Conical Funnel
    c) Elbow Pipe
    d) Brazing
4. **Fitting:** Familiarity with Different Types of Tools used in Fitting and do the Following Fitting Exercises.
    a) V-Fit
    b) Dovetail Fit
    c) Semi-Circular Fit
    d) Bicycle Tire Puncture and Change of Two-Wheeler Tyre
5. **Electrical Wiring**: Familiarity with Different Types of Basic Electrical Circuits and make the Following Connections.
    a) Parallel and Series
    b) Two-Way Switch
    c) Godown Lighting
    d) Tube Light
    e) Three Phase Motor
    f) Soldering of Wires
6. **Foundry Trade:** Demonstration and Practice on Moulding Tools and Processes, Preparation of Green Sand Moulds for Given Patterns.
7. **Welding Shop:** Demonstration and Practice on Arc Welding and Gas Welding. Preparation of Lap Joint and Butt Joint.
8. **Plumbing:** Demonstration and Practice of Plumbing Tools, Preparation of Pipe Joints with Coupling for Same Diameter and with Reducer for Different Diameters.

TEXT BOOKS:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge Publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

REFERENCES:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai, 2007, 14th edition.
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

I Year B.Tech. – I Semester

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(CS23AES103) IT WORKSHOP

COURSE OBJECTIVES:
The objectives of this course are to:

- Introduce the internal parts of a computer, peripherals, I/O ports, connecting cables.
- Teach basic command line interface commands on Linux.
- Teach the usage of Internet for productivity and self-paced life-long learning
- Introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:

CO 1: Perform Hardware troubleshooting.
CO 2: Understand Hardware components and inter dependencies.
CO 3: Safeguard computer systems from viruses/worms.
CO 4: Document/ Presentation preparation.
CO 5: Perform calculations using spreadsheets

Hardware:
Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheraland submit to your instructor.
Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.
Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.
Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web:
Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.
Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.
Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block activey downloads to avoid viruses and/or worms.

LaTeX and WORD:
Task 1: Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word

– Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.
Task 2: Using La TeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.
Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel:
Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.
Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text
Task 2: Calculating GPA - Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,
LOOKUP/VLOOKUP
Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean andlogical operators, Conditional formatting

Power Point:
Task 1: Students will be working on basic power point utilities and toolswhich help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrowsin PowerPoint.
Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art,Audio, Video, Objects, Tables and Charts.
Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI Tools – ChatGPT:
Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences
to see how the model completes them.
Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"
Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas
Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this newreality."
Task 3: Code Generation: Test the model's ability to generate code by giving it partial code snippets and asking it to complete them. You can also ask the model to explain programming concepts or help you debug code.
Ex: Prompt: "Complete the following Python code to swap the values of two variables:\npython\na = 5\nb = 10\ntemp = a\na = b\nb = temp\n"
Task 4: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it intoanother language. Compare the output to see how accurate and fluent the translations are.
Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Task 5: Summarization: Provide a long piece of text, such as an article or a blog post, and ask the model to summarize it. Compare the model's summary with the original text to assess its ability to condense information effectively.
Ex: Prompt: "Summarize the article titled 'Ramayanam' in 3-4 sentences."
Task 6: Futuristic Predictions: Have fun by asking the model to predict future technological advancements, societal changes, or even hypothetical scenarios. Compare its responses with your own ideas.
Ex: Prompt: "Predict how artificial intelligence will transform everyday life in the next 20 years."
Task 7: Technical Explanations: Challenge the model with technical questions from different domains. Ask it to explain scientific concepts, mathematical theorems, or complex algorithms in simple terms.
Ex: Prompt: "Explain the concept of neural networks in machine learning, including their layers and the process of backpropagation."

TEXT BOOKS:

1. Vikas Gupta, Comdex Information Technology Course Tool Kit, WILEY Dreamtech, 1st Edition, 2005.
2. Cheryl A. Schmidt, The Complete Computer Upgrade and Repair Text Book, Dreamtech Press, 3rd Edition, 2006.

REFERENCES:

1. ITL Education Solutions Limited, Introduction to Information Technology, Pearson Education, 2nd Edition, 2012.
2. Kate J. Chase, PC Hardware: A Handbook, Microsoft Press, 1st Edition, 2004.
3. Leslie Lamport, LaTeX: A Document Preparation System, Addison-Wesley, 2nd Edition, 1994.
4. David Anfinson, Ken Quamme, IT Essentials: PC Hardware and Software Companion Guide, Cisco Press, 3rd Edition, 2008.
5. Patrick Regan, IT Essentials: PC Hardware and Software Labs and Study Guide, Cisco Press, 3rd Edition, 2008.

I Year B.Tech. – I Semester

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(CH23ABS105) HEALTH AND WELLNESS, YOGA AND SPORTS

COURSE OBJECTIVES:

The objective of this course is to:

- Make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand the importance of yoga and sports for Physical fitness and sound health.
CO 2: Demonstrate an understanding of health-related fitness components.
CO 3: Compare and contrast various activities that help enhance their health.
CO 4: Assess current personal fitness levels.
CO 5: Develop Positive Personality.

UNIT I:

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

ii) Organizing health awareness programmes in community.
iii) Preparation of health profile.
iv) Preparation of chart for balance diet for all age groups.

UNIT II:

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas-Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III:

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho,Table tennis, Cricket etc. Practicing general and specific warm up, aerobics
ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

TEXT BOOKS:

1. Gordon Edlin, Eric Golanty, Health and Wellness, Jones & Bartlett Learning, 14th Edition, 2022.
2. T.K.V. Desikachar, The Heart of Yoga: Developing a Personal Practice, Inner Traditions, 1st Edition, 1995.

REFERENCES:

1. Archie J. Bahm, Yoga Sutras of Patanjali, Jain Publishing Company, 1st Edition, 1993.
2. John Lofty Wiseman, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere, William Morrow Paperbacks, 3rd Edition, 2014.
3. Thomas Hanlon, The Sports Rules Book, Human Kinetics, Inc., 3rd Edition, 2014.

I Year B.Tech. – II Semester

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(EE23AES101) BASIC ELECTRICAL & ELECTRONICS ENGINEERING

PART A: BASIC ELECTRICAL ENGINEERING

COURSE OBJECTIVES:

The objectives of this course are to:

- Gain the knowledge about various laws, simplification techniques and principles associated with electrical circuits.
- Acquire basic knowledge about the Electric machines, their principle of operation and the concept of measuring instruments.
- Understand the concept of Power Generation, Electricity Bill and Safety Measures.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Apply the knowledge of theorems/laws to analyze the simple AC and DC circuits.
CO 2: Illustrate the operating principles of various electrical machines and electrical measuring equipment's.
CO 3: Understand the basic concepts of electrical power generation, Electricity Bill and Safety Measures.

UNIT I: (8 Periods)

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT II: (7 Periods)

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone Bridge.

UNIT III: (7 Periods)

Energy Resources, Electricity Bill & Safety Measures Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity Bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

TEXT BOOKS:

1. D.C. Kulshreshtha, Basic Electrical Engineering, Tata McGraw Hill, 1st Edition, 2019.
2. P.V. Gupta, M.L. Soni, U.S. Bhatnagar, A. Chakrabarti, Power System Engineering, Dhanpat Rai & Co., 1st Edition, 2013.

REFERENCES:

1. D.P. Kothari, I.J. Nagrath, Basic Electrical Engineering, McGraw Hill, 4th Edition, 2019.
2. V.K. Mehta, Principles of Power Systems, S. Chand Technical Publishers, 1st Edition, 2020.

3. T.K. Nagsarkar, M.S. Sukhija, Basic Electrical Engineering, Oxford University Press, 1st Edition, 2017.
4. S.K. Bhattacharya, Basic Electrical and Electronics Engineering, Pearson Publications, 2nd Edition, 2018.

PART B: BASIC ELECTRONICS ENGINEERING

COURSE OBJECTIVES:

The objectives of this course are to:

- Understand the working principle of various electronic devices.
- Acquire knowledge on the operating conditions of a DC power supply system, amplifiers and general electronic instrumentation system.
- Learn basic techniques in the design of a logic circuit.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Apply the concept of science and mathematics to understand the working principles of electronic devices.
CO 2: Analyze the working principle of a DC power supply system and Amplifiers.
CO 3: Solve digital logic circuits and implement using different logic gates.

UNIT I: (7 Periods)

Semiconductor Devices: Introduction - Evolution of electronics - Characteristics of PN Junction Diode - Zener Effect- Zener Diode and its Characteristics. Bipolar Junction Transistor - CB, CE, CC Configurations and Characteristics - Elementary Treatment of Small Signal CE Amplifier.

UNIT II: (8 Periods)

Basic Electronic Circuits and Instrumentation: Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple Zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT III: (8 Periods)

Digital Electronics: Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only).

Total Periods: 45

TEXT BOOKS:

1. R.L. Boylestad, Louis Nashelsky, Electronic Devices & Circuit Theory, Pearson Education, 11th Edition, 2021.
2. R.P. Jain, Modern Digital Electronics, Tata McGraw Hill, 4th Edition, 2009.

REFERENCES:

1. R.S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co., 1st Edition, 2010.
2. Santiram Kal, Basic Electronics: Devices, Circuits and IT Fundamentals, Prentice Hall India, 1st Edition, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

I Year B.Tech. – II Semester

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(EG23AHS101) COMMUNICATIVE ENGLISH

COURSE OBJECTIVES:

The objectives of this course are to:

- Facilitate effective listening, Reading, Speaking and Writing skills among the students.
- Enhance the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary.
- Make them effective in speaking and writing skills and to make them industry ready.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand the context, topic, and pieces of specific information from socialor Transactional dialogues.
CO 2: Apply grammatical structures to formulate and correct word forms.
CO 3: Analyze discourse markers to speak clearly on a specific topic in informal discussions.
CO 4: Evaluate reading/listening texts and write summaries based on global comprehension of these texts.
CO 5: Create a coherent paragraph, essay, and resume.

UNIT I: **(6 Periods)**

Lesson: HUMAN VALUES: The Gift of the Magi (Short Story)
Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information. Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.
Grammar: Parts of Speech, Basic Sentence Structures-forming questions.
Writing: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT II: **(7 Periods)**

Lesson: NATURE: The Brook by Alfred Tennyson (Poem)
Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Structure of a paragraph - Paragraph writing (specific topics)
Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.
Vocabulary: Homonyms, Homophones, Homographs.

UNIT III: **(6 Periods)**

Lesson: BIOGRAPHY: Elon Musk
Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.
Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.

Writing: Summarizing, Note-making, paraphrasing.
Grammar: Verbs - tenses; subject-verb agreement; Compound words, Collocations.

Vocabulary: Compound words, Collocation.

UNIT IV: **(5 Periods)**

Lesson: INSPIRATION: The Toys of Peace by Saki
Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading: Studying the use of graphic elements in texts to convey information, reveal trends / patterns / relationships, communicate processes or display complicated data.
Writing: Letter Writing: Official Letters, Resumes
Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice.
Vocabulary: Words often confused, Jargons.

UNIT V: **(6 Periods)**

Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)
Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts
Reading: Reading comprehension.
Grammar: Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement).
Vocabulary: Technical Jargons

Total Periods: 30

TEXT BOOKS:

1. Pathfinder: Communicative English for Undergraduate Students, Orient Black Swan, 1st Edition, 2023.
2. Empowering Cengage Publications, Empowering with Language, Cengage Learning, 1st Edition, 2023.

REFERENCES:

1. Sham Ji Dubey, English for Engineers, Vikas Publishers, 1st Edition, 2020.
2. Stephen Bailey, Academic Writing: A Handbook for International Students, Routledge, 1st Edition, 2014.
3. Raymond Murphy, English Grammar in Use, Cambridge University Press, 4th Edition, 2019.
4. Norman Lewis, Word Power Made Easy: The Complete Handbook for Building a Superior Vocabulary, Anchor, 1st Edition, 2014.

ONLINE RESOURCES:

Grammar:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

Vocabulary:

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

I Year B.Tech. – II Semester

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(CS23APC201) DATA STRUCTURES

COURSE OBJECTIVES:
The objectives of this course are to:
- Familiarize with basic techniques of algorithm analysis.
- Familiarize Stacks, Queues using Arrays and Linked List.
- Understand Searching and Sorting techniques.
- Learn the concepts of different types of trees and its operations.
- Familiarize with graph algorithms.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:
- **CO 1:** Analyze the problems using asymptotic notations.
- **CO 2:** Apply Stack, Queues and linked list to solve different applications.
- **CO 3:** Demonstrate suitable sorting techniques for the real world problem.
- **CO 4:** Implement tree structures in different patterns of representation of data.
- **CO 5:** Analyze the given problem using graph traversal techniques.

UNIT I: (8 Periods)
Introduction to Linear Data Structures: Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Insertion Sort, Merge Sort, Quick Sort.

UNIT II: (10 Periods)
Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

UNIT III: (10 Periods)
Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.
Queues: Introduction to queues: Introduction to queues: properties and operations, Implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc

UNIT IV: (9 Periods)
Deque: Introduction to deque (double-ended queues), Operations on deque and their applications.
Trees: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal, AVL Trees, Heap Sort

UNIT V: (8 Periods)
Graph Theory: Graphs Terminology, Graph ADT, Data Structures for Graphs- Adjacency Matrix Structure, Graph Traversals, Shortest Paths, Minimum Spanning Trees- Prims' Algorithm, Kruskal's Algorithm.
Hashing: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.

Total Periods: 45

TEXT BOOKS:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Pearson, 2nd Edition, 2002.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, Introduction to Algorithms, PHI, 3rd Edition, 2010.

REFERENCES:

1. Horowitz, Sahani, Anderson-Freed,Fundamental of Data Structures in C, Universities Press. 2nd Edition, 2008.
2. Debasis Samantha, Classic Data Structures, PHI, 2nd Edition, 2009.
3. Narasimha Karumanchi, Data Structures and Algorithms Made Easy, Career Monk Publications, 1st Edition, 2020.

I Year B.Tech. – II Semester

L	T	P	C
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(MA23ABS201) DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

COURSE OBJECTIVES:
The objectives of this course are to:

- Enlighten the learners in the concept of differential equations and multivariable calculus.
- Furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:

CO 1: Familiarize to solve the first and higher order differential equations.
CO 2: Apply the knowledge of linear differential equations related to various engineering fields.
CO 3: Identify solution methods for partial differential equations that model physical processes.
CO 4: Interpret the physical meaning of different operators such as gradient, curl and divergence.
CO 5: Evaluate the work done by force field, circulation and transformation between single, double and triple integrals using vector calculus.

UNIT I: (8 Periods)
Differential Equations: Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay, Electrical circuits.

UNIT II: (10 Periods)
Linear Differential Equations of Higher Order: Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT III: (10 Periods)
Partial Differential Equations: Introduction, Formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogenous linear Partial Differential equations with constant coefficients.

UNIT IV: (8 Periods)
Vector Differentiation: Scalar and vector point functions, vector operator Del, Del applies to scalar point functions, Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT V: (9 Periods)
Vector Integration: Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

Total Periods: 45

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. HH Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2011.

REFERENCES:

1. Dennis G. Zill, Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 1st Edition, 2011.
2. Michael Greenberg, Advanced Engineering Mathematics, Pearson, 2nd Edition, 2018.
3. George B. Thomas, Maurice D. Weir, Joel Hass, Thomas Calculus, Pearson Publishers, 13th Edition, 2013.
4. R.K. Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Alpha Science International Ltd., 3rd Edition, 2002.
5. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education, 1st Edition.
6. H.K. Dass, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand, 1st Edition2014.
7. N. Bali, M.Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press,2007.

I Year B.Tech. – II Semester

L	T	P	C
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(CH23ABS101) CHEMISTRY

COURSE OBJECTIVES:
The objectives of this course are to:
- Familiarize engineering chemistry and its applications.
- Train the students on the principles and applications of electrochemistry and polymers.
- Introduce instrumental methods

COURSE OUTCOMES:
At the end of the course, the students will be able to:
- **CO 1:** Understand Schrodinger Wave equation, MOT, energy level diagrams Apply the knowledge of linear differential equations related to various engineering fields.
- **CO 2:** Apply the principle of Band diagrams in the application of conductors and semiconductors.
- **CO 3:** Compare the materials for construction of a battery and electrochemical sensors.
- **CO 4:** Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers.
- **CO 5:** Explain the principles of spectrometry and separation of solid and liquid mixtures by chromatography

UNIT I: (8 Periods)
Structure and Bonding Models: Fundamentals of Quantum Mechanics-Plank's quantum theory, de-Broglie's hypothesis, Heisenberg uncertainty principle, Schrodinger Wave equation, significance of Ψ and Ψ2, molecular orbital theory – bonding in homo- and hetero nuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT II: (10 Periods)
Modern Engineering materials: Crystal field theory, d- orbital's splitting in tetra hedral and octa hedral complexes, Semiconductors – Introduction, doping concept, application, Super Conductors- Introduction basic concept, applications. Super capacitors-: Introduction, Basic Concept-Classification – applications. Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon Nano tubes and Graphenes

UNIT III: (10 Periods)
Electrochemistry and Applications: Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).
Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT IV: (8 Periods)
Polymer Chemistry: Introduction to polymers, functionality of monomers, Tactility, chain growth and step growth polymerization, co- polymerization, with specific examples and mechanisms of polymer formation.
Plastics–Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6, 6.
Elastomers–Processing and vulcanization of natural rubber, Buna-S, Buna-N– preparation, properties and applications.
Conducting polymers – poly acetylene, poly aniline, – mechanism of conduction and applications. Bio-Degradable polymer - Poly Glycolic Acid (PGA).

UNIT V: **(9 Periods)**

Instrumental Methods and Applications: Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV- Visible Spectroscopy- electronic transition, Instrumentation and applications, IR spectroscopy- principle, Instrumentation and applications. Chromato graphy-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

Total Periods: 45

TEXT BOOKS:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical.Chemistry,10/e, Oxford University Press, 2010.

REFERENCES:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson,2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition
4. Chemistry Mc GrawHill, K.N.Jayaveera, G.V. Subba Reddy and C. Rama Chandraiah.
5. G.H. Vogel, Vogel's Quantitative Chemical Analysis, Pearson/Prentice Hall, 6th Edition, 2009.

I Year B.Tech. – II Semester

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(EG23AHS102) COMMUNICATIVE ENGLISH LAB

COURSE OBJECTIVES:
The objectives of this course are to:
- Expose the students to a variety of self-instructional, learner friendly modes of language learning.
- Train students in basic communication skills and also make them ready to face job interviews.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:
- **CO 1:** Understand the different aspects of the English language proficiency with an emphasis on LSRW skills.
- **CO 2:** Apply communication skills through various language learning activities.
- **CO 3:** Analyze the English speech sounds, stress, rhythm, intonation, and syllable division for better listening and speaking comprehension.
- **CO 4:** Evaluate and exhibit professionalism in participating in debates and group discussions.
- **CO 5:** Create effective Course Objectives.

List of Topics:
1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

Suggested Software:
- Walden InfoTech
- Young India Films

TEXT BOOKS:
1. Raman Meenakshi, Sangeeta Sharma, Technical Communication, Oxford University Press, 1st Edition, 2018.
2. Taylor Grant, English Conversation Practice, Tata McGraw-Hill Education India, 1st Edition, 2016.

REFERENCES:
1. Martin Hewings, Cambridge Academic English (B2), Cambridge University Press, 1st Edition, 2012.
2. J. Sethi, P.V. Dhamija, A Course in Phonetics and Spoken English, Kindle Edition, 2nd Edition, 2013.

ONLINE RESOURCES:
Spoken English:
1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online

5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

VOICE AND ACCENT:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

I Year B.Tech. – II Semester

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(CS23APC202) DATA STRUCTURES LAB

COURSE OBJECTIVES:

The objective of this course is to:

- Strengthen the ability to identify and apply the suitable data structure for the given real-world problem.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Demonstrate the concept of Recursion for solving a problem.
CO 2: Choose and implement linear data structure to solve problems.
CO 3: Develop programs for searching and sorting algorithms.
CO 4: Select and implement suitable nonlinear data structure for solving a problem.

Tasks:

1. Implement basic operations on arrays: insertion, deletion, searching.
2. Create a program to find the maximum and minimum elements in an array.
3. Write a program to reverse an array.
4. Demonstrate recursive algorithms with examples.
5. Develop a program to perform operations of a Stack and Queue using arrays.
6. Implement and perform different operations on Single, Double and CircularLinked Lists.
7. Develop a program to perform operations of Stack and Queue using LinkedLists.
8. Develop a program to implement Stack applications.
9. Implement Circular Queues.
10. Implement various Searching techniques.
11. Develop programs for different Sorting techniques.
12. Develop a program to demonstrate operations on Binary Search Tree.
13. Demonstrate Graph Traversal Techniques.
14. Develop a program to find Minimum Cost Spanning tree.

TEXT BOOKS:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, PHI, 3rd Edition, 2010.
2. Narasimha Karumanchi, Data Structures and Algorithms Made Easy, Career Monk Publications, 1st Edition, 2020.

I Year B.Tech. – II Semester

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-	-	2	1

(CH23ABS102) CHEMISTRY LAB

COURSE OBJECTIVES:
The objective of this course is to:
- Verify the fundamental concepts with experiments.

COURSE OUTCOMES:
At the end of the course, the students will be able to:
CO 1: To verify Beer Lambert's law
CO 2: To analyse the IR and NMR spectra of some organic compounds
CO 3: To apply electro analytical techniques foe sample analysis.
CO 4: To measure the strength of an acid present in the samples.
CO 5: To prepare advanced polymer materials.

LIST OF EXPERIMENTS:
1. Measurement of 10Dq by spectrophotometric method
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of Bakelite
8. Verify Lambert-Beer's law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry

TEXT BOOKS:
1. J. Mendham, R.C. Denney, J.D. Barnes, B. Sivasankar, Vogel's Quantitative Chemical Analysis, Pearson Publications, 6th Edition, 2009.
2. P.L. Soni, P.L. Fulekar, Experiments in Physical Chemistry, S. Chand & Co., 1st Edition, 2010.

REFERENCES:
1. Y.R. Sharma, Instrumental Methods of Chemical Analysis, Goel Publishing House, 23rd Edition, 2018.
2. O.P. Pandey, Organic Spectroscopy, New Age International, 2nd Edition, 2012.

I Year B.Tech. – II Semester

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(EE23AES102) ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP

PART A: ELECTRICAL ENGINEERING LAB

COURSE OBJECTIVES:
The objectives of this course are to:
- Gain the practical knowledge about various laws/theorems for the given circuit.
- Acquire knowledge about various electrical measuring instruments and safety measures.
- Obtain the performance characteristics of DC generator.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:
- **CO 1:** Understand the concept of KCL, KVL and Theorems practically for the given circuit.
- **CO 2:** Evaluate the resistance, power and power factor of circuit elements by using measuring instruments.
- **CO 3:** Obtain the Magnetization Characteristics of DC shunt Generator

List of Experiments:
1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

TEXT BOOKS:
1. D.C. Kulshreshtha, Basic Electrical Engineering, Tata McGraw Hill, 1st Edition, 2019.
2. P.V. Gupta, M.L. Soni, U.S. Bhatnagar, A. Chakrabarti, Power System Engineering, Dhanpat Rai & Co., 1st Edition, 2013.

REFERENCES:
1. Rajendra Prasad, Fundamentals of Electrical Engineering, PHI Publishers, 3rd Edition, 2014.

Note: Minimum Six Experiments to be performed.

PART B: ELECTRONICS ENGINEERING LAB

COURSE OBJECTIVES:
The objectives of this course are to:
- Gain hands on experience in testing various electronic components.
- Acquire knowledge related to the use of electronic measuring instruments for different applications.
- Design and simulate a RC coupled amplifier.
- Verify the operating conditions of combinational and sequential circuits.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:
- **CO 1:** Identify & Test various electronic components.
- **CO 2:** Employ various electronic measuring instruments for different applications.
- **CO 3:** Evaluate the biasing conditions of various diodes and BJTs.

CO 4: Examine the operating conditions of a digital circuit

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
   i. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
7. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs. Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

TEXT BOOKS:

1. R.L. Boylestad, Louis Nashelsky, Electronic Devices & Circuit Theory, Pearson Education, 11th Edition, 2021.
2. R. P. Jain, Modern Digital Electronics, Tata Mc Graw Hill, 4th Edition, 2009

REFERENCES:

1. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 1st Edition, 2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

I Year B.Tech. – II Semester

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(CH23ABS106) NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

COURSE OBJECTIVES:
The objective of this course is to:
- Impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:
CO 1: Understand the importance of discipline, character and service motto.
CO 2: Solve some societal issues by applying acquired knowledge, facts, and techniques.
CO 3: Explore human relationships by analyzing social problems.
CO 4: Determine to extend their help for the fellow beings and downtrodden people.
CO 5: Develop leadership skills and civic responsibilities

UNIT I:
Orientation: General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.
Activities:
i) Conducting –ice breaking sessions-expectations from the course- knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans- activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings-any other contribution.

UNIT II:
Nature & Care
Activities:
i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT III:
Community Service
Activities:
i) Conducting One Day Special Camp in a village contacting village-area leaders-Survey in the village, identification of problems- helping them to solve via media-authorities experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs etc.

TEXT BOOKS:
1. Nirmalya Kumar Sinha, Surajit Majumder, A Text Book of National Service Scheme, Vol. I, Vidya Kutir Publication, 1st Edition, 2021.
2. Directorate General of NCC, Ministry of Defence, New Delhi, Red Book - National

Cadet Corps: Standing Instructions, Vol. I & II, 1st Edition, 2010.

REFERENCES:

1. Davis M. L., Cornwell D. A., Introduction to Environmental Engineering, McGraw Hill, 4th Edition, 2008.
2. Masters G. M., Joseph K., Nagendran R., Introduction to Environmental Engineering and Science, Pearson Education, 2nd Edition, 2007.
3. Ram Ahuja, Social Problems in India, Rawat Publications, 4th Edition, 2021.

II Year B.Tech. – I Sem

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(MA23ABS306) PROBABILITY AND STATISTICS

COURSE OBJECTIVES:

The objectives of this course are to:

- Illuminate the students in the concepts of probability and statistical methods.
- Equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- **CO 1:** Acquire knowledge in finding the analysis of the data quantitatively or categorically and various statistical elementary tools Understand the concepts of Probability, Random Variables and their characteristics.
- **CO 2:** Develop skills in designing mathematical models involving probability, random variables and the critical thinking in the theory of probability and its applications in real life problems.
- **CO 3:** Apply the theoretical probability distributions like binomial, Poisson, and Normal in the relevant application areas.
- **CO 4:** Analyze to test various hypotheses included in theory and types of errors for large samples.
- **CO 5:** Apply the different testing tools like t-test, F-test, chi-square test to analyze the relevant real life problems.

UNIT I: (10 Periods)

Descriptive statistics: Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Measures of Central tendency, Measures of Variability (spread or variance) Skewness, Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, method of least squares, regression lines.

UNIT II: (09 Periods)

Probability: Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

UNIT III: (08 Periods)

Probability distributions: Probability distributions: Binomial, Poisson and Normal-their properties (Chebyshev's inequality). Approximation the binomial distribution to normal distribution.

UNIT IV: (10 Periods)

Estimation and Testing of hypothesis, large sample tests: Estimation-parameters, statistics, Point estimation, Confidence interval, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means.

UNIT V: (08 Periods)

Small sample tests: Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

Total Periods: 45

TEXT BOOKS:

1. Millerand, Freund's, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

REFERENCES:

1. S. Ross, A First Course in Probability, Pearson Education India, 2002.
2. W. Feller, An Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.
3. B.V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2. https://onlinecourses.nptel.ac.in/noc22_mg31/preview

II Year B.Tech. – I Sem

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3	-	-	3

(EC23AES301) DIGITAL LOGIC AND COMPUTER ORGANIZATION

COURSE OBJECTIVES:

The objectives of the course are to:

- Provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals
- Describe memory hierarchy concepts
- Explain input/output(I/O) systems and their interaction with the CPU, memory, and peripheral devices

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand the properties of Boolean algebra, logic operations and design of Combinational Circuits.

CO 2: Analyze & Design sequential Circuits and demonstrate an understanding of the design of the functional units of a digital computer system.

CO 3: Understand the architecture of modern computer, and also understanding of how the computer performs arithmetic operations on positive and negative numbers.

CO 4: Describe memory hierarchy concepts, including cache memory, virtual memory, and secondary storage, and evaluate their impacton system performance and scalability.

CO 5: UnderstandofI/O devices communicating with Processing Unit and also knowing the characteristics of multiprocessors.

UNIT I **(10 Periods)**

Data Representation: Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, complements, Signed binary numbers, Binary codes

Digital Logic Circuits-I: Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers

UNIT II **(9 Periods)**

Digital Logic Circuits-II: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters

Basic Structure of Computers: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von- Neumann Architecture

UNIT III **(10 Periods)**

Computer Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations

Processor Organization: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multiprogrammed Control

UNITIV **(9 Periods)**

The Memory Organization: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage

UNITV **(8 Periods)**

Input/Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces

Total Periods: 45

TEXT BOOKS:

1. Zvonko Vranesic, Safwat Zaky, Computer Organization, Carl Hamacher, Mc Graw Hill, 6th Edition, 2023.
2. M. Morris Mano, Digital Design, 6th Edition, Pearson Education, 2018.
3. William Stallings, Computer Organization and Architecture, 11th Edition, Pearson, 2022.

REFERENCES:

1. David A. Patterson, John L. Hennessy, Computer Organization and Design, Elsevier, 3rd Edition, 2004.
2. M. Morris Mano, Fundamentals of Logic Design, Pearson/Thomson, 5th Edition, 2003.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106/103/106103068/

II Year B.Tech. – I Semester

L	T	P	C
2	-	-	2

(BA23AHS301) ORGANIZATIONAL BEHAVIOR

COURSE OBJECTIVE:

The objective of this course is to:

- Provide the student with a background of various environment factors that have major repercussions on business and sharpen their mind to watch and update the changes that occur constantly in this sphere.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- **CO 1:** Identify and analyze environmental factors affecting business operations.
- **CO 2:** Assess how environmental changes influence business strategies and anticipate challenges and opportunities.
- **CO 3:** Monitor and adapt business strategies to ongoing environmental changes for competitiveness and sustainability.
- **CO 4:** Understand their strategic decision-making will improve by integrating environmental knowledge into business planning.
- **CO 5:** Sharpen critical thinking to evaluate environmental impacts on industries and propose innovative solutions.

UNIT I: (6 Periods)

Introduction to Organization Behavior: Introduction to organization, organization and managers, manager' roles and skills, behavior at work, introduction organization behavior, major behavioral science disciplines contributing to OB, challenges and opportunities managers have in applying OB concepts, OB model (including motivation models) and levels of OB model

UNIT II: (6 Periods)

Individual Behaviour: Introduction to individual behaviour, values, attitudes, job satisfaction, personality, perception and individual decision making, learning, motivation at work, managing emotions and stress (Meaning-Definition Stress and job performance relationship Approaches to stress management (Coping with stress)

UNIT III: (6 Periods)

INTERPERSONAL BEHAVIOUR: Interpersonal Behaviour, Johari Window, Transactional Analysis–ego states, types of transactions, life positions, applications of T.A., managerial interpersonal styles.

UNIT V: (6 Periods)

Organizational Behavior: Foundations of organization structure, organization design, organization culture, organization change, managing across cultures, human resource management policies and practices, diversity at work.

Total Periods: 30

TEXT BOOKS:

1. Pardeshi, P. C., Organizational Behaviour & Principles & Practice of Management, Nirali Publication
2. Robbins, S. P/ Judge, T. A/ Sanghi, S., Organizational Behavior, Pearson Publication

REFERENCES:

1. Aswathappa, K., Organizational Behaviour– Text and Problem, Himalaya Publication

II Year B.Tech. – I Semester

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3	-	-	3

(CS23APC301) ADVANCED DATA STRUCTURES AND ALGORITHM ANALYSIS

COURSE OBJECTIVES:

The objectives of this course are to:

- Provide knowledge on advance data structures frequently used in Computer Science domain
- Develop skills in algorithm design techniques popularly used
- Understand the use of various data structures in the algorithm design

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- **CO 1:** Illustrate the working of the advanced tree data structures and their applications
- **CO 2:** Understand the Graph data structure, traversals and apply them in various contexts.
- **CO 3:** Use various data structures in the design of algorithms
- **CO 4:** Recommend appropriate data structures based on the problem being solved
- **CO 5:** Analyze algorithms with respect to space and time complexities
- **CO 6:** Design new algorithms.

UNIT I: (9 periods)

Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations. AVL Trees – Creation, Insertion, Deletion operations, and Applications. Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications

UNIT II: (9 periods)

Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's Matrix multiplication, Convex Hull Problem.

UNIT III: (9 periods)

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths
Dynamic Programming: General Method, All pairs shortest paths

UNIT IV: (9 periods)

Dynamic Programming: 0/1 Knapsack, String Editing, Travelling Salesperson problem. Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem

UNIT V: (9 periods)

Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem Introduction to NP Hard and NP Complete Problems: Basic Concepts.

Total Periods: 45

TEXTBOOKS:

1. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, Fundamentals of Data Structures in C++, Universities Press, 2nd Edition, 2008.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Computer Algorithms in

C++, Universities Press, 2nd Edition, 2007.

REFERENCES:

1. Robert Kruse, Data Structures and Program Design in C, Pearson Education Asia, 1st Edition, 2007.
2. J.P. Tremblay, R. Sorenson, An Introduction to Data Structures with Applications, McGraw Hill, 1st Edition, 2007.
3. Donald E. Knuth, The Art of Computer Programming, Vol. 1: Fundamental Algorithms, Addison-Wesley, 3rd Edition, 1997.
4. Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tenenbaum, Data Structures Using C and C++, Pearson Education, 2nd Edition, 1995
5. iklaus Wirth, Algorithms + Data Structures = Programs, Prentice-Hall, 1st Edition, 1976.
6. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, Fundamentals of Data Structures in C++, Galgotia Publications, 1st Edition, 1999.
7. Thomas A. Standish, Data Structures in Java, Addison-Wesley, 1st Edition, 1994.

ONLINE RESOURCES:

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. http://peterindia.net/Algorithms.html
3. Abdul Bari,1. Introduction to Algorithms (youtube.com)

II Year B.Tech. – I Semester

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3	-	-	3

(CS23APC302) OBJECT ORIENTED PROGRAMMING THROUGH JAVA

COURSE OBJECTIVES:

The objectives of this course are to:

- Identify Java language components and how they work together in Applications.
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications.
- Understand how to design applications with threads in Java.
- Understand how to use Java apis for program development.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Analyze problems, design solutions using OOP principles, and implement them efficiently in Java.

CO 2: Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects

CO 3: Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.

CO 4: Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.

CO 5: Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX.

CO 6: Choose appropriate data structure of Java to solve a problem

UNIT I: (9 Periods)

Object Oriented Programming: Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final.

Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II: (9 Periods)

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III: (9 Periods)

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class- Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV: (9 Periods)

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto- unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

UNIT V: (9 Periods)

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread- Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events.

Total Periods: 45

TEXT BOOKS:

1. Anitha Seth, B. L. Juneja, Java: One Step Ahead, Oxford University Press, 2008.
2. Debasis Samanta, Monalisa Sarma, Joy with Java: Fundamentals of Object-Oriented Programming, Cambridge University Press, 2023.

REFERENCES:

1. Herbert Schildt, The Complete Reference Java, , McGraw-Hill (TMH), 11th Edition 2018.
2. Introduction Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson, 2013.
3. Paul Deitel, Harvey Deitel, Java 9 for Programmers, Pearson, 4th Edition, 2018

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547 18816347shared/overview

II Year B.Tech. – I Semester

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1	-	2	2

(CS23AES301) DESIGN THINKING AND INNOVATION

COURSE OBJECTIVES:

The objectives of this course are to:

- Familiarize students with design thinking process as a tool for breakthrough innovation.
- Equip students with design thinking skills and ignite their minds to create innovative ideas, develop solutions for real-time problems.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Define the concepts related to design thinking.
CO 2: Explain the fundamentals of Design Thinking and innovation.
CO 3: Apply the design thinking techniques for solving problems in various sector
CO 4: Analyze to work in a multidisciplinary environment.
CO 5: Evaluate the value of creativity.
CO 6: Formulate specific problem statements of real-time issues.

UNIT I: **(2 Periods)**

Introduction to Design Thinking Introduction to elements and principles of Design, basics of design - dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, new materials in Industry.

UNIT II: **(2 Periods)**

Design Thinking Process Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, customer, journey map, brainstorming, product development.

Activity: Every student presents their idea in three minutes. Every student can present the design process in the form of a flow diagram or flow chart, etc. Every student should explain about product development.

UNIT III: **(4 Periods)**

Innovation Art of innovation, difference between innovation and creativity, role of creativity and innovation in organizations - Creativity to Innovation - Teams for innovation - Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, flow and planning from idea to innovation, debate on value-based innovation.

UNIT IV: **(3 Periods)**

Product Design Problem formation, introduction to product design, product strategies, product value, product planning, product specifications - Innovation towards product design - Case studies.

Activity: Importance of modeling, how to set specifications, explaining their own product design.

UNIT V: **(4 Periods)**

Design Thinking in Business Processes Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business - Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs - Design thinking for Startups - Defining and testing Business Models and Business Cases - Developing & testing prototypes.

Activity: How to market our own product, about maintenance, reliability and plan for startup.

Total Periods: 15

TEXT BOOKS:

1. Tim im Brown. Change by Design: How Design Thinking Creates New Alternatives for Business and Society,Harper Collins, 1st Edition ,2009.
2. John Wiley & Sons, Idris Mootee. Design Thinking for Strategic Innovation, 1st Edition. 2013.

REFERENCES:

1. David Lee, Design Thinking in the Classroom: Easy-to-Use Teaching Tools to Foster Creativity, Encourage Innovation, and Unleash Potential in Every Student, Ulysses Press, 1st Edition, 2018.
2. Shrutin N. Shetty, Design the Future: Simplifying Design Thinking to Help You..., Notion Press, 1st Edition, October 2018.
3. William Lidwell, Kritina Holden, and Jill Butler, Universal Principles of Design, Rockport Publishers, 1st Edition, 2003.
4. Henry W. Chesbrough, The Era of Open Innovation, MIT Sloan Management Review, Spring 2003, Vol. 44, No. 3, Reprint 4435.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/110/106/110106124/
2. https://nptel.ac.in/courses/109/104/109104109/
3. https://swayam.gov.in/nd1_noc19_mg60/preview

II Year B.Tech. – I Semester

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(CS23APC304) OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

COURSE OBJECTIVES:

The objectives of this course are to:

- Practice object-oriented programming in the Java programming language
- Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity
- Construct Threads, Event Handling, implement packages, Java FX GUI

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Demonstrate a solid understanding of Java syntax, including data types, control structures, methods, classes, objects, inheritance, polymorphism, and exception handling.

CO 2: Apply fundamental OOP principles such as encapsulation, inheritance, polymorphism, and abstraction to solve programming problems effectively.

CO 3: Familiar with commonly used Java libraries and APIs, including the Collections Framework, Java I/O, JDBC, and other utility classes.

CO 4: Develop problem-solving skills and algorithmic thinking, applying OOP concepts to design efficient solutions to various programming challenges.

CO 5: Proficiently construct graphical user interface (GUI) applications using JavaFX

CO 6: Develop new programs for solving typical computer science problems

Experiments Covering the Topics:

- Object Oriented Programming fundamentals- data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams, JavaFX GUI

Sample Experiments:

Exercise – 1:

a) Write a JAVA program to display default value of all primitive data type of JAVA
b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise – 2

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
b) Write a JAVA program to sort for an element in a given list of elements using bubble sort
c) Write a JAVA program using StringBuffer to delete, remove character.

Exercise – 3

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
b) Write a JAVA program implement method overloading.
c) Write a JAVA program to implement constructor. Write a JAVA program to implement constructor overloading.

Exercise – 4

a) Write a JAVA program to implement Single Inheritance

b) Write a JAVA program to implement multi level Inheritance
c) Write a JAVA program for abstract class to find areas of different shapes

Exercise – 5

a) Write a JAVA program give example for "super" keyword.
b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
c) Write a JAVA program that implements Runtime polymorphism

Exercise – 6

a) Write a JAVA program that describes exception handling mechanism
b) Write a JAVA program Illustrating Multiple catch clauses
c) Write a JAVA program for creation of Java Built-in Exceptions
d) Write a JAVA program for creation of User Defined Exception

Exercise – 7

a) Write a JAVA program that creates threads by extending Thread class. First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds, (Repeat the same by implementing Runnable)
b) Write a program illustrating is Alive and join ()
c) Write a Program illustrating Daemon Threads.
d) Write a JAVA program Producer Consumer Problem

Exercise – 8

a) Write a JAVA program that import and use the user defined packages
b) Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)
c) Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

TEXT BOOKS:

1. Anitha Seth and B. L. Juneja, Java: One Step Ahead, Oxford University Press, 1st Edition, 2008.
2. Herbert Schildt, Java: The Complete Reference, McGraw-Hill Education, 11th Edition, 2018.

REFERENCES:

1. Y. Daniel Liang, Introduction to Java Programming, Pearson, 7th Edition, 2013.
2. Paul Deitel and Harvey Deitel, Java 9 for Programmers, Pearson, 4th Edition, 2018.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547 18816347shared/overview

II Year B.Tech. – I Semester

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(CS23APC303) ADVANCED DATA STRUCTURES AND ALGORITHM ANALYSIS LAB

COURSE OBJECTIVES:

The objectives of this course are to:

- Acquire practical skills in constructing and managing Data structures
- Apply the popular algorithm design methods in problem-solving scenarios

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Design and develop programs to solve real world problems with the popular algorithm design methods.

CO 2: Demonstrate an understanding of Non-Linear data structures by developing implementing the operations on AVL Trees, B-Trees, Heaps and Graphs.

CO 3: Critically assess the design choices and implementation strategies of algorithms and data structures in complex applications.

CO 4: Utilize appropriate data structures and algorithms to optimize solutions for specific computational problems.

CO 5: Compare the performance of different of algorithm design strategies

CO 6: Design algorithms to new real world problems

Experiments Covering the Topics:

1. Operations on AVL trees, B-Trees, Heap Trees
2. Graph Traversals
3. Sorting techniques
4. Minimum cost spanning trees
5. Shortest path algorithms
6. 0/1 Knapsack Problem
7. Travelling Salesperson problem
8. Optimal Binary Search Trees
9. N-Queens Problem
10. Job Sequencing

Sample Programs:

1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.
2. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
3. Implement BFT and DFT for given graph, when graph is represented by
   a) Adjacency Matrix b) Adjacency Lists
4. Write a program for finding the bi-connected components in a given graph.
5. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).
6. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.
7. Implement Job sequencing with deadlines using Greedy strategy.
8. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
9. Implement N-Queens Problem Using Backtracking.
10. Use Backtracking strategy to solve 0/1 Knapsack problem.
11. Implement Travelling Sales Person problem using Branch and Bound approach.

TEXT BOOKS:

1. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, Fundamentals of Data Structures in C++, Universities Press, 2nd Edition, 2008.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Computer Algorithms in C++, Universities Press, 2nd Edition, 2007.

REFERENCES:

1. Robert Kruse, Data Structures and Program Design in C, Pearson Education Asia, 1st Edition, 2007.
2. J.P. Tremblay, R. Sorenson, An Introduction to Data Structures with Applications, McGraw Hill, 1st Edition, 2007.

ONLINE RESOURCES:

1. http://CSE (AI & ML)01-iiith.vlabs.ac.in/
2. http://peterindia.net/Algorithms.html

II Year B.Tech. – I Semester

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(CS23ASC302) PYTHON PROGRAMMING

COURSE OBJECTIVES:
The objectives of this course are to:
- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries.
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

COURSE OUTCOMES:
After successful completion of the course, students will be able to:
- **CO 1:** Classify data structures of Python.
- **CO 2:** Apply Python programming concepts to solve a variety of computational problems.
- **CO 3:** Understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs.
- **CO 4:** Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas.
- **CO 5:** Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries.
- **CO 6:** Propose new solutions to computational problems

UNIT I:
History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupiter Notebook.
Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.
Control Flow Statements: if statement, if-else statement, if.eif else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:
1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.
   - Arithmetic Operators
   - Relational Operators
   - Assignment Operators
   - Logical Operators
   - Bit wise Operators Ternary Operator
   - Membership Operators Identity Operators
5. Write a program to print multiplication table of a given number.

UNIT II:
Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.
Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.
Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists.

Sample Experiments:
1. Write a program to define a function with multiple return values.

2. Write a program to define a function using default arguments.
3. Write a program to find the length of the string without using any library functions.
4. Write a program to check if the substring is present in a given string or not.
5. Write a program to perform the given operations on a list:
   i. Addition ii. Insertion iii. slicing
6. Write a program to perform any 5 built-in functions by taking any list

UNIT III:

Dictionaries: Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.
Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries.

Sample Experiments:

1. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
2. Write a program to count the number of vowels in a string (No control flow allowed).
3. Write a program to sum all the items in a given dictionary.

UNIT IV:

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Python os and os.path Modules.
Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, method overloading, constructor overloading, classes with Multiple Objects, Inheritance, Polymorphism.

Sample Experiments:

1. Write a program to create Classes and Objects in Python
2. Write a program to implement inheritance concept
3. Write a Python program to implement method overloading, constructor overloading

UNIT V:

Introduction to Data Science: NumPy, Pandas, Matplotlib libraries.

Sample Experiments:

1. Python Program to demonstrate NumPy arrays creation using array () function.
2. Python program to demonstrate use of ndim, shape, size, dtype.
3. Python programs to demonstrate different ways to create Pandas Dataframe
4. Python programs to demonstrate various plots in matplotlib.

REAL TIME PROJECT:

Dice Rolling Simulator in Python

TEXT BOOKS:

1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press,1st Edition,2018
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, Pearson, 2nd Edition,2024

REFERENCES:

1. Introduction to Programming Using Python, Y. Daniel Liang, Pearson 1stEdition 2017.

ONLINE RESOURCES:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

II Year B.Tech. – II Semester

L	T	P	C
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(MA23ABS302) DISCRETE MATHEMATICS AND GRAPH THEORY

COURSE OBJECTIVES:
The objectives of this course are to:
- Describe logical sentences in terms of predicates, quantifiers, and logical connectives in theory of inference for the statement calculus.
- Demonstrate the application of basic methods of discrete mathematics in Computer Science problem solving.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:
- **CO 1:** Apply mathematical concepts and logical reasoning to solve problems in different fields of computer science and information technology.
- **CO 2:** Categorize the properties of Algebraic Structures to find the given sets are semi group, Monoid and Groups.
- **CO 3:** Analyze the concepts of Combinations, permutations and Binomial theorems.
- **CO 4:** Analyze the concepts of Generating and Recurrence relations for solving Homogeneous and In-Homogeneous equations
- **CO 5:** Apply Graph Theory in solving in computer science problems.

UNIT I: (9 Periods)
Mathematical Logic: Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus.

UNIT II: (10 Periods)
Set theory: The Principle of Inclusion- Exclusion, Pigeon hole principle and its application, Functions, Composition of functions, Inverse Functions, Recursive Functions.
Algebraic structures: Algebraic systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, Homomorphism, Isomorphism.

UNIT III: (09 Periods)
Elementary Combinatorics: Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial theorems.

UNIT IV: (09 Periods)
Recurrence Relations: Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of In homogeneous Recurrence Relations.

UNIT V: (08 Periods)
Graphs: Basic Concepts, Isomorphism and Sub-graphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs.

Total Periods: 45

TEXT BOOKS:
1. J.P. Tremblay, R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 1st Edition, 2002.

2. Kenneth H. Rosen, Discrete Mathematics and Its Applications with Combinatorics and Graph Theory, McGraw Hill Education (India) Private Limited, 7th Edition, 2012.

REFERENCES:

1. Joe L. Mott, Abraham Kandel, Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, Pearson Education, 2nd Edition, 2011.
2. Narsingh Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice-Hall of India, 1st Edition, 2003.

ONLINE RESOURCES:

1. http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

II Year B.Tech. – II Semester

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(BA23AHS302) UNIVERSAL HUMAN VALUES

COURSE OBJECTIVES:

The objectives of this course are to:

- Help the students appreciate the essential complementary between 'VALUES' and' SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- Facilitate the development of a Holistic perspective among students towards life and profession as well as toward shappiness and prosperity based on a correct understanding of the Human reality and there of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- Highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Define the terms like Natural Acceptance, Happiness and Prosperity
CO 2: Identify one's self, and one's surroundings (family, society nature).
CO 3: Apply what they have learnt to their own self in different day-to-day settings in real life.
CO 4: Relate human values with human relationship and human society.
CO 5: Justify the need for universal human values and harmonious existence.
CO 6: Develop as socially and ecologically responsible engineers

UNIT I: **(10 Periods)**

Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) – Understanding Value Education ;Practice Session - Sharing about Oneself ; Self-Exploration as the Process for Value Education - Continuous Happiness and Prosperity - the Basic Human Aspirations ; Practice Session - Exploring Human Consciousness ; Happiness and Prosperity – Current Scenario - Method to Fulfill the Basic Human Aspirations ; Practice Session - Exploring Natural Acceptance.

UNIT II: **(9 Periods)**

Harmony in the Human Being: Understanding Human Being as the Co-existence of the Self and the Body - Distinguishing between the Needs of the Self and the Body ; Practice Session - Exploring the difference of Needs of self and body ; The Body as an Instrument of the Self - Understanding Harmony in the Self ; Practice Session - Exploring Sources of Imagination in the Self ; Harmony of the Self with the Body - Programme to ensure Self-regulation and Health ; Practice Session - Exploring Harmony of Self with the Body.

UNIT III: **(9 Periods)**

Harmony in the Family and Society: Harmony in the Family – The Basic Unit of Human Interaction - 'Trust' – The Foundational Value in Relationship; Practice Session - Exploring the Feeling of Trust ; 'Respect' – as the Right Evaluation ; Practice Session - Exploring the Feeling of Respect ; Other Feelings, Justice in Human-to-Human Relationship - Understanding Harmony in the Society - Vision for the Universal Human Order ; Practice Session ; Exploring Systems to fulfill Human Goal.

UNIT IV: **(8 Periods)**

Harmony in the Nature / Existence: Understanding Harmony in the Nature - Interconnectedness, Self-regulation and Mutual fulfillment among the Four Orders of Nature ;Practice Session - Exploring the Four Orders of Nature ; Realizing Existence as Co-existence

at All Levels - The Holistic Perception of Harmony in Existence ; Practice Session - Exploring Co-existence in Existence**.**

UNIT V: (9 Periods)

Implications of the Holistic Understanding – a Look at Professional Ethics: Natural Acceptance of Human Values - Definitiveness of (Ethical) Human Conduct ; Practice Session -Exploring Ethical Human Conduct ; A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order - Competence in Professional Ethics ; Practice Session - Exploring Humanistic Models in Education ; Holistic Technologies, Production Systems and Management Models-Typical Case Studies - Strategies for Transition towards Value-based Life and Profession ; Practice Session - Exploring Steps of Transition towards Universal Human Order.

Total Periods: 45

TEXT BOOKS:

1. R.R. Gaur, R. Asthana, G.P. Bagaria, A Foundation Course in Human Values and Professional Ethics, Excel Books, 2nd Revised Edition, 2019.
2. R R.R. Gaur, R. Asthana, G.P. Bagaria, Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, Excel Books, 2nd Revised Edition, 2019,

REFERENCES:

1. A. Nagaraj, Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan, Amarkantak, 1st Edition, 1999.
2. A. N. Tripathy, Human Values, New Age International Publishers, 1st Edition, 2003.
3. E.G. Seebauer, Robert L. Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press, 1st Edition, 2000.
4. M. Govindarajan, S. Natarajan, V.S. Senthil Kumar, Engineering Ethics (Includes Human Values), Prentice Hall of India, 1st Edition, 2004.
5. L. Bajpai, Indian Ethos and Modern Management, New Royal Book Co., Lucknow, 1st Edition, 2004; Reprinted 2008.

ONLINE RESOURCES:

1. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
2. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

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(CS23APC401) DATABASE MANAGEMENT SYSTEMS

COURSE OBJECTIVES:

The objectives of this course are to:

- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand the basic concepts of database management systems
CO 2: Analyze a given database application scenario to use ER model for conceptual design of the database
CO 3: Utilize SQL proficiently to address diverse query challenges
CO 4: Employ normalization methods to enhance database structure
CO 5: Assess and implement transaction processing, concurrency control and database recovery protocols in databases.

UNIT I: (9 Periods)

Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

UNIT II: (9 Periods)

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

UNIT III: (9 Periods)

SQL: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non- updatable), relational set operations.

UNIT IV: (9 Periods)

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

UNIT V: (9 Periods)

Transaction Concept: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Storage and File Structure: Overview of Physical Storage Media, RAID, File Organization.

Introduction to Indexing Techniques: B+ Trees, operations on B+ Trees, Hash Based Indexing.

Total Periods: 45

TEXT BOOKS:

1. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw-Hill (TMH), 2003.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGraw-Hill (TMH), 5th Edition, 2006.

REFERENCES:

1. C. J. Date, Introduction to Database Systems, 8th Edition, Pearson, 2003.
2. Ramez Elmasri, Shamkant B. Navathe, Database Management Systems, 6th Edition, Pearson, 2010.
3. Carlos Coronel, Steven Morris, Peter Rob, Database Systems: Design, Implementation, and Management, 9th Edition, Cengage Learning, 2009.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012758066672820224 56_shared/overview

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(CS23APC402) OPERATING SYSTEMS

COURSE OBJECTIVES:

The objectives of this course are to:

- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Describe the basics of the operating systems, mechanisms of OS to handle processes,threads, and their communication.
CO 2: Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection.
CO 3: Make use of process scheduling algorithms and synchronization techniques to achievebetter performance of a computer system.
CO 4: Illustrate different conditions for deadlock and their possible solutions.
CO 5: Analyze the memory management and its allocation policies.

UNIT I: (9 periods)

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Free and Open-Source Operating Systems **System Structures:** Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Building and Booting an Operating System, Operating system debugging

UNIT II: (9 periods)

Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication. **Threads and Concurrency:** Multithreading models, Thread libraries, Threading issues. **CPU Scheduling:** Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

UNIT III: (9 periods) Synchronization

Tools: The Critical Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization. **Deadlocks:** system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

UNIT IV: (9 periods)

Memory-Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping. **Virtual Memory Management:** Introduction, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing. **Storage Management:** Overview of Mass Storage Structure, HDD Scheduling.

UNIT V: (9 periods)

File System: File System Interface: File concept, Access methods, Directory Structure; File system Implementation: File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File- System Mounting, Partitions and Mounting, File Sharing. **Protection:** Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix.

Total Periods: 45

TEXT BOOKS:

1. Silberschatz A, Galvin P B, Gagne G, Operating System Concepts, Wiley, 10th Edition, 2018.
2. Tanenbaum A S, Modern Operating Systems, Pearson, 4th Edition, 2016.

REFERENCES:

1. Stallings W, Operating Systems -Internals and Design Principles, Pearson, 9th Edition, 2018.
2. D.M Dhamdhere, Operating Systems: A Concept Based Approach, McGraw- Hill, 3rd Edition,2013.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

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(AM23APC301) ARTIFICIAL INTELLIGENCE

COURSE OBJECTIVES:

The objectives of this course are to:

- Study the concepts of Artificial Intelligence.
- Learn the methods of solving problems using Artificial Intelligence.
- Introduce the concepts of Expert Systems.
- Understand the applications of AI, namely game playing, theorem proving, and machine learning.
- Learn different knowledge representation techniques.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand the AI, Intelligent agents and environment.
CO 2: Apply the search strategies and concept of problem reduction.
CO 3: Understand the fundamentals of knowledge representation and reasoning.
CO 4: Apply the concepts of learning from observation.
CO 5: Analyze architecture of expert systems and language models.

UNIT I: (**9 Periods)**

Introduction: AI problems, foundation of AI and history of AI.

Intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem-solving agents, problem formulation, Strong AI and Weak AI.

UNIT II: (**9 Periods)**

Searching: Searching for solutions, uninformed search strategies – Breadth-first search, Depth-first search.

Search with partial information (Heuristic search): Hill climbing, A*, AO* Algorithms. **Problem reduction.**

Game Playing: Adversarial search, Games, Mini-max algorithm, Optimal decisions in multiplayer games, Problems in Game playing, Alpha-Beta pruning, Evaluation functions.

UNIT III: (**9 Periods)**

Representation of Knowledge: Knowledge representation issues, predicate logic - logic programming, semantic nets - frames and inheritance, constraint propagation, representing knowledge using rules, rules-based deduction systems.

Reasoning under uncertainty: Review of probability, Bayes' probabilistic inferences, and Dempster-Shafer theory.

UNIT IV: (**10 Periods)**

Logic concepts: First-order logic, Inference in first-order logic, Propositional vs. first-order inference, Unification & lifts, Forward chaining, Backward chaining, Resolution.

Learning from observation: Inductive learning, Decision trees, Explanation-based learning, Statistical learning methods, Reinforcement learning.

UNIT V: **(8 Periods)**

Expert Systems: Architecture of expert systems, Roles of expert systems – Knowledge Acquisition, Meta knowledge, Heuristics.

Natural Language Processing: Language Models, Phrase Structure grammar, Speech Recognition, Machine Translation.

Case Study: Chatbot, Voice Assistants.

Total Periods: 45

TEXT BOOKS

1. S. Russell and P. Norvig, Artificial Intelligence – A Modern Approach, Pearson Education, 3rd Edition.
2. Kevin Night and Elaine Rich, Nair B., Artificial Intelligence (SIE), McGraw Hill.

REFERENCES:

1. David Poole, Alan Mackworth, Randy Goebel, Computational Intelligence: A Logical Approach, Oxford University Press.
2. G. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, 4th Edition, Pearson Education.
3. J. Nilsson, Artificial Intelligence: A New Synthesis, Elsevier Publishers.
4. Saroj Kaushik, Artificial Intelligence, CENGAGE Learning.
5. Stuart Russell, Human Compatible: Artificial Intelligence and the Problem of Control.

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(CS23APC403) DATABASE MANAGEMENT SYSTEMS LAB

COURSE OBJECTIVES:

The objectives of this course are to:

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Utilizing Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL) commands effectively within a database environment

CO 2: Constructing and execute queries to manipulate and retrieve data from databases.

CO 3: Develop application programs using PL/SQL.

CO 4: Analyze requirements and design custom Procedures, Functions, Cursors, and Triggers, leveraging their capabilities to automate tasks and optimize database functionality

CO 5: Establish database connectivity through JDBC (Java Database Connectivity)

Experiments Covering the Topics:

- DDL, DML, DCL commands
- Queries, nested queries, built-in functions,
- PL/SQL programming- control structures
- Procedures, Functions, Cursors, Triggers,
- Database connectivity- ODBC/JDBC

Sample Experiments:

1. Creation, altering and droping of tables and inserting rows into a table (use constraintswhile creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between,least, greatest, trunc, round, to_char, to_date)
5. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
6. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
7. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
8. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-

APPLICATION ERROR.

9. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
10. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
11. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
12. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
13. Create a table and perform the search operation on table using indexing and non-indexing techniques.
14. Write a Java program that connects to a database using JDBC
15. Case Study: Database Design Given the following requirements for the e-commerce system: products catalog, customer accounts, order management, and reviews. Design a normalized relational database schema. Include tables, primary keys, foreign keys, and relationships. Explain your design decisions and how normalization principles are applied.

TEXT BOOKS:

1. George B. Koch and Kevin Loney, Oracle: The Complete Reference, Osborne McGraw-Hill, 3rd Edition, 1995.
2. Nilesh Shah, Database Systems Using Oracle, PHI Learning, 2nd Edition, 2007.

REFERENCES:

1. Rick F Vander Lans, "Introduction to SQL", Pearson Education, 4th Edition, 2007

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(CS23APC404) OPERATING SYSTEMS LAB

COURSE OBJECTIVES:

The objectives of this course are to:

- Provide insights into system calls, file systems, semaphores,
- Develop and debug CPU Scheduling algorithms, page replacement algorithms, thread implementation
- Implement Bankers Algorithms to Avoid the Dead Lock
- Acquire the generic software development skill through various stages of software life cycle
- Generate test cases for software testing

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Trace different CPU Scheduling algorithms
CO 2: Implement Bankers Algorithms to Avoid the Dead Lock
CO 3: Evaluate Page replacement algorithms
CO 4: Understand the functional and non-functional requirements of software model
CO 5: Analyze the knowledge in project managements and its principles.

Experiments Covering the Topics:

- UNIX fundamentals, commands & system calls
- CPU Scheduling algorithms, thread processing
- IPC, semaphores, monitors, deadlocks
- Page replacement algorithms, file allocation strategies
- Memory allocation strategies

Sample Experiments:

1. Practicing of Basic UNIX Commands.
2. Write programs using the following UNIX operating system calls fork, exec, getpid, exit, wait, close, stat, opendir and readdir
3. Simulate UNIX commands like cp, ls, grep, etc.,
4. Simulate the following CPU scheduling algorithms
   a) FCFS b) SJF c) Priority d) Round Robin
5. Control the number of ports opened by the operating system with
   a) Semaphore b) Monitors
6. Write a program to illustrate concurrent execution of threads using pthreads library.
7. Write a program to solve producer-consumer problem using Semaphores.
8. Implement the following memory allocation methods for fixed partition
   a) First fit b) Worst fit c) Best fit
9. Simulate the following page replacement algorithms
   a) FIFO b) LRU c) LFU
10. Simulate Paging Technique of memory management.
11. Implement Bankers Algorithm for Dead Lock avoidance and prevention
12. Simulate the following file allocation strategies
    a) Sequential b) Indexed c) Linked

TEXT BOOKS:

1. Silberschatz A, Galvin P B, Gagne G, Operating System Concepts, Wiley, 10th Edition, 2018.
2. Tanenbaum A S, Modern Operating Systems, Pearson, 4th Edition, 2016.

REFERENCES:

1. Stallings W, Operating Systems -Internals and Design Principles, Pearson, 9th Edition, 2018.
2. D.M Dhamdhere, Operating Systems: A Concept Based Approach, McGraw- Hill, 3rd Edition,2013.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

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(AM23APC302) ARTIFICIAL INTELLIGENCE LAB

COURSE OBJECTIVES:
The objectives of this course are to:
- Teach the methods of implementing algorithms using artificial intelligence techniques
- Illustrate search algorithms
- Demonstrate the building of intelligent agents

COURSE OUTCOMES:
After successful completion of the course, students will be able to:
CO1: Analyze searching algorithms.
CO2: Solve Artificial intelligence problems
CO3: Design chatbot and virtual assistant

List of Experiments:
1. Write simple fact for the statements using PROLOG.
2. Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing.
3. Write a program to solve the Monkey Banana problem.
4. Write a program to implement DFS and BFS
5. Write a Program to find the solution for traveling salesman Problem
6. Write a program to implement Simulated Annealing Algorithm
7. Write a program to find the solution for the wumpus world problem
8. Write a program to implement 8 puzzle problem
9. Write a program to implement Towers of Hanoi problem
10. Write a program to implement A* Algorithm
11. Write a program to implement Hill Climbing Algorithm
12. Build a Chatbot using AWS Lex, Pandora bots.
13. Build a bot that provides all the information related to your college.
14. Build a virtual assistant for Wikipedia using Wolfram Alpha and Python

TEXT BOOKS
1. S. Russell and P. Norvig, Artificial Intelligence – A Modern Approach, Pearson Education, 3rd Edition.
2. Kevin Night and Elaine Rich, Nair B., Artificial Intelligence (SIE), McGraw Hill.

REFERENCES:
1. David Poole, Alan Mackworth, Randy Goebel, Computational Intelligence: A Logical Approach, Oxford University Press.
2. G. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, 4th Edition, Pearson Education.
3. J. Nilsson, Artificial Intelligence: A New Synthesis, Elsevier Publishers.
4. Saroj Kaushik, Artificial Intelligence, CENGAGE Learning.
5. Stuart Russell, Human Compatible: Artificial Intelligence and the Problem of Control.

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(CS23ASC401) FULL STACK DEVELOPMENT-1

COURSE OBJECTIVES:
The main objectives of the course are to:
- Make use of HTML elements and their attributes for designing static web pages
- Build a web page by applying appropriate CSS styles to HTML elements
- Experiment with JavaScript to develop dynamic web pages and validate forms

COURSE OUTCOMES:
After successful completion of the course, students will be able to:
- **CO 1:** Design Websites.
- **CO 2:** Apply Styling to web pages.
- **CO 3:** Make Web pages interactive
- **CO 4:** Design Forms for applications.
- **CO 5:** Choose Control Structure based on the logic to be implemented.
- **CO 6:** Understand HTML tags, Attributes and CSS properties.

Experiments covering the Topics:
- Lists, Links and Images
- HTML Tables, Forms and Frames
- HTML 5 and Cascading Style Sheets, Types of CSS Selector forms
- CSS with Color, Background, Font, Text and CSS Box Model
- Applying JavaScript - internal and external, I/O, Type Conversion
- JavaScript Conditional Statements and Loops, Pre-defined and User-defined Objects
- JavaScript Functions and Events

SAMPLE EXPERIMENTS:

1. Lists, Links and Images

a. Write a HTML program, to explain the working of lists.
   Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.
b. Write a HTML program, to explain the working of hyperlinks using <a> tag and href, target Attributes.
c. Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles.
d. Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique

2. HTML Tables, Forms and Frames

a. Write a HTML program, to explain the working of tables. (use tags: <table>, <tr>, <th>, <td> and attributes: border, rowspan, colspan)
b. Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use <caption> tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspan etc.).
c. Write a HTML program, to explain the working of forms by designing Registration form. (Note: Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie: submit and reset. Use tables to provide a better

view).

d. Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction. (Note: first frame image, second frame paragraph, third frame hyperlink. And also make sure of using "no frame" attribute such that frames to be fixed).

3. HTML 5 and Cascading Style Sheets, Types of CSS

a. Write a HTML program, that makes use of <article>, <aside>, <figure>, <figcaption>,<footer>, <header>, <main>, <nav>, <section>, , tags.

b. Write a HTML program, to embed audio and video into HTML web page.

c. Write a program to apply different types (or levels of styles or style specification formats) - inline, internal, external styles to HTML elements. (identify selector, property and value)

4. Selector forms

a. Write a program to apply different types of selector forms
- ✓ Simple selector (element, id, class, group, universal)
- ✓ Combinator selector (descendant, child, adjacent sibling, general sibling)
- ✓ Pseudo-class selector
- ✓ Pseudo-element selector
- ✓ Attribute selector

5. CSS with Color, Background, Font, Text and CSS Box Model

a. Write a program to demonstrate the various ways you can reference a color in CSS.

b. Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.

c. Write a program using the following terms related to CSS font and text:
   i. font-size
   ii. font-weight
   iii. font-style
   iv. text-decoration
   v. text-transformation
   vi. text-alignment

d. Write a program, to explain the importance of CSS Box model using
   i. Content
   ii. Border
   iii. Margin
   iv. padding

6. Applying JavaScript - internal and external, I/O, Type Conversion

a. Write a program to embed internal and external JavaScript in a web page.

b. Write a program to explain the different ways for displaying output.

c. Write a program to explain the different ways for taking input.

d. Create a webpage which uses prompt dialogue box to ask a voter for hisname and age. Display the information in table format along with either the voter can vote or not

7. JavaScript Pre-defined and User-defined Objects

a. Write a program using document object properties and methods.

b. Write a program using window object properties and methods.

c. Write a program using array object properties and methods.

d. Write a program using math object properties and methods.

e. Write a program using string object properties and methods.

f. Write a program using regex object properties and methods.

g. Write a program using date object properties and methods.

h. Write a program to explain user-defined object by using properties, methods,

accessors, constructors and display.

8. JavaScript Conditional Statements and Loops

a. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".
b. Write a program to display week days using switch case.
c. Write a program to print 1 to 10 numbers using for, while and do-while loops.
d. Write a program to print data in object using for-in, for-each and for-of loops
e. Develop a program to determine whether a given number is an 'ARMSTRONG NUMBER' or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e.,13 + 53+ 33 = 153]
f. Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's & 1's.(Eg: If deposited amount is Rs.163, the output should be 1-100's, 1-50's, 1- 10's, 1-2's & 1-1's)

9. Java script Functions and Events

a. Design a appropriate function should be called to display
   - ✓ Factorial of that number
   - ✓ Fibonacci series up to that number
   - ✓ Prime numbers up to that number
   - ✓ Is it palindrome or not

b. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
   - ✓ Factorial of that number
   - ✓ Fibonacci series up to that number
   - ✓ Prime numbers up to that number
   - ✓ Is it palindrome or not

c. Write a program to validate the following fields in a registration page
   i. Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
   ii. Mobile (only numbers and length 10 digits)
   iii. E-mail (should contain format like xxxxxxx@xxxxxx.xxx)

TEXT BOOKS:

1. Robet W Sebesta, Pearson,Programming the World Wide Web, 7th Edition, 2013.
2. John Dean, Web Programming with HTML5, CSS, and JavaScript, Jones & Bartlett Learning, 2nd Edition, 2019.

REFERENCES:

1. Vasan Subramanian, Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Apress, 2nd Edition, 2019.

ONLINE RESOURCES:

1. https://www.w3schools.com/html
2. https://www.w3schools.com/css
2. https://www.w3schools.com/js/
3. https://www.w3schools.com/nodejs
4. https://www.w3schools.com/typescript

II Year B.Tech. – II Semester

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2	-	-	-

(CH23AMC301) ENVIRONMENTAL SCIENCE

COURSE OBJECTIVES:

The objectives of this course are to:

- Make the students to get awareness on environment.
- Understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life.
- Save earth from the inventions by the engineers.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- **CO 1:** Exploring different types of renewable and non-renewable energy sources.
- **CO 2:** Students will learn about the structure and function of different ecosystems.
- **CO 3:** Students will learn about different types of pollution and their sources, effects and control measures.
- **CO 4:** Exploring the science behind climate change, its evidence, and its impacts on ecosystems and human societies.
- **CO 5:** Understanding demographic factors and their environmental implications.

UNIT I: (6 Periods)

Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness.

Natural Resources: Energy Resources**-** Renewable and Non-Renewable Resources – Natural Resources and Associated Problems – Forest Resources – Use and Over – Exploitation, Deforestation, Case Studies – Timber Extraction – Mining, Dams and other effects on Forest and Tribal People Water Resources – Use and Over Utilization of Surface and Ground Water – Floods, Drought, conflicts over Water, Dams – Benefits and Problems – Mineral Resources: Use and Exploitation, Environmental Effects of extracting and using Mineral Resources, Case Studies – Food Resources, World Food Problems, changes caused by Agriculture and Overgrazing, Effects of Modern Agriculture, Fertilizer-Pesticide Problems, Water Logging, Salinity, Case Studies.

UNIT II: (7 Periods)

Ecosystems: Concept of an Ecosystem. – Structure and Function of an Ecosystem – Producers, Consumers and Decomposers – Energy flow in the Ecosystem – Ecological Succession – Food Chains, Food Webs and Ecological Pyramids – Introduction, Types, Characteristic Features, Structure and Function of the following Ecosystems:

a) Forest Ecosystem.
b) Grassland Ecosystem
c) Desert Ecosystem.
d) Aquatic Ecosystems (Freshwater - Ponds, Streams, Lakes, Rivers, Marine Ecosystem- Oceans, Estuaries)

Biodiversity and its Conservation : Introduction, Definition: Genetic, Species and Ecosystem Diversity – Bio-Geographical Classification of India – Value of Biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and Option Values – Biodiversity at Global, National and Local levels – India as a Mega-Diversity Nation – Hot-Spots of Biodiversity – Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – Endangered and Endemic Species of India – Conservation of Biodiversity: In-situ and Ex-situ Conservation of Biodiversity. Specific Case Studies.

UNIT III: (6 Periods)

Environmental Pollution: Definition, Cause, Effects, and Control measures of: Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear Hazards - Pollution Case Studies - Role of an Individual in the Prevention of Pollution - Solid

Waste Management- Causes, Effects and Control Measures of Urban and Industrial Wastes - Disaster Management-Floods, Earthquakes, Cyclones and Landslides.

UNIT IV: (5 Periods)

Social Issues and the Environment: Sustainable Development Goals, From Unsustainable to Sustainable Development–Urban Problems related to Energy – Water Conservation, Rainwater Harvesting, Watershed Management –Resettlement and Rehabilitation of People; Its Problems and Concerns. Case Studies – Environmental Ethics: Issues and Possible Solutions – Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust. Case Studies – Wasteland Reclamation. – Consumerism and Waste Products - Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and Control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in Enforcement of Environmental Legislation – Public Awareness.

UNIT V: (6 Periods)

Human Population and the Environment: Population Growth, Variation among Nations. Population Explosion – Family Welfare Programmes. – Environment and Human Health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health – Case Studies.

Field Work: Visit a Local Area to Document Environmental Assets River / Forest Grassland / Hill / Mountain – Polluted Site – Urban / Rural / Industrial / Agricultural - Study of Common Plants, Insects and Birds – River, Hill Slopes.

Total Periods: 30

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press, 3rd Edition, 2021.
2. K. Raghavan Nambiar, Textbook of Environmental Studies for Undergraduate Courses as per UGC model syllabus, Scitech Publications (India), Pvt. Ltd. 2nd Edition, 2008.

REFERENCES:

1. Deeksha Dave and E. Sai Baba Reddy, Textbook of Environmental Science, Cengage Publications, 2nd Edition, 2012.
2. M. Anji Reddy, Textbook of Environmental Sciences and Technology, BS Publication, 2nd Edition, 2023.
3. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, 3rd Edition, 2009.
4. J. Glynn Henry and Gary W. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private Limited, 2nd Edition, Studies2014.
5. Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science, Prentice Hall of India Private Limited, 3rd Edition, 2007.
6. Palaniswamy, Environmental Studies, Pearson Education, 2nd Edition, 2014.
7. A. Koushik & C. P. Koushik, Perspectives in Environmental Studies, New Age International, 4th Edition, 2006.

III Year B.Tech. – I Semester

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3	-	-	3

(CS23APC501) AUTOMATA THEORY AND COMPILER DESIGN

COURSE OBJECTIVES:

The objectives of this course are to:

- Introduce the fundamentals of formal languages, automata theory, and computation models.
- Develop an understanding of regular expressions, context-free grammars, and their role in language recognition.
- Explore the design and behavior of Pushdown Automata and Turing Machines as language acceptors.
- Explain the different phases of a compiler with a focus on lexical and syntax analysis using tools like LEX and YACC.
- Illustrate syntax-directed translation schemes and intermediate code generation for real time language processing.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- **CO 1:** Understand and apply formal language concepts, including finite automata and regular languages, to language recognition.
- **CO 2:** Design and analyze context-free grammars, derivations, and normal forms, and use Pushdown Automata for parsing.
- **CO 3:** Compare different computation models including Turing Machines and understand their capabilities.
- **CO 4:** Analyze and implement lexical and syntax analysis phases of a compiler using formal methods and tools like LEX/YACC.
- **CO 5:** Apply syntax-directed translation techniques and generate intermediate representations for language translation.

UNIT I: (9 Periods)

Fundamentals: Formal Languages, Strings, Alphabets, Languages, Chomsky Hierarchy of languages.

Finite Automata: Introduction to Finite State machine, Acceptance of strings and languages, Deterministic finite automaton (DFA) and Non-deterministic finite automaton (NFA), Equivalence of NFA and DFA– Equivalence of NDFAs with and without €-moves, Minimization of finite automata, Equivalence between two DFA's, Finite automata with output– Moore and Mealy machines, conversion of Moore to Mealy and Mealy to Moore

UNIT II: (9 Periods)

Regular Languages: Regular expressions, Identity rules, Conversion of a given regular expression into a finite automaton, Conversion of finite automata into a regular expression, pumping lemma for regular sets, Closure properties of regular sets (proofs not required).

Context Free Grammars: Context free grammars and languages, Derivation trees, Leftmost and rightmost derivation of strings and Sentential forms, Ambiguity, left recursion and left factoring in context free grammar, Minimization of context free grammar, Normal forms for context free grammars, Chomsky normal form, Greibach normal form, Pumping Lemma for Context free Languages, Closure and decision properties of context free languages.

UNIT III: (9 Periods)

Pushdown Automata: Introduction to Pushdown automata, Acceptance of context free languages, Acceptance by final state and acceptance by empty state and its equivalence, Equivalence of context free grammar and pushdown automata, Inter-conversion (Proofs not required).

Turing Machine: Introduction to Turing Machine, Design of Turing machines, Types of Turing machines.

UNIT IV: (9 Periods)

Introduction to Compiling: Overview of Compilers, Phases of a Compiler.

Lexical Analysis: The Role of Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, A language for specifying Lexical Analyzers (LEX).

Syntax Analysis: The role of the Parser, First and Follow, Predictive Parsing, LR Parsers-SLR, Canonical LR, LALR, Parser Generator (YACC).

UNIT V: (9 Periods)

Syntax-Directed Translation: Syntax-Directed Definition, S-Attributed SDD, L-Attributed SDD, Translation Schemes.

Intermediate Code Generation: Intermediate Languages- Graphical Representations, Three address code, Implementations.

Total Periods: 45

TEXT BOOKS:

1. John E Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory Languages and Computation, Pearson Education, 3rd Edition, 2011.
2. Alfred Aho, Monica S Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers- Principles Techniques and Tool, Pearson Education India, 2nd Edition, 2013.

REFERENCES:

1. Peter Linz, An introduction to Formal Languages and Automata, Jones & Bartlett, 6th Edition, 2016
2. V.Raghavan, Principles of Compiler Design, Mc Graw Hill Education, 1st Edition, 2017.
3. Mishra and Chandrashekaran, Theory of Computer Science– Automata Languages and Computation, PHI, 3rd Edition, 2009
4. K.V.N.Sunitha , N.Kalyani, Formal Languages and Automata Theory, TMH, 1st Edition, 2010
5. Michel Sip ser, Introduction to Theory of Computation, Thomson, 2nd Edition, 2012

ONILNE RESOURSES:

1. https://swayam.gov.in/nd1_noc19_cs79/preview

III Year B.Tech. – I Semester

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(CY23APC301) COMPUTER NETWORKS

COURSE OBJECTIVES:

The objectives of this course are to:

- Understand the different types of networks
- Discuss the software and hardware components of a network
- Develop an understanding the principles of computer networks.
- Familiarize with OSI model and the functions of layered structure.
- Explain networking protocols, algorithms and design perspectives

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Identify the software and hardware components of a Computer network.
CO 2: Explain the functionality of each layer of a computer network.
CO 3: Identify and analyze flow control, congestion control, and routing issues.
CO 4: Analyze and interpret the functionality and effectiveness of the routing protocols.
CO 5: Choose the appropriate transport protocol based on the application requirements.

UNIT I: (8 Periods)

Introduction: Types of Computer Networks, Network technology from local to global, Personal Area Networks, Local Area Networks, Home Networks, Metropolitan Area Networks, Wide Area Networks, Internetworks, Network Protocols, Design Goals, Protocol Layering, Connections and Reliability, Service Primitives, The Relationship of Services to Protocols ,Reference Models, The OSI Reference Model, The TCP/IP Reference Model, A Critique of the OSI Model and Protocols, A Critique of the TCP/IP Reference Model and Protocols.

UNIT II: (10 Periods)

The Data Link Layer: Guided Transmission Media, Persistent Storage, Twisted Pairs, Coaxial Cable, Power Lines, Fiber Optics, Data Link Layer Design Issues, Services Provided To The Network Layer, Framing Error Control, Flow Control, Error Detection And Correction, Error-Correcting Codes, Error-Detecting Codes, Elementary Data Link Protocols, Initial Simplifying Assumptions Basic Transmission And Receipt, Simplex Link- Layer Protocols, Half duplex, Full-Duplex.

Sliding Window Protocols: The Channel Allocation Problem, Static Channel Allocation, Assumptions for Dynamic Channel Allocation, Multiple Access Protocols, Aloha, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited Contention Protocols, Wireless LAN Protocols, Ethernet.

UNIT III: (9 Periods)

The Network Layer: Network Layer Design Issues, Store-And-Forward Packet Switching, Services Provided To The Transport Layer, Implementation Of Connectionless Service, Implementation Of Connection-Oriented Service, Comparison Of Virtual-Circuit And Datagram Networks, Routing Algorithms In A Single Network, The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing Within a Network, Broadcast Routing, Multicast Routing, unicast Routing, **Internetworking, Internetworks:** An Overview, How Networks differ, Connecting Heterogeneous Networks, Connecting Endpoints Across Heterogeneous Networks, Internetwork Routing: Routing Across Multiple Networks Supporting Different Packet Sizes: Packet Fragmentation, The Network Layer In The Internet, The IP Version 4 Protocol, IP Addresses, IP Version 6.

UNIT IV: (8 Periods)

The Transport Layer: The Transport Service, Services Provided to the Upper Layers, Transport Service Primitives, Error Control and Flow Control, Multiplexing, Congestion Control, Regulating the Sending Rate, Wireless Issues, The Internet Transport Protocols: UDP, Introduction To UDP, Remote Procedure Call, Real-Time Transport

Protocols,
The Internet Transport Protocols: TCP, Introduction To TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release.

UNIT V: (10 Periods)
The Application Layer: Electronic Mail, Architecture and Services, The World Wide Web, Architectural Overview, Static Web Objects, Dynamic Web Pages and Web Applications, HTTP and HTTPS, Web Privacy, Content Delivery, Content and Internet Traffic, Content Delivery Networks, Peer-To-Peer Networks, Evolution of The Internet.

Total Periods: 45

TEXT BOOKS:
1. Andrew Tanenbaum, Feamster, Wetherall, *Computer Networks* (Global Edition), Pearson, 6th Edition, 2021.
2. Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill, 5th Edition, 2017.

REFERENCES:
1. James F. Kurose, Keith W. Ross, Computer Networking: A Top-Down Approach, Pearson, 6th Edition, 2019.
2. Youlu Zheng, Shakil Akthar, "Networks for Computer Scientists and Engineers", OxfordPublishers.1st Edition, 2016.

ONLINE RESOURCES:
1. https://nptel.ac.in/courses/106105183/25
2. http://www.nptelvideos.in/2012/11/computer-networks.html
3. https://nptel.ac.in/courses/106105183/3

III Year B.Tech. – I Semester

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(CS23APC502) DATA WAREHOUSING AND DATA MINING

COURSE OBJECTIVES:

The objectives of this course are to:

- Understand the concepts of data warehousing, OLAP, and data preprocessing techniques.
- Explore various data mining processes, tasks, and methodologies to extract patterns and knowledge from large datasets.
- Gain knowledge of classification, clustering, association rule mining, and outlier detection techniques.
- Evaluate various models using statistical and machine learning methods for improved data analysis.
- Apply data mining algorithms using tools such as WEKA and R programming for real-world datasets and case studies.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Explain data warehousing architecture, OLAP concepts, and data warehouse schemas.
CO 2: Apply data preprocessing techniques and summarize data using statistical methods.
CO 3: Perform frequent pattern mining and derive association rules using different mining algorithms.
CO 4: Develop classification and clustering models using machine learning techniques and evaluate their performance.
CO 5: Use WEKA and R programming tools for implementing data mining algorithms and analyzing datasets.

UNIT I: (9 Periods)

Basic Concepts – Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors – Multidimensional Data Model – Data Warehouse Schemas for Decision Support, Concept Hierarchies -Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP.

UNIT II: (9 Periods)

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications- Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT III: (9 Periods)

Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns.

UNIT IV: (9 Periods)

Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines –– Lazy Learners – Model Evaluation and Selection Techniques to improve Classification Accuracy. Clustering Techniques – Cluster analysis Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods.

UNIT V: (9 Periods)

Weka Tool: Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database – Introduction to WEKA, The Explorer – Getting started, Exploring the

explorer, Learning algorithms, Clustering algorithms, Association–rule learners.

Total Periods: 45

TEXT BOOKS:

1. Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, Elsevier, 3rd Edition, 2012.
2. Alex Berson and Stephen J.Smith, Data Warehousing, Data Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint 2016.

REFERENCES:

1. K.P. Soman, Shyam Diwakar and V. Ajay, Insight into Data Mining Theory and Practice, Prentice Hall of India, Eastern Economy Edition, 2006.
2. Ian H.Witten and Eibe Frank, —Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, 2nd Edition.

III Year B.Tech. – I Semester

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(IT23APC401) SOFTWARE ENGINEERING

(Professional Elective-I)

COURSE OBJECTIVES:

The objectives of this course are to:

- Understand the Evolution of Software Development, Gain Insight into Software Development Life Cycle Models.
- Develop Project Management Skills, Learn Requirements Engineering Techniques.
- Design Reliable Software Architectures, Explore User Interface Design Principles.
- Master the Practices of Coding and Testing, Understand Software Quality and Reliability.
- Introduce CASE Tools and Automation in SE, Understand Software Maintenance and Reuse

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.
CO 2: Analyze various software engineering models and apply methods for design and development of software projects.
CO 3: Develop system designs using appropriate techniques.
CO 4: Understand various testing techniques for a software project.
CO 5: Apply standards, CASE tools and techniques for engineering S/W projects

UNIT I: **(10 Periods)**

Introduction: Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering.

Software Life Cycle Models: Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model, Spiral model

UNIT II: **(9 Periods)**

Software Project Management: Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management.

Requirements Analysis and Specification: Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL.

UNIT III: **(8 Periods)**

Software Design: Overview of the design process, How to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling. approaches to software design.

Agility: Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, Tool Set for the Agile Process (Text Book 2)

User Interface Design: Characteristics of a good user interface, Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.

UNIT IV: **(9 Periods)**

Coding and Testing: Coding, Code review, Software documentation, Testing, Black box testing, White-Box testing, Debugging, Program analysis tools, Integration testing

Software Reliability and Quality Management: Software reliability. Statistical testing, Software quality, Software quality management system, ISO 9000. SEI Capability maturity

model. Few other important quality standards, and Six Sigma.

UNIT V: (9 Periods)

Computer-Aided Software Engineering (Case): CASE and its scope, CASE environment, CASE support in the software life cycle, other characteristics of CASE tools, Towards second generation CASE Tool, and Architecture of a CASE Environment.

Software Maintenance: Characteristics of software maintenance, Software reverse engineering, Software maintenance process models and Estimation of maintenance cost.

Software Reuse: reuse- definition, introduction, reason behind no reuse so far, Basic issues in any reuse program and A reuse approach.

Total Periods: 45

TEXT BOOKS:

1. Rajib Mall, Fundamentals of Software Engineering, PHI Learning Pvt. Ltd., 5th Edition, 2018.
2. Roger S. Pressman and Bruce R. Maxim, Software Engineering: A Practitioner's Approach, McGraw-Hill Education, 9th Edition, 2019.

REFERENCES:

1. Ian Sommerville, Software Engineering, Pearson Education, 10th Edition, 2015.
2. Deepak Jain, Software Engineering: Principles and Practices, Oxford University Press, 2018.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105182/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012605895063871 48827_shared/overview
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013382690411003 904735_shared/overview

III Year B.Tech. – I Semester

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(EC23APC504) MICROPROCESSORS AND MICROCONTROLLERS

(Professional Elective-I)

COURSE OBJECTIVES:

The objectives of this course are to:

- Learn the fundamental architectural concepts of microprocessors.
- Gain knowledge about assembly language programming concepts.
- Get familiar about 8086 interfacing.
- Understand the fundamentals of the 8051 Microcontroller.
- Learn interfacing with the 8051 Microcontroller.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Learn the fundamental architectural concepts of microprocessors.
CO 2: Gain knowledge about assembly language programming concepts.
CO 3: Understand the concepts of 8086 interfacing.
CO 4: Learn the fundamentals of the 8051 Microcontroller.
CO 5: Know the interfacing with the 8051 Microcontroller.

UNIT I: (9 Periods)

8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT II: (9 Periods)

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT III: (9 Periods)

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT IV: (9 Periods)

Microcontroller: Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT V: (9 Periods)

Interfacing Microcontroller: - Programming 8051 Timers - Serial Port Programming Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors**.**

Total Periods: 45

TEXT BOOKS:

1. Douglas V. Hall and S. S. S. P. Rao, Microprocessors and Interfacing: Programming and Hardware, Tata McGraw-Hill Education Pvt. Ltd., 3rd Edition, 1994.
2. K. M. Bhurchandi and A. K. Ray, Advanced Microprocessors and Peripherals, McGraw-Hill Education, 3rd Edition, 2017.

REFERENCES:

1. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, Pearson Education, 2nd Edition, 2012.
2. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, Penram International Publishing, 6th Edition, 2013.
3. Kenneth J. Ayala, The 8051 Microcontroller, Cengage Learning, 3rd Edition, 2004.

III Year B.Tech. – I Semester

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3	-	-	3

(IT23APE502) OBJECT ORIENTED ANALYSIS AND DESIGN

(Professional Elective-I)

COURSE OBJECTIVES:

The objectives of this course are to:

- Understand the complexity of software systems and principles for designing large-scale, structured software architectures.
- Learn the fundamentals of UML, including its conceptual model, architecture, and role in the software development life cycle.
- Develop the ability to create and interpret structural models such as class, object, and package diagrams.
- Model system behaviour using use cases, interaction diagrams, activity diagrams, and state machines.
- Apply architectural modelling techniques using component and deployment diagrams for real-world applications.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Analyze the problem from object-oriented perspective
CO 2: Model complex systems using UML Diagrams
CO 3: Choose the suitable design patterns in software design
CO 4: Adapt Object-Oriented Design Principles
CO 5: Identify the challenges in testing object-oriented software.

UNIT I: (9 Periods)

Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems. Case Study: System Architecture: Satellite-Based Navigation.

UNIT II: (9 Periods)

Introduction to UML: Importance of modelling, principles of modelling, object oriented modelling, conceptual model of the UML, Architecture, and Software Development Life Cycle. Basic Structural Modelling: Classes, Relationships, common Mechanisms, and diagrams. Case Study: Control System: Traffic Management.

UNIT III: (9 Periods)

Class & Object Diagrams: Terms, concepts, Modelling techniques for Class & Object Diagrams. Advanced Structural Modelling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. Case Study: AI: Cryptanalysis.

UNIT IV: (9 Periods)

Basic Behavioural Modelling-I: Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams.
Case Study: Web Application: Vacation Tracking System.

UNIT V: (9 Periods)

Advanced Behavioural Modelling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Architectural Modelling: Component, Deployment, Component diagrams and Deployment diagrams Case Study: Weather Forecasting.

Total Periods: 45

TEXT BOOKS:

1. Rajib Mall, Fundamentals of Software Engineering, PHI Learning Pvt. Ltd., 5th Edition, 2018.
2. Grady Booch, James Rumbaugh, and Ivar Jacobson, The Unified Modeling Language User Guide, Pearson Education, 2nd Edition, 2005.

REFERENCES:

1. James Rumbaugh and Michael Blaha, Object-Oriented Modeling and Design with UML, Pearson Education, 2007.
2. Bernd Bruegge and Allen H. Dutoit, Object-Oriented Software Engineering: Using UML, Patterns, and Java, Pearson Education, 2009.
3. Meilir Page-Jones, Fundamentals of Object-Oriented Design in UML, Pearson Education, New York, 2000.
4. Craig Larman, Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and the Unified Process, Pearson Education, 3rd Edition, 2004.

III Year B.Tech. – I Semester

L	T	P	C
3	-	-	3

(AM23APE501) SOFT COMPUTING

(Professional Elective-I)

COURSE OBJECTIVES:

The objectives of this course are to:

- Understand the concepts of soft computing techniques and how they differ from traditional AI techniques.
- Introduce the fundamentals of fuzzy logic and fuzzy systems.
- Familiarize with artificial neural networks and their architectures.
- Learn genetic algorithms and their role in optimization.
- Explore hybrid systems integrating fuzzy logic, neural networks, and genetic algorithms.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand the components and applications of soft computing.
CO 2: Apply fuzzy logic concepts to real-world problems.
CO 3: Build and train various neural network models.
CO 4: Implement genetic algorithms for problem-solving and optimization.
CO 5: Design hybrid systems using soft computing techniques.

UNIT I: (8 Periods)

Introduction to Soft Computing and Fuzzy Logic: Introduction to Soft Computing: Definition, Components, Differences with Hard Computing, Applications of Soft Computing
Fuzzy Logic: Crisp Sets vs Fuzzy Sets, Membership Functions, Fuzzy Set Operations, Fuzzy Rules and Fuzzy Reasoning
Fuzzy Inference Systems: Mamdani and Sugeno Models, Defuzzification Techniques

UNIT II: (9 Periods)

Artificial Neural Networks – I: Introduction to Neural Networks: Biological Neurons vs Artificial Neurons, Architecture of Neural Networks: Feedforward, Feedback Learning Rules: Hebbian, Delta, Perceptron Learning Rule, Single Layer Perceptron and its Limitations, Multi-Layer Perceptron: Backpropagation Algorithm, Applications of Neural Networks

UNIT III: (10 Periods)

Artificial Neural Networks – II: Hopfield Networks and Associative Memories, Radial Basis Function Networks, Self-Organizing Maps (SOM), Recurrent Neural Networks (RNNs) – Basic Concepts, Convolutional Neural Networks (CNNs) – Overview and Applications, and Practical Use Cases in Image and Pattern Recognition.

UNIT IV: (10 Periods)

Genetic Algorithms and Optimization: Introduction to Genetic Algorithms, GA Operators: Selection, Crossover, Mutation, Fitness Function and Evaluation, Schema Theorem, Elitism, Applications in Function Optimization, Scheduling, and Robotics, Introduction to Particle Swarm Optimization (PSO).

UNIT V: (8 Periods)

Hybrid Systems and Advanced Topics: Hybrid Systems: Neuro-Fuzzy Systems, Fuzzy-GA, GA-ANN, ANFIS: Architecture and Learning, Case Studies on Hybrid Systems, Introduction to Deep Learning in Soft Computing, Real-World Applications: Forecasting, Control Systems, Medical Diagnosis, Image Processing.

Total Periods: 45

TEXT BOOKS:

1. S. N. Sivanandam and S. N. Deepa, Principles of Soft Computing, Wiley, 3rd Edition, 2019.
2. Timothy J. Ross, Fuzzy Logic with Engineering Applications, Wiley, 4th Edition, 2016.

REFERENCES:

1. S. Rajasekaran and G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, PHI Learning Pvt. Ltd., 2003.
2. Laurene Fausett, Fundamentals of Neural Networks: Architectures, Algorithms and Applications, Pearson Education, 1994.
3. David E. Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Pearson Education, 1989.
4. Simon Haykin, Neural Networks and Learning Machines, 3rd Edition, Pearson Education, 2008.
5. Bart Kosko, Neural Networks and Fuzzy Systems, Prentice Hall, 1992.

ONLINE RESOURCES:

1. NPTEL – Soft Computing by Prof. S. Sengupta (IIT Kharagpur)
2. Coursera – Neural Networks and Deep Learning (Andrew Ng)

III Year B.Tech. – I Semester

L	T	P	C
-	-	3	1.5

(CY23APC302) COMPUTER NETWORKS LAB

COURSE OBJECTIVES:

The objectives of this course are to:

- Understand the different types of networks.
- Discuss the software and hardware components of a network.
- Enlighten the working of networking commands supported by operating system.
- Impart knowledge of Network simulator 2/3.
- Familiarize the use of networking functionality supported by JAVA.
- Familiarize with computer networking tools.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand working of wired and wireless networks.
CO 2: Develop scripts for Simulating Wired and wireless Networks.
CO 3: Analyze the data traffic using tools.
CO 4: Develop JAVA programs for client-server communication.
CO 5: Utilize networking commands proficiently to diagnose and troubleshoot the network issues.

LIST OF ACTIVITIES/EXPERIMENTS:

1. Study different types of Network cables (Copper and Fiber) and prepare cables (Straight and Cross) to connect Two or more systems. Use crimping tool to connect jacks. Use LAN tester to connect the cables. Install and configure Network Devices: HUB, Switch and Routers. Consider both manageable and non-manageable switches. Do the logical configuration of the system. Set the bandwidth of different ports. Install and Configure Wired and Wireless NIC and transfer files between systems in Wired LAN and Wireless LAN. Consider both adhoc and infrastructure mode of operation.
2. Work with the commands Ping, Tracert, Ipconfig, pathping, telnet, ftp, getmac, ARP, Hostname, Nbtstat, net diag, and Ns lookup
3. Find all the IP addresses on your network. Unicast, Multicast, and Broadcast on your network.
4. Use Packet tracer software to build network topology and configure using Distance vector routing protocol.
5. Use Packet tracer software to build network topology and configure using Link State routing protocol.
6. Using JAVA RMI Write a program to implement Basic Calculator.
7. Implement a Chatting application using JAVA TCP and UDP sockets.
8. Hello command is used to know whether the machine at the other end is working or not. Echo command is used to measure the round-trip time to the neighbor. Implement Hello and Echo commands using JAVA.
9. Using Wireshark perform the following operations:
    - Inspect HTTP Traffic
    - Inspect HTTP Traffic from a Given IP Address,
    - Inspect HTTP Traffic to a Given IP Address,
    - Reject Packets to Given IP Address,
    - Monitor Apache and MySQL Network Traffic.
10. Install Network Simulator 2/3. Create a wired network using dumbbell topology. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metrics throughput, delay, jitter and packet loss.
11. Create a static wireless network. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.

12. Create a mobile wireless network. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.

TEXT BOOKS:

1. Andrew Tanenbaum, Feamster, Wetherall, *Computer Networks* (Global Edition), Pearson, 6th Edition, 2021.
2. Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill, 5th Edition, 2017.

REFERENCES:

1. James F. Kurose, Keith W. Ross, Computer Networking: A Top-Down Approach, Pearson, 6th Edition, 2019.
2. Youlu Zheng, Shakil Akthar, "Networks for Computer Scientists and Engineers", OxfordPublishers.1st Edition, 2016.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106105183/25
2. http://www.nptelvideos.in/2012/11/computer-networks.html
3. https://nptel.ac.in/courses/106105183/3

III Year B.Tech. – I Semester

L	T	P	C
-	-	3	1.5

(CS23APC503) DATA WAREHOUSE AND DATA MINING LAB

COURSE OBJECTIVES:

The objectives of this course are to:

- Introduce students to the WEKA tool for data mining applications.
- Explore data preprocessing, transformation, and visualization techniques.
- Implement key data mining algorithms such as classification, clustering, and association rules.
- Enable students to perform model evaluation using cross-validation and performance metrics.
- Apply OLAP operations for multidimensional data analysis.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Demonstrate the installation and navigation of WEKA tool interfaces for data mining tasks.

CO 2: Create, load, and manage datasets in ARFF and CSV formats suitable for mining.

CO 3: Apply preprocessing techniques and feature selection methods to prepare data for modeling.

CO 4: Implement and analyze data mining algorithms such as Apriori, FP-Growth, J48, Naïve Bayes, and K-Means using WEKA.

CO 5: Perform OLAP operations and evaluate information gain for feature selection and data summarization.

LIST OF EXPERIMENTS

1. Installation of WEKA Tool
   Experiment: Investigation the Application interfaces of the Weka tool. Introduction.
   Real Example: Results destination: ARFF file, CSV file, JDBC database. Cross-validation (default), Train/Test Percentage Split (data randomized). Iteration control: Number of repetitions, Data sets first/Algorithms first. Algorithms: filters
   Use Case: Normalize the data using min-max normalization.
2. Creating new ARFF file
   Experiment: Creating a new ARFF file.
   Real Example: The external representation of an Instances class Consists of: A header: Describes the attribute types. Data section: Comma separated list of data.
   Use Case: Creating a sample dataset for supermarket (supermarket.arff).
3. Pre-Processes Techniques on Data Set
   Experiment: Pre-process a given dataset based on Attribute selection.
   Real Example: To search through all possible combinations of attributes in the data and find which subset of attributes works best for prediction, make sure that you set up attribute evaluator to „Cfs Subset Val" and a search method to „Best First". The evaluator will determine what method to use to assign a worth to each subset of attributes. The search method will determine what style of search to perform. The options that you can set for selection in the
   „Attribute Selection Mode".
   Use Case: Explain data preprocessing steps for heart disease dataset.
4. Generate Association Rules using the Apriori Algorithm
   Experiment: The Apriori algorithm is an influential algorithm for mining frequent item sets for Boolean association rules. It uses a "bottom-up" approach, where frequent subsets are extended one at a time (a step known as candidate generation, and groups of candidates are tested against the data).
   Real Example:

TID	ITEMS
100	1,3,4

200	2,3,5
300	1,2,3,5
400	2,5

To find frequent item sets for above transaction with a minimum support of 2 having confidence measure of 70% (i.e, 0.7)

Use Case: Apply the Apriori algorithm on Airport noise monitoring dataset discriminating between patients with parkinsons and neurological diseases using voice recording dataset.

5. Generating Association Rules Using FP Growth Algorithm

Experiment: To generate association rules using FP Growth Algorithm

Real Example: To find all frequent item sets in following dataset using FP-growth algorithm. Minimum support=2 and confidence =70%

TID	ITEMS
100	1,3,4
200	2,3,5
300	1,2,3,5
400	2,5

Use Case: Apply FP-Growth algorithm on Blood Transfusion Service Center data set

6. Build a Decision Tree by using J48 algorithm

Experiment: Generate a Decision Tree by using J48 algorithm.

Real Example: Build a decision tree for the following data

AGE	INCOME	STUDENT	CREDIT_RATING	BUYS_COMPUTER
Youth	High	No	Fair	No
Youth	High	No	Excellent	No
Middle aged	High	No	Fair	Yes
Senior	Medium	No	Fair	Yes
Senior	Low	Yes	Fair	Yes
Senior	Low	Yes	Excellent	No
Middle aged	Medium	Yes	Excellent	Yes
Youth	Low	No	Fair	No
Youth	Medium	Yes	Fair	Yes
Senior	Medium	Yes	Fair	Yes
Youth	Medium	Yes	Excellent	Yes
Middle aged	Medium	No	Excellent	Yes
Middle aged	High	Yes	Fair	Yes
Senior	Medium	No	Excellent	No

Use Case: Apply decision tree algorithm to book a table in a hotel/ book a train ticket/ movie ticket.

7. Naïve bayes classification on a given data set

Experiment: To apply naïve bayes classifier on a given data set.

Real Example: In machine learning, Naïve Bayes classifiers are a family of simple probabilistic classifiers based on applying Bayes" Theorem with strong (naïve) independence assumptions between the features

AGE	INCOME	STUDENT	CREDIT_RATING	BUYS_COMPUTER
<30	High	No	Fair	No

<30	High	No	Excellent	No
31-40	High	No	Fair	Yes
>40	Medium	No	Fair	Yes
>40	Low	Yes	Fair	Yes
>40	Low	Yes	Excellent	No
31-40	Medium	Yes	Excellent	Yes
<=30	Low	No	Fair	No
<=30	Medium	Yes	Fair	Yes
>40	Medium	Yes	Fair	Yes
<30	Mediu m	Yes	Excellent	Yes
31-40	Mediu m	No	Excellent	Yes
31-40	High	Yes	Fair	Yes
>40	Mediu m	No	Excellent	No

Use Case: Classify data (lung cancer/ diabetes /liver disorder) using Bayesian approach

8. Applying k-means clustering on a given data set

Experiment: K-means algorithm aims to partition n observations into "k clusters" in which each observation belongs to the cluster with the nearest mean, serving as a prototype of the cluster. This results in partitioning of the data into Voronoi cells.

Real Example: As a simple illustration of a k-means algorithm, consider the following data set consisting of the scores of two variables on each of the five variables.

I	X1	X2
A	1	1
B	1	0
C	0	2
D	2	4
E	3	5

Use Case: Implement of K-means clustering using crime dataset.

9. Calculating information gain measures

EXPERIMENT: Information gain (IG) measures how much "information" a feature gives us about the class. – Features that perfectly partition should give maximal information. – Unrelated features should give no information. It measures the reduction in entropy. CfsSubset Eval aims to identify a subset of attributes that are highly correlated with the target while not being strongly correlated with one another. It searches through the space of possible attribute subsets for the "best" one using the Best First search method by default, although other methods can be chosen. To use the wrapper method rather than a filter method, such as CfsSubsetEval, first select Wrapper Subset Eval and then configure it by choosing a learning algorithm to apply and setting the number of cross-validation folds to use when evaluating it on each attribute subset.

Real Example: Open WEKA Tool.
Click on WEKA Explorer.
Click on Preprocessing tab button.
Click on open file button.
Select and Click on data option button.
Choose a data set and open file.
Click on select attribute tab and Choose attribute evaluator, search method algorithm

Use Case: Calculate the information gain on weather data set(for each attributes separately).

10. OLAP Cube and its different operations

Experiment: An OLAP cube is a term that typically refers to multi-dimensional array of data. OLAP is an acronym for online analytical processing,[1]which is a computer-based technique of analyzing data to look for insights. The term cube here refers to a multi-dimensional dataset, which is also sometimes called a hypercube if the number of dimensions is greater than 3.

Real Example:

Operations: Slice is the act of picking a rectangular subset of a cube by choosing a single value for one of its dimensions, creating a new cube with one fewer dimension. The picture shows a slicing operation: The sales figures of all sales regions and all product categories of the company in the year 2005 and 2006 are "sliced" out of the data cube.

Dice: The dice operation produces a subcube by allowing the analyst to pick specific values of multiple dimensions. The picture shows a dicing operation: The new cube shows the sales figu

Drill Down/Up allows the user to navigate among levels of data ranging from the most summarized (up) to the most detailed (down). The picture shows a drill-down Operation: The analyst moves from the summary category "Outdoor-Schutzausrüstung" to see the sales figures for the individual products.

Roll-up: A roll-up involves summarizing the data along a dimension. The summarization rule might be computing totals along a hierarchy or applying a set of formulas such as "profit = sales- expenses".

Pivot allows an analyst to rotate the cube in space to see its various faces. For example, cities could be arranged vertically and products horizontally while viewing data for a particular quarter. Pivoting could replace products with time periods to see data across time for a single product.

Use Case: Apply the OLAP operations for the above banking application.

TEXT BOOKS:

1. Jiawei Han, Micheline Kamber, and Jian Pei, Data Mining: Concepts and Techniques, Morgan Kaufmann, 3rd Edition, 2011.
2. Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, Introduction to Data Mining, Pearson Education, 2nd Edition, 2018.

REFERENCES:

1. Ian H. Witten, Eibe Frank, and Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann, 4th Edition, 2016.
2. Mehmed Kantardzic, Data Mining: Concepts, Models, Methods, and Algorithms, Wiley-IEEE Press, 2nd Edition, 2011.
3. Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, An Introduction to Statistical Learning, Springer, 2nd Edition, 2021.
4. Margaret H. Dunham, Data Mining: Introductory and Advanced Topics, Pearson Education, 1st Edition, 2002.
5. Alexis Leon and Mathews Leon, Data Mining and Data Warehousing, Vikas Publishing House, 2012.
6. K. P. Soman, Shyam Diwakar, and V. Ajay, Insight into Data Mining: Theory and Practice, PHI Learning, 1st Edition, 2006.
7. Michael J. A. Berry and Gordon S. Linoff, Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management, Wiley, 3rd Edition, 2011.
8. Galit Shmueli, Nitin R. Patel, and Peter C. Bruce, Data Mining for Business Analytics: Concepts, Techniques, and Applications, Wiley, 3rd Edition, 2016.

III Year B.Tech. – I Semester

L	T	P	C
-	1	2	2

(CS23ASC501) FULL STACK DEVELOPMENT-II

COURSE OBJECTIVES:

The objectives of this course are to:

- Enable the use of Modern JavaScript (ES6) for building dynamic, interactive, and modular front-end applications.
- Develop fast, scalable, and responsive user interfaces using React.js, a widely-used JavaScript library.
- Design and implement backend APIs using Express.js, a Node.js framework.
- Establish seamless full-stack connectivity between the frontend (React), backend (Express), and database (MySQL).
- Provide hands-on experience in building a complete web application with real- time interactions and persistent storage.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Build fast, dynamic, and interactive user interfaces using React.js.
CO 2: Use declarative programming paradigms to develop scalable web applications.
CO 3: Leverage ES6 JavaScript features for writing modern, cleaner, and efficient code.
CO 4: Design and implement backend services and RESTful APIs using Express.js.
CO 5: Integrate frontend, backend, and MySQL database to build a complete full stack solution.

Experiments covering the Topics:

- Introduction to DOM (Document Object Model), Ecma Script (ES6) standards and features like Arrow functions, Spread operator, Rest operator, Type coercion, Type hoisting, String literals, Array and Object Destructuring.
- Basics of React. js like React Components, JSX, Conditional rendering Differences between Real DOM and Virtual DOM.
- Important React.js concepts like React hooks, Props, React forms, Fetch API, Iterative rendering using JavaScript map() function.
- JavaScript runtime environment node. js and its uses, Express. js and Routing, Micro- Services architecture and MVC architecture, database connectivity using (My SQL)
- Introduction to My SQL, setting up MySQL and configuring, Databases, My SQL queries, subqueries, creating My SQL driver for database connectivity to Express. js server.

Sample Experiments:

1. Introduction to Modern JavaScript and DOM
    a. Write a JavaScript program to link JavaScript file with the HTML page
    b. Write a JavaScript program to select the elements in HTML page using selectors
    c. Write a JavaScript program to implement the event listeners
    d. Write a JavaScript program to handle the click events for the HTML button elements
    e. Write a JavaScript program to With three types of functions
        i. Function declaration
        ii. Function definition
        iii. Arrow functions
2. Basics of React. js
    a. Write a React program to implement a counter button using react class components
    b. Write a React program to implement a counter button using react functional components
    c. Write a React program to handle the button click events in functional component
    d. Write a React program to conditionally render a component in the browser

e. Write a React program to display text using String literals

3. Important concepts of React. js
   a. Write a React program to implement a counter button using React use State hook
   b. Write a React program to fetch the data from an API using React use Effect hook
   c. Write a React program with two react components sharing data using Props.
   d. Write a React program to implement the forms in react
   e. Write a React program to implement the iterative rendering using map() function.
4. Introduction to Node. js and Express. js
   a. Write a program to implement the ‗hello world' message in the route through the browser using Express
   b. Write a program to develop a small website with multiple routes using Express. js
   c. Write a program to print the ‗hello world' in the browser console using Express. js
   d. Write a program to implement the CRUD operations using Express. js
   e. Write a program to establish the connection between API and Database using Express – My SQL driver
5. Introduction to My SQL
   a. Write a program to create a Database and table inside that database using My SQL Command line client
   b. Write a My SQL queries to create table, and insert the data, update the data in the table
   c. Write a My SQL queries to implement the subqueries in the My SQL command line client
   d. Write a My SQL program to create the script files in the My SQL workbench
   e. Write a My SQL program to create a database directory in Project and initialize a database. sql file to integrate the database into API.

TEXT BOOKS:

1. Jon Duckett, Web Design with HTML, CSS, JavaScript and jQuery Set, Wiley, 2014.
2. Nicholas C. Zakas, Professional JavaScript for Web Developers, Wiley, 3rd Edition, 2012.

REFERENCES:

1. John Dean, Web Programming with HTML5, CSS, and JavaScript, Jones & Bartlett Learning, 2019.
2. Vasan Subramanian, Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Apress/O'Reilly, 2nd Edition, 2019.
3. Robin Nixon, Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites, O'Reilly Media, 5th Edition, 2021.
4. Eric Bush, Full-Stack JavaScript Development, Independently Published, 2021.
5. Robert W. Sebesta, Programming the World Wide Web, Pearson Education, 7th Edition, 2013.
6. Tomasz Dyl, Kamil Przeorski, and Maciej Czarnecki, Mastering Full Stack React Web Development, Packt Publishing, 2017.

ONLINE RESOURCES:

1. https://ict.iitk.ac.in/product/full-stack-developer-html5-css3-js-bootstrap-php-4/
2. https://www.w3schools.com/html
3. https://www.w3schools.com/css
4. https://www.w3schools.com/js/
5. https://www.w3schools.com/nodejs
6. https://www.w3schools.com/typescript.

III Year B.Tech. – I Semester

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(EC23AES501) TINKERING LAB

COURSE OBJECTIVES:

The objectives of the course are to:

- Encourage Innovation and Creativity
- Provide Hands-on Learning and Impart Skill Development
- Foster Collaboration and Teamwork
- Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship
- Impart Problem-Solving mind-set

COURSE OUTCOMES:

After Successful completion of the course, students will be able to:

CO 1: Demonstrate creativity and innovation by designing and developing working prototypes for real-world applications.

CO 2: Apply interdisciplinary knowledge of electronics, programming, mechanical design, and data science/AI in problem-solving.

CO 3: Use modern engineering tools such as microcontrollers, sensors, 3D printing, and CAD software for prototype development.

CO 4: Work collaboratively in teams to plan, design, and execute projects, demonstrating leadership, communication, and teamwork skills.

CO 5: Analyze, test, and evaluate prototype performance to validate solutions against given requirements.

LIST OF EXPERIMENTS:

1. Make your own parallel and series circuits using breadboard for any application of your choice.
2. Design and 3D print a Walking Robot
3. Design and 3D Print a Rocket.
4. Temperature & Humidity Monitoring System (DHT11 + LCD)
5. Water Level Detection and Alert System
6. Automatic Plant Watering System
7. Bluetooth-Based Door Lock System
8. Smart Dustbin Using Ultrasonic Sensor
9. Fire Detection and Alarm System
10. RFID-Based Attendance System
11. Voice-Controlled Devices via Google Assistant
12. Heart Rate Monitoring Using Pulse Sensor
13. Soil Moisture-Based Irrigation
14. Smart Helmet for Accident Detection
15. Milk Adulteration Detection System
16. Water Purification via Activated Carbon
17. Solar Dehydrator for Food Drying
18. Temperature-Controlled Chemical Reactor
19. Ethanol Mini-Plant Using Biomass
20. Smart Fluid Flow Control (Solenoid + pH Sensor)
21. Portable Water Quality Tester
22. AI Crop Disease Detection
23. AI-based Smart Irrigation
24. ECG Signal Acquisition and Plotting
25. AI-Powered Traffic Flow Prediction
26. Smart Grid Simulation with Load Monitoring
27. Smart Campus Indoor Navigator
28. Weather Station Prototype
29. Firefighting Robot with Sensor Guidance
30. Facial Recognition Dustbin
31. Barcode-Based Lab Inventory System

32. Growth Chamber for Plants
33. Biomedical Waste Alert System
34. Soil Classification with AI
35. Smart Railway Gate
36. Smart Bin Locator via GPS and Load Sensors
37. Algae-Based Water Purifier
38. Contactless Attendance via Face Recognition

Note: The students can also design and implement their own ideas, apart from the list of experiments mentioned above.

Note: A minimum of **8** to **10** experiments must be completed by the students.

III Year B.Tech. – I Semester

L	T	P	C
3	-	-	-

(BA23AMC501) BUSINESS ECONOMICS AND FINANCIAL MANAGEMENT

COURSE OBJECTIVES:

The objectives of this course are to:

- Introduce fundamental economic concepts and tools relevant to business decision-making.
- Provide insights into production functions, cost behaviors, and break-even analysis for efficient resource utilization.
- Examine market structures and understand the impact of liberalization, privatization, and globalization.
- Introduce the core concepts, objectives, and functions of financial management.
- Explore capital structure, working capital, and investment decision-making through capital budgeting techniques.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Able to analyze demand, measure elasticity, and apply forecasting techniques for business planning.
CO 2: Understand cost structures and apply break-even analysis for managerial decisions.
CO 3: Able to differentiate market types and evaluate economic reforms like GST and demonetization.
CO 4: Understand the goals of financial management and its importance in business strategy.
CO 5: Able to evaluate capital budgeting proposals using various appraisal methods.

UNIT I: (7 Periods)

Business Economics: Definition, Nature, Scope, and Contemporary importance of Business Economics. Demand Analysis: Concept of Demand, Demand Function, Law of Demand. Elasticity of Demand: Significance, Types of Elasticity, Measurement of elasticity of demand. Demand Forecasting: Factors governing demand forecasting-Methods of demand forecasting**.**

UNIT II: (10 Periods)

Theory of Production and Cost Analysis: Production Function-Least cost combination-Short-run and Long-run production function- Iso quants and Is costs, MRTS Cobb-Douglas production function, Laws of returns - Internal and External economies of scale - Cost Analysis: Cost concepts and cost behavior-Break-Even Analysis (BEA)-Determination of Break Even Point (Simple Problems)-Managerial significance and Limitations of Break- Even Point.

UNIT III: (9 Periods)

Markets and New Economic Environment: Market structures: Types of Markets-Perfect and Imperfect Competition-Features of perfect Competition-Monopoly-Monopolistic Competition-Oligopoly-Price-Output Determination. Pricing Methods and Strategies - New Economic Environment-Economic Liberalization-privatization-Globalization. GST and Demonetization.

UNIT IV: (8 Periods)

Financial Management: Nature, Scope and objectives of financial management. Importance of Finance function– Goals of Finance function; Profit Vs Wealth maximization– The role in the contemporary scenario.

UNIT V: (11 Periods)

Capital and Capital Budgeting: Concept of Capital-Over and Under capitalization-Remedial Measures-Sources of Shot term and Long term Capital-Estimating Working Capital Requirements, Capital Budgeting Features of Capital Budgeting Proposals -Methods and Evaluation of Capital Budgeting Projects - Pay Back Method -Accounting Rate of Return (ARR)-

Net Present Value (NPV) - Internal Rate Return (IRR) Method (simple problems).

Total Periods: 45

TEXT BOOKS:

1. A. R. Aryasri, Managerial Economics and Financial Analysis, Tata McGraw-Hill, 4th Edition, 2009.
2. R. L. Varshney and K. L. Maheshwari, Managerial Economics, Sultan Chand & Sons, 2009.

REFERENCES:

1. Premchand Babu and Madan Mohan, Financial Accounting and Analysis, Himalaya Publishing House, 2009.
2. S. A. Siddiqui and A. S. Siddiqui, Managerial Economics and Financial Analysis, New Age International Publishers, 2009.
3. Joseph G. Nellis and David Parker, Principles of Business Economics, Pearson Education, 2nd Edition, 2002.
4. Dominick Salvatore, Managerial Economics in a Global Economy, Cengage Learning, 6th Edition, 2009.
5. H. L. Ahuja, Managerial Economics, S. Chand Publishing, 3rd Edition, 2009.

ONLINE LEARNING RESOURCES:

1. https://aim.gov.in/pdf/equipment-manual-pdf.pdf
2. https://atl.aim.gov.in/ATL-Equipment-Manual/
3. https://aim.gov.in/pdf/Level-1.pdf
4. https://aim.gov.in/pdf/Level-2.pdf
5. https://aim.gov.in/pdf/Level-3.pdf

(CS23ACS501) COMMUNITY SERVICE PROJECT

Experiential learning through community engagement

COURSE DESCRIPTION:

The Community Service Project (CSP) is an experiential learning strategy that integrates meaningful community service with academic instruction, active participation, and real-life problem-solving. It provides students with opportunities to engage in community development activities, apply their classroom knowledge in real-world contexts, and reflect on their learning for both personal and academic growth.

The initiative is designed to foster a strong linkage between the college and the community for mutual benefit. While communities benefit from the focused contributions of students toward local/village development, colleges gain the opportunity to instill in students a sense of social sensitivity, responsibility, and accountability—thus positioning themselves as socially responsible institutions.

CSP also serves as an effective alternative to summer internships, apprenticeships, or on-the-job training in situations where students cannot pursue those options. By immersing students in societal realities, the project enhances their holistic development, cultivates leadership qualities, and strengthens their commitment to inclusive growth and sustainable development

COURSE OBJECTIVES:

The objectives of this course are to:

- Develop understanding of societal structures, cultural practices, traditions, habits, lifestyles, resource utilization, wastage management, social problems, public administration system and the roles and responsibilities of different persons across different social systems, enabling students to analyze the living conditions, challenges, and aspirations of communities.
- Enhance students' abilities in analyzing societal problems, designing and implementing innovative solutions, applying problem-solving techniques, using appropriate tools and technologies, managing projects and resources effectively, communicating professionally, and working efficiently both individually and in teams while engaging in community development activities in coordination with local communities, public agencies, and government authorities.
- Cultivate social responsibility, empathy, ethical awareness, societal consciousness, and accountability, fostering holistic perspectives and empowering students to address societal challenges responsibly and creatively.

COURSE OUTCOMES:

On successful completion of the course, the students will be able to:

CO 1: Create engineering solutions or processes to address complex societal problems by applying modern tools, relevant codes, standards, policies, and emerging developments.

CO 2: Evaluate environmental, sustainability, ethical, and economic aspects with project management principles to formulate impactful community interventions.

CO 3: Demonstrate teamwork, leadership, and effective communication (written, oral, graphical) while executing and reflecting on community service projects.

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will benefit with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and emerge as a socially responsible institution.

Implementation of Community Service Project

- Every student should put in 6 weeks for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, housewives, etc
- A logbook must be maintained by each of the students, where the activities undertaken/involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty in charge.
- An evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.The Community Service Project should be different from the regular programs of
- NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project reports should be submitted by each student. An internal Viva shallalso be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ onthe job training.

Procedure

A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, to enable them to commute from their residence and return back by evening or so.
The Community Service Project is a twofold one –

- First, the student/s could conduct a survey of the habitation, if necessary, interms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format couldbe designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
- Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like
  - Agriculture Health
  - Marketing and Cooperation
  - Animal Husbandry
  - Horticulture
  - Fisheries Sericulture
  - Revenue and Survey
  - Natural Disaster Management
  - Irrigation
  - Law & Order
  - Excise and Prohibition
  - Mines and Geology
  - Energy
  - Internet
  - Free Electricity
  - Drinking Water

EXPECTED OUTCOMES

Benefits of Community Service Project To Students

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.

- Improved ability to understand complexity and ambiguity

Personal Outcomes
- Greater sense of personal efficacy, personal identity, spiritual growth, andmoral development
- Greater interpersonal development, particularly the ability to work well withothers, and build leadership and communication skills.

Social Outcomes
- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development
- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity.

Relationship with the Institution
- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

Benefits of Community Service Project to Faculty Members
- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between facultyand community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research.

Benefits of Community Service Project to Colleges and Universities
- Improved institutional commitment.Improved student retention
- Enhanced community relations

Benefits of Community Service Project to Community
- Satisfaction with student participation
- Valuable human resources needed to achieve community goals.
- New energy, enthusiasm and perspectives applied to community Work. Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following are the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions, and modifications. Colleges are expected to focus on specific local issues for this kind of project. The students are expectedto carry out these projects with involvement, commitment, responsibility, andaccountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of project. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting should be ensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture

6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilization of free electricity to farmers and related issues
40. Gender ration in schooling level- observation.

Complementing the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programs are

Programs for School Children

1. Reading Skill Program (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Program on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Program on Socially relevant themes.

Programs for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Women's Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water

5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti-Plastic Awareness
9. Programs on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programs for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Developmen

Common Programs

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programs in consonance with the Govt. Departments like –
   i. Agriculture
   ii. Health
   iii. Marketing and Cooperation
   iv. Animal Husbandry
   v. Horticulture
   vi. Fisheries
   vii. Sericulture
   viii. Revenue and Survey
   ix. Natural Disaster Management
   x. Irrigation
   xi. Law & Order
   xii. Excise and Prohibition
   xiii. Mines and Geology
   xiv. Energy

Role of Students:

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also, with the Governmental Departments. If the program is rolled out, the District Administration could be roped in for the successful deployment of the program.
- An in-house training and induction program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. Preliminary Survey (One Week)

- A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
- A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
- The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.

2. Community Awareness Campaigns (One Week)

- Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeksof time. The list of activities suggested could be taken into consideration.

3. Community Immersion Programme (Three Weeks)

- **Along with the Community Awareness Programmes**, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.

4. Community Exit Report (One Week)

During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks' works to be drafted and a copy shall be submitted to thelocal administration. This report will be a basis for the next batch of students visiting that habitation. The same report submitted to the teacher-mentor will be evaluated bythe mentor and suitable marks are awarded for onward submission to the University. Throughout the Community Service Project, a daily logbook need to be maintained by the students batch, which should be countersigned by the governmental agencyrepresentative and the teacher-mentor, who is required to periodically visit the studentsand guide them.

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(CS23AES501) INTRODUCTION TO QUANTUM TECHNOLOGY AND APPLICATIONS

COURSE OBJECTIVES:

The objectives of this course are to:

- Introduce fundamental quantum concepts like superposition and entanglement.
- Understand theoretical structure of qubits and quantum information.
- Explore conceptual challenges in building quantum computers.
- Explain principles of quantum communication and computing.
- Examine real-world applications and the future of quantum technologies.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Explain core quantum principles in a non-mathematical manner.
CO 2: Compare classical and quantum information systems.
CO 3: Identify theoretical issues in building quantum computers.
CO 4: Discuss quantum communication and computing concepts.
CO 5: Recognize applications, industry trends, and career paths in quantum technology.

UNIT I: (9 Periods)

Introduction to Quantum Theory and Technologies: The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India's Quantum Mission, EU, USA, China

UNIT II: (9 Periods)

Theoretical Structure of Quantum Information Systems: Qubit, Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non engineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract, The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role

UNIT III: (9 Periods)

Building a Quantum Computer – Theoretical Challenges and Requirements: Building a Quantum Computer, Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability

Theoretical Barriers: Why maintaining entanglement is difficult,Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Superconducting circuits, Trapped ions, Photonics, Visionvs reality: what's working and what remains elusive,The role of quantum software in managing theoretical complexities.

UNIT IV: (9 Periods)

Quantum Communication and Computing: Theoretical Perspective: Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD), Role of Entanglement in Communication, The Idea of the Quantum Internet – Secure Global Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at

Once), Classical vs Quantum Gates, Challenges: Decoherence and Error Correction, Real-World Importance and Future Potential

UNIT V: (9 Periods)

Applications, Use Cases, and the Quantum Future: Real-world application domains: Healthcare (drug discovery), Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum, Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization, Emerging careers in quantum: roles, skillsets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race.

Total Periods: 45

TEXT BOOKS:

1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.

REFERENCES:

1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.
4. Alastair I.M. Rae, Quantum Physics: A Beginner's Guide, Oneworld Publications, Revised Edition, 2005.
5. Eleanor G. Rieffel, Wolfgang H. Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
6. Leonard Susskind, Art Friedman, Quantum Mechanics: The Theoretical Minimum, Basic Books, 2014.
7. Bruce Rosenblum, Fred Kuttner, Quantum Enigma: Physics Encounters Consciousness, Oxford University Press, 2nd Edition, 2011.
8. Giuliano Benenti, Giulio Casati, Giuliano Strini, Principles of Quantum Computation and Information, Volume I: Basic Concepts, World Scientific Publishing, 2004.
9. K.B. Whaley et al., Quantum Technologies and Industrial Applications: European Road map and Strategy Document, Quantum Flagship, European Commission, 2020.
10. Department of Science & Technology (DST), Government of India, National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers, MeitY/DST Publications, 2020 onward.

ONLINE RESOURCES:

1. IBM Quantum Experience and Qiskit Tutorials
2. Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
3. edX – The Quantum Internet and Quantum Computers
4. YouTube – Quantum Computing for the Determined by Michael Nielsen
5. Qiskit Textbook – IBM Quantum

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(IT23APC501) CLOUD COMPUTING

COURSE OBJECTIVES:

The objectives of this course are to:

- Explain the evolving computer model called cloud computing.
- Introduce the various selves of services that can be achieved by cloud.
- Describe the security aspects in cloud.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Ability to create a cloud computing environment
CO 2: Ability to design applications for cloud environment
CO 3: Design and develop back up strategies for cloud data based on features
CO 4: Use and examine different cloud computing services
CO 5: Ability to learn about applications and issues in cloud

UNIT I: (9 Periods)

Basics of Cloud computing

Introduction to cloud computing: Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications.

Cloud concept and Technologies: Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.

Cloud Services and Plat forms: Compute Services, Storage Services, Database Services, Application services, Content delivery services, Analytics Services Deployment and Management Services, Identity and Access Management services, Open Source Private Cloud software.

UNIT II: (9 Periods)

Hadoop and Python

Hadoop Map Reduce: Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Cluster setup.

Cloud Application Design: Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

Python Basics: Introduction, Installing Python, Python data Types & Data Structures, Control flow, Function, Modules, Packages, File handling, Date/Time Operations, Classes

UNIT III: (9 Periods)

Python for Cloud computing

Python for Cloud: Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for Map Reduce, Python package self-interest, Python web Application Frame work ,Designing a Restful web API.

Cloud Application Development in Python: Design Approaches, Image Processing APP, Document Storage App, Map Reduce App, Social Media Analytics App.

UNIT IV: (9 Periods)

Big data, multimedia and Tuning Big Data Analytics: Introduction, Clustering Big Data, Classification of Big data Recommendation of Systems.

Multimedia Cloud: Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Transco ding App.

Cloud Application Benchmarking and Tuning: Introduction, Workload Characteristics, Application Performance Metrics, Design Considerations for a Benchmarking Methodology, Benchmarking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hardtop benchmarking case Study.

UNIT V: (9 Periods)

Applications and Issues in Cloud Security: Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity Access Management, Data Security, Key Management, Auditing.

Cloud for Industry, Healthcare & Education: Cloud Computing for Health care, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.

Migrating into a Cloud: Introduction, Broad Approach est. migrating into the cloud, the seven–step model of migration into a cloud.

Organization area dines and Change Management in The Cloud Age: Introduction, Basic concepts of Organizational Readiness,

Drivers for changes: A frame work to comprehendthe competitive environment, common change management models,

change management maturate models, Organization area dines self–assessment.

Legal Issues Cloud Computing: Introduction, Data Privacy and security Issues, cloud contracting models, Jurisdictional issues raised by virtualization and data location, commercial and business considerations, Special Topics.

Total Periods: 45

TEXT BOOKS:

1. Arshdeep Bahga,Vijay Marinetti, Cloud Computing A hands on Approach, Universities Press, 2016
2. Raj Kumar Buyya, James Bromberg, And razesGoscinski, Cloud Computing Principles and Paradigms, Wiley, 2016

REFERENCES:

1. Rajkumar Buyya, Christian Vecchiola, and S. Thamarai Selvi, Mastering Cloud Computing, McGraw-Hill Education, 2013.
2. Arshdeep Bahga and Vijay Madisetti, Cloud Computing: A Hands-On Approach, Universities Press, 2016.
3. Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw-Hill, 2011.
4. Gautam Shroff, Enterprise Cloud Computing: Technology, Architecture, Applications, Cambridge University Press, 2010.
5. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly Media / SPD, 2011.

ONLINE RESOURCES:

1. Cloud computing – Course (nptel.ac.in)

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(CY23APC601) CRYPTOGRAPHY AND NETWORK SECURITY

COURSE OBJECTIVES:

The objectives of this course are to:

- The concepts of classical encryption techniques and concepts of finite fields and number theory
- Working principles and utilities of various crypto graphic algorithms including secret key cryptography, hashes, and message digests, and public key algorithms
- Design issues and working principles of various authentication protocols, PKI standards
- Various secure communications tend arid secluding Kerberos, IPSec, TLS and email
- Concepts of cryptographic utilities and authentication mechanisms to design secure applications

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- **CO 1:** Identify information security goals, classical encryption technique and acquire fundamental knowledge on the concepts off in tie fields and number theory
- **CO 2:** Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
- **CO 3:** Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
- **CO 4:** Apply different digital signature algorithms to achieve authentication and create secure applications
- **CO 5:** Apply network security basics, analyze different attack son networks and evaluate the performance of fire walls and security protocols like TLS, IPSec, and PGP.

UNIT I: (9 periods)

Computer and Network Security Concepts: Computer Security Concepts, Theo's Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques Transposition Techniques, Steganography, Block Ciphers: Traditional Block Cipher Structure, The Data Encryption Standard, Advanced Encryption Standard: AES Structure, AES Transformation Functions

UNIT II: (9 periods)

Number Theory: The Euclidean Algorithm, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem, Discrete Logarithms, Finite Fields: Finite Fields of the Form GF(p), Finite Fields of the Form GF(2^n). Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Daffy Hellman Key Exchange, Elliptic Curve Cryptography.

UNIT III: (9 periods)

Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC & CMAC. Digital Signatures: NIST Digital Signature Algorithm, Distribution of Public Keys, X.509 Certificates, Public- Key Infrastructure

UNIT IV: (9 periods)

User Authentication: Remote User Authentication Principles, Kerberos. Electronic Mail Security: Pretty Good Privacy (PGP) Ands /MIME.IP Security: I P Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange.

UNIT V: **(9 periods)**

Transport Level Security: Web Security Requirements, Transport Layer Security (TLS), HTTPS, Secures hell (SSH) Firewalls: Firewall Characteristics and Access Policy, Types of Fire walls, Fire wall ovation and Configurations.

Total Periods: 45

TEXT BOOKS:

1. William Stallings, Cryptography and Network Security, Pearson Education, 8th Edition.
2. Bernard Menaces, Cryptography, Network Security and Cyber Laws, Engage Learning, 2010.

REFERENCES:

1. Beerhouse Frozen, Debden Mukhopadhyaya, Cryptography and Network Security, Mc –Grow Hill, 3rd Edition, 2015.
2. Jason Albanese and Wes Scone Reich, Network Security Illustrated, MGH Publishers, 2003.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105031/lecture.
2. https://nptel.ac.in/courses/106/105/106105162/lecturebyDr.SouravMukhopadhyaIIT Kharagpur[Video Lecture].
3. https://www.mitel.com/articles/web-communication-cryptography-and-network-security web articles by Mitel Power Connections.

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(AM23APC401) MACHINE LEARNING

COURSE OBJECTIVES:
The objectives of this course are to:
- Define machine learning and its different types (supervised and unsupervised) and understand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN).
- Implement unsupervised learning techniques, such as K-means clustering.

COURSE OUTCOMES:
After successful completion of the course, students will be able to:
CO 1: Identify machine learning techniques suitable for a given problem.
CO 2: Solve real-world problems using various machine learning techniques.
CO 3: Apply dimensionality reduction techniques for data preprocessing.
CO 4: Analyze what is learning and why it is essential in the design of intelligent machines.
CO 5: Evaluate advanced learning models for language, vision, speech, decision making.

UNIT I: **(8 Periods)**
Introduction to Machine Learning: Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Stages in Machine Learning.
CRISP-Model: CRISP-DM framework.

UNIT II: **(12 Periods)**
Dimensionality Reduction: Principal Component Analysis, Singular Value Decomposition.
Nearest Neighbor-Based Models: Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures, K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers.

UNIT III: **(8 Periods)**
Models Based on Decision Trees: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression.
The Bayes Classifier: Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality.

UNIT IV: **(10 Periods)**
Linear Discriminants for Machine Learning: Introduction to Linear Discriminants, Linear Discriminants for Classification, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Performance of Regression Algorithms.
Artificial Neural Networks: Characteristics, Neural Network Representation in Machine Learning, Multi-Layer Perceptrons (MLPs), Back propagation for Training an MLP.

UNIT V: **(7 Periods)**
Clustering: Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Fuzzy C-Means Clustering ,K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

Total Periods: 45

TEXT BOOKS:

1. M. N. Murthy and V. S. Ananthanarayana, Machine Learning: Theory and Practice, Universities Press (India), 2024.
2. Tom M. Mitchell, Machine Learning, McGraw-Hill Education, 2017.

REFERENCES:

1. Peter Harrington, Machine Learning in Action, Dream Tech Press, 2012.
2. Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, Introduction to Data Mining, Pearson Education, 7th Edition, 2019.

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(CY23APC501) CYBER SECURITY

(Professional Elective-II)

COURSE OBJECTIVES:

The objectives of this course are to:

- Introduce the fundamental concepts of cybercrime and information security, enabling students to understand the evolving nature of digital threats.
- Classify and analyze different types of cybercrimes, including their planning, execution, and legal implications at both national and global levels.
- Explore the use of digital devices and mobile technologies in cybercrimes, emphasizing security challenges in wireless and mobile environments.
- Examine various tools and techniques used in cyberattacks, such as phishing, malware, DoS/DDoS attacks, SQL injection, and more.
- Understand the organizational impacts of cyber threats, including cost, privacy concerns, and the formulation of security policies in response to social computing and media challenges.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Classify the cybercrimes and understand the Indian ITA 2000
CO 2: Analyze the vulnerabilities in any computing system and find the solutions
CO 3: Predict the security threats of the future
CO 4: Investigate the protection mechanisms
CO 5: Design security solutions for organizations

UNIT I: (9 periods)

Introduction to Cybercrime: Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT II: (9 periods)

Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing

UNIT III: (9 periods)

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

UNIT IV: (9 periods)

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT V: (9 periods)

Cyber Security: Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Total Periods: 45

TEXT BOOKS:

1. N. Godbole and S. Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley, 1st Edition, 2011.
2. John Graham, Richard Olson, and Rick Howard, Cyber Security Essentials, CRC Press/Auerbach, 1st Illustrated Edition, 2016.

REFERENCES:

1. C.-H. (John) Wu and J. D. Irwin, Introduction to Computer Networks and Cybersecurity, Taylor & Francis/CRC Press, 1st Illustrated Edition, 2017.

ONLINE RESOURCES:

1. http://nptel.ac.in/courses/106105031/40
2. http://nptel.ac.in/courses/106105031/39
3. http://nptel.ac.in/courses/106105031/38

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(CS23APE601) DEVOPS

(Professional Elective-II)

COURSE OBJECTIVES:

The objectives of this course are to:

- Introduce the fundamentals of DevOps, including its origins, principles, practices, and cultural aspects essential for modern software delivery.
- Enable students to understand and build a DevOps adoption strategy, including the development of a playbook and business case to support implementation in organizations.
- Familiarize learners with the Business Model Canvas, and how it can be applied to design and optimize the DevOps delivery pipeline.
- Explore innovative DevOps practices, such as microservices, APIs, and platform-driven approaches that enable rapid software delivery and business agility.
- Impart knowledge on scaling DevOps practices across large enterprises, addressing team models, tool standardization, security, and continuous improvement.
- Develop leadership and strategic thinking skills for driving DevOps transformation within organizations through pilot projects, collaboration, and roadmap planning.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand the fundamental principles, origins, practices, and culture of DevOps.
CO 2: Analyze and develop a DevOps adoption playbook and build a business case for implementation.
CO 3: Apply the Business Model Canvas to identify key segments and optimize the DevOps delivery pipeline.
CO 4: Identify and implement DevOps plays to drive innovation through platforms, microservices, and APIs.
CO 5: Examine strategies for scaling DevOps in enterprises including standardization, tooling, and security.

UNIT I: (9 Periods)

Dev Ops: An Overview, Dev Ops: Origins, Dev Ops: Roots, Dev Ops: Practices Dev Ops: Culture.

Adopting Dev Ops: Developing the Playbook. Developing a Business Case for a Dev Ops: Developing the Business Case.

UNIT II: (9 Periods)

Completing the Business Model Canvas, Customer Segments, Value Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, Cost Structures. Dev Ops Plays for Optimizing the delivery Pipeline: Dev Ops as an optimization Exercise, Core Themes, The Dev Ops Plays

UNIT III: (9 Periods)

Dev Ops Plays for Driving Innovation: Optimize to Innovate, The Uber Syndrome, Innovation and the Role of Technology, Core Themes, play: Build a Dev Ops Platform, play: Deliver Micro services Architectures, play: DevOps an API Economy, play: Organizing for Innovation.

UNIT IV: (9 Periods)

Scaling Dev Ops for the Enterprise: Core Themes, play: Dev Ops Center of Competency, play: Developing Culture of Innovation at Scale, play: Developing a Culture of continuous Improvement, play: Team Models for Dev Ops, play: Standardization of Tools and Process, play: Security Considerations for Dev Ops, Play: Dev Ops and Outsourcing.

UNIT V: (9 Periods)

Leading Dev Ops Adoption in the Enterprise: Play: Dev Ops as a transformation Exercise, play: Developing a Culture of Collaboration and Trust, play: Dev Ops Thinking for the Line of Business, play: starting with Pilot Projects, Play: Rearing Unicorns on an Aircrafts Carrier. Appendix Case Study: Example Dev Ops Adoption Roadmap Organization Background, Roadmap Structure, Adoption Roadmap.

Total Periods: 45

TEXT BOOKS:

1. Sanjeev Sharma, The DevOps Adoption Playbook, John Wiley & Sons, Inc., 2017.
2. Sanjeev Sharma and Bernie Coyne, DevOps for Dummies, John Wiley & Sons, Inc., 2018.

REFERENCES:

1. Michael Hüttermann, DevOps for Developers, Apress, 2012.

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(EC23APE603) EMBEDDED SYSTEM DESIGN

(Professional Elective-II)

COURSE OBJECTIVES:

The objectives of this course are to:

- Understand the history, classification, and design process of embedded systems.
- Explore the core components of embedded systems, including processors, memory, and I/O components.
- Introduce onboard and external communication interfaces used in embedded systems.
- Explain different firmware design approaches and programming techniques for embedded systems.
- Provide an understanding of real-time operating systems and task management in embedded systems.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Classify embedded systems based on their purpose, generation, and complexity.
CO 2: Identify and select appropriate hardware components for an embedded system design.
CO 3: Differentiate and implement various communication protocols like I2C, SPI, and CAN.
CO 4: Develop firmware using assembly and high-level programming languages.
CO 5: Analyze and apply RTOS-based task scheduling and synchronization techniques.

UNIT I: **(9 Periods)**

Introduction to Embedded Systems History of embedded systems, Classification of embedded systems based on generation and complexity, Purpose of embedded systems, The embedded system design process-requirements, specification, architecture design, designing hardware and software, components, system integration, Applications of embedded systems, and characteristics of embedded systems.

UNIT II: **(9 Periods)**

Typical Embedded System Core of the embedded system-general purpose and domain specific processors, ASICs, PLDs, COTs; Memory-ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems, Sensors, actuators, I/O components: seven segment LED, relay, piezo buzzer, push button switch, other sub-systems: reset circuit, brownout protection circuit, oscillator circuit real time clock, watch dog timer.

UNIT III: **(9 Periods)**

Communication Interface Onboard communication interfaces-I2C, SPI, CAN, parallel interface; External communication interfaces-RS232 and RS485, USB, infrared, Bluetooth, Wi-Fi, ZigBe, GPRS, GSM.

UNIT IV: **(9 Periods)**

Embedded Firmware Design and Development Embedded firmware design approaches-super loop based approach, operating system based approach; embedded firmware development languages assembly language based development, high level language based development.

UNIT V: **(9 Periods)**

RTOS based Embedded System Design Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling: non-pre-emptive and preemptive scheduling; task communication shared memory, message passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/

Synchronization Issues, Task Synchronization Techniques

Total Periods: 45

TEXT BOOKS:

1. Shibu K. V., Introduction to Embedded Systems, McGraw-Hill Education, 2017.
2. Wayne Wolf, Computers as Components, Morgan Kaufmann, 2nd Edition, 2008.

REFERENCES:

1. Frank Vahid and Tony Givargis, Embedded System Design, John Wiley & Sons, 2002.
2. Lyla B. Das, Embedded Systems: An Integrated Approach, Pearson Education, 2012.
3. Raj Kamal, Embedded Systems: Architecture, Programming and Design, Tata McGraw-Hill, 2011.

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(IT23APE603) SOFTWARE TESTING METHODOLOGIES

(Professional Elective-II)

COURSE OBJECTIVES:

The objectives of this course are to:

- Study the fundamental concepts of software testing which includes objectives, process, criteria, strategies, and methods.
- Discuss various software testing types and levels of testing like black and white box testing along with levels unit test, integration, regression, and system testing
- Learn the types of bugs, testing levels with which the student can very well identify a bug and correct as when it happens.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Know the basic concepts of software testing and its essentials.
CO 2: Able to identify the various bugs and correcting them after knowing the consequences of the bug.
CO 3: Use of program's control flow as a structural model is the corner stone of testing.
CO 4: Performing functional testing using control flow and transaction flow graphs.
CO 5: Evaluate software quality using metrics and apply defect tracking techniques

UNIT I: (9 Periods)

Introduction:-Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs.

Flow graphs and Path testing:- Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT II: (9 Periods)

Transaction Flow Testing:-Transaction flows, transaction flow testing techniques.

Dataflow testing:- Basics of dataflow testing, strategies in dataflow testing, application of data flow testing.

UNIT III: (9 Periods)

Domain Testing:-domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT IV: (9 Periods)

Paths, Path products and Regular expressions: path products & paths expression, reduction procedure, applications, regular expressions & flow anomaly detection.

Logic Based Testing:-over view, decision tables, path expressions, kv charts, specifications.

UNIT V: (9 Periods)

State, State Graphs and Transition testing:- state graphs, good & bad state graphs, state testing, Testability tips.

Graph Matrices and Application:-Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools.

Total Periods: 45

TEXT BOOKS:

1. Boris Beizer, Software Testing Techniques, 2nd Edition, Dreamtech Press, 2002.
2. K. V. K. K. Prasad, Software Testing Tools, Dreamtech Press, 2004.

REFERENCES:

1. Edward Kit, Software Testing in the Real World, Pearson Education, 2001.
2. Elfriede Dustin, Effective Methods of Software Testing, John Wiley & Sons, 2006.
3. Glenford J. Myers, The Art of Software Testing, 3rd Edition, John Wiley & Sons, 2011.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106101163

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(CS23APE603) DISTRIBUTED OPERATING SYSTEMS

(Professional Elective-III)

COURSE OBJECTIVES:

The objectives of this course are to:

- Understand the architecture and design issues of distributed systems and their operating systems.
- Analyze distributed mutual exclusion and synchronization algorithms.
- Explore deadlock detection strategies in distributed environments.
- Study multiprocessor architectures, their operating systems, and distributed file systems.
- Understand the principles of distributed scheduling and shared memory systems.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- **CO 1:** Understand system architectures, communication primitives, and event ordering in distributed systems
- **CO 2:** Analyze and compare mutual exclusion algorithms for distributed systems
- **CO 3:** Apply deadlock detection strategies and evaluate their efficiency
- **CO 4:** Explain multiprocessor OS concepts and analyze distributed file system architectures
- **CO 5:** Understand and implement load distribution and distributed shared memory concepts

UNIT I: (9 Periods)

Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives. Theoretical Foundations: Inherent Limitations of a Distributed System, Lamport ‘s Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.

UNIT II: (9 Periods)

Distributed Mutual Exclusion: The Classification of Mutual Exclusion Algorithms, Non-Token – Based Algorithms: Lamport‘s Algorithm, The Ricart-Agrawalsa Algorithm, Maekawa‘s Algorithm, Token Based Algorithms: Suzuki-Kasami‘s Broadcast Algorithm, Singhal‘s Heurisric Algorithm, Raymond‘s Heuristic Algorithm.

UNIT III: (9 Periods)

Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms

UNIT IV: (9 Periods)

Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures Multi Processor Operating Systems: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling. Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues.

UNIT V: (9 Periods)

Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration Distributed Shared Memory: Architecture and Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues

Total Periods: 45

TEXT BOOKS:

1. Mukesh Singhal and Niranjan G. Shivaratri, Advanced Concepts in Operating Systems, Tata McGraw-Hill, 2001.
2. Michael Hüttermann, DevOps for Developers, Apress, 2012.

REFERENCES:

1. Andrew S. Tanenbaum and Maarten Van Steen, Distributed Systems: Principles and Paradigms, Pearson Prentice Hall, 2nd Edition, 2007.

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(CY23APE604) MOBILE ADHOC NETWORKS

(Professional Elective-III)

COURSE OBJECTIVES:

The objectives of this course are to:

- Knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
- Knowledge of routing mechanisms and the three classes of approaches: proactive, on demand, and hybrid.
- Knowledge of clustering mechanisms and the different schemes that have been employed, e.g., hierarchical, flat, and leaderless.
- Knowledge of the 802.11 Wireless Lane (Wi-Fi) and Bluetooth standards.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Describe the unique issues in ad-hoc/sensor networks.
CO 2: Describe current technology trends for the implementation and deployment of wireless ad-hoc/sensor networks.
CO 3: Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc/sensor networks.
CO 4: Discuss the challenges in designing routing and transport protocols for wireless Adhoc/sensor networks.
CO 5: Comprehend the various sensor network Platforms, tools and applications

UNIT I: (9 periods)

Introduction to Ad Hoc Networks: Characteristics of MANETs, Applications of MANETs and challenges of MANETs -Routing in MANETs: Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms, Position based routing algorithms, other routing algorithms.

UNIT II: (9 periods)

Data Transmission: Broad cast storm problem, Broadcasting, Multicasting and Recasting -TC Plover Ad Hoc: TCP protocol overview, TCP and MANETs, Solutions for TCP over Adhoc.

UNIT III: (9 periods)

Basics of Wireless, Sensors and Applications: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer.

UNIT IV: (9 periods)

Data Retrieval in Sensor Networks: Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots-Security: Security in Ad Hoc networks, Key management, Secure routing, Cooperation in MANETs, Intrusion Detection systems.

UNIT V: (9 periods)

Sensor Network Plat forms and Tools: Sensor Net work Hardware, Berkeley motes, Sensor Network Programming Challenges, Node Level Software Platforms -Operating System: T annoys -Imperative Language: knees C, Dataflow style language: Tiny GALS, Node Level Simulators, ns-2 and its sensor network extension.

Total Periods: 45

TEXT BOOKS:

1. C. de M. Cordeiro and D. P. Agrawal, Ad Hoc and Sensor Networks: Theory and Applications, World Scientific Publishing, 2nd Edition, 2011.
2. Feng Zhao and Leonidas J. Guibas, Wireless Sensor Networks: An Information Processing Approach, Morgan Kaufmann/Elsevier Science, Illustrated Edition, 2004.

REFERENCES:

1. Carlos de Morais Cordeiro and Dharma Prakash Agrawal, Ad Hoc and Sensor Networks: Theory and Applications, World Scientific, 2nd Edition, 2011.
2. Kazem Sohraby, Daniel Minoli, and Taieb Znati, Wireless Sensor Networks: Technology, Protocols, and Applications, Wiley-Interscience, 2007.

ONLINE RESOURCES:

1. https://onlinecourses.swayam2.ac.in/ntr25_ed126/preview

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(AM23APC502) NATURAL LANGUAGE PROCESSING

(Professional Elective-III)

COURSE OBJECTIVES:

The objectives of this course are to:

- Explain and apply fundamental algorithms and techniques in the area of natural language processing(NLP)
- Discuss approaches to syntax and semantics in NLP.
- Examine current methods for statistical approach into machine translation.
- Teach machine learning techniques used in NLP.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Under stand the various NLP Applications and Organization of Natural language, able to learn and implement realistic applications using Python.

CO 2: Apply the various Parsing techniques, Bayes Rule, Shannongame, Entropy and Cross Entropy.

CO 3: Under stand the fundamentals of CFG and parsers and mechan is msin ATN's.

CO 4: Apply Semantic Interpretation and Language Modelling.

CO 5: Apply the concept of Machine Translation and multilingual Information Retrieval systems and Automatic Summarization.

UNIT I: (8 periods)

Introduction to Natural language: The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Under standing Systems, Linguistic Back ground: Anoutline of English Syn tax.

UNIT II: (9 periods)

Grammars and Parsing: Grammars and Parsing – Top – Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphologica l Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayees Rule, Shannongame, Entropy and Cross Entropy.

UNIT III: (10 periods)

Grammars for Natural Language: Grammars for Natural Language, Movement Phenomenonin Language, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

UNIT IV: (10 periods)

Semantic Interpretation: Semantic &Logical form, Word senses &ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs &States in logical form, The maticroles, Speech acts & embedded sentences, Defining semantics structure model theory.

Language Modelling: Introduction,n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Crosslingual Language Modelling.

UNIT V: (9 periods)

Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusarakaor Language Accessor: Background **Machine Translation: Survey:**, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, UserInterface, Linguistic Area, Givingup Agreement in Anusarsaka Output, LanguageBridges.

Multilingual Information Retrieval: Introduction, Document Pre-processing, Monolingual

Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.

Multilingual Automatic Summarization: Introduction, Approach esto Summarization, Evaluation, How to Builda Summarizer, Competitions and Datasets.

Total Periods: 45

TEXT BOOKS:

1. James Allen, Natural Language Understanding, Pearson Education, 2nd Edition, 2003.
2. Daniel M. Bikel and ImedZitouni, Multilingual Natural Language Processing Applications: From Theory To Practice, Pearson Publications.

REFERENCES:

1. Akshar Bharathi, Vineetchaitanya, Natural Language Processing, A paninian perspective, Prentice Hall of India.
2. Charniack, Eugene, Statistical Language Learning, MIT Press,1993.
3. Jurafsky, Dan and Martin, James, Speech and Language Processing, Prentice Hall, 2nd Edition, 2008.
4. Manning, Christopher and Hen rich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105158

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(CS23APE605) SOFTWARE PROJECT MANAGEMENT

(Professional Elective-III)

COURSE OBJECTIVES:

The objectives of this course are to:

- Understand the limitations of conventional software management and explore the evolution of software economics.
- Familiarize students with modern software engineering principles and lifecycle models including iterative processes.
- Introduce work breakdown structures, milestone-based tracking, and planning methodologies for software project workflows.
- Emphasize process automation, project metrics, and team management strategies for successful project execution.
- Examine organizational structures and analyze real-world case studies in the context of modern software project management.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- **CO 1:** Describe traditional and modern software management practices and Understand software economics and cost estimation.
- **CO 2:** Analyze and apply iterative software development models and understand the role of lifecycle phases and process artifacts.
- **CO 3:** Plan project iterations effectively using WBS, scheduling techniques, milestones, and assessments.
- **CO 4:** Utilize automation tools, interpret key software metrics, and tailor processes based on project-specific factors.
- **CO 5:** Evaluate organizational project structures and apply best practices through real-world case studies like CCPDS-R.

UNIT I: (9 Periods)

Conventional Software Management: The water fall model, conventional software Management performance Evolution of Software Economics: software Economics. Pragmatic Software Cost Estimation Improving Software Economics: Reducing Software Product Size, Improving Software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality, Peer Inspections.

UNIT II: (9 Periods)

The old way and the new: The principles of convention al software Engineering, principles of modern software management, transitioning to an iterative process. Lifecycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts

UNIT III: (9 Periods)

Work Flows of the process: Software process work flows, Inter Trans work flows. Check points of the Process: Major Mile Stones, Minor Milestones, Periodic status assessments. Iterative Process Planning: work break down structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning

UNIT IV: (9 Periods)

Process Automation: Automation Building Blocks, The Project Environment. Project Control and Process instrumentation: The sevencore Metrics, Management indicators, quality indicators Tailoring the Process: Process discriminants. Managing people and organizing teams.

UNIT V: (9 Periods)

Project Organizations and Responsibilities: Line - of-Business Organizations, Project Organizations, evolution of Organizations.

Future Software Project Management: modern Project Profiles, Next generation Software economics, modern process stransitions.

Case Study: The Command Center Processing and Display System-Replacement (CCPDS-R)

Total Periods: 45

TEXT BOOKS:

1. Walker Royce, Software Project Management, Pearson Education,2012
2. Bob Hughes, Mike Cotterell and Rajib Mall, Software Project Management, Mc Graw Hill, 6th Edition, 2017

REFERENCES:

1. Pankaj Jalote, Software Project Management in practice, Pearson Education, 5th Edition, 2017
2. Murali K. Chemuturi, Thomas M. Cagley Jr. Mastering Software Project Management: Best Practices, Tools and Techniques‖, J.Ross Publishing, 2010
3. Sanjay Mohapatra, Software Project Management, Cengage Learning,2011

ONLINE RESOURCES:

1. http://nptel.ac.in/courses/106101061/29

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(CY23APC605) CRYPTOGRAPHY AND NETWORK SECURITY LAB

COURSE OBJECTIVES:

The objectives of this course are to:

- Understand and implement basic cryptographic operations and bitwise manipulations using C and Java.
- Develop programs for classical and modern encryption/decryption algorithms such as Caesar cipher, DES, Blowfish, and RSA.
- Utilize Java cryptography libraries and tools for secure key generation and encryption processes.
- Implement key exchange mechanisms and hash functions using Java and JavaScript for secure communication.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Students will be able to write C and Java programs to perform encryption, decryption, and bitwise operations on strings.

CO 2: Students will implement classical ciphers and modern cryptographic algorithms such as DES, Blowfish, RSA, and RC4.

CO 3: Students will use Java cryptography APIs and key management tools to securely encrypt and decrypt data.

CO 4: Students will develop web-based applications to implement secure key exchange (Diffie- Hellman) and compute message digests (SHA-1, MD5).

LIST OF EXPERIMENTS:

1. Write a C program that contains a string (char pointer) with a value ‗Hello world'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value ‗Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms
   a. Cease cipher b. Substitution cipher c. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Randal algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text ―Hello world‖ using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement RSA algorithm.
9. Implement the Daffy-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA.

TEXT BOOK:

1. Gary McGraw, Software Security: Building Security In, Addison-Wesley, 2006.
2. William Stallings, Cryptography and Network Security: Principles and Practice, Pearson Education, 7th Edition, 2017.

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(AM23APC402) MACHINE LEARNING LAB

COURSE OBJECTIVES:

The objectives of this course are to:

- Learn about computing central tendency measures and data preprocessing techniques.
- Learn about classification and regression algorithms.
- Apply different clustering algorithms for a problem.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Apply preprocessing techniques
CO 2: Perform regression techniques
CO 3: Solve clustering algorithms

LIST OF EXPERIMENTS:

1. Compute Central Tendency Measures: Mean, Median, Mode. Measure of Dispersion: Variance, Standard Deviation.
2. Apply the following Pre-processing techniques for a given dataset:
   a. Attribute selection b. Handling Missing Values c. Discretization d. Elimination of Outliers
3. Apply KNN algorithm for classification and regression.
4. Demonstrate decision tree algorithm for classification and regression problem.
5. Demonstrate Naïve Bayes Classification algorithm.
6. Apply Support Vector algorithm for classification.
7. Demonstrate simple linear regression algorithm for a regression problem.
8. Apply Logistic regression algorithm for a classification problem.
9. Demonstrate Multi-layer Perceptron algorithm for a classification problem.
10. Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of the Euclidean distance of each example from its class center. Test the performance of the algorithm as a function of the parameters K.
11. Demonstrate the use of Fuzzy C-Means Clustering.
12. Demonstrate the use of Expectation Maximization-based clustering algorithm.

TEXT BOOKS:

1. M. N. Murthy and V. S. Ananthanarayana, Machine Learning: Theory and Practice, Universities Press (India), 2024.
2. Tom M. Mitchell, Machine Learning, McGraw-Hill Education, 2017.

REFERENCES:

1. Peter Harrington, Machine Learning in Action, DreamTech Press, 2012.

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(EG23ASC401) SOFT SKILLS

COURSE OBJECTIVES:

The objectives of this course are to:

- Encourage all round development of the students by focusing on soft skills.
- Make the students aware of critical thinking and problem-solving skills.
- Enhance healthy relationship and understanding within and outside an organization.
- Function effectively with heterogeneous teams.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: List out various elements of soft skills.
CO 2: Describe methods for building professional image.
CO 3: Apply critical thinking skills in problem solving.
CO 4: Analyze the needs of an individual and team for well-being.
CO 5: Assess the situation and take necessary decisions.
CO 6: Create a productive workplace atmosphere using social and work-life skills ensuring personal and emotional well-being

UNIT I:

Soft Skills & Communication Skills: Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills -Significance, process, types - Barriers of communication - Improving techniques.

Activities:

Intrapersonal Skills - Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity.
(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources).

Interpersonal Skills - Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication-Oral Presentations – Extempore - brief addresses and speeches – Convincing - Negotiating- Agreeing and disagreeing with professional grace.

Non - verbal communication - Public speaking - Mock interviews - presentations with an objective to identify non - verbal clues and remedy the lapses on observation.

UNIT II:

Critical Thinking: Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open- mindedness – Creative Thinking - Positive thinking – Reflection.

Activities:

Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues – placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis.

UNIT III:

Problem Solving & Decision Making: Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Team building - Effective decision making in teams – Methods & Styles.

Activities:
Placing a problem which involves conflict of interests, choice and views - formulating the problem - exploring solutions by proper reasoning - Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision. Case Study & Group Discussion.

UNIT IV:
Emotional Intelligence & Stress Management: Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips.

Activities:
Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations. Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT V:
Corporate Etiquette: Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette - Corporate grooming tips - Overcoming challenges.

Activities
Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games.

NOTE:
1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.
2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear.

TEXT BOOKS:
1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, Paper/Cdr Edition, 2012.
2. Shikha Kapoor, Personality Development and Soft Skills: Preparing for Tomorrow, I K International Publishing House, 2018.

REFERENCES:
1. Prashant Sharma, Soft Skills: Personality Development for Life Success, BPB Publications, 2018.
2. Alex K., Soft Skills, S. Chand & Co., Revised Edition, 2012.
3. Gajendra Singh Chauhan and Sangeetha Sharma, Soft Skills: An Integrated Approach to Maximise Personality, Wiley, 2013.
4. Sabina Pillai and Agna Fernandez, Soft Skills and Employability Skills, Cambridge University Press, 2018.
5. Renu Shorey, Soft Skills for a Big Impact, Notion Press, 2016.
6. Rajiv Kumar Jain and Usha Jain, Life Skills, Vayu Education of India, 2014.

III Year B.Tech. – II Semester

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2	-	-	2

(CS23AMC601) TECHNICAL REPORT WRITING AND IPR

COURSE OBJECTIVES:

The objectives of this course are to:

- Enable the students to practice the basic skills of research paper writing
- Make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
- Practice the basic skills of performing quality literature review
- Help them in knowing the significance of real-life practice and procedure of Patents.
- Enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Identify key secondary literature related to their proposed technical pap writing
CO 2: Explain various principles and styles in technical writing
CO 3: Use the acquired knowledge in writing a research/technical paper
CO 4: Analyse rights and responsibilities of holder of Patent, Copyright, trademark, International Trademark etc.
CO 5: Evaluate different forms of IPR available at national & international evel

UNIT I: (9 Periods)

Principles of Technical Writing: styles in technical writing; clarity, precision, coherence and logical sequence in writing-avoiding ambiguity- repetition, and vague language - highlighting your findings- discussing your limitations -hedging and criticizing -plagiarism and paraphrasing.

UNIT II: (9 Periods)

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature Problems and Framing Research Questions- Synopsis

UNIT III: (9 Periods)

Process of Research: publication mechanism: types of journals- indexing-seminars-conferences proof reading –plagiarism style; seminar & conference paper writing; Methodology-discussion results- citation rules

UNIT IV: (9 Periods)

Introduction to Intellectual Property: Introduction, types of intellectual property, International organizations, agencies and ties, importance of intellectual property rights Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and uating trade mark, trade mark registration processes.

UNIT V: (9 Periods)

Law of Copy Rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer. Patent law, intellectual property audits.

Total Periods: 45

TEXT BOOKS:

1. Deborah E. Bouchoux, Intellectual Property Rights, Cengage Learning India, 2013.
2. Meenakshi Raman and Sangeeta Sharma, Technical Communication: Principles and Practices, Oxford University Press, 2011.

REFERENCES:

1. R. Myneni, Law of Intellectual Property, 9th Edition, Asia Law House, 2019.
2. Prabuddha Ganguli, Intellectual Property Rights, Tata McGraw-Hill, 2001.
3. P. Narayan, Intellectual Property Law, 3rd Edition, Eastern Law House, 2007.
4. Adrian Wallwork, English for Writing Research Papers, Springer, 2nd Edition, 2016.
5. Dan Jones and Sam Dragga, Technical Writing Style, Routledge, 2018.

ONLINE RESOURCES:

1. https://theconceptwriters.com.pk/principles-of-technical-writing/
2. https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html
3. https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html
4. https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper- journal/
5. https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf
6. https://lawbhoomi.com/intellectual-property-rights-notes/
7. https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf

IV Year B.Tech. – I Semester

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2	-	-	2

(BA23AHS701) BUSINESS ETHICS AND CORPORATE GOVERNANCE

(Management Course)

COURSE OBJECTIVES:

The objectives of this course are to:

- Make the student understand the principles of business ethics
- Enable them in knowing about the ethics in management
- Facilitate the student' role in corporate culture
- Impart knowledge about the fair-trade practices
- Encourage the student in knowing about the corporate governance

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand the meaning of loyalty and ethical Behavior
CO 2: Develop ethical values in self and organization
CO 3: Understand the key elements of corporate culture
CO 4: Make use of Environmental Protection and Fair Trade Practices
CO 5: Analyze role of auditors, board of directors and shareholders in corporate governance.

UNIT I: (5 Periods)

Ethics: Introduction–Meaning–Nature, Scope, significance, Loyalty, and ethical behavior. Value systems – Business Ethics-Types, Characteristics, Factors, Contradictions and Ethical Practices in Management-Corporate Social Responsibility–Issues of Management–Crisis Management. Ethics in the Digital Age: AI Ethics, Data Privacy, Cyber security Ethics.

UNIT II: (6 Periods)

Ethics In Management: Introduction-Ethics in production, finance, Human resource management and Marketing Management –The Ethical Value System–Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics–Ethical Values in different Cultures -Culture and Individual Ethics – professional ethics and technical ethics. Ethical Challenges in Startups & Gig Economy.

UNIT III: (7 Periods)

Corporate Culture: Introduction - Meaning, definition, Nature, and significance – Key elements of corporate culture, shared values, beliefs and norms, rituals, symbols and language - Types of corporate culture, hierarchical culture, market driven culture – Organization leadership and corporate culture, leadership styles and their impact on culture, transformational leadership and culture change**.** Toxic Workplaces: Recognizing and Managing Ethical Culture Failures.

UNIT IV: (5 Periods)

Legal Frame Work: Law and Ethics -Agencies enforcing Ethical Business Behavior -Legal Impact –Environmental Protection, ESG (Environmental, Social, Governance) Regulations, Fair Trade Practices, legal Compliances ,Safe guarding Health and wellbeing of Customers – Corporate law, Securities and financial regulations, corporate governance codes and principles.

UNIT V: (7 Periods)

Corporate Governance: Introduction - Meaning–Corporate governance code, transparency & disclosure -Role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work - Corporate scams-Committees in India and abroad, corporate social responsibility. BoDs composition, Cadbury Committee - Various

committees- Reports –Benefits and Limitations. Emerging Global Trends in Corporate Governance (OECD Guidelines)

Total Periods: 30

TEXT BOOKS:

1. Murthy, C.S.V., Business Ethics and Corporate Governance, Himalaya Publishing House (HPH), July 2017,
2. Bholananth Dutta, S.K. Podder, Corporate Governance, Vikas Publishing House (VBH), June 2010

REFERENCES:

1. Dr. K. Nirmala, Karunakara Readdy, Business Ethics and Corporate Governance, Himalaya Publishing House (HPH)
2. H.R. Machiraju, Corporate Governance, Himalaya Publishing House (HPH),
3. K. Venkataramana, Corporate Governance, Sai Publications / SHBP (Sai Hand Book Publishers).
4. N.M. Khandelwal, Indian Ethos and Values for Managers

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_mg46/
2. https://archive.nptel.ac.in/courses/110/105/110105138/
3. https://onlinecourses.nptel.ac.in/noc21_mg54/
4. https://onlinecourses.nptel.ac.in/noc22_mg54/
5. https://archive.nptel.ac.in/courses/109/106/109106117/

IV Year B.Tech. – I Semester

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(BA23AHS702) E-BUSINESS

(Management Course)

COURSE OBJECTIVES:

The objectives of this course are to:

- Provide knowledge on emerging concept on E-Business related aspect
- Understand various electronic markets & business models.
- Impart the information about electronic payment systems &banking.
- Create awareness on security risks and challenges in E-commerce.
- The students aware on different e-marketing channels &strategies.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Remember E-Business & its nature, scope and functions.
CO 2: Understand the concept of business models.
CO 3: Understand the Electronic payment system.
CO 4: Understand E-Security, Contrast and compare security protocols and public network.
CO 5: Understand the concept of on line marketing.

UNIT I: (6 Periods)

Electronic Business: Introduction – Nature, meaning, significance, functions and advantages - Definition of Electronic Business - Functions of Electronic Commerce (EC)- Advantages & Disadvantages of E-Commerce – E-Commerce and E-Business, Internet Services, Online Shopping- E-Commerce Opportunities for Industries. Green E-Business & Sustainable Digital Practices

UNIT II: (7 Periods)

Electronic Markets and Business Models: Introduction –E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals -Business Models-Business to Business (B2B)-Business to Customers(B2C) - Business to Government(B2G)-Auctions-B2B Portals in India. Platform-Based Business Models (e.g., Uber, Amazon, Airbnb), Subscription-Based E-Business Models (SaaS, DaaS).

UNIT III: (5 Periods)

Electronic Payment Systems: Introduction to electronic payment systems (EPS) -Types of electronic payments - Credit/debit cards, e-wallets, UPI, and crypto currencies -Smart cards and digital wallets: Features and usage -Electronic Fund Transfer (EFT): Role in business transactions -Infrastructure requirements and regulatory aspects of e-payments. Cross-Border E-Commerce and Global Payment Gateways (PayPal, Stripe, Razorpay).

UNIT IV: (7 Periods)

E-Security: Security risks and challenges in electronic commerce - Cyber threats -Phishing, hacking, identity theft, and malware - Digital Signatures & Certificates - Security protocols over public networks (HTTP, SSL, TLS) -Firewalls in securing e-business platforms. Data Privacy Laws and Compliance (GDPR, PDP Bill - India).

UNIT V: (5 Periods)

E-Marketing: Introduction – Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Market Research–E-marketing planning: Online branding, social media marketing, and email marketing - E-business strategies: Digital advertising, content marketing, and analytics – E-Customer Relationship Management (eCRM) E-supply chain management (e-SCM).AI in Personalized Marketing (Chatbots, Product Recommendations).

Total Periods: 30

TEXT BOOKS:

1. Arati Oturkar & Sunil Khilari, E-Business, Everest Publishing House, 2022.
2. P.T.S. Joseph, E-Commerce, Fourth Edition, Prentice Hall of India, 2011.

REFERENCES:

1. Debjani & Kamalesh K. Bajaj, E-Commerce, Second Edition, Tata McGraw-Hill, 2005.
2. Dave Chaffey, E-Commerce E-Management, Second Edition, Pearson, 2012.
3. Henry Chan, Raymond Leatham, E-Commerce: Fundamentals and Applications, Wiley India, 2007.
4. S. Jaiswal, E-Commerce, Galgotia Publications Pvt. Ltd., 2003.

ONLINE RESOURCES:

1. https://www.slideshare.net/fatimahAlkreem/e-businessppt-67935771
2. https://www.slideshare.net/VikramNani/e-commerce-business-models
3. https://www.slideshare.net/RiteshGoyal/electronic-payment-system
4. https://www.slideshare.net/WelingkarDLP/electronic-security
5. https://www.slideshare.net/Ankitha2404/emarketing-ppt

IV Year B.Tech. – I Semester

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(BA23AHS703) MANAGEMENT SCIENCE

(Management Course)

COURSE OBJECTIVES:

The objectives of this course are to:

- Provide fundamental knowledge on Management, Administration, Organization & its concepts.
- Make the students understand the role of management in Production.
- Impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts.
- Create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management.
- Make the students aware of the contemporary issues in modern management.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Remember the concepts & principles of management and designs of organization in a practical world.

CO 2: Understand the knowledge of Work-study principles & Quality Control techniques in industry.

CO 3: Apply the process of Recruitment & Selection in organization.

CO 4: Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.

CO 5: Create awareness on contemporary issues in modern management &technology.

UNIT I: (5 Periods)

Introduction to Management: Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor‘s Scientific Theory-Henry Fayol‘s principles - Elton Mayo‘s Human relations -Organizational Designs - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management. Global Management Practices – cross-cultural management insights.

UNIT II: (7 Periods)

Operations Management: Principles and Types of Plant Layout -Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- Material Management - Objectives - Inventory- Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Marketing Management - Concept-Meaning-Nature-Functions of Marketing- Marketing Mix-Channels of Distribution-Advertisement and Sales Promotion-Marketing Strategies based on Product Life Cycle.Smart Manufacturing / Industry 4.0 **–** IoT, automation, robotics in production.

UNIT III: (6 Periods)

Human Resources Management (HRM):HRM - Definition and Meaning – Nature - Managerial and Operative functions - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection -Process -Employee Training and Development - methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration. Remote Work & Hybrid Workforce Management

UNIT IV: (5 Periods)

Strategic& Project Management: Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process – Environmental Scanning-Steps in Strategy Formulation and Implementation –SWOT Analysis- Project Management - Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM)Identifying Critical Path

- Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems). Risk Management in Projects – identification and mitigation

UNIT V: (7 Periods)

Contemporary Issues in Management: Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management – employee engagement and retention - Business Process Re- engineering and Bench Marking - Knowledge Management – change management – sustainability and corporate social responsibility. Corporate Social Innovation (CSI).

Total Periods: 30

TEXT BOOKS:

1. Frederick S. Hillier, MarkS. Hillier. Introduction to Management Science, October26,2023
2. A.R Aryasri, Management Science, TMH, 2019

REFERENCES:

1. Stoner, Freeman, Gilbert. Management, Pearson Education, New Delhi, 2019.
2. Koontz & Weihrich, Essentials of Management, TMH, 6th Edition, 2005.
3. Thomas N. Duening & John M. Ivancevich, Management Principles and Guidelines, Biztantra.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. Samuel C. Certo, Modern Management, PHI, 9th Edition, 2005.

ONLINE RESOURCES:

1. https://www.slideshare.net/slideshow/introduction-to-management-and-organization-231308043/231308043
2. https://nptel.ac.in/courses/112107238
3. https://archive.nptel.ac.in/courses/110/104/110104068/
4. https://archive.nptel.ac.in/courses/110/105/110105069/

IV Year B.Tech. – I Semester

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(AM23APC603) DEEP LEARNING

COURSE OBJECTIVES:

The objectives of this course are to:

- Introduce the fundamental concepts and mathematical foundations of deep learning.
- Explore different neural network architectures including CNNs, RNNs, LSTMs, and
- Transformers.
- Enable students to implement, train, and optimize deep neural networks.
- Analyze the performance and limitations of various architectures in different AI tasks.
- Develop the ability to apply deep learning models to real-world applications such as image recognition, language modeling, and autonomous systems.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand the theoretical foundations of neural networks and deep learning.
CO 2: Implement and train multilayer perceptrons, CNNs, RNNs, and other architectures.
CO 3: Analyze and optimize deep learning models using advanced regularization and tuning techniques.
CO 4: Evaluate the applicability of different neural network architectures for various AI problems.
CO 5: Apply state-of-the-art models such as Transformers and GANs in real-world domains.

UNIT I: (8 Periods)

Foundations of Neural Networks: Introduction to Artificial Neural Networks, Biological Neuron vs. Artificial Neuron, Perceptron, Multilayer Perceptron (MLP), Activation Functions: ReLU, Sigmoid, Tanh, Softmax, Backpropagation and Gradient Descent, Loss Functions: MSE, Cross Entropy, Overfitting, Regularization (L1/L2), Dropout.

UNIT II: (9 Periods)

Convolutional Neural Networks (CNNs): Convolution Operation and Feature Maps, Pooling Layers: Max and Average Pooling, CNN Architectures: LeNet, AlexNet, VGG, ResNet, Transfer Learning and Fine-tuning, Image Classification, Object Detection Basics, Implementation with TensorFlow/PyTorch.

UNIT III: (10 Periods)

Recurrent Neural Networks (RNNs) and Variants: Sequential Data and Time Series, RNN Basics and Back propagation Through Time (BPTT), Vanishing and Exploding Gradients, LSTM and GRU Architectures, Applications in Text, Speech, and Music, Sequence-to-Sequence Models.

UNIT IV: (10 Periods)

Advanced Architectures & Optimization: Autoencoders and Variational Autoencoders (VAEs), Generative Adversarial Networks (GANs), Deep Reinforcement Learning Overview, Batch Normalization, Early Stopping, Hyperparameter Tuning and Optimization, Performance Metrics and Evaluation.

UNIT V: (8 Periods)

Transformer Models & Applications: Attention Mechanism and Self-Attention, Transformers and BERT Architecture, Positional Encoding, Multi-head Attention, Pre-trained Language Models and Fine-Tuning, Applications in NLP: Text Classification, Translation, Large Language Models and Transfer Learning.

Total Periods: 45

TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning, MIT Press, 2016.
2. Michael A. Nielsen, Neural Networks and Deep Learning, Online Book, 2015.

REFERENCES:

1. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
2. Rajalingappaa Shanmugamani, Deep Learning for Computer Vision, Packt Publishing, 2018.
3. Lewis Tunstall, Leandro von Werra, and Thomas Wolf, Natural Language Processing with Transformers, O'Reilly, 2022.
4. Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An Introduction, MIT Press, 2nd Edition, 2018.
5. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow, O'Reilly, 2nd Edition, 2019.

ONLINE RESOURCES:

1. Deep Learning Specialization – Andrew Ng (Coursera)
2. CS231n: Convolutional Neural Networks for Visual Recognition – Stanford
3. Practical Deep Learning for Coders – Fast.ai
4. Deep Learning with PyTorch – Udacity
5. Transformers by Hugging Face – Free Course

IV Year B.Tech. – I Semester

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(AM23APE701) AUGMENTED REALITY AND VIRTUAL REALITY

(Professional Elective-IV)

COURSE OBJECTIVES:

The objectives of this course are to:

- Introduce students to the foundational principles and technologies of Virtual Reality (VR) and Augmented Reality (AR), along with the key devices, modeling techniques, and interaction mechanisms involved in creating immersive environments.
- Cover the essentials of VR and AR, including hardware, software, and human perception, as well as advanced concepts such as 3D modeling, interaction design, and audio rendering.
- Gain hands-on experience in the use of VR/AR systems and explore the challenges and methodologies for building interactive virtual environments.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand the core concepts of Virtual Reality and Augmented Reality, and their differences.

CO 2: Learn about the hardware and software components required for VR and AR systems, as well as the impact of human physiology and perception on the virtual experience.

CO 3: Gain knowledge of input devices (trackers, navigation, and gesture interfaces) and output devices (graphics, sound displays, and haptic feedback).

CO 4: Develop skills in modeling techniques, including geometric, kinematics, physical, and behavior modeling for VR and AR environments.

CO 5: Explore the technologies and methodologies used to create Augmented Reality systems, including marker-based AR and AR software development.

UNIT I: (9 Periods)

Introduction to Virtual Reality (VR): Defining Virtual Reality, Key elements of virtual reality experience,Virtual Reality, Telepresence, Augmented Reality and Cyberspace, Bird's-Eye View: Hardware, Software, Human Physiology and Perception

UNIT II: (9 Periods)

Input and Output Devices: Input Devices: Trackers, Navigation, and Gesture Interfaces, Three-dimensional position trackers, Navigation and manipulation interfaces, Gesture interfaces

Output Devices: Graphics displays, sound displays & haptic feedback.

UNIT III: (9 Periods)

Modeling: Geometric modeling, Kinematics modeling, Physical modeling, Behavior modeling, Model management.

UNIT IV: (9 Periods)

Augmented Reality (AR): Taxonomy, Technology and Features of Augmented Reality, AR vs VR, Challenges with AR, AR systems and functionality, Augmented Reality Methods and Visualization Techniques, Enhancing interactivity in AR Environments, Evaluating AR systems, AR software development: Camera parameters, calibration, marker-based AR, AR Toolkit.

UNIT V: (9 Periods)

Interaction & Audio: Interaction: Motor Programs and Remapping, Locomotion, Manipulation, Social Interaction

Audio: The Physics of Sound, Physiology of Human Hearing, Auditory Perception, Auditory Rendering

Total Periods: 45

TEXT BOOKS:

1. Gregory C. Burdea and Philippe Coiffet, Virtual Reality Technology, John Wiley & Sons, 2nd Edition, 2017.
2. Steven M. LaValle, Virtual Reality, Cambridge University Press, 1st Edition, 2016.

REFERENCES:

1. Rajesh K. Maurya, Computer Graphics with Virtual Reality System, Wiley, 3rd Edition, 2018.
2. William R. Sherman and Alan B. Craig, Understanding Virtual Reality: Interface, Application, and Design, Morgan Kaufmann Publishers (Elsevier), 2nd Edition, 2019.
3. Grigore C. Burdea and Philippe Coiffet, Virtual Reality Technology, Wiley, 2nd Edition, 2017.
4. K.S. Hale and K.M. Stanney, Handbook on Virtual Environments, CRC Press, 2nd Edition, 2015.

ONLINE RESOURCES:

1. http://vr.cs.uiuc.edu/vrbook.pdf
2. https://nptel.ac.in/courses/106/106/106106138/

IV Year B.Tech. – I Semester

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(CY23APC701) BLOCKCHAIN TECHNOLOGY

(Professional Elective-IV)

COURSE OBJECTIVES:

The objectives of this course are to:

- Understand how block chain systems (mainly Bit coin and Ethereal) work and to securely interact with them.
- Design, build, and deploy smart contracts and distributed applications.
- Integrate ideas from block chain technology into their own projects.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding. Identify the risks involved in building Block chain applications.

CO 2: Review of legal implications using smart contracts.

CO 3: Choose the present landscape of Block chain implementations and Understand Crypto currency markets

CO 4: Examine how to profit from trading crypto currencies.

UNIT I: (9 periods)

Introduction, Scenarios, Challenges Articulated, Block chain, Block chain Characteristics, Opportunities Using Block chain, History of Block chain. Evolution of Block chain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Block chain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Block chain Ecosystem, Players in Market.

UNIT II: (9 periods)

Block chain Concepts: Introduction, Changing of Blocks, Hashing, Markel-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on block chain, data storage on block chain, wallets, coding on block chain: smart contracts, peer-to-peer network, types of block chain nodes, risk associated with block chain solutions, life cycle of block chain transaction.

UNIT III: (9 periods)

Architecting Block chain solutions: Introduction, Obstacles for Use of Block chain, Block chain Relevance Evaluation Framework, Block chain Solutions Reference Architecture, Types of Block chain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Block chain Solutions, Architecture Considerations, Architecture with Block chain Platforms, Approach for Designing Block chain Applications.

UNIT IV: (9 periods)

Ethereal Block chain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereal Ecosystem, Ethereal Development, Ethereal Tool Stack, Ethereal Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Gouache, Unit Testing, Ethereal Accounts, My Ether Wallet, Ethereal Networks/Environments, Inure, Ether scan, Ethereal Clients, Decentralized, Application, Metalmark, Tuna Fish Use Case Implementation, Open Zeppelin in Contracts

UNIT V: (9 periods)

Hyper ledger Block chain Implementation: Introduction, Use Case – Car Ownership Tracking, Hyper ledger Fabric, Hyper ledger Fabric Transaction Flow, Facer Use Case Implementation, Invoking Chain code Functions Using Client Application.

Advanced Concepts in Block chain: Introduction, Inter Planetary File System (IPFS), Zero Knowledge Proofs, Oracles, Self-Sovereign Identity, Block chain with IoT and AI/ML Quantum

Computing and Block chain, Initial Coin Offering, Block chain Cloud Offerings, Block chain and its Future Potential.

Total Periods: 45

TEXT BOOKS:

1. Arshad Iqbal and Arched Surfers A. Riff, Blockchain for Enterprise Application Developers, Wiley, 1st Edition, 2020.
2. Andreas M. Antonopoulos and David A. Harding, Mastering Bitcoin: Programming the Open Blockchain, O'Reilly Media, 3rd Edition, 2023.

REFERENCES:

1. J.J. Bambara and P.R. Allen, Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, McGraw-Hill Education, 1st Edition, 2018.
2. M. Swan, Blockchain: Blueprint for a New Economy, O'Reilly Media, 1st Edition, 2015.

ONLINE RESOURCES:

1. https://github.com/blockchainedindia/resources

IV Year B.Tech. – I Semester

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(IT23APE501) INTERNET OF THINGS

(Professional Elective-IV)

COURSE OBJECTIVES:

The objectives of this course are to:

- Understand the basics of Internet of Things and protocols.
- Discuss the requirement of IoT technology.
- Introduce some of the application areas where IoT can be applied.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand general concepts of Internet of Things.
CO 2: Apply design concept to IoT solutions.
CO 3: Analyze various M2M and IoT architectures.
CO 4: Evaluate design issues in IoT applications.
CO 5: Create IoT solutions using sensors, actuators and Devices.

UNIT I: (9 Periods)

Introduction to IoT: Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates

UNIT II: (9 Periods)

Prototyping IoT Objects using Microprocessor/Microcontroller: Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

UNIT III: (9 Periods)

IoT Architecture and Protocols: Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.

UNIT IV: (9 Periods)

Device Discovery and Cloud Services for IoT: Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

UNIT V: (9 Periods)

UAV IoT: Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defence, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software – Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase.

Total Periods: 45

TEXT BOOKS:

1. Vijay Madisetti and Arshdeep Bahga, Internet of Things (A Hands-on Approach), VPT, 1st Edition, 2014.
2. K. Valavanis and George J. Vachtsevanos, Handbook of Unmanned Aerial Vehicles, Springer, 2016.

REFERENCES:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, and David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Academic Press, 1st Edition, 2014.

2. Arshdeep Bahga and Vijay Madisetti, Internet of Things: A Hands-On Approach, Universities Press, 2014.
3. Pethuru Raj and Anupama C. Raman, The Internet of Things: Enabling Technologies and Use Cases, CRC Press, 2022.
4. Francis daCosta, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, Apress Publications, 1st Edition, 2013.
5. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011.
6. Directorate General of Civil Aviation (DGCA), RPAS Guidance Manual, Revision 3, 2020.

ONLINE RESOURCES:

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/
3. https://nptel.ac.in/courses/106105166/5
4. https://nptel.ac.in/courses/108108098/4

IV Year B.Tech. – I Semester

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(CS23APE701) SOFTWARE ARCHITECTURE AND DESIGN PATTERNS

(Professional Elective-IV)

COURSE OBJECTIVES:

The objectives of this course are to:

- Discuss the Presentation tier design patterns and their affect on: sessions, client access, validation and consistency.
- Understand the variety of implemented bad practices related to the Business and Integration tiers.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Highlight the evolution of patterns.
CO 2: Learn how to add functionality to designs while minimizing complexity
CO 3: Learn what design patterns really are, and are not
CO 4: Know about specific design patterns.
CO 5: Learn how to use design patterns to keep code quality high without over design.

UNIT I: (9 Periods)

Envisioning Architecture: The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views. Creating an Architecture: Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

UNIT II: (9 Periods)

Analyzing Architectures: Architecture Evaluation, Architecture design decision making, ATAM, CBAM. Moving from one system to many: Software Product Lines, Building systems from off the shelf components, Software architecture in future.

UNIT III: (9 Periods)

Patterns: Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage.Creational and Structural patterns: Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight.

UNIT IV: (9 Periods)

Behavioural Patterns: Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy. template method, visitor.

UNIT V: (9 Periods)

Case Studies: A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development.

Total Periods: 45

TEXT BOOKS:

1. Len Bass, Paul Clements, and Rick Kazman, Software Architecture in Practice, Pearson Education, 2nd Edition, 2003.
2. Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides, Design Patterns: Elements of Reusable Object-Oriented Software, Pearson Education, 1994.

REFERENCES:

1. Luke Hohmann, Beyond Software Architecture, Addison-Wesley, 2003.

2. David M. Dikel, David Kane, and James R. Wilson, Software Architecture, Prentice Hall PTR, 2001.
3. David Budgen, Software Design, Pearson Education, 2nd Edition, 2003.
4. Eric Freeman and Elisabeth Freeman, Head First Design Patterns, O'Reilly, 2007.
5. Steven John Metsker and William C. Wake, Design Patterns in Java, Pearson Education, 2006.
6. Deepak Alur, John Crupi, and Dan Malks, J2EE Patterns, Pearson Education, 2003.
7. Steven John Metsker, Design Patterns in C#, Pearson Education, 2004.
8. Frank Buschmann et al., Pattern-Oriented Software Architecture, John Wiley & Sons, 1996.

IV Year B.Tech. – I Semester

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(CS23APE702) AGILE METHODOLOGIES

(Professional Elective-V)

COURSE OBJECTIVES:

The objectives of this course are to:

- Understand the fundamental theories, values, and principles of Agile methodology and contrast it with traditional software development models.
- Explore various Agile frameworks and processes such as Scrum, XP, Crystal, and FDD. Recognize the role of agility in knowledge management and decision-making within software projects.
- Apply Agile practices in requirements engineering, focusing on handling dynamic and evolving requirements.
- Evaluate Agile techniques for software quality assurance, including metrics and test-driven development in a global context.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Explain the core principles of Agile methodology and differentiate it from traditional models.

CO 2: Apply various Agile processes and frameworks in managing software development lifecycle.

CO 3: Analyze the integration of Agile approaches in knowledge management within software teams.

CO 4: Develop and prioritize agile-based requirements using abstraction and modeling techniques.

CO 5: Evaluate Agile quality assurance practices such as TDD and use metrics for performance tracking.

UNIT I: (9 Periods)

Agile Methodology: Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT II: (9 Periods)

Agile Processes: Lean Production - SCRUM, Crystal, Feature Driven Development Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT III: (9 Periods)

Agility and Knowledge Management: Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story- Cards – Story-Card Maturity Model (SMM).

UNIT IV: (9 Periods)

Agility and Requirements Engineering: Impact of Agile Processes in RE– Current Agile Practices – Variance – Overview of RE Using Agile Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V: (9 Periods)

Agility and Quality Assurance: Agile Product Development – Agile Metrics – Feature

Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

Total Periods: 45

TEXT BOOKS:

1. David J. Anderson and Eli Schragenheim, Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.
2. Hazza and Dubinsky, Agile Software Engineering (Series: Undergraduate Topics in Computer Science), Springer, 2009.

REFERENCES:

1. Craig Larman, Agile and Iterative Development: A Manager's Guide, Addison-Wesley, 2004.
2. Kevin C. Desouza, Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann, 2007.

ONLINE RESOURCES:

1. https://www.nptelvideos.com/video.php?id=904

IV Year B.Tech. – I Semester

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(CS23APE602) COMPUTER VISION

(Professional Elective-V)

COURSE OBJECTIVES:

The objectives of this course are to:

- Introduce the basic concepts and mathematical foundations of computer vision and enable students to understand how digital images can be processed for feature extraction.
- Study linear filters, convolution, and frequency-based analysis for understanding image structure and transformation.
- Explore edge detection techniques, including noise handling and smoothing, for accurate object boundary identification in images.
- Examine texture representation methods using filter banks, pyramids, and spatial domain transformations to extract patterns and structural information.
- Provide an understanding of image segmentation techniques, including clustering and graph-theoretic methods, for dividing images into meaningful regions.
- Enable students to apply recognition techniques using template relations, classifiers, and probabilistic models like Hidden Markov Models for real-world object detection and interpretation.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

- **CO 1:** Understand the fundamentals of computer vision and apply linear filters and convolution operations.
- **CO 2:** Analyze the impact of noise and smoothing in edge detection and implement techniques like Gaussian filters.
- **CO 3:** Represent and synthesize texture using filter banks, pyramids, and spatial frequency analysis.
- **CO 4:** Apply clustering and graph-based methods for image segmentation and detect shapes using the Hough Transform.
- **CO 5:** Use relational and probabilistic models such as HMMs for object recognition and person detection.

UNIT I: (9 Periods)

Linear Filters: Introduction to Computer Vision, Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing Filters as Templates, Technique: Normalized Correlation and Finding Patterns, Technique: Scale and Image Pyramids.

UNIT II: (9 Periods)

Edge Detection: Noise- Additive Stationary Gaussian Noise, Why Finite Differences Respond to Noise, Estimating Derivatives - Derivative of Gaussian Filters, Why Smoothing Helps, Choosing a Smoothing Filter, Why Smooth with a Gaussian? Detecting Edges-Using the Lap lacian to Detect Edges, Gradient-Based Edge Detectors, Technique: Orientation Representations and Corners.

UNIT III: (9 Periods)

Texture: Representing Texture –Extracting Image Structure with Filter Banks, Representing Texture using the Statistics of Filter Outputs, Analysis (and Synthesis) Using Oriented Pyramids –The Lap lacian Pyramid, Filters in the Spatial Frequency Domain, Oriented Pyramids, Application: Synthesizing Textures for Rendering, Homogeneity, Synthesis by Sampling Local Models, Shape from Texture, Shape from Texture for Planes

UNIT IV: (9 Periods)

Segmentation by Clustering: What is Segmentation, Human Vision: Grouping and

Gestalt, Applications: Shot Boundary Detection and Background Subtraction. Image Segmentation by Clustering Pixels, Segmentation by Graph- Theoretic Clustering. The Hough Transform, Fitting Lines, Fitting Curves

UNIT V: (9 Periods)

Recognization by Relations Between Templates: Finding Objects by Voting on Relations between Templates, Relational Reasoning Using Probabilistic Models and Search, Using Classifiers to Prune Search, Hidden Markov Models, Application: HMM and Sign Language Understanding, Finding People with HMM.

Total Periods: 45

TEXT BOOKS:

1. David A. Forsyth and Jean Ponce, Computer Vision – A Modern Approach, PHI, 1st Edition, 2003.
2. Eckhard Sommer, Geometric Computing with Clifford Algebras: Theoretical Foundations and Applications in Computer Vision and Robotics, Springer, 1st Edition, 2001.

REFERENCES:

1. Milan Sonka, Vaclav Hlavac, and Roger Boyle, Digital Image Processing and Computer Vision, Cengage Learning, 1st Edition, 1999.
2. Jack Sklansky, Computer Vision and Applications: Concise Edition (With CD), Academic Press, 2000.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106105216https://nptel.ac.in/courses/108103174

IV Year B.Tech. – I Semester

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(CY23APE701) CYBER PHYSICAL SYSTEMS

(Professional Elective-V)

COURSE OBJECTIVES:

The objectives of this course are to:

- Provide students with a comprehensive understanding of the various techniques and methodologies used to design, secure, synchronize, and schedule operations within Cyber- Physical Systems (CPS).
- Cover symbolic synthesis for CPS, security aspects, distributed synchronization, real-time scheduling, and model integration, with an emphasis on both basic principles and advanced techniques.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand the core principles behind CPS
CO 2: Identify Security mechanisms of Cyber physical systems
CO 3: Understand Synchronization in Distributed Cyber-Physical Systems
CO 4: Understand the Scheduling for Cyber-Physical Systems
CO 5: Understand the various Cyber-Physical System models

UNIT I: (9 periods)

Symbolic Synthesis for Cyber-Physical Systems: Introduction and Motivation, Basic Techniques - Preliminaries, Problem Definition, Solving the Synthesis Problem, Construction of Symbolic Models, Advanced Techniques: Construction of Symbolic Models, Continuous-Time Controllers, Software Tools

UNIT II: (9 periods)

Security of Cyber-Physical Systems: Introduction and Motivation, Basic Techniques - Cyber Security Requirements, Attack Model, Countermeasures, Advanced Techniques: System Theoretic Approaches

UNIT III: (9 periods)

Synchronization in Distributed Cyber-Physical Systems: Challenges in Cyber-Physical Systems, A Complexity-Reducing Technique for Synchronization, Formal Software Engineering, Distributed Consensus Algorithms, Synchronous Lockstep Executions, Time Triggered Architecture, Related Technology, Advanced Techniques

UNIT IV: (9 periods)

Real-Time Scheduling for Cyber-Physical Systems: Introduction and Motivation, Basic Techniques - Scheduling with Fixed Timing Parameters, Memory Effects, Multiprocessor/Multicore Scheduling, Accommodating Variability and Uncertainty

UNIT V: (9 periods)

Model Integration in Cyber-Physical Systems: Introduction and Motivation, Causality, Semantic Domains for Time, Interaction Models for Computational Processes, Semantics of CPS DSMLs, Advanced Techniques, For Spec, The Syntax of CyPhyML, Formalization of Semantics, Formalization of Language Integration.

Total Periods: 45

TEXT BOOKS:

1. Raj Rajkumar, Dionisio De Niz, and Mark Klein, Cyber-Physical Systems, Addison-Wesley Professional, 1st Edition, 2016.
2. Rajeev Alur, Principles of Cyber-Physical Systems, MIT Press, 1st Edition, 2015.

REFERENCES:

1. Albert Benveniste et al., Contracts for System Design, Springer, 1st Edition, 2018.
2. Eugene Y. Song and James H. Aylor, Cyber-Physical Systems: From Theory to Practice, CRC Press, 1st Edition, 2016.
3. Edward A. Lee and Sanjit A. Seshia, Introduction to Embedded Systems: A Cyber-Physical Systems Approach, Lulu.com, 1st Edition, 2017.
4. Frank Drews, Cyber-Physical Systems Security: Foundations, Principles and Applications, Springer, 1st Edition, 2020.

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc25_cs32/preview

IV Year B.Tech. – I Semester

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(AM23APE707) METAVERSE

(Professional Elective-V)

COURSE OBJECTIVES:

The objectives of this course are to:

- Present and discuss Metaverse characteristics, concepts and layers.
- Explain and analyse Metaverse technologies, tools, platforms, and applications.
- Discuss design theories and practices relevant to the Metaverse.
- Explore cyber security and cybercrime in the Metaverse.
- Examine open challenges in the Metaverse.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand the characteristics and interdisciplinary nature of the Metaverse, and the opportunities and risks it presents.

CO 2: Analyze Metaverse layers, the technologies used in creating them, and relevant design theories and practices.

CO 3: Examine and discuss Metaverse platforms, applications and the latest technological developments.

CO 4: Identify cyber security issues, understand cybercrime, and discuss open challenges.

CO 5: Build Metaverse applications.

UNIT I: (9 Periods)

Metaverse Fundamentals: Metaverse evolution, importance, and characteristics; the interdisciplinary nature of the Metaverse; opportunities and risks. Computer-mediated communication theories: social presence theory, social information processing theory, media richness theory, cyborg theory. Avatar-mediated communication.

UNIT II: (9 Periods)

Metaverse Layers and Core Technologies (Part I): The seven layers of the Metaverse: Experience, Discovery, Creator economy, Spatial computing, Decentralization, Human interface, Infrastructure. Metaverse technologies (Part I): AR/VR/MR/XR, 3D reconstruction, Game engines, Smart glasses, wearables, haptic devices, headsets, and headwear.

UNIT III: (9 Periods)

Metaverse Technologies (Part II) and Design Practices: Metaverse technologies (Part II): Blockchain, smart contracts, tokens, NFTs, cryptography, AI, IoT, edge computing, 5G, 6G.

Design theories and practices: Social presence and co-presence, motion sickness and cybersickness, uncanny valley, sense of self-location, agency, body ownership. Universal simulation principle. Prototyping and evaluation techniques (qualitative and quantitative).

UNIT IV: (9 Periods)

Metaverse UI/UX Tools and Platforms: Tools and services for avatar systems, spatial user interface design, crossplatform user experience design, multimodal user interface. Technologies and devices for HCI in the Metaverse. Metaverse platforms: Decentraland, SANDBOX, Roblox, Axie Infinity, uHive, Hyper Nation, Nakamoto (NAKA), Metahero (HERO), Star Atlas (ATLAS), Bloktopia (BLOK), Stageverse, Spatial, PalkaCity, Viverse, Sorare, Illuvium, Upland, Second Life, Sansar, Sensorium Galaxy.

UNIT V: (9 Periods)

Applications, Security, and Challenges: Applications Part I: Gaming, entertainment, travel, tourism, education, learning, remote working, commerce, and business.

Applications Part II: Real estate, banking, finance, healthcare, social media, fashion.

Cybersecurity in the Metaverse: Social engineering attacks, data theft, decentralization vs

vulnerabilities, process/people/technology risks. Cybercrime: Scams, thefts, rug pulls, money manipulation, wash trading, money laundering. Challenges and Open Issues: Persistency, interoperability, scalability, maturity, regulation, usefulness, ease-of-use, privacy and data security, content creation, NFTs and creator economy, social/legal/ethical issues.

Total Periods: 45

TEXT BOOK:

1. Terry Winters, The Metaverse, Independently Published, 2021, ISBN: 9798450959283.
2. Matthew Ball, The Metaverse and How It Will Revolutionize Everything, Liveright, 2022, ISBN: 9781324092032.

REFERENCE BOOKS:

1. M. Damar, Metaverse: Shape of Your Life for Future – A Bibliometric Snapshot, Journal of Metaverse, Vol. 1, No. 1, 2021, pp. 1–8.
2. J. Day, Metaverse Will See Cyber Warfare Attacks Unlike Anything Before, Express.co.uk, 2022.
3. A. Polyviou, K. Sharma, and I.O. Pappas, Training in the Metaverse: Employing Physiological Data, Temple University, 2023.
4. QuHarrison Terry and Scott Keeney, The Metaverse Handbook: Innovating for the Internet's Next Tectonic Shift, Wiley, 2022, ISBN: 9781119892526.
5. M. Themistocleous, K. Christodoulou, and L. Katelaris, An Educational Metaverse Experiment, Springer, 2023.
6. Neal Stephenson, Snow Crash, Bantam Books, 1992, ISBN: 978055338.

IV Year B.Tech. – I Semester

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(AM23ASC701) PROMPT ENGINEERING

COURSE OBJECTIVES:

The objectives of this course are to:

- Introduce the principles, strategies, and best practices of prompt engineering in NLP and ML.
- Understand how prompt design influences AI model behavior, performance, and output quality.
- Develop skills in formulating effective prompts for different natural language processing tasks.
- Explore advanced prompting techniques such as zero-shot, few-shot, and chain-of-thought prompting.
- Provide hands-on experience in evaluating, refining, and optimizing prompts across AI applications.

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

CO 1: Understanding the fundamentals and evolution of prompt engineering.
CO 2: Gaining the ability to craft effective closed-ended, open-ended, and role-based prompts.
CO 3: Learning to probe and stress-test AI models for bias and robustness.
CO 4: Applying prompt optimization techniques and performance evaluation methods.
CO 5: Mitigating bias and promoting ethical prompting practices in NLP/ML systems.

Module 1: Introduction to Prompt Engineering

Lesson 1: Foundations of Prompt Engineering
a. Overview of prompt engineering and its significance in NLP and ML.
b. Historical context and evolution of prompt-based approaches.

Module 2: Types of Prompts and Their Applications

Lesson 2: Closed-Ended Prompts
a. Understanding and creating prompts for specific answers.
b. Applications in question-answering systems.

Lesson 3: Open-Ended Prompts
a. Crafting prompts for creative responses.
b. Applications in language generation models.

Module 3: Strategies for Effective Prompting

Lesson 4: Probing Prompts
a. Designing prompts to reveal model biases.
b. Ethical considerations in using probing prompts.

Lesson 5: Adversarial Prompts
a. Creating prompts to stress-test models.
b. Enhancing robustness through adversarial prompting.

Module 4: Fine-Tuning and Optimizing with Prompts

Lesson 6: Fine-Tuning Models with Prompts
a. Techniques for incorporating prompts during model training.
b. Balancing prompt influence and generalization.

Lesson 7: Optimizing Prompt Selection
a. Methods for selecting optimal prompts for specific tasks.
b. Customizing prompts based on model behavior.

Module 5: Evaluation and Bias Mitigation

Lesson 8: Evaluating Prompt Performance

a. Metrics and methodologies for assessing model performance with prompts.
b. Interpreting and analyzing results.

Lesson 9: Bias Mitigation in Prompt Engineering

a. Strategies to identify and address biases introduced by prompts.
b. Ensuring fairness and inclusivity in prompt-based models.

Module 6: Real-World Applications and Case Studies

Lesson 10: Case Studies in Prompt Engineering

a. Exploration of successful implementations and challenges in real-world scenarios.
b. Guest lectures from industry experts sharing their experiences.

TEXT BOOKS:

1. Danny D. Sullivan,Prompt Engineering in Action
2. Nathan Hunter, The Art of Prompt Engineering with Chat GPT: A Hands-On Guide

REFERENCES:

1. Michael F. Lewis Prompt Engineering in Practice.
2. Adriano Damiao, Mastering AI Prompt Engineering: The Ultimate Guide for Chat GPT Users.
3. Stephanie Diamond and Jeffrey Allan, Writing AI Prompts for Dummies

IV Year B.Tech. – I Semester

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(CS23ASC701) INTRODUCTION TO R PROGRAMMING

COURSE OBJECTIVES:

The objectives of this course are to:

- Introduce the R programming environment and familiarize students with installation, basic setup, and package management.
- Provide foundational understanding of R programming concepts, including data types, variables, operators, and control structures.
- Develop the ability to work with different data structures in R, such as vectors, lists, matrices, and data frames.
- Enable students to write functions and use R packages for implementing programming logic and solving problems.
- Train students in data manipulation, analysis, and visualization using built-in functions and graphical tools in R.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Setup R Programming Environment
CO 2: Understand and use R – Data types.
CO 3: Understand and use R – Data Structures.
CO 4: Develop programming logic using R – Packages.
CO 5: Analyze data sets using R – programming capabilities

List of Experiments:

1. Download and install R-Programming environment and install basic packages using install.packages() command in R.
2. Learn all the basics of R-Programming (Data types, Variables, Operators etc,.)
3. Write a program to find list of even numbers from 1 to n using R-Loops.
4. Create a function to print squares of numbers in sequence.
5. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.
6. Implement different String Manipulation functions in R.
7. Implement different data structures in R (Vectors, Lists, Data Frames)
8. Write a program to read a csv file and analyze the data in the file in R.
9. Create pie chart and bar chart using R.
10. Create a data set and do statistical analysis on the data using R.

TEXT BOOKS:

1. Norman Matloff, The Art of R Programming, UC Davis 2009.

REFERENCES:

1. Garrett Grolemund, Hands-On Programming with R: Write Your Own Functions and Simulations, O'Reilly Media, 2014, ISBN: 9781449372720.
2. Hadley Wickham and Garrett Grolemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data, O'Reilly Media, 2017. (Available freely at: https://r4ds.had.co.nz)
3. W.N. Venables and B.D. Ripley, Modern Applied Statistics with S, Springer, 4th Edition, 2002, ISBN: 9780387954578.

ONLINE RESOURCES:

1. https://www.r-project.org/

IV Year B.Tech. – I Semester

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(BA23AAC701) GENDER SENSITIZATION

COURSE OBJECTIVES:

The objectives of this course are to:

- Enable students to understand the gender related issues, vulnerability of women and men
- Familiarize them about constitutional safeguard for gender equality
- Expose the students to debates on the politics and economics of work
- Help students reflect critically on gender violence
- Make them understand that gender identities and gender relations are part of culture as they shape the way daily life is lived in the family as well as wider community and the workplace.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Understand the basic concepts of gender and its related terminology.
CO 2: Identify the biological, sociological, psychological and legal aspects of gender.
CO 3: Use the knowledge in understanding how gender discrimination works in our society and how to counter it.
CO 4: Able to critically analyze the concept, types, and consequences of gender-based violence.
CO 5: able to evaluate gender representations in media, literature, and language.

UNIT I: (7 Periods)

Understanding Gender: Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

UNIT II: (5 Periods)

Gender Roles and Relations: Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences- Declining Sex Ratio- Demographic Consequences-Gender Spectrum

UNIT III: (7 Periods)

Gender and Labour: Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction-Unrecognized and Unaccounted work -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

UNIT IV: (5 Periods)

Gender-Based Violence: The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

UNIT V: (6 Periods)

Gender and Culture: Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language- Just Relationships.

Total Periods: 30

TEXT BOOKS:

1. A. Suneetha, Uma Bhrugubanda, Towards a World of Equals: A Bilingual Textbook on Gender, Telugu Akademi, Telangana, 2015.
2. Butler, Judith, Gender Trouble: Feminism and the Subversion of Identity, UK Paperback Edn., March 1990

REFERENCES:

1. Wtatt, Robin and Massood, Nazia, Broken Mirrors: The Dowry Problems in India, London: Sage Publications, 2011
2. Datt, R. and Kornberg, J., Women in Developing Countries, Assessing Strategies for Empowerment, London: Lynne Rienner Publishers, 2002
3. Brush, Lisa D., Gender and Governance, New Delhi, Rawat Publication, 2007
4. Singh, Direeti, Women and Politics World Wide, New Delhi, Axis Publications, 2010
5. Raj Pal Singh, Anupama Sihag, Gender Sensitization: Issues and Challenges (English, Hardcover), Raj Publications, 2019
6. A. Revathy & Murali, Nandini, A Life in Trans Activism (Lakshmi Narayan Tripathi). The University of Chicago Press, 2016.

ONLINE RESOURCES:

1. https://onlinecourses.swayam2.ac.in/nou24_hs53/preview
2. https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are-gender-roles-and-stereotypes
3. https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on-our-relationships-7499408
4. https://onlinecourses.swayam2.ac.in/cec23_hs29/preview
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IV Year B.Tech. – I Semester

L	T	P	C
-	-	-	2

(CS23AIP701) INDUSTRY INTERNSHIP

COURSE DESCRIPTION: This course is designed to expose students to the industrial environment and prepare them as competent professionals for the industry. It sharpens real-time technical and managerial skills required on the job, while providing valuable professional experience and an understanding of engineers' responsibilities and ethics. Students will gain familiarity with the latest equipment, materials, and technologies, develop proficiency in technical report writing, and acquire first-hand exposure to corporate working culture.

COURSE OBJECTIVES:

The objectives of this course are to:

- Equip students with an understanding of industrial processes, organizational structures, professional practices, and emerging technologies relevant to engineering domains.
- Enhance technical competence, analytical ability, problem-solving, leadership, team spirit, finance, project management, and communication skills through hands-on engagement in real-time industrial projects.
- Cultivate professional ethics, social responsibility, adaptability to corporate culture, environmental and sustainability awareness, and a lifelong learning mindset for industry readiness.

COURSE OUTCOMES:

On successful completion of the course, the students will be able to:

CO 1: Evaluate industrial processes, latest equipment, materials, and technologies to solve complex engineering problems in compliance with relevant standards, codes, policies, and regulations.

CO 2: Evaluate safety, health, societal, environmental, sustainability, ethical, economic, and managerial considerations in industrial problem-solving and decision-making.

CO 3: Analyze individual and team performance, leadership, and professional communication effectiveness in written, oral, and graphical forms while practicing engineering in real-time industrial settings.

IV Year B.Tech. – II Semester

L	T	P	C
-	-	-	4

(CS23AIP801) INTERNSHIP

COURSE DESCRIPTION: This semester-long course provides students with comprehensive, hands-on exposure to industry, national laboratories, or academic institutions, relevant to their branch-specific or interdisciplinary interests, through offline, online, or blended modes. It is designed to prepare students as competent professionals by sharpening real-time technical, managerial, and problem-solving skills, while fostering an understanding of professional responsibilities, ethics, and workplace culture.
Students will analyze, design, and develop innovative solutions to real-world engineering problems, gain familiarity with latest equipment, materials, and technologies, and enhance proficiency in technical report writing, documentation, and professional communication. They will also acquire first-hand exposure to organizational processes and corporate working culture, preparing them to function effectively in diverse professional settings.

COURSE OBJECTIVES:
The objectives of this course are to:

- Equip students with an understanding of industrial processes, organizational structures, professional practices, and emerging technologies relevant to engineering domains.
- Enhance technical competence, analytical ability, design, problem-solving, leadership, team spirit, finance, project management, and communication skills through hands-on engagement in real-time industrial projects.
- Cultivate professional ethics, social responsibility, adaptability to corporate culture, environmental and sustainability awareness, and a lifelong learning mindset for industry readiness.

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

CO 1: Create real-world engineering solutions using industrial processes, latest equipment, materials, and technologies in compliance with relevant standards, codes, policies, and regulations.
CO 2: Evaluate safety, health, societal, environmental, sustainability, ethical, economic, and managerial considerations in industrial problem-solving and decision-making.
CO 3: Analyze individual and team performance, leadership, and professional communication effectiveness in written, oral, and graphical forms while practicing engineering in real-time industrial settings.

IV Year B.Tech. – II Semester

L	T	P	C
-	-	-	8

(CS23APW801) PROJECT

COURSE DESCRIPTION: This capstone course provides students with the opportunity to conceptualize, design, and execute a comprehensive project, either research-oriented or application-oriented, relevant to their discipline or interdisciplinary areas. Students will identify a project topic, perform a critical literature survey, and gather preliminary data. They will evaluate feasibility through time, cost, and resource analysis, select suitable tools and methodologies, and carry out detailed design, analysis, and implementation. The project emphasizes creating solutions to real-world problems, supported by ethical, sustainable, and professional considerations. The outcomes are documented in a thesis and defended through a formal presentation before an evaluation committee.

COURSE OBJECTIVES:

The objectives of this course are to:

- Develop a thorough understanding of project identification, planning, and execution by integrating domain knowledge, research insights, and emerging trends in engineering practice.
- Equip students with the ability to design, develop, and implement project-based engineering solutions through systematic analysis, application of modern tools and techniques, project and financial management, leadership, and effective individual and team participation.
- Foster professional ethics, societal and environmental responsibility, and a lifelong learning mindset by engaging students in real-world project work that addresses contemporary challenges and community needs.

COURSE OUTCOMES:

On successful completion of the course, the students will be able to:

CO 1: Create engineering systems or processes to solve complex problems by applying appropriate tools, techniques, standards, codes, policies, regulations, and the latest developments.

CO 2: Evaluate societal, health, safety, environmental, sustainability, economic, and project management considerations in developing engineering solutions.

CO 3: Demonstrate effective individual or teamwork, leadership, and professional communication in written, oral, and graphical forms while executing engineering projects.