

MOHAN BABU UNIVERSITY

Sree Sainath Nagar, Tirupati – 517 102



DREAM. BELIEVE. ACHIEVE

SCHOOL OF COMPUTING

Bachelor of Computer Applications

(3 Years Degree)

Bachelor of Computer Applications (Hons.)

(4 Years Degree)

CURRICULUM AND SYLLABUS

(From 2025-26 Admitted Students)

FULLY FLEXIBLE CHOICE BASED CREDIT SYSTEM (FFCBCS)



MBU
MOHAN BABU
UNIVERSITY

MOHAN BABU UNIVERSITY

Vision

To be a globally respected institution with an innovative and entrepreneurial culture that offers transformative education to advance sustainability and societal good.

Mission

- ❖ Develop industry-focused professionals with a global perspective.
- ❖ Offer academic programs that provide transformative learning experience founded on the spirit of curiosity, innovation, and integrity.
- ❖ Create confluence of research, innovation, and ideation to bring about sustainable and socially relevant enterprises.
- ❖ Uphold high standards of professional ethics leading to harmonious relationship with environment and society.

SCHOOL OF COMPUTING

Vision

To lead the advancement of computer science research and education that has real-world impact and to push the frontiers of innovation in the field.

Mission

- ❖ Instil within our students fundamental computing knowledge, a broad set of skills, and an inquisitive attitude to create innovative solutions to serve industry and community.
- ❖ Provide an experience par excellence with our state-of-the-art research, innovation, and incubation ecosystem to realize our learners' fullest potential.
- ❖ Impart continued education and research support to working professionals in the computing domain to enhance their expertise in the cutting-edge technologies.
- ❖ Inculcate among the computing engineers of tomorrow with a spirit to solve societal challenges.

DEPARTMENT OF COMPUTER APPLICATIONS

Vision

To become a center of excellence in the field of computer science and applications.

Mission

- Imparting knowledge and skills through contemporary curriculum to the diverse group of students.
- Creating a talent pool of faculty in diverse domains of computer applications through continuous training.
- Domain and transferable skill development for the holistic personality of students to inculcate values and ethics for effective professional practice and as an entrepreneur.

BACHELOR OF COMPUTER APPLICATIONS (BCA)

PROGRAM EDUCATIONAL OBJECTIVES

After few years of graduation, the graduates of BCA Program will be able to:

- PEO1.** Pursue higher education in the core and allied areas of computer science and applications.
- PEO2.** Become professionals in industry or academia with an ability to adapt to evolving technologies in cultivating skills for thriving career.
- PEO3.** Become successful entrepreneurs and be engaged in technology innovation and deployment.
- PEO4.** Exhibit professionalism, and uplifting health, safety, legal, environmental, ethical, and cultural diversity issues for serving the society and communicating with local and national peers, bound within regulations and leading to lifelong learning.

PROGRAM OUTCOMES

On successful completion of the Program, the graduates of BCA Program will be able to:

- PO1. Computational Knowledge:** Apply knowledge of mathematics and computing fundamental and domain concepts to find solutions for defined problems.
- PO2. Problem Analysis:** Adapt basic principles of Mathematics and Computing sciences to identify and formulate problems to provide solutions for complex problems.
- PO3. Design/Development of Solutions:** Design, analyze and develop solutions and evaluate system components or processes to meet a specific need for local, regional and global public health, societal, cultural, and environmental systems.
- PO4. Conduct Investigations of Complex Computing Problems:** Use research-based knowledge and methods with the ability to perform analysis and development to reach valid conclusions.
- PO5. Modern Tool Usage:** Design, analyze and develop solutions using modern tools by considering the limitations.

- PO6. Professional Ethics:** Commit to ethics and cyber regulations, responsibilities, and norms in computing practices.
- PO7. Life-long Learning:** Enhance understanding and building research, strategies in independent learning for continual development as computer applications professional.
- PO8. Project Management and Finance:** Establishing strategies for developing and implementing ideas in multi-disciplinary environments using computing and management skills as a member or leader in a team.
- PO9. Communication Efficacy:** Contribute to progressive community and society in comprehending computing activities by writing effective reports, designing documentation, making an effective presentation, and understanding instructions.
- PO10. Societal and Environmental Concern:** Apply mathematics and computing knowledge to access and solve issues relating to health, safety, societal, environmental, legal, and cultural issues within local, regional and global contexts.
- PO11. Individual and Teamwork:** Self and continuous learning to improve knowledge and competence as a member or leader of a team.
- PO12. Innovation and Entrepreneurship:** Identify a timely opportunity and use innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

PROGRAM SPECIFIC OUTCOMES

On successful completion of the Program, the graduates of BCA Program will be able to:

- PSO1.** Design, develop, test, and deploy computing applications of specified requirements using programming skills.
- PSO2.** Apply tools and techniques to create database and adapt managerial and domain Skills of Information Management for storage and decision making.
- PSO3.** Apply suitable techniques and algorithms to integrate Operating System Services, Network devices, Security mechanisms and Infrastructure to meet the requirements for the deployment of an application on networks.

BACHELOR OF COMPUTER APPLICATIONS - 3 years Program

Basket Wise - Credit Distribution

S. No.	Basket	Credits (Min.- Max.)
1	SCHOOL CORE	36-45
2	PROGRAM CORE	36-42
3	PROGRAM ELECTIVE	18-24
4	SPECIALIZATION ELECTIVE	12-18
5	UNIVERSITY ELECTIVE	6-9
TOTAL CREDITS		Min. 120

BACHELOR OF COMPUTER APPLICATIONS (Hons) 4 years Program

Basket Wise - Credit Distribution

S. No.	Basket	Credits (Min.- Max.)
1	SCHOOL CORE	36-45
2	PROGRAM CORE	42-54
3	PROGRAM ELECTIVE	36-45
4	SPECIALIZATION ELECTIVE	24-30
5	UNIVERSITY ELECTIVE	9-12
TOTAL CREDITS		Min. 160

School Core (36-45 Credits)- BCA General – 3 years

School Core (36-45 Credits)- BCA with Honours – 4 years

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
25LG102402	General English	2	-	2	-	3	-
25CM101401	Principles of Accounting	3	-	-	-	3	-
25MM101401	Matrix Theory and Linear Algebra	3	-	-	-	3	-
25MM101409	Numerical Analysis, Probability and Statistics	3	-	-	-	3	-
25CA101001	Computer Fundamentals and Organization	3	-	-	-	3	-
25CA101002	Digital Electronics	3	-	-	-	3	-
25CA102001	Programming for Problem Solving	3	-	2	-	4	-
25MM101410	Discrete Mathematics for Computer Science	3	-	-	-	3	-
25CA101003	Basics of Virtualization and Cloud Technology	3	-	-	-	3	-
25CA105001	Computer Hardware and System Essentials	-	1	2	-	2	-
25CM101402	Entrepreneurial Development	2	-	-	-	2	-
25CM101403	Innovation and Design Thinking	2	-	-	-	2	-
25CA111001	Internship	-	-	-	-	2	-
25CA108001	Capstone Project	-	-	-	-	8	-

Mandatory Courses (Min. 6 Credits to be earned. Earned Credits will not be considered for CGPA)							
25CB107601	Essentials of Cyber Security *	2	-	-	-	2	-
25LG107601	Professional Ethics and Human Values	2	-	-	-	2	-
25CE107601	Environmental Science*	2	-	-	-	2	-
25CE107602	Disaster Mitigation and Management	2	-	-	-	2	-
25CE107603	Rural Technology	2	-	-	-	2	-
25LG107603	Spoken English	-	1	2	-	2	-
25LG107602	Essential Life Skills for Holistic Development	2	-	-	-	2	-
25AB107601	NSS Activities	-	-	-	-	2	-
25AB107602	Yoga	-	-	-	-	2	-
25AB107603	NCC Activities	-	-	-	-	2	-
25MG107601	Innovation, Incubation and Entrepreneurship	2	-	-	-	2	-
25EE107601	Intellectual Property Rights	2	-	-	-	2	-
25EE107602	Fundamentals of Research Methodology	2	-	-	-	2	-
25LG207601	Technical Report Writing	2	-	-	-	2	-

*Compulsory Course

Program Core (36 - 42 Credits) BCA General – 3 years

Program Core (42 - 54 Credits) BCA with Honours – 4 years

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
25CA102002	Database Management Systems	3	-	2	-	4	-
25CA102003	Data Warehousing and Data Mining	3	-	2	-	4	Database Management Systems
25CA101004	Computer Communication	3	-	-	-	3	-
25CA102004	Data Structures	3	-	2	-	4	-
25CA102005	Python Programming	3	-	2	-	4	Programming for Problem Solving
25CA104001	Object Oriented Programming through C++	3	-	2	4	5	Programming for Problem Solving
25CA102006	Java Programming	3	-	2	-	4	Object Oriented Programming with C++
25CA102007	Computer Graphics	3	-	2	-	4	-
25CA102008	Data Analytics	3	-	2	-	4	-
25CA101005	Fundamentals of Data Science	2	-	-	-	2	-
25CA101006	Software Engineering	3	-	-	-	3	-
25CA101007	User Experience/ Interface (UX/UI) Design	2	-	-	-	2	-
25CA102009	UNIX Shell Programming	2	-	2	-	3	-
25CA101008	Machine Learning	3	-	-	-	3	Data Warehousing and Data Mining
25CA102010	Web Designing using HTML, CSS, JavaScript	2	-	2	-	3	-
25CA102011	Big Data Programming	2	-	2	-	3	Java Programming/Python Programming

Program Elective (18 - 24 Credits) BCA General – 3 years

Program Elective (36 - 45 Credits) BCA with Honours – 4 years

Course Code	Knowledge Area	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
			L	T	P	S	C	
25CA101009	Information Management	Decision Support Systems	3	-	-	-	3	Software Engineering
25CA101010		Advanced Databases	3	-	-	-	3	Database Management Systems
25CA102012	Networks	LINUX Administration	2	-	2	-	3	Computer Communication
25CA101011		Internet of Things	3	-	-	-	3	-
25CA101012		Digital Forensics	3	-	-	-	3	Computer Communication
25CA101013		Computer Networks	3	-	-	-	3	Computer Communication
25CA102013	Infrastructure Management Services	Network Administration	2	-	2	-	3	Computer Communication
25CA102014	Programming Languages	Open Source Programming	2	-	2	-	3	Java Programming
25CA102015		Scripting Languages	2	-	2	-	3	Python Programming
25CA102016		Programming with C#	2	-	2	-	3	Programming for Problem Solving
25CA102017		PHP and MySQL Programming	2	-	2	-	3	Java Programming
25CA101014	Graphics	Game Theory	3	-	-	-	3	Computer Graphics

25CA101015	Cloud Computing	Cloud Computing	3	-	-	-	3	-
25CA102018		MS Azure Administration	2	-	2	-	3	Cloud Computing
25CA102019		Cloud Practitioner	2	-	2	-	3	Cloud Computing
25CA101016	Information Security	Cryptography	3	-	-	-	3	Computer Networks
25CA101017		Cyber Security	3	-	-	-	3	Computer Networks
25CA101018		Ethical Hacking	3	-	-	-	3	Computer Networks
25CA102020	Software Engineering	Object Oriented System Design	2	-	2	-	3	Software Engineering
25CA102021		Software Testing and Automation	2	-	2	-	3	Software Engineering
25CA102022	Platform Based Development	.Net Technologies	2	-	2	-	3	Object Oriented Programming with C++
25CA102023		Web Applications Development using PHP	2	-	2	-	3	Web Designing using HTML,CSS, JavaScript
25CA102024		Multimedia Systems	2	-	2	-	3	Web Applications Development using PHP
25CA102025		Game Design and Development	2	-	2	-	3	Python Programming
25CA102026	Intelligent Systems	Machine Learning and AI Using python	2	-	2	-	3	Python Programming
25CA101019		Artificial Intelligence	3	-	-	-	3	-

Specialization Electives (12 - 18 Credits) BCA General – 3 years
Specialization Electives (24 - 30 Credits) BCA with Honours – 4 years

Course Code	Title of the Course	Lecture	Tutorial	Practical	Project based Learning	Credits	Pre-requisite
		L	T	P	S	C	
25CA101020	Introduction to Virtual Reality	3	-	-	-	3	Computer Graphics
25CA102027	Graphics and Animation Tools Using Open source Software	3	-	2	-	4	Introduction to 3D Computer Animation
25CA102028	User Interface Design	3	-	2	-	4	-
25CA101021	Introduction to Augmented Reality Graph	3	-	2	-	4	-
25CA101022	Graph Theory and Combinatorics	3	-	-	-	3	-
25CA102029	Animation Design	3	-	2	-	4	-
25CA102030	Introduction to 3D Computer Animation	3	-	2	-	4	-
25CA102031	Digital Image Processing	3	1	2	-	5	-
25CA104002	Advanced Computer Graphics	2	-	2	4	4	-
25CA101023	Responsible AI Artificial Intelligence	3	-	-	-	3	-

University Elective (6-9 Credits) BCA General – 3 years

University Elective (9-12 Credits) BCA with Honours – 4 years

Course Code	Title of the Course	L	T	P	S	C	Prerequisite
25EC101701	AI in Healthcare	3	-	-	-	3	-
25CM101701	Banking and Insurance	3	-	-	-	3	-
25DS101701	Bioinformatics	3	-	-	-	3	-
25BS101701	Biology for Engineers	3	-	-	-	3	-
25CE101701	Civil Engineering and The Society	3	-	-	-	3	-
25SS101701	Constitution of India	3	-	-	-	3	-
25CM101702	Cost Accounting and Financial Management	3	-	-	-	3	-
25CB101701	Cyber Laws and Security	3	-	-	-	3	-
25EE101701	Electrical Safety and Safety Management	3	-	-	-	3	-
25MG101701	Entrepreneurship for Micro, Small and Medium Enterprises	3	-	-	-	3	-
25CE101702	Environmental Pollution and Control	3	-	-	-	3	-
25EC101702	Essentials of VLSI	3	-	-	-	3	-
25CB101702	Introduction to Ethical Hacking	3	-	-	-	3	-
25BS101703	Forensic Science	3	-	-	-	3	-
25SS101702	Gender and Environment	3	-	-	-	3	-
25ME101701	Global Strategy and Technology	3	-	-	-	3	-
25EE101704	Green Technologies	3	-	-	-	3	-
25ME101702	Human Resource Management	3	-	-	-	3	-
25SS101703	Indian Economy	3	-	-	-	3	-
25SS101704	Indian History	3	-	-	-	3	-
25SS101705	Indian Tradition and Culture	3	-	-	-	3	-

Course Code	Title of the Course	L	T	P	S	C	Prerequisite
25EC101703	Instrumentation in Industries	3	-	-	-	3	-
25EC101704	Introduction to Nano technology	3	-	-	-	3	-
25AI101701	Introduction to Artificial Intelligence	3	-	-	-	3	-
25DS101702	Introduction to Data Science	3	-	-	-	3	-
25AI101702	Introduction to Machine Learning	3	-	-	-	3	-
25CS101701	Introduction to Python Programming	3	-	-	-	3	-
25CB101704	Introduction to Internet of Things	3	-	-	-	3	-
25ME101703	Management Science	3	-	-	-	3	-
25ME101704	Managing Innovation and Entrepreneurship	3	-	-	-	3	-
25ME101705	Material Science	3	-	-	-	3	-
25LG201701	Personality Development	3	-	-	-	3	-
25CE101703	Planning for Sustainable Development	3	-	-	-	3	-
25EC101705	Principles of Communication Engineering	3	-	-	-	3	-
25EE101702	Reliability and Safety Engineering	3	-	-	-	3	-
25CE101704	Remote Sensing, GIS and GPS	3	-	-	-	3	-
25CE101705	Smart Cities	3	-	-	-	3	-
25EC101706	Smart Sensors for Engineering Applications	3	-	-	-	3	-
25EE101703	Sustainable Energy Systems	3	-	-	-	3	-
25CS101702	Web Design Fundamentals	3	-	-	-	3	-
25SS101706	Women Empowerment	3	-	-	-	3	-
25SS101707	Indian Knowledge System in Science	3	-	-	-	3	-
25SS101708	Introduction to Indian Knowledge Systems	3	-	-	-	3	-
25CE101706	Indian Knowledge System in Town Planning and Architecture	3	-	-	-	3	-
25LG101702	Quantitative Aptitude and Verbal Ability	3	-	-	-	3	-

Course Code	Title of the Course	L	T	P	S	C	Prerequisite
25LG101703	Logical Reasoning and Recruitment Essentials	3	-	-	-	3	-
25EC101707	Quantum AI	3	-	-	-	3	-
25CA101702	Software Engineer for AI	3	-	-	-	3	-
25CB101703	Advanced Artificial Intelligence	3	-	-	-	3	Artificial intelligence
25CA101704	Generative AI and Professional Practices	3	-	-	-	3	-
25LG101701	Business Communication and Career Skills	3	-	-	-	3	-
25SS101709	Stress Management and Wellbeing	3	-	-	-	3	-
25SS101710	Strategies for Sustainable Design	3	-	-	-	3	-

Note:

1. If any student has chosen a course or equivalent course from the above list in their regular curriculum then, he/she is not eligible to opt the same course/s under University Elective.
2. The student can choose courses from other disciplines offered across the schools of MBU satisfying the pre-requisite other than the above list.

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25LG102402	GENERAL ENGLISH	2	-	2	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course deals with selected literary works of eminent writers, conversation practice, listening skills, reading comprehensions, writing techniques, vocabulary building and functional grammar.

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

- CO1.** Analyze the texts using effective reading techniques.
- CO2.** Apply grammatically correct English in writing
- CO3.** Develop ability to understand various accents by developing listening skills.
- CO4.** Apply general and technical vocabulary in effective communication.
- CO5.** Apply different communication styles in various situations.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	-	-	2	-	3	-	2	-	-	-	-
CO2	-	-	-	-	-	-	2	-	3	-	2	1	-	-	-
CO3	-	-	-	-	-	-	2	-	3	-	1	-	-	-	-
CO4	-	-	-	-	-	-	2	-	3	-	2	1	1	1	-
CO5	-	-	-	-	-	1	2	2	3	-	3	2	-	-	-
Course Correlation Mapping	-	-	-	1	-	1	2	2	3	-	2	2	1	1	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: A SNAKE IN THE GRASS

(10 Periods)

- Reading** 'A Snake in the Grass' short story by R.K. Narayan (from the prescribed text book)
- Speaking** Common Everyday Conversations
- Listening** Listening for specific information (from the selected audios and videos)
- Writing** Paragraph Writing: Sentence Structures- use of phrases and clauses - proper punctuation- introducing, logical order, coherence, unity and summarizing.
- Grammar** Parts of Speech: Nouns, Pronouns, Verbs, Adjectives and Adverbs, Prepositions, Conjunctions and Interjections

Module 2: ON SAYING PLEASE

(09 Periods)

- Reading** On saying Please 'short essay by A. G. Gardiner (from the prescribed text book)
- Listening** Listening for understanding concepts (from the selected audios and videos)
- Speaking** Tongue twisters practice
- Writing** Letter Writing: Parts of a Letter - Formats of Letters- Types of Letters(enquiry, Complaints, seeking permission, seeking internship etc.)
- Grammar** Basic sentence structures, word order in sentences, verb agreement, Pronoun Agreement

Module 3: BECAUSE I COULDN'T STOP FOR DEATH

(08 Periods)

- Reading** Because I couldn't Stop for Death by Emily Dickinson
- Listening** Listening for understanding concepts (from the selected audios and videos)
- Speaking** Communication at Work Place
- Writing** Descriptions: Writing introduction- defining – classifying -describing technical/specific features of an Automobile / gadget/ product or the process- installation manuals
- Grammar** Usage of Articles and omission of Article, Prepositions and phrasal prepositions

Module 4: AFTER THE SUNSET

(09 Periods)

- Reading** 'After the Sunset' short story by Bhoopal (from the prescribed text book)
- Listening** Listening to short audio texts and answering a series of questions
- Speaking** Reviewing a book or movie/ summarizing or reporting any incident

Writing Email Communication- Etiquette – Format- Writing Effective Business Email

Grammar Tenses- Active Voice & Passive Voice; Conditional Sentences

Module 5: MAN’S PERIL (06 Periods)

Reading ‘Man’s Peril’ a speech made by Bertrand Russell (from the prescribed text book)

Speaking Prepared or extempore speeches

Writing Essay Writing: Writing structured essays on specific topics- Introducing, analyzing and concluding an issue-creating coherence-Usage of proper punctuation.

Vocabulary Antonyms, Synonyms, Idioms and Phrases, One-word substitutes

Grammar Common Errors: Identifying and correcting common errors (articles, prepositions, tenses, subject verb agreement, pronoun agreement etc.)

Total Periods: 45

EXPERIENTIAL LEARNING

1. In rainy seasons a lot of snakes are found crawling around. Prepare a write-up on the reactions of people when they found snakes.
2. India is now for entrepreneurs and the government announced a lot of startup programmes for that. Prepare a presentation on recent entrepreneurs.
3. Small courtesies play a major role in creating an impression on other people. List out a few examples.
4. Prepare a PowerPoint presentation on the present scenario in higher education and jobs in India.
5. Being a shopkeeper and persuading a customer to buy a product which is introduced newly in the market. Prepare a conversation.
6. The English language has a rich vocabulary. List out the homophones and homonyms and write down the pronunciation and meaning of those words.
7. Describe a situation in your college where teamwork is needed and explain the strategies to manage the team effectively.
8. India is a country of unity in diversity. List out the existence of different racial and religious people and bring out reasons for the harmonious relationship among the people.
9. Forget and forgive are the most important quality of any human being. Prepare a write-up on any two experiences which come across in your life where you forgive or forget to maintain good relationships with friends or relatives.
10. Make a case study on the problems of second language learners of English and suggest solutions to overcome them.
11. How do you feel that the role of science and technology in nation-building?

RESOURCES

TEXT BOOKS:

1. G. Damodar "English Language for Undergraduate Students", Cambridge University-2019.

REFERENCE BOOKS:

1. Word Power Made Easy by Norman Lewis, Goyal Publishers, 2020.
2. A Communicative Grammar of English, Geoffrey Leech and Prof Jan Svartvik, Pearson Publication, 2013
3. Grammar in Use Intermediate with Answers, Raymond Murphy, Cambridge University Press, 2019.
4. How to Speak Effectively: A Guide to Engaging Conversations, Presentations, Patrik King, Penguin, 2024

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=WnOOKO0CdaM>
2. <https://www.youtube.com/watch?v=H6Nlz8qmcFc>
3. <https://www.youtube.com/watch?v=-ITliZO85YM>
4. <https://www.youtube.com/watch?v=048YjXwgHWE>
5. <https://www.youtube.com/watch?v=XLLQm7Grmcc>

WEB RESOURCES:

1. <https://englicist.com/topics/be-the-best>
2. <https://inspiration624.wordpress.com/wp-content/uploads/2018/01/on-saying-please.pdf>
3. <https://englishlanguage-lit.blogspot.com/2021/05/after-sunset-short-story-by-bhoopal.html>
4. <https://www.taylorfrancis.com/chapters/mono/10.4324/9781003090359-31/man-peril-bertrand-russell?context=ubx&refId=1d767e2d-ceb1-4537-9de5-6417eab47d1e>
5. <https://learnenglish.britishcouncil.org/grammar/english-grammar-reference>
6. <https://www.usingenglish.com/reference/grammar/>
7. https://www.englishclub.com/esl-activities/#google_vignette
8. <https://eslvault.com/word-association-games/>
9. <https://testbook.com/english-grammar/tongue-twisters>

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25CM101401	PRINCIPLES OF ACCOUNTING	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION:

The course is designed so that the students can understand the scientific preparation of accounting books with relevant interpretation. The course also provides students with knowledge of preparation of final accounts.

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

- CO1.** Demonstrate knowledge of basic concepts of financial accounting.
- CO2.** Analyze Cash book and reconciliation statements and acquaint oneself with preparation of statements.
- CO3.** Demonstrate knowledge on preparation of Bank Reconciliation statements.
- CO4.** Analyze and prepare financial statements for the sole proprietorship of business.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	1	1	3	2	2	1	-	1	2	-	2	-
CO2	2	3	-	2	2	2	2	3	2	-	1	2	-	3	-
CO3	2	3	-	2	2	2	2	3	1	-	1	2	-	3	-
CO4	3	3	2	2	2	3	2	3	2	-	2	3	1	3	-
Course Correlation Mapping	2	3	2	2	2	3	2	3	2	-	2	2	1	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO ACCOUNTING (09 Periods)

Meaning – Definition – Objectives of Accounting - Scope of accounting – Accounting principles – Branches of accounting - Classification of accounts - Double Entry System - Book Keeping – Users of Accounting Information - Advantages and limitations of accounting

Module 2: PROCESS OF ACCOUNTING (09 Periods)

Meaning and Definition of Journal – Importance of Journal Entry – Proforma of Journal Entries – Journalising – Posting - Problems on Journal Entries – Ledger – Problems on Ledger accounts – Balancing of Ledger accounts

Module 3: SUBSIDIARY BOOKS (09 Periods)

Introduction to Subsidiary Books- Purchase Book, sales Book, Purchase Returns, Sales Returns, Bills Receivable, Bills Payable, Journal Paper-Preparation of Subsidiary Books- Cash Books, Three Column Cash Book– Trial Balance (Simple problems)

Module 4: BANK RECONCILIATION STATEMENT (09 Periods)

Meaning – Need - Reasons for differences between cash book and pass book balances – Favorable and over draft balances – Ascertainment of correct cash book balance (Amended Cash Book) - Preparation of Bank Reconciliation Statement. (Including problems)

Module 5: PREPARATION OF FINAL ACCOUNTS (09 Periods)

Introduction to Final Accounts - Trading account - Profit and Loss account - Balance Sheet with simple adjustments (Simple problems)

Total Periods: 45

EXPERIENTIAL LEARNING

1. Observation of Recording Business Transactions in an Audit firm.
2. Visiting a Business and knowing entire process of maintenance of Books of Accounts.

RESOURCES

TEXT BOOKS:

1. Maheswari S.N. & Maheswari S. K., "Introduction to Financial Accountancy," Vikas Publications, 2020.
2. Grewal. T.S., "Fundamentals of Accounting," Sultan Chand & Sons Pvt Ltd New Delhi, 2019.

REFERENCE BOOKS:

1. Jawahar Lal, Financial Accounting, Wheeler Publishing, New Delhi, 2021.
2. Chawla & Jain-Financial Accounting, Kalyani Publishers, New Delhi, 2008.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=tIDFXs6_Tjc
2. <https://www.youtube.com/watch?v=xWKfKCnQqAE>

WEB RESOURCES:

1. <https://icmai.in/upload/Students/Syllabus2016/Inter/Paper-5New.pdf>
2. https://ebooks.lpude.in/management/bba/term_2/DMGT104_FINANCIAL_ACCOUNTING.pdf

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25MM101401	MATRIX THEORY AND LINEAR ALGEBRA	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a discussion on matrix factorizations, linear systems, Eigenvalues and Eigenvectors, vector spaces, linear transformations, and orthogonality.

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

- CO1.** Demonstrate the concepts of matrix factorizations and solutions of the linear system.
- CO2.** Determine the Eigenvalues and Eigenvectors of the matrix and implement the concept of Eigen values and decompositions of a matrix in intelligent systems.
- CO3.** Apply the concepts of vector spaces and linear transformation on problems of computational systems.
- CO4.** Use the inner product spaces for the study of orthogonality and to construct orthonormal basis.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	2	1	1	-	1	2	3	2	2
CO2	3	3	3	3	3	-	2	2	1	-	1	2	3	2	3
CO3	3	3	3	3	3	-	2	2	1	-	2	2	3	2	3
CO4	3	3	2	3	2	-	2	1	1	-	2	2	3	2	3
Course Correlation Mapping	3	3	3	3	3	-	2	2	1	-	2	2	3	2	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: MATRICES AND LINEAR SYSTEM OF EQUATIONS (10 Periods)

Elementary Row-operations, Elementary Matrices, Echelon form, Rank of a matrix by row-reduction, Solutions of system of linear equations by row reduction, Matrix Factorization, LU factorization, LDU factorization.

Module 2: EIGEN VALUES, EIGEN VECTORS AND DIAGONALIZATION (09 Periods)

Characteristic equation of a matrix, Eigenvalues and Eigenvectors of matrices, Similarity of matrices, Diagonalization by using Eigenvalues, Cayley-Hamilton Theorem (Without Proof), Evaluation of matrix powers.

Module 3: VECTOR SPACES (10 Periods)

Vector spaces, Sub-spaces, Four fundamental subspaces of a matrix, Span, Linearly independent and dependent, Basis, construction of Basis, dimensions, Finite dimensional vector space.

Module 4: LINEAR TRANSFORMATION (08 Periods)

Linear transformation, Kernel and range of linear transformation, Basic properties, Invertible linear transformation, Matrix of linear transformation.

Module 5: INNER PRODUCT SPACES (08 Periods)

Inner product, Norm, Distance, Inner product space, Orthogonal and orthonormal basis, Gram-Schmidt orthogonalization, Singular Value Decomposition for square matrices.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Explain the role of Eigen values and Eigen vectors in image processing.
2. Explain how the matrix theory is used in robotics and automachines.

RESOURCES

TEXT BOOKS:

1. Peter Selinger, "Matrix theory and linear algebra", 1st Edition, creative commons license, 2018.
2. Stephen H. Friedberg, Arnold J. Insel and Lawrence E. Spence, "Linear Algebra," Pearson Education, 5th Edition, 2022.

REFERENCE BOOKS:

1. Kuladeep Sing, "Linear Algebra step by step," 1st edition, Oxford University press, 2014.
2. David Poole, "Linear Algebra: A Modern Introduction," Brooks/Cole, 2nd edition, 2005.
3. Edgar G. Goodaire, "Linear Algebra," Cambridge University Press, 1st Edition, 2014.
4. M. Thamban Nair and Arindama Singh, "Linear Algebra," Springer, 1st Edition, 2019.
5. Hans Schneider and George Phillip Barker, "Matrices and Linear Algebra," Dover Publications, 2nd Edition, 1989.
6. Jim DeFranza, Daniel Gagliardi, "Introduction to Linear algebra with applications," Mc GrawHill, 2009.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/111106051>
2. <https://nptel.ac.in/courses/111106135>

WEB RESOURCES:

1. <https://catalogimages.wiley.com/images/db/pdf/9781119570271.excerpt.pdf>
2. [https://web.northeastern.edu/dummit/docs/linalgprac_5_eigenvalues_and_diagonalization.p df](https://web.northeastern.edu/dummit/docs/linalgprac_5_eigenvalues_and_diagonalization.pdf)
3. <https://web.auburn.edu/holmerr/2660/Textbook/vectorspace-print.pdf>
4. <https://textbooks.math.gatech.edu/ila/linear-transformations.html>
5. <https://linear.axler.net/InnerProduct.pdf>

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25MM101409	NUMERICAL ANALYSIS, PROBABILITY AND STATISTICS	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course aims to provide an understanding the numerical solutions of linear and nonlinear equations, Numerical techniques of interpolation in various intervals, Numerical techniques of differentiation and Integration. The course also provides an introduction to probability and statistics, random variables, mathematical expectations, distributions, correlation and regression.

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

- CO1.** Solve equations, derivatives and integrals through numerical methods for the given data.
- CO2.** Identify the types of random variables and determine their mathematical expectation & probabilities.
- CO3.** Apply the concept of probability distributions to solve computing problems.
- CO4.** Apply the concepts of Correlation and Regression in result analysis and Business forecasting.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	-	2	2	1	-	2	2	3	2	3
CO2	3	3	2	2	2	-	2	1	1	-	1	1	3	2	2
CO3	3	3	2	3	2	-	2	2	1	-	2	2	3	3	3
CO4	3	3	2	2	2	-	2	3	2	1	2	3	3	3	2
Course Correlation Mapping	3	3	2	3	2	-	2	2	2	1	2	2	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: NUMERICAL SOLUTIONS OF EQUATIONS (09 Periods)

Solutions of Algebraic and Transcendental Equations: Bisection Method, Regula-falsi method, Newton-Raphson Method.

Systems of linear algebraic equations: Gauss elimination method, Gauss-Seidel methods, Gauss-Iteration methods.

Module 2: INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION (10 Periods)

Interpolation: Finite differences: Forward and backward differences, Newton's forward and backward interpolation formula, Divided difference: Newton's divided difference formula, Lagrange's interpolation formula.

Numerical differentiation, Integration: Numerical differentiation using forward and backward interpolation formula, Numerical integration using Trapezoidal and Simpson's rules.

Module 3: RANDOM VARIABLES (09 Periods)

Introduction to Probability, Random variables, Discrete and continuous random variables, Distribution function of random variables, Properties, Probability mass function, Probability density function, Mathematical expectation, Properties of mathematical expectation, Mean and Variance.

Module 4: PROBABILITY DISTRIBUTIONS (08 Periods)

Binomial Distribution, Poisson distribution, Normal distribution - Mean, Variance, Standard deviation.

Module 5: CORRELATION AND REGRESSION (09 Periods)

Introduction to simple correlation, Covariance, Correlation between two variables, Scatter diagram and its utility, Karl Pearson's coefficient of correlation Computation, Spearman's rank correlation coefficient, Estimation of regression lines.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Solve the following the system of equations by Gauss- Jordan iterative method correct to three decimal places.
 $X + Y + 5Z = 110$; $27X + 6Y - Z =$; $6X + 15Y + 2Z = 72$.
2. If X is a normally distributed with mean 70 and standard deviation 16, find
 $P(38 \leq X \leq 46)$ (ii) $P(82 \leq X \leq 94)$ (iii) $P(62 \leq X \leq 86)$.

RESOURCES

TEXT BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna publishers, 44th edition, 2017.
2. J. Ravichandran, Probability and Statistics for Engineers, Wiley India, 1st Edition, 2019.

REFERENCE BOOKS:

1. Richard A Johnson, Miller and Freund's Probability and Statistics for Engineers, Prentice Hall of India, 8th Edition, 2011.
2. M. K. Jain, S.R.K Iyengar, R. K. Jain, Numerical Methods for Scientific & Engineering Computation, New Age International Publishers, 6th Edition, 2012.
3. G. Shankar Rao, Numerical Analysis, New Age International Publishers, 5th Edition, 2018.
4. S.S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India, 5th Edition 2012.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/127106019>
2. <https://nptel.ac.in/courses/111106112>
3. <https://nptel.ac.in/courses/111105041>
4. <https://nptel.ac.in/courses/111106112>

WEB RESOURCES:

1. <https://www.pdfdrive.com/introductory-methods-of-numerical-analysis-by-ss-sastry-d148704487.html>
2. https://faculty.ksu.edu.sa/sites/default/files/probability_and_statistics_for_engineering_and_the_sciences.pdf
3. <http://brharnetc.edu.in/br/wp-content/uploads/2018/11/21.pdf>
4. <http://www.mi.sanu.ac.rs/~gvm/Teze/Numerical%20methods%20In%20Computational%20Engineering.pdf>

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25CA101001	COMPUTER FUNDAMENTALS AND ORGANIZATION	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course deals with fundamentals of computers, Data Representations, input and output units, primary and secondary storage devices, programming languages, Binary Arithmetic and Logic circuits. Understand Computer architecture and organization working scenario in addition to Reduced Instruction Set Computer (RISC) platform.

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

- CO1.** Demonstrate fundamentals of computer and computer organization concepts to design of modern processors, memories and I/Os.
- CO2.** Analyze the performance of commercially available computers.
- CO3.** Develop to use the computer organization techniques in digital systems.
- CO4.** Identify, formulates, and solve hardware and software computer engineering problems using sound computer engineering principles.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	-	2	1	1	-	2	2	3	2	3
CO2	3	3	2	3	3	-	2	2	1	1	2	2	3	2	3
CO3	3	2	3	3	3	-	2	2	2	-	2	3	3	3	3
CO4	3	3	3	3	3	-	3	2	2	1	2	3	3	3	3
Course Correlation Mapping	3	3	3	3	3	-	2	2	2	1	2	3	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO COMPUTERS (09 Periods)

Computer basics: Algorithms, simple model of a computer, characteristics of computer, problem solving using computers: flow chart, Program, working of a computer, stored program concept.

Data Representation: Representation of characters in Computers, integers, fractions, Hexadecimal representation of numbers, decimal to binary conversion, error detecting codes.

Input units: Traditional computer Input/ Output units: Keyboard, Display unit, computer mouse, other input technologies: touch pad, touch screen, magnetic Ink Character recognition (MICR), Optical Mark Reading and Recognition (OMR), Flatbed Scanner and barcode.

Module 2: OUTPUT UNITS AND COMPUTER MEMORY (09 Periods)

Computer Output Devices: Flat panel display technology, E-ink display, printers, inkjet printers, dot matrix printers, line printers, plotters, choosing printer.

Computer Memory: Memory cell, Memory Organization, Read Only Memory, Serial Access Memory, Physical Devices used to Construct Memories, magnetic hard disk, Compact disk read only memory, Magnetic tape drive and memory hierarchy.

Processor: Structure of Instructions, Description of Processor, Machine Language Program, Algorithm to Simulate the Hypothetical Computer, Enhancing Hypcom.

Module 3: BINARY ARITHMETIC AND LOGIC CIRCUIT (09 Periods)

Binary Arithmetic: Binary addition, subtraction, Signed Numbers, Two's complement representations of Numbers, additions/subtractions of Numbers in 2's complement Notation, binary multiplications, Binary division, floating point representation of numbers.

Logic circuit: Switching Circuit, AND/OR Operations, NOT Operation, Boolean functions, Postulates, duality Principle, theorems, Precedence operators, canonical Forms for Boolean Functions, Logic circuits, Parallel and Serial adders and Physical devices used to construct gates.

Module 4: COMPUTER ORGANIZATION AND CENTRAL PROCESSING UNIT ORGANIZATION (09 Periods)

Computer Organization and Design: Instruction codes, Computer Registers, Computer Instructions and Instruction cycle. Timing and Control, Memory-Reference Instructions, Input-Output and interrupt. Central processing unit: Stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Complex Instruction Set Computer (CISC) Reduced Instruction Set Computer (RISC), CISC vs. RISC.

Central Processing Unit organization: General Register Organization, Stack organization, Instruction formats, Addressing modes, Data Transfer and Manipulation, Program Control, CISC and RISC processors.

Module 5: MEMORY ORGANIZATION AND INPUT/OUTPUT ORGANIZATION (09 Periods)

Memory Organization: Semiconductor Memory Technologies, Memory hierarchy, Interleaving, Main Memory-RAM and ROM chips, Address map, Associative memory-Hardware organization. Match logic. Cache memory-size vs. block size, Mapping functions-Associate, Direct, Set Associative mapping. Replacement algorithms, write policies, Auxiliary memoryMagnetic.

Total Periods: 45

EXPERIENTIAL LEARNING

1.
 - a) Understand the Role of Binary arithmetic in digital computers and perform the following operations.
 - i. Binary Addition
 - ii. Binary Subtraction
 - iii. Binary Multiplication
 - iv. Binary Division
 - b) How to represent the following expression into Logic gates and Truth table?

Boolean Expression
$$Q = \overline{(A.B)} . \overline{(A+B)} . C$$
3.
 - c) Illustrate the organization of i5 Processors.

RESOURCES:

TEXT BOOKS:

1. V. Rajaraman, Neeharika Adabala, "Fundamentals of Computers", PHI Learning Private Ltd, 6th Edition, 2015.
2. M. Moris Mano, "Computer System Architecture", 3rd edition, Pearson/PHI, India, 2006.

REFERENCE BOOKS:

1. Priti Sinha, Pradeep K., Sinha "Computer Fundamentals: Concepts, Systems & Applications", 8th Edition, BPB Publications.
2. William Stallings, "Computer Organization and Architecture- designing for performance", 8th edition, Prentice Hall, New Jersey, 2010.

VIDEO LECTURES:

1. https://onlinecourses.swayam2.ac.in/cec19_cs06/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs61/preview

WEB RESOURCES:

1. <https://www.electrical4u.com/binary-arithmetic/>
2. <https://www.youtube.com/watch?v=JQBRzsPhw2w>
3. <https://www.techtarget.com/whatis/definition/logic-gate-AND-OR-XOR-NOT-NAND-NOR-and-XNOR>

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25CA101002	DIGITAL ELECTRONICS	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion and hands on experience on Number systems, Boolean algebra, Minimization of Boolean functions, Analysis and synthesis of digital circuits; Asynchronous Sequential Logic & Programmable Memories.

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

- CO1.** Design logical circuits by analyzing various Boolean functions and simplification methods to perform desired logical operations using logical gates.
- CO2.** Design combinational logical circuits for performing various arithmetic operations and data encoding and decoding in various data lines.
- CO3.** Analyze various sequential circuits for realizing counters and registers using flip-flops
- CO4.** Design Asynchronous sequential logic and programmable memories for societal needs.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	-	2	1	1	-	2	2	3	2	3
CO2	3	2	3	2	3	-	2	2	1	1	2	3	3	2	3
CO3	3	3	3	3	3	-	2	2	2	-	2	3	3	3	3
CO4	3	3	3	3	3	1	2	2	2	2	2	3	3	3	3
Course Correlation Mapping	3	3	3	3	3	1	2	2	2	1	2	3	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: NUMBER SYSTEMS AND BOOLEAN ALGEBRA (10 Periods)

Digital systems, Binary Numbers, Number base conversions, Complements of numbers, Binary codes, Error detection and correction codes. Boolean Algebra-Basic definition, Basic theorems and properties, Boolean Functions, Canonical & Standard forms, logic operations & Logic gates.

Module 2: GATE LEVEL MINIMIZATION (08 Periods)

The map method, four variable, Five variable K-map, POS & SOP Simplification, Don't care conditions, NAND & NOR Implementation, Tabular Method- Simplification of Boolean function.

Module 3: COMBINATIONAL LOGIC CIRCUIT DESIGN (09 Periods)

Combinational circuits, Adders, Subtractors, Binary Adder-Subtractor, Decimal Adder, carry look-a-head adder, Binary Multiplier, Magnitude comparator, Decoder, Encoders, Priority Encoder, Multiplexers.

Module 4: SEQUENTIAL LOGIC CIRCUIT DESIGN (10 Periods)

Sequential Circuits, Latches, Flip-Flops-SR, D, JK & T, Introduction to Registers-Universal Shift Registers, State table and state diagrams, State Reduction & Assignment, Sequence Detector, Design of counters-Modulo-n, Johnson, Ring, Up/Down.

Module 5: ASYNCHRONOUS SEQUENTIAL LOGIC & PROGRAMMABLE MEMORIES (08 Periods)

Analysis of Clocked sequential circuits, State Reduction & Assignment- partition technique, merger chart & merger table, Hazards

Programmable Memories: ROM, PLA, PAL.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Minimization of logic circuits using K-Map.
2. Design of half adder & subtractor and full adder & subtractor.
3. Design of 4 bit
 - a. binary adder and
 - b. binary adder-subtractor

RESOURCES

TEXT BOOKS:

1. M. Morris Mano, Digital Design, Pearson education, 5th Edition, 2013.
2. Charles H. Roth, Fundamentals of Logic Design, Thomson Publications, 5th Edition, 2004.

REFERENCE BOOKS:

1. A. Anand Kumar, Switching Theory and Logic Design, PHI Learning Private Limited, 3rd edition, India, 2017
2. ZviKohavi and NirahK.Jha, Switching theory and Finite Automata Theory, Tata McGraw-Hill, 2nd Edition, 1978.

SOFTWARE/TOOLS:

1. Digital Schematic tool (DSCH2)

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc21_ee75/preview
2. https://onlinecourses.nptel.ac.in/noc20_cs63/preview

WEB RESOURCES:

1. <https://www.digitalelectronicsdeeds.com/>
2. https://www.tutorialspoint.com/digital_circuits/digital_circuits_useful_resources.htm

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25CA102001	PROGRAMMING FOR PROBLEM SOLVING	3	-	2	-	4
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on C Programming concepts, Operators and Expressions, Input and Output Functions, Control Structures, Problem Solving Aspects, Arrays and Strings, Functions, Pointers, Structures and Unions and File Handling.

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

- CO1.** Design algorithms using problem-solving techniques for given problems.
- CO2.** Apply functions and Arrays to enhance reusability and data manipulation.
- CO3.** Develop programs using pointers for efficient memory management.
- CO4.** Apply structures, unions and file handling concepts to develop societal applications.
- CO5.** Work independently or in team to solve problems with effective communications.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	2	-	2	1	1	-	2	2	3	2	3
CO2	3	3	3	2	2	-	2	1	1	-	2	2	3	2	3
CO3	3	3	3	3	3	-	2	2	1	-	2	2	3	3	3
CO4	3	3	3	3	2	-	2	2	2	1	2	3	3	3	3
CO5	2	2	2	2	2	-	3	2	3	1	3	2	2	2	2
Course Correlation Mapping	3	3	3	3	2	-	2	2	2	1	2	2	3	2	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO C PROGRAMMING (09 Periods)

Basics of C Programming: Introduction, Structure of a C program, Concept of a variable,

Data types in C, Program statement, Declaration, Storing the data in memory, Tokens, Operators and expressions, Lvalues and Rvalues, Type conversion in C.

Input and Output: Basic screen and keyboard I/O in C, Non-formatted input and output, formatted input and output functions.

Module 2: CONTROL STATEMENTS AND INTRODUCTION TO PROBLEM SOLVING (08 Periods)

Control Statements: Specifying test condition for selection and iteration, Writing test expression, Conditional execution and selection, Iteration and repetitive execution, goto statement, Special control statements, Nested loops.

Introduction to Problem Solving: Algorithms, Flowcharts, Problem solving aspect, Top-down design, Implementation of algorithms, program verification and efficiency of algorithms.

Module 3: ARRAYS & STRINGS AND FUNCTIONS (10 Periods)

Arrays and Strings: One-dimensional array – Declaration, Initialization, Accessing elements, operations; Multi-dimensional arrays – Declaration, Initialization, Working with 2D arrays; Strings – Declaration, Initialization, Printing strings, String input, Character manipulation, String manipulation; Arrays of strings – Initialization, manipulating string arrays.

Functions: Concept of function, Using functions, Call by value mechanism, working with functions, passing arrays to functions, Scope and extent, Storage classes, Recursion.

Module 4: POINTERS (08 Periods)

Introduction to Pointers: Understanding memory addresses, Address operator (&), Pointer – declaration, Initialization, Indirection operator and dereferencing, Void and Null pointers, Use of pointers, Arrays and pointers, Pointers and strings, Pointer arithmetic, Pointers to pointers, Array of pointers, Pointers to an array, Two-dimensional arrays and pointers, Pointers to functions, Dynamic memory allocation.

Module 5: USER-DEFINED DATA TYPES AND FILES (10 Periods)

User-Defined Data Types: Structures - Declaration, Accessing the members, Initialization, typedef and its use, Arrays of structures, Arrays within structure, Structures and pointers, Structures and functions; Unions, Enumeration types, Bitfields.

Files: Using files in C, Working with text and binary files, Direct File Input and Output, Files of records, Random access to files of records.

Total Periods: 45

EXPERIENTIAL LEARNING

1.
 - a) Write a C program to perform the arithmetic operations on two integer numbers.
 - b) Write a program to evaluate the following expressions by reading the necessary values from the keyboard.
 - i. $(ax + b)/(ax - b)$
 - ii. $2.5 \log x + \cos 32^\circ + |x^2 + y^2|$
 - iii. $ax^5 + bx^3 + c$
 - iv. ae^{kt}
2.
 - a) Write a C program to find the roots of a quadratic equation.
 - b) In a town, the percentage of men is 52. The percentage of total literacy is 48 and the total percentage of literate men is 35 of the total population. Write a C program to find the total number of illiterate men and women if the population of the town is 7000.
3.
 - a) Write a C Program to compute an electricity bill based on the following slab rates.

Consumption units	Rate (in Rupees/unit)
-------------------	-----------------------

0-100	4.0
101-150	4.6
151-200	5.2
201-300	6.3
Above 300	8.0

(**Hint:** Take current and old meter readings from the user to get consumption units)

- b) An insurance company computes the premium amount based on the following;
 - i. If a person's health is excellent and the person is between 25 and 35 years of age and lives in a city, and is a male then the premium is Rs.4 per thousand and the policy amount cannot exceed Rs.2 lakhs.
 - ii. If a person satisfies all the above conditions and is female then the premium is Rs.3 per thousand and the policy amount cannot exceed Rs.1 lakh.
 - iii. If a person's health is poor and the person is between 25 and 35 years of age and lives in a village and is a male then premium is Rs.6 per thousand and the policy cannot exceed Rs. 10000.
 - iv. In all other cases the person is not insured.
- Write a C program to determine whether the person should be insured or not, his/her premium rate and maximum amount for which he/she can be insured.
- c) Write a C Program to find the grade for a student using a Switch case. The user needs to enter a subject score (varies from 0 to 100) and then display the grade as described below.

Score	Grade	Score	Grade
≥ 90	O	≥ 50 to < 60	D
≥ 80 to < 90	A	≥ 40 to < 50	E
≥ 70 to < 80	B	< 40	Fail
≥ 60 to < 70	C		

4. a) A Fibonacci sequence is defined as follows:

The first and second terms in the sequence are 0 and 1. Sub-sequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

- b) Write a C program to find the sum of individual digits of a positive integer.

- c) Write a C program to read two numbers x and n, and then compute the sum of the geometric progression: $1+x+x^2+x^3+\dots+x^n$. Show appropriate error message for $n < 0$.

(Example: if n is 3 and x is 5, then the sum is: $1+5+25+125$)

- d) Write a C program to print the following pattern.

```

                                     1
                                1   2   1
                           1   2   3   2   1
                      1   2   3   4   3   2   1
                 1   2   3   4   5   4   3   2   1
```

5. a) Write a C program to find both the largest and smallest numbers in a list of integers.

- b) Write a C program that uses function to perform the following:

i) Addition of Two Matrices ii) Multiplication of Two Matrices

6. a) Write a C program to insert a sub-string in to a main string at a given position.

- b) Write a C program to count the lines, words and characters in a given text.

7. a) Write a C program to generate all the prime numbers between 1 and n, where n is

8. a) value entered by the user. Define a separate function to generate prime numbers.

- b) Write C program that uses recursive function to find
i) Factorial of a given integer ii) GCD of two given integers

9. a) Write a C program to print the elements of an array in reverse order using pointers.

- b) Write a C program to count the number of vowels and consonants in a string using pointers.

- c) Write a C program to store n elements in an array and print the elements in sorted order using pointers.

10. a) Write a C program that performs the following operations:
- i. Reading a complex number ii. Writing a complex number
 - iii. Addition of two complex numbers iv. Multiplication of two complex numbers (**Note:** Represent complex number using a structure.)
- b) Define a structure to store employee details include Employee-Number, Employee-Name, Basic-pay, Date-of-Joining. Write a C program for the following.
- i) A function to store 10 employee details.
 - ii) A function to implement the following rules while revising the basic pay. If Basic-pay $\leq$ Rs.5000 then increase it by 15%.
If Basic-pay $>$ Rs.5000 and $\leq$ Rs.25000 then it increase by 10%. If Basic-pay $>$ Rs.25000 then there is no change in Basic-pay.
 - iii) A function to print the details of employees who have completed 20 years of service from the Date-of-Joining.
11. a) Write a C program to reverse the first n characters of a given text file.
- b) Write a C program to merge two files into a new file.
12. a) Develop a phone book application to save users contact information include name, mobile number and email id as well as to edit and delete contact details.

RESOURCES

TEXT BOOKS:

1. PradipDey and Manas Ghosh, "Programming in C," Oxford University Press, New Delhi, 2nd Edition, 2013.
2. R. G. Dromey, "How to Solve it by Computer," Pearson Education, 1st Edition, 2013.

REFERENCE BOOKS:

1. Byron S Gottfried and Jitender Kumar Chhabra, "Programming with C," 4th Edition, McGraw Hill Education, 2019.
2. Yashavant Kanetkar, "Let Us C," 5th Edition, BPB Publications, 2017.
3. E. Balagurusamy, "Programming in C," McGraw Hill Education Pvt, Ltd, New Delhi, 7th Edition, 2017.
4. Behrouz A. Forouzan and Richard F. Gilberg, "Computer Science: A Structured Programming Approach Using C," Cengage Learning, 3rd Edition, 2008.

SOFTWARE/TOOLS:

1. Software: Turbo C++/Dev C++

VIDEO LECTURES:

1. <https://www.digimat.in/nptel/courses/video/106105171/L03.html>
2. <https://nptel.ac.in/courses/106104128>

WEB RESOURCES:

1. Learn C Programming - <https://www.programiz.com/c-programming>
2. Learn C Programming - <https://www.tutorialspoint.com/cprogramming/index.htm>
3. C Programming Exercises, Practice, Solution - <https://www.w3resource.com/c-programming-exercises/>
4. Basic programming exercises and solutions in C - <https://codeforwin.org/2015/05/basic-programming-practice-problems.html>
5. C Programming Exercises, Practice, Solution - <https://www.w3resource.com/c-programming-exercises/>
6. Basic programming exercises and solutions in C - <https://codeforwin.org/2015/05/basic-programming-practice-problems.html>

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25MM101410	DISCRETE MATHEMATICS FOR COMPUTER SCIENCE	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course will discuss fundamental concepts such as sets, proof techniques, functions, relations, counting principles, mathematical logics and graph theoretical approaches with applications to computer science.

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

- CO1.** Identify the mathematical logic through the algebraic skills of expressions, tables and normal forms.
- CO2.** Demonstrate the basic concepts of Mathematical systems to analyse the proof techniques in mathematical induction.
- CO3.** Apply the techniques of counting, permutations and combinations for solving various practical problems.
- CO4.** Apply the concepts of graph theory to solve structural and graphical designs.

CO-PO-2PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	2	-	1	-	2	2	2	2	2
CO2	3	3	2	3	1	-	2	-	1	-	2	2	2	2	2
CO3	3	3	3	2	2	-	2	1	1	-	2	2	3	2	2
CO4	3	3	3	3	2	-	2	1	2	-	2	2	3	2	2
Course Correlation Mapping	3	3	3	3	2	-	2	1	1	-	2	2	3	2	2

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: MATHEMATICAL LOGIC

(08 Periods)

Propositions and Logical Operations, Truth Tables, Equivalence, Implications, Laws of Logic, Normal Forms: Conjunctive Normal Form, Disjunctive Normal Form, Principle Disjunctive Normal Form, Principle Conjunctive Normal Form.

Module 2: SET THEORY

(09 Periods)

Sets and Elements, Subsets, Venn Diagrams, Set Operations, Algebra of Sets, Finite Sets, Counting Principle, Classes of Sets, Power Sets, Partitions, Mathematical Induction.

Module 3: RELATIONS AND FUNCTIONS

(10 Periods)

Relations, Operations on Relations, Equivalence Relation, Partitions and Equivalence Classes, Functions, One-One and Onto Functions, Special Type of Functions, Invertible Functions, Compositions of Functions, Recursively Defined Functions.

Module 4: TECHNIQUES OF COUNTING

(09 Periods)

Basic Counting Principles, Permutations, Combinations, Generalized Permutations and Combinations, Pigeonhole Principle, Generalized Pigeonhole Principle, InclusionExclusion Principle.

Module 5: GRAPHS

(09 Periods)

Definition of a Graph, Graph Terminology and special Types of Graphs, Handshaking Theorem, Finite and Infinite graphs, Incidence and Degree, Null graph, Sub graphs, Walks, Paths and Circuits in a graph, Connected graphs.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Demonstrate that $R \wedge (P \vee Q)$ is a valid conclusion from the premises $(P \vee Q)$, $(Q \rightarrow R)$, $(P \rightarrow M)$ and $\neg M$.
2. Draw the Hasse diagram of the set $\{2,4,8,16\}$ under the partial ordering relation "divides" and indicate those which are totally ordered

RESOURCES

TEXT BOOKS:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw Hill, 8th Edition, 2019.
2. Jon Pierre Fortney, "Discrete Mathematics for Computer Science," CRC Press, Taylor & Francis Group, 1st Edition, 2021.

REFERENCE BOOKS:

1. Richard Johnsonbaugh, "Discrete Mathematics," Prentice Hall, 8th Edition, 2019.
2. Narasing Deo, "Graph Theory with application to Engineering and Computer Science", Prentice Hall India, 2016.
3. J.P. Trembly and R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science," Tata McGraw Hill, 3rd Edition, 2017.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/106106183>
2. <https://nptel.ac.in/courses/106106094>

WEB RESOURCES:

1. <https://www.coursera.org/learn/discrete-mathematics>
2. <https://people.cs.pitt.edu/~milos/courses/cs441/>
3. <https://web.stanford.edu/class/cs103x/cs103x-notes.pdf>

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25CA101003	BASICS OF VIRTUALIZATION AND CLOUD TECHNOLOGY	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course gives students an insight into the basics of cloud computing along with virtualization. It will provide the students basic understanding about cloud and virtualization.

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

- CO1.** Demonstrate basic concepts of Virtualization and Cloud Technology of Cloud Computing.
- CO2.** Analyze desktop virtualization, providers with traditional IT service providers, Roots of cloud computing, hardware virtualization and Regularity issues for cloud technology.
- CO3.** Use Microsoft's Virtualization solutions for cloud virtualization
- CO4.** Adapt architectural influences using High-performance computing, Utility and Enterprise grid computing for the performance in Cloud environment.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	2	-	1	1	2	2	3	2	2
CO2	3	3	3	3	2	-	2	2	2	2	2	2	3	2	3
CO3	3	3	3	2	3	-	2	2	2	1	2	2	3	3	3
CO4	3	3	3	3	2	-	2	2	2	2	2	3	3	3	3
Course Correlation Level	3	3	3	3	2	-	2	2	2	2	2	2	3	3	3

Correlation Levels: 3: High 2: Medium; 1: Low

COURSE CONTENT

Module 1: BASICS OF VIRTUALIZATION (09 Periods)

Virtualization and cloud computing: Need of virtualization, cost, administration, fast deployment, reduce infrastructure cost, limitations.

Types of hardware virtualization: Full virtualization, partial virtualization, para virtualization

Desktop virtualization: Software virtualization, Memory virtualization, Storage virtualization, Data virtualization, Network virtualization

Module 2: HYPERVISORS AND VIRTUAL MACHINES (10 Periods)

Server Virtualization: Understanding Server Virtualization, types of server virtualization, Virtual machine basics, types of virtual machines, hypervisor concepts and types.

Module 3: VIRTUALIZATION SOLUTIONS (09 Periods)

Understanding Microsoft's Virtualization solutions: Microsoft's Infrastructure Optimization Model, Virtualization and the Infrastructure Optimization Model, Benefits of Virtualization, Achieving the Benefits of Datacenter Virtualization, Achieving the Benefits of Client Virtualization, Achieving the Benefits of Cloud Virtualization.

Module 4: BASICS OF CLOUD COMPUTING (09 Periods)

Origins of Cloud computing, Cloud components, Essential characteristics, On-demand self-service, Broad network access, Location independent resource pooling, Rapid elasticity, Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

Module 5: CLOUD INSIGHTS (08 Periods)

Architectural influences: High-performance computing, Utility and Enterprise grid computing; Cloud scenarios, Benefits: scalability, simplicity, vendors, security, Limitations, Sensitive information, Application development, security level of third party, security benefits, Regularity issues: Government policies.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Creating Virtualized Environment using VM ware.
2. Deploying an WebApp/MobileApp in Public Cloud.
3. Invoke an operating System in an Virtualized environment.

RESOURCES

TEXT BOOKS:

1. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center," Auerbach.
2. Anthony T. Velte, Toby J. Velte Robert Elsenpeter "Cloud computing a practical approach", TATA McGraw- Hill, 2010.

REFERENCE BOOKS:

1. Michael Miller, "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate," 2008.
2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, "Cloud Computing (Principles and Paradigms)", John Wiley & Sons, Inc. 2011
3. Judith Hurwitz , Robin Bloor , Marcia Kaufman , Fern Halper, "Cloud computing for Dummies", Wiley Publishing Inc., 2010

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=Jph3H1wZTKM>
2. <https://www.digimat.in/nptel/courses/video/106105167/L07.html>

WEB RESOURCES:

1. <https://www.knowledgehut.com/blog/cloud-computing/virtualization-in-cloud-computing>
2. <https://www.analyticssteps.com/blogs/what-virtualization-cloud-computing-characteristics-benefits>
3. <https://www.javatpoint.com/virtualization-in-cloud-computing>

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25CA105001	COMPUTER HARDWARE AND SYSTEM ESSENTIALS	-	1	2	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on internal components of a computer, assemble a computer system, install an operating system, and troubleshoot using system tools and diagnostic software. Students will also be able to understand various network cables, connectors and TCP/IP networks, and work group.

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

CO1. Identify different hardware components on personal computer and peripheral devices.

CO2. Create network architecture using TCP and UDP protocols for data transmission.

CO3. Devise the solutions for the problems occurred in personal computer in Operating Systems.

CO4. Implement the functionalities of different peripheral devices and networks by configuring multi-functional devices.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	2	1	1	1	2	1	3	-	2
CO2	3	3	3	3	2	-	2	2	2	2	2	2	3	-	3
CO3	3	3	3	3	2	-	2	2	2	2	2	2	3	-	3
CO4	3	3	3	3	3	-	2	2	2	2	2	2	3	-	3
Course Correlation Mapping	3	3	3	3	2	-	2	2	2	2	2	2	3	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

EXPERIENTIAL LEARNING

HARDWARE CONFIGURATION

1. Peripherals of the computer
2. Implement the following activities:
 - a) Configure settings using BIOS/UEFI tools on a PC.
 - b) Identify different components of mother board
 - c) Analyze various RAM types, PC extensions cards and storage devices
3. Implement the following activities:
 - a) Identify various CPU's, cooling methods and PC connection interfaces
 - b) Identification of various power supply, display devices and common PC Connectors
 - c) Install and configure common peripheral devices and SOHO multi-function device

PC Networking using Packet Tracer

Network Types and Components, Topologies, Wired and Wireless Transmission, Protocols.

4.
 - a) Identify various types of network cables and connectors and characteristics
 - b) Implement the following characteristics of TCP/IP
 - i) IPv4 and IPv6
 - ii) Client side DNS Settings
5.
 - a) Identify following TCP and UDP Ports
 - i) 21-FTP
 - ii) 443-HTTPS
 - iii) 80-HTTP
 - iv) Telnet
 - b) Analyze the following TCP and UDP protocols
 - i) SMD
 - ii) SNMP
 - iii) DHCP
6.
 - a) Configure the following network types
 - i) LAN
 - ii) WAN
 - iii) WLAN
 - b) Configure network architecture using the following
 - i) HUB
 - ii) Switch
 - iii) Router

OPERATING SYSTEMS

Introduction to Operating System, Characteristics of Operating System, Types of Operating System and its components

7. Installation of Windows Operating System
8. Installation of Application and Device Drivers management

TROUBLESHOOTING

Introduction to trouble shooting, Hardware and Software Trouble shooting

9.
 - a) Study the common problems related to the following
 - i) Mother Board
 - ii) RAM
 - iii) CPU
 - iv) Power
 - b) Troubleshoot the following failures
 - i) Read/Write Failure
 - ii) Slow Performance
 - iii) Failure to boot
10. Trouble Shoot the following symptoms of Video, projector and display issues
 - i) VGA Mode
 - ii) No Image of Screen
 - iii) Dead Pixels
 - iv) Color patterns
11. Trouble shoot the following issues of wired, wireless and mobile devices
 - i) No Connectivity
 - ii) IP conflict
 - iii) Ghost Cursor
 - iv) Sticking Keys

RESOURCES

REFERENCES:

1. David Anfinson, Allan Johnson and Kathleen Czurda, IT Essentials v7 Companion Guide, CISCO Press, 2020
2. Brian W. Kernighan, Understanding the Digital World: What You Need to Know about Computers, the Internet, Privacy, and Security, Second Edition, Princeton University Press, 2021
3. Kavin Wilson, Exploring Computer Systems: The Illustrated Guide to Understanding Computer Systems, Hardware & Networks, Elluminent Press, 2019

SOFTWARE/TOOLS:

1. Windows 8/10 operating systems
2. Cisco Packet Tracer

VIDEO LECTURES:

1. <https://www.edx.org/course/computer-hardware-and-operating-systems>
2. <https://www.coursera.org/learn/computer-hardware-software>

WEB RESOURCES:

1. <https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/configuration/15-s/ir-15-s-book.pdf>
2. <https://www.certexams.com/comptia/a+/cert-notes-aplus-networking.htm>
3. <https://www.rcboe.org/cms/lib/GA01903614/Centricity/Domain/4399/Network%20n10-007.pdf>
4. <https://www.tutorialsworld.com/CertNotes/CompTIA-cert/A+/aplu-prac-10.htm>

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25CM101402	ENTREPRENEURIAL DEVELOPMENT	2	-	-	-	2

Pre-Requisite

Anti-Requisite

Co-Requisite

COURSE DESCRIPTION: The course aim is to acquaint with the concepts of Entrepreneurship and business opportunities, business planning, and generation of finance and project reports for starting a new business.

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

- CO1.** Demonstrate concepts of entrepreneurship and professional behaviour expected of an entrepreneur.
- CO2.** Demonstrate knowledge about recognising the business opportunities and generation of business ideas.
- CO3.** Analyze generation and screening of project ideas and assessment of its feasibility and Business planning process.
- CO4.** Acquainted with the knowledge various sources of funding for new business projects.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PSO2	PSO2	PSO2	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	1	3	2	2	2	1	2	3	3	-	3
CO2	1	2	2	2	2	2	2	2	2	1	2	3	3	-	3
CO3	1	3	3	3	2	2	2	3	2	1	2	3	3	1	3
CO4	1	2	2	2	2	2	2	3	2	1	2	3	3	-	3
Course Correlation Mapping	1	2	2	2	2	2	2	3	2	1	2	3	3	1	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: ENTREPRENEURSHIP

(06 Periods)

Entrepreneur, entrepreneurship – Types of Entrepreneurship – Traits of entrepreneurship – Factors promoting entrepreneurship- Barriers to entrepreneurship- the entrepreneurial culture- Stages in entrepreneurial process – Women entrepreneurship and economic development- SHG.

Module 2: BUSINESS IDEAS

(06 Periods)

Recognizing opportunities – trend analysis – generating ideas – Brainstorming, Focus Groups, Surveys, Customer advisory boards, Day in the life research – Encouraging focal point for ideas and creativity at a firm level-Protecting ideas from being lost or stolen – Patents and IPR.

Module 3: OPPORTUNITY IDENTIFICATION AND EVALUATION

(07 Periods)

Opportunity identification and product/service selection – Generation and screening the project ideas – Market analysis, Technical analysis, and Cost benefit analysis and network analysis- Project formulation – Assessment of project feasibility- Dealing with basic and initial problems of setting up of Enterprises.

Module 4: BUSINESS PLANNING PROCESS

(05 Periods)

Meaning of business plan- Business plan process- Advantages of business planning- preparing a model project report for starting a new venture.

Module 5: FUNDING

(06 Periods)

Sources of Finance- Venture capital- Venture capital process- Business angles- Commercial banks- Government Grants and Schemes.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Observation of Business environment and Identification of New business Ideas.
2. Visiting a Business and knowing entire process of commencement of business.

RESOURCES

TEXT BOOKS:

1. Khanka S.S., Entrepreneurial Development, S.Chand& Co. Ltd., New Delhi, 2001.
2. Sangeeta Sharma, Entrepreneurship Development, PHI Learning Pvt. Ltd., 2016.

REFERENCE BOOKS:

1. Barringer, B., Entrepreneurship: Successfully Launching New Ventures, 3rd Edition, Pearson, 2011.
2. Bessant, J., and Tidd, J., Innovation and Entrepreneurship, 2nd Edition, John Wiley & Sons, 2011.

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=gCRN8wS8PBM>
2. <https://www.youtube.com/watch?v=hnBla1FfcLo>

WEB RESOURCES:

1. <https://ncert.nic.in/ncerts/l/lebs213.pdf>
2. <http://depintegraluniversity.in/userfiles/Entrepreneurship%20Development.pdf>

SCHOOL CORE

Course Code	COURSE TITLE	L	T	P	S	C
25CM101403	INNOVATION AND DESIGN THINKING	2	-	-	-	2
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course introduces design thinking in product innovation. This course is intended to familiarize product design process, introduce the basics of design thinking, to bring awareness on idea generation, to familiarize the role of design thinking in services design.

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

- CO1.** Demonstrate fundamental knowledge of Design thinking.
- CO2.** Analyze characteristics of successful product development
- CO3.** Demonstrate knowledge on Idea generation techniques
- CO4.** Analyze the process of design thinking for services.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PSO2	PSO2	PSO2	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	1	2	2	2	2	1	2	3	3	-	-
CO2	2	3	3	3	2	2	2	3	2	1	2	3	3	3	3
CO3	1	2	2	2	1	2	2	2	2	1	2	3	3	3	-
CO4	2	3	3	3	2	2	2	3	2	1	2	3	3	3	-
Course Correlation Mapping	2	3	3	3	2	2	2	3	2	1	2	3	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO DESIGN

(06 Periods)

Introduction to design, characteristics of successful product development, product development process, identification of opportunities, product planning, Innovation in product development.

Module 2: DESIGNING THINKING

(06Periods)

Design Thinking: Introduction, Principles, the process, Innovation in Design Thinking, benefits of Design thinking, design thinking and innovation, case studies.

Module 3: IDEA GENERATION

(06 Periods)

Idea generation: Introduction, techniques, Conventional methods, Intuitive methods, Brainstorming, Gallery method, Delphi method, Synectics etc., case studies

Module 4: DESIGN THINKING IN INFORMATION TECHNOLOGY

(06 Periods)

Design Thinking in Business process model, Design Thinking for agile software development, virtual collaboration, multi user and multi account interaction, need for communication, TILES toolkit, Cloud implementation.

Module 5: DESIGN THINKING FOR SERVICE DESIGN

(06 Periods)

How to design a service, Principles of service design, Benefits of service design, Service blueprint, Design strategy, organization, principles for information design.

Total Periods: 30

EXPERIENTIAL LEARNING

1. What data-driven insights can help us evolve our product?
2. How can we gather ongoing feedback to drive future enhancements?

RESOURCES

TEXT BOOKS:

1. Lagerfeld Kilian., "Design Thinking for Beginners", 1st Edition, Personal Growth Hackers, 2020.
2. PavanSoni, "Design Your Thinking: The Mindsets, Toolsets and Skill Sets for Creative Problem- Solving", 2nd Edition, Penguin Random House India Private Limited, 2020.
3. Marc stickdorn and Jacob Schneider, This is Service Design Thinking, Wiely, 2011

REFERENCE BOOKS:

1. Walter Brenner and Falk Uebernickel, "Design Thinking for Innovation Research", 1stEdition, Springer, 2016.
2. GK Van Patter and Garry K. VanPatte, "Rethinking Design Thinking: Making Sense of the Future", 1stEdition, Humantific Publishing, 2020.

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=4nTh3AP6knM>
2. <https://www.youtube.com/watch?v=NRQLznGIKk>

WEB RESOURCES

1. <https://web.stanford.edu/~mshanks/MichaelShanks/files/509554.pdf>
2. https://www.tutorialspoint.com/hi/design_thinking/design_thinking_tutorial.pdf
3. <http://www.algarytm.com/it-executives-guide-to-design-thinking:e-book>

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25CA111001	INTERNSHIP	-	-	-	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Expose students to the industrial environment; Create competent professionals for the industry; sharpen the real time technical / managerial skills required at the job; Gain professional experience and understand engineer's responsibilities and ethics. Familiarize with latest equipment, materials and technologies; Gain exposure to technical report writing; Gain exposure to corporate working culture.

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

- CO1.** Analyze latest equipment, materials and technologies that are used in industry to solve complex engineering problems following relevant standards, codes, policies and regulations.
- CO2.** Analyze safety, health, societal, environmental, sustainability, economical and managerial factors considered in industry in solving complex engineering problems.
- CO3.** Perform individually or in a team besides communicating effectively in written, oral and graphical forms on practicing engineering.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PSO2	PSO2	PSO2	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	3	2	2	2	1	3	1	2	-	-	-
CO2	1	2	3	2	2	3	2	2	1	3	1	2	-	-	-
CO3	1	2	2	2	1	2	2	2	3	2	3	2	-	-	-
Course Correlation Mapping	2	2	3	3	2	3	2	2	2	3	2	2	-	-	-

Correlation Level: 3-High; 2-Medium; 1-Low

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25CA108001	CAPSTONE PROJECT	-	-	-	-	8

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

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

- CO1.** Create/Design computer science engineering systems or processes to solve complex computer science engineering and allied problems using appropriate tools and techniques following relevant standards, codes, policies, regulations and latest developments.
- CO2.** Consider society, health, safety, environment, sustainability, economics and project management in solving complex computer science engineering and allied problems.
- CO3.** Perform individually or in a team besides communicating effectively in written, oral and graphical forms on computer science engineering systems or processes.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PSO2	PSO2	PSO2	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	2	2	1	2	1	2	3	2	2
CO2	2	2	3	2	2	3	2	3	1	3	1	2	1	2	1
CO3	1	2	2	2	1	2	2	2	3	2	3	2	1	1	1
Course Correlation Mapping	2	3	3	3	2	3	2	3	2	3	2	2	2	2	2

Correlation Level: 3-High; 2-Medium; 1-Low

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25CB107601	ESSENTIALS OF CYBER SECURITY	2	-	-	-	2
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Cybercrime, Cyber offenses, Phishing, Identity theft, Cybercrime in mobile and wireless devices, Organizational measures for handling mobile devices, Security implications on using mobile devices, Tools and methods used in cybercrime, Forensics of computer and handheld devices.

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

- CO1.** Analyze methods of cybercrime, cyber offenses to maintain cybersecurity.
- CO2.** Investigate tools used for cybercrime to protect computational assets.
- CO3.** Apply appropriate authentication mechanisms to reduce attacks on mobile and wireless devices.
- CO4.** Use appropriate cyber forensics tools and techniques to maintain cybersecurity.
- CO5.** Recognize the need for cybersecurity and practice ethics to protect privacy, property rights in cyberspace.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PSO2	PSO2	PSO2	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	2	2	1	2	1	1	2	2	2
CO2	2	3	3	3	3	2	2	2	1	2	1	1	3	3	2
CO3	2	2	3	3	3	2	2	2	1	2	1	1	3	2	3
CO4	2	3	3	3	3	2	2	2	1	2	1	1	3	2	3
CO5	1	2	2	2	2	3	2	2	2	3	2	1	1	1	2
Course Correlation Mapping	2	3	3	3	3	2	2	2	1	2	1	1	2	2	2

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: CYBERCRIME (05 Periods)

Cybercrime and information security, Cybercriminals, Classifications of cybercrimes, How criminals plan the attacks, Social engineering

Module 2: CYBER OFFENSES (07 Periods)

Cyber stalking, Cybercafe and cybercrimes, Botnets, Attack vector, Cloud computing, Phishing – Methods, Techniques, Spear phishing, Phishing scams, Phishing toolkits, Spy phishing, Countermeasures; Identity Theft – Personally identifiable information, Types, Techniques, Countermeasures, Effacing online identity.

Module 3: CYBERCRIME IN MOBILE AND WIRELESS DEVICES (06 Periods)

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, Security implications of mobile devices for organizations, Organizational measures for handling mobile devices related security issues.

Module 4: TOOLS AND METHODS USED IN CYBERCRIME (06 Periods)

Proxy servers and anonymizers, Password cracking, Keyloggers and spywares, Virus and worms, Trojan horses and backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow, Attacks on wireless networks.

Module 5: CYBER FORENSICS (06 Periods)

Cyber forensics, Cyber forensics and digital evidence, Forensics analysis of e-mail, Forensics and social networking sites, Forensics of handheld devices – Smartphone forensics

Total Periods:30

EXPERIENTIAL LEARNING

1. Think of a recent cybercrime news report you read.
 - What type of cybercrime was it?
 - Who do you think were the cybercriminals behind it, and what might have been their motive?
 - How could this attack have been prevented?
2. Analyze a phishing email sample.
 - What were the clues indicating it was a phishing attempt?
 - How could an ordinary user fall for it?
 - Suggest three preventive actions users can take against phishing.
3. Reflect on your online presence.
 - List down all Personally Identifiable Information (PII) you share publicly.
 - What risks does this pose for identity theft?
 - What changes will you make to protect your online identity?
4. Our organization allowing BYOD (Bring Your Own Device).
 - What security challenges can arise?
 - Suggest practical measures to ensure device security in such an environment.

RESOURCES

TEXT BOOKS:

1. Nina Godbole, SunitBelapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley, 2013.

REFERENCE BOOKS:

1. Nilakshi Jain, Ramesh Menon, Cyber Security and Cyber Laws, Wiley, 2020.
2. Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, Cybersecurity Essentials, 1stEdition, Sybex, 2018.
3. ErdalOzkaya, Cybersecurity: The Beginner's Guide, 1stEdition, Packt Publishing, 2019.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/106106129>
2. <https://www.coursera.org/specializations/intro-cyber-security>

WEB RESOURCES:

1. <https://www.interpol.int/en/Crimes/Cybercrime>
2. <https://owasp.org/www-project-mobile-top-10/>
3. <https://www.netacad.com/courses/cybersecurity-essentials?courseLang=en-US>

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25LG107601	PROFESSIONAL ETHICS AND HUMAN VALUES	2	-	-	-	2

Pre-Requisite -
Anti-Requisite -
Co-Requisite -

COURSE DESCRIPTION: This course deals with personal conviction, and ethics and describes the accepted principles and standards of conduct regarding moral duties and virtues as applied to an organization. Codes of professional ethics guide the stakeholders of an organization about the desirable and undesirable acts related to the profession.

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

- CO1.** Demonstrate the principles of ethics, professional values, and social responsibility.
- CO2.** Analyze the problems in the implementation of moral autonomy and use ethical theories in resolving moral dilemmas.
- CO3.** Develop suitable strategies to resolve problems that arise in practicing professional ethics and Industrial standards.
- CO4.** Function as a member, consultant, manager, advisor and leader in multi-disciplinary teams.
- CO5.** Provide solutions to complex problems associated with professional ethics using analysis and interpretation.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PSO2	PSO2	PSO2	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	2	2	2	2	-	-	-	3	2	3
CO2	2	3	2	-	2	2	2	2	2	-	-	-	3	2	3
CO3	2	-	3	-	2	2	2	2	2	-	-	-	3	3	3
CO4	2	-	-	-	-	2	2	2	2	-	-	-	3	3	3
CO5	2	2	3	2	-	3	2	2	2	-	-	-	3	2	3
Course Correlation Mapping	2	2	3	1	2	2	2	2	2	-	-	-	3	2	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: PROFESSIONAL ETHICS

(06 Periods)

Scope and significance of ethics, varieties of moral issues, types of ethical inquiry, moral dilemmas, moral autonomy — Kohlberg's theory; Gilligan's theory of moral development.

Module2: PROFESSIONAL IDEALS AND VIRTUES

(06 Periods)

Theories of virtues and professional ideals; professional responsibility and accountability; self-respect and integrity; role of customs and religion in ethics; religion and divine command theory; resolving moral dilemmas; moral leadership.

Module 3: SOCIAL EXPERIMENTATION

(06 Periods)

Social experimentation and its similarities to standard scientific experiments; learning from the past and knowledge gained; responsibilities of engineers as experimenters; the Challenger's case study; role of industrial standards; issues and limitations in engineering law

Module 4: RESPONSIBILITIES AND RIGHTS

(06 Periods)

Collegiality and professional loyalty; respect for authority; collective bargaining and employee rights; confidentiality and trust; occupational crime and ethical misconduct; rights and responsibilities of engineers; whistle-blowing and its implications; the BART case study.

Module 5: HARMONY WITH PROFESSIONALETHICS

(06 Periods)

tance and practice of human values; ethical human conduct in personal and professional life; transition from the present state to a universal human order; role of engineers and technologists in promoting social and ecological responsibility; contribution to enriching institutions and organizations.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Demonstrate orally using your experiences of what is naturally acceptable in a relationship – Feeling of respect or disrespect and what is naturally acceptable is to nurture or exploit others.
2. Identify community partners and discuss with a community partner or organization. Prepare a report by identifying and analysing the issues or opportunities.
3. Field experiences may be directed to include a range of time-intensive endeavours that require varying levels of student interaction. Prepare a report on visiting a Juvenile home.
4. Students read a speech in the classroom by former United Nations Secretary-General Kofi Annan on human values.
5. Students are encouraged to bring a daily newspaper to class or to access any news related to the need for human values and note down the points.
6. Bring out the relevance of engineering ethics theory and practice with relevance to current trends.
7. Professional ideals and virtues are important to everyone. Prepare a case study on the professional ideals and virtue of any one of the famous sports personalities from India.
8. Compare the present to the past in engineering experimentations concerning the change in professionalism.

9. Make a study on occupational crime and the role of modern technology in finding solutions.
 10. Prepare a case study on how to maintain harmony with different cultural people using professional ethics.
- (It's an indicative one. The course instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXTBOOKS:

1. Gaur R R, Sangal R & G P Bagaria, Human Values and Professional Ethics, Excel Books, New Delhi, 2010.
2. Govindarajan, M., Nata Govindarajan, M., Natarajan, S. and Senthilkumar, V. S., Engineering Ethics, Prentice Hall of India, 2004.
3. Mike W. Martin and Roland Schinzinger, Ethics in Engineering, Tata McGraw-Hill, 3rd Edition, 2007.

REFERENCE BOOKS:

1. S. Kannan and K. Srilakshmi, Human Values and Professional Ethics, Taxmann Allied Services Pvt Ltd., 2009.
2. Edmund G. Seebauer and Robert L. Barry, Fundamental of Ethics for Scientists and Engineers, Oxford University Press, 2001.
3. Charles F. Fledderman, Engineering Ethics, Pearson Education, 2nd Edition, 2004.
4. R. Subramanaian, Professional Ethics, Oxford Higher Education, 2013.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=jfGIq_EiXzI
2. <https://www.youtube.com/watch?v=QFH0tH54oUc>
3. <https://www.youtube.com/watch?v=JJshY11nX14>
4. <https://www.youtube.com/watch?v=TyP09S0UEzA>
5. https://www.youtube.com/watch?v=0QMwjV_ZVtc

WEB RESOURCES:

1. <https://siiet.ac.in/wp-content/uploads/2020/09/7.1.10-professional-ethics-manual.pdf>
2. <https://soaneemrana.org/onewebmedia/Professional%20Ethics%20and%20Human%20Values%20by%20R.S%20NAAGARAZAN.pdf>
3. <https://india.oup.com/productPage/5591038/7421214/9780199475070>

SCHOOL CORE**Course Code****Course Title****L T P S C****25CE107601****ENVIRONMENTAL SCIENCE**

2 - - - 2

Pre-Requisite -**Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: This course provides a detailed discussion on natural resources, ecosystems, biodiversity, environment pollution and control, social issues and environment, human population and environment.

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

- CO1.** Analyze natural resources to solve complex environmental problems and natural resource management considering society, environment and sustainability.
- CO2.** Analyze ecosystems and biodiversity to solve complex environmental problems by following environmental ethics considering society, environment and sustainability besides communicating effectively in graphical form.
- CO3.** Analyze various types of pollution and their control measures to solve environmental problems through appropriate tools and techniques following latest developments considering society, ethics, environment and sustainability.
- CO4.** Analyze social issues and its impact on environment, environmental acts to solve complex environmental problems considering society, environment and sustainability besides communicating effectively in graphical form.
- CO5.** Analyze human population and its impact on environment to solve complex environmental problems through team work and using appropriate tools and techniques considering ethics, society, environment and sustainability.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PSO2	PSO2	PSO2	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	2	2	1	2	3	2	1	2	2	2
CO2	2	3	2	2	2	3	2	1	3	3	2	1	3	2	2
CO3	2	3	3	2	3	3	2	1	2	3	2	1	3	2	2
CO4	2	3	2	2	2	3	2	1	3	3	2	1	2	2	2
CO5	2	3	2	2	2	3	3	2	2	3	3	1	2	2	2
Course Correlation Mapping	2	3	2	2	2	3	2	1	2	3	2	1	2	2	2

Correlation Levels:**3: High;****2: Medium;****1: Low**

COURSE CONTENT

Module 1: NATURAL RESOURCES

(07 Periods)

Multidisciplinary nature of environment; Natural Resources: Renewable and non-renewable resources; Forest, Water, Mineral, Food and Energy resources -Causes, Effects, Remedies, Case studies; Role of an individual in conservation of natural resource and equitable use of resources for sustainable lifestyles.

Module 2: ECOSYSTEMS AND BIODIVERSITY

(07 Periods)

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem - Producers, Consumers, Decomposers; Food chains, Food webs, Ecological pyramids - Types; Characteristic features, Structure and functions of forest ecosystem, Desert ecosystem, Aquatic ecosystem.

Biodiversity: Concept and value of biodiversity, Role of biodiversity in addressing new millennium challenges, Hot spots of biodiversity, Threats to biodiversity, Man-wild life conflicts, Endemic, Endangered and extinct species of India, Conservation of biodiversity - In-situ and ex-situ.

Module 3: ENVIRONMENTAL POLLUTION AND CONTROL

(06 Periods)

Causes, Adverse effects and control measures of pollution - Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution, Nuclear pollution, Solid waste management - Urban waste, industrial waste; Latest developments in pollution control, Hazards and disaster management - Floods, Earthquakes, Tsunamis, Case studies.

Module 4: SOCIAL ISSUES AND THE ENVIRONMENT

(06 Periods)

Sustainable development, Urban problems related to energy, Environmental ethics -Issues, Solutions; Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and case studies, Wasteland reclamation, Consumerism and waste products, Concept of green technologies, Environment justice: National Green Tribunal and its importance; Environment protection act, Air act, Water act, Wildlife protection act, Forest conservation act, Issues involved in enforcement of environmental legislation, Public environmental awareness.

Module 5: HUMAN POPULATION AND THE ENVIRONMENT

(04 Periods)

Population growth, Population characteristics and variation among nations, Population explosion, Family welfare programme, 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/Assignment/Seminar on Environmental assets - Water bodies/Forest/Grassland/Hill/Mountain.

Total Periods: 30

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING:

1. Visit a nearby villages and know the status of availability of local resources that can be improved through proper education.
2. Make an awareness program in the villages for the development of natural resources, ecosystems and biodiversity.
3. Prepare a document by visiting a local urban waste dumping yard near to the Tirupati city.
4. Visit a local village and find a barren land and make the land into a useful land by planting plants or providing the soil and fertilizers required to improve the soil.
5. Visit a local zoological park and identify the species variety and variability.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Anubha Kaushik and Kaushik, C.P., Perspectives in Environmental Studies, New Age International (P) Ltd. Publications, 6th Edition, 2018.
2. Erach Barucha, Environmental Studies, Orient Blackswan, 3rd Edition, 2021.

REFERENCE BOOKS:

1. Cunningham, W. P. and Cunningham, M. A., Principles of Environmental Science, Tata McGraw-Hill Publishing Company, New Delhi, 8th Edition, 2016.
2. Benny Joseph, Environmental Studies, Tata McGraw-Hill, 2nd Edition, 2009.
3. Anji Reddy, M., Text Book of Environmental Science and Technology, BS Publications, Revised Edition, 2014.
4. Rajagopalan, R., Environmental Studies, Oxford University Press, 3rd Edition, 2015.

VIDEO LECTURES:

1. [http:// nptel.ac.in/courses/109/104/109104047](http://nptel.ac.in/courses/109/104/109104047)
2. <https://www.youtube.com/watch?v=mIPBPG-5dUw>

WEB RESOURCES:

1. <https://nptel.ac.in/courses/122102006>
2. <https://www.flame.edu.in/academics/ug/program-structure/major-minor/courses/environmental-studies>
3. https://www.tutorialspoint.com/environmental_studies/environmental_studies_environment.htm

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25CE107602	DISASTER MITIGATION AND MANAGEMENT	2	-	-	-	2
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion on disasters, earthquakes, floods, cyclones, droughts, landslides and disaster management.

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

- CO1.** Analyze the vulnerability of an area to natural and man-made disasters/hazards as per the guidelines to solve complex problems using appropriate techniques ensuring safety, environment and sustainability.
- CO2.** Propose appropriate mitigation strategies for earthquake and tsunami impacts as per code of practice using suitable techniques ensuring safety, environment and sustainability besides communicating effectively in graphical form.
- CO3.** Analyze the causes and impacts of floods, cyclones and droughts using appropriate tools and techniques and suggest mitigation measures ensuring safety, environment and sustainability besides communicating effectively in graphical form.
- CO4.** Analyze the causes and impacts of landslides using appropriate tools and techniques and suggest mitigation measures ensuring safety, environment and sustainability.
- CO5.** Design disaster management strategies to solve pre, during and post disaster problems using appropriate tools and techniques following the relevant guidelines and latest developments ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PSO2	PSO2	PSO2	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	2	2	1	2	3	2	1	2	2	2
CO2	2	3	2	2	2	2	2	1	3	3	2	1	3	2	2
CO3	2	3	2	2	2	2	2	1	3	3	2	1	3	2	2
CO4	2	3	2	2	2	2	2	1	2	3	2	1	2	2	2
CO5	3	3	3	3	3	2	2	2	3	3	2	2	3	2	2
Course Correlation Mapping	2	3	2	2	2	2	2	1	3	3	2	1	3	2	2

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: DISASTERS

(06 Periods)

Types of disasters - Natural disasters; Impact of disasters on environment, infrastructure and development; Concepts of hazards and vulnerability analysis, Hazard Assessment, Guidelines for hazard assessment and vulnerability analysis, Basic principles and elements of disaster mitigation.

Module 2: EARTHQUAKES

(06 Periods)

Introduction to earthquake, Intensity scale (MSK-64), Seismic zones and activity in India, Action plan for earthquake disaster preparedness, Elements at risk, Recovery and rehabilitation after earthquake, Concepts of Earthquake resistant design and construction of buildings; Tsunami – Onset, Types and causes, Warning, Elements at risk, Typical effects, Specific preparedness and mitigation strategies, Case studies.

Module 3: FLOODS, CYCLONES AND DROUGHTS

(07 Periods)

Floods and Cyclones: Onset, Types, Causes, Warnings, Elements at risk, Typical effects, Indian floods and cyclones, Hazard zones, Potential for reducing hazards, Mitigation strategies and community based mitigation, Case studies.

Droughts: Onset, Types and warning; Causes, Impact, Early warning and response mechanisms, Mitigation strategies, Droughts in India, Case studies.

Module 4: LANDSLIDES

(06 Periods)

Onset, Types and warning; Causes, Elements at risk, Indian landslides, Hazards zones, Typical effects, Mitigation strategies and community based mitigation, Case studies.

Module 5: DISASTER MANAGEMENT

(05 Periods)

Disaster management organization and methodology, Disaster management cycle, Disaster management in India – Typical cases and Cost-benefit analysis, Disaster management programs implemented by NGOs and Government of India, Usage of GIS and Remote sensing techniques in disaster management, Leadership and Coordination in Disaster management, Emerging trends in disaster management.

Total Periods: 30

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING:

1. Perform hazard assessment and vulnerability analysis for any nearby town/city and prepare a detailed report of possible impacts of various disasters on environment, infrastructure and development.
2. Prepare a detailed report on the causes and effects of Tsunami that was occurred in the year 2004. Also discuss various advancements in Tsunami warning systems.
3. Identify the major causes of urban floods in cities like Chennai, Hyderabad & Mumbai and submit a report along with various mitigation strategies to reduce the impact of floods.
4. Prepare a detailed report on how various man-made activities are directly/indirectly related to the occurrence of landslides that occurred in recent days in India.
5. Visit AP State Disaster Response and Fire Services Department and record about various methods used by them in mitigating disasters and their management.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Sharma V. K., Disaster Management, Medtech Publishing, 2nd Edition, 2013.
2. Anand S. Arya, Anup Karanth, and Ankush Agarwal, Hazards, Disasters and Your Community: A Primer for Parliamentarians, GOI-UNDP Disaster Risk Management Programme, Government of India, National Disaster Management Division, Ministry of Home Affairs, New Delhi, Version 1.0, 2005

REFERENCE BOOKS:

1. Donald Hyndman and David Hyndman, Natural Hazards and Disasters, Cengage Learning, USA, 5th Edition, 2015.
2. Disaster Management in India, A Status Report, Ministry of Home Affairs, Govt. of India, May 2011.
3. Rajendra Kumar Bhandari, Disaster Education and Management: A Joyride for Students, Teachers, and Disaster Managers, Springer India, 2014.
4. Singh R. B., Natural Hazards and Disaster Management, Rawat Publications, 2009.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/105104183>
2. <https://www.digimat.in/nptel/courses/video/124107010/L01.html>

WEB RESOURCES:

1. <https://egyankosh.ac.in/handle/123456789/25093>
2. <https://www.egyankosh.ac.in/handle/123456789/25912>
3. <https://www.nios.ac.in/media/documents/333courseE/12.pdf>
4. <https://ndmindia.mha.gov.in/images/public-awareness/Primer%20for%20Parliamentarians.pdf>

SCHOOL CORE						
Course Code	Course Title	L	T	P	S	C
25CE107603	RURAL TECHNOLOGY	2	-	-	-	2
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion on technology for rural development, nonconventional energy, technologies for rural development, community development and it in rural development.

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

- CO1.** Compare various technologies for rural development by solving rural problems through different schemes by considering ethics, society, environment and sustainability.
- CO2.** Analyze non-conventional energy sources using appropriate tools and techniques to solve rural energy problems considering society, environment and sustainability besides communicating effectively in graphical form.
- CO3.** Select appropriate technologies in different areas of rural development to solve rural issues following latest developments considering society, environment and sustainability.
- CO4.** : water conservation, health, safety and rural employment issues for community development to solve rural problems through appropriate technologies considering ethics, society, environment and sustainability.
- CO5.** Analyze the impact of IT, public and private partnership on rural development to solve complex rural problems using appropriate tools and techniques considering ethics, society, environment and sustainability.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	2	2	1	2	3	2	1	2	2	2
CO2	2	3	2	2	2	2	2	1	3	3	2	1	3	2	2
CO3	2	3	2	2	2	2	2	1	3	3	2	1	3	2	2
CO4	2	3	2	2	2	2	2	1	2	3	2	1	2	2	2
CO5	3	3	3	3	3	2	2	2	3	3	2	2	3	2	2
Course Correlation Mapping	2	3	2	2	2	2	2	1	3	3	2	1	3	2	2

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO RURAL DEVELOPMENT (06 Periods)

India - Technology and rural development, Pre and post-independence period, Rural India Life, Indian farmer, Role of science and technology in rural development, Rural technology and poverty eradication, Rural business hubs, Technology in improving rural infrastructure, Various organizations related to innovation, Issues of technology transfer - CAPART, NABARD, CSIR, NIF.

Module 2: NON CONVENTIONAL ENERGY (06 Periods)

Definition of energy, Types of alternative sources of energy, Sources of non-conventional energy – Solar energy: Solar pump in agriculture, Solar dryer, Solar cooker, Solar heater; Biogas, Recycling and management, Wastes conservation, Assessment and production of biomass products and their utilization.

Module 3: TECHNOLOGIES FOR RURAL DEVELOPMENT (06 Periods)

Food and agro based technologies, Tissue culture, Nursery, Building and construction technologies, Cultivation and processing of economic plants, Cottage and social industries, Latest developments in rural technologies.

Module 4: COMMUNITY DEVELOPMENT (06 Periods)

Water conservation, Rain water Harvesting, Drinking water Standards and simple treatments used, Environment and Sanitation, Bio fertilizers, Medical and aromatic plants, Employment generating technologies – Apiculture, Pisciculture, Aquaculture.

Module 5: IT IN RURAL DEVELOPMENT (06 Periods)

Role of information technology (IT) in rural areas, Impact of IT in rural development, Need and necessity of technology, Corporate social responsibilities, Private sector participation (Activities in different spheres: Employment, Education, Health, Agriculture and service sectors) and Saansad Adarsh Gram Yojana (SAGY), Village adoption schemes.

Total Periods: 30

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Visit a nearby village and know the status of small-scale industries which are implanted and to be established based on the availability of the local resources.
2. Visit a local village and make an awareness program on energy utilization using biomass products.
3. Make a awareness program in the villages for the rural development in terms of home-made products.
4. Construct rain water harvesting structures in nearby villages where water scarcity is more and prepare a document.
5. Develop a small IT application the village area which will be used for the growth of the village.

(Note: It's an indicative one. The course instructor may change the activities and shall be reflected in the course handout.)

RESOURCES

TEXT BOOKS:

1. Viridi, M. S., Sustainable Rural Technologies, Daya Publishing House, 2nd Edition 2018.
2. Prabhath, S. V. and P. Ch. Sita Devi, Technology and Rural India, Serials Publications, 1st Edition, 2012.

REFERENCE BOOKS:

1. Chakravarthy, R., and Murthy, P. R. S., Information Technology and Rural Development, Pacific Book International, 1st Edition, 2012.
2. Shivakanth Singh, Rural Development Policies and Programmes, Northern Book Centre, 1st Edition, 2002.
3. Katar Singh, and Anil Shishodia, Rural Development: Principles, Policies, and Management, SAGE Publications India Private Limited, 4th Edition, 2016.
4. Vinayak Reddy, A. and Yadagira Charyulu, M., Rural Development in India: Policies & Initiatives, New Century Publications, 1st Edition, 2008.

VIDEO LECTURES:

1. [http:// nptel.ac.in/courses/109/104/109104047](http://nptel.ac.in/courses/109/104/109104047)
2. https://www.youtube.com/channel/UCEZxAQu3ZBuIN-pYMYO2i_A/videos
3. <https://www.youtube.com/watch?v=HnrIB-QmvlQ>

WEB RESOURCES:

1. en.wikibooks.org/wiki/Technologies_for_Rural_Development/Complete
2. <https://www.oecd-ilibrary.org/sites/ae6bf9cd-en/index.html?itemId=/content/component/ae6bf9cd-en>
3. <https://crdt.iitd.ac.in/>

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25LG107603	SPOKEN ENGLISH	-	1	2	-	2
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course deals with the development of fluency and intelligibility in spoken English. Through individual and group activities, students work on improving pronunciation, practicing conversation strategies, and delivering oral presentations.

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

- C01.** Demonstrate knowledge of functional English for effective communication.
- C02.** Analyze different types of vocabulary for fluency in communication
- C03.** Apply correct usage of English grammar in writing and speaking.
- C04.** Apply speaking strategies in terms of usage of English with accuracy, appropriacy, and fluency.
- C05.** Analyze techniques to use communication skills for effective presentation.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PS02	PS02	PS02	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
C01	3	-	-	-	-	-	2	-	3	-	-	-	3	3	3
C02	2	3	-	-	-	-	2	-	3	-	-	-	3	3	3
C03	2	-	3	-	3	-	2	-	3	-	-	-	3	3	3
C04	2	-	-	-	3	-	2	-	3	-	-	-	3	3	3
C05	2	3	2	-	3	-	2	-	3	-	-	-	3	3	3
Course Correlation Mapping	2	3	2	-	3	-	2	-	3	-	-	-	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: FUNCTIONAL ENGLISH (06 Periods)

Concepts of Functional Spoken English, Self Introduction; Listening and Speaking: Do's and Don'ts; Expressions: Ability, Admiration, Agreement, Annoyance, Appreciation, Pleasure, Sarcasm, Satisfaction, Surprise, Approval, Certainty, Doubt, Gratitude, Possibility, Fear, Worry, Condolences; Asking for: Advice, Clarification, Direction, Information, Permission; Making: Predictions, recommendations

Module 2: VOCABULARY BUILDING (06 Periods)

Vocabulary for day-to-day conversations: Vegetables, Groceries, Fruits, Weather, Parts of a Human body, Dresses, Furniture; Relations: Birds, Cries of Animals, Food, Hospitality, Houses, Rooms, Tools, Airport, News Paper, Books, Gems, Corporate Vocabulary, Jobs, Occupations, Diseases; British and American spelling; Slang Words and Technical Jargons.

Module 3: FUNCTIONAL GRAMMAR - I (06 Periods)

English Grammar and the Indian Student, Parts of Speech, Verb forms: Tenses, Voice and Speech.

Module 4: FUNCTIONAL GRAMMAR -II (06Periods)

Universal Auxiliaries: Sentence Structure, WH Questions, framing of Questions with answers; Question Tags, Subject and verb agreement, Spotting Errors.

Module 5: COMMUNICATION SKILLS: (06 Periods)

Polite, Courteous and diplomatic expressions, Good manners and Etiquette, Conversation Techniques, Narrating Stories.

Total Periods: 30

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Critically analyse the value of Indian money and its impact on the common man and Prepare a PowerPoint Presentation.
2. Prepare a conversation between you and a sanitary officer regarding sanitary conditions in your locality.
3. The English Language has a rich vocabulary and it increases day by day. Present a seminar on the norms adhered to in adding new words and list out the words added in the last five years with their meaning.
4. Enact roleplays in different situations.
5. Participate in group discussions and debate on present issues
6. A conversation is an exchange of ideas, thoughts, and feelings between two or more persons. Explain it with suitable examples
7. Prepare a schedule and identify various committees to be formed for celebrating the Annual Day of a college and explain team involvement in the celebration.
8. Gather various ideas on discussing with parents the role of higher education and job opportunities.

9. Imagine you see a person wasting water. Write a dialogue objecting to such wastage of natural resources.
10. Since social media offers a wide reach easily, it becomes easier for bullies to spread gossip or issue threats. How do you think Cybercrime is a menace brought about by social media?

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXTBOOKS:

1. L. Adinarayana and V. Prakasam, "Spoken English", Neelkamal Publications Pvt. Ltd., NewDelhi, 2008.
2. Ram Bhasker Raju, "The Complete Book on Spoken English" Goutham Buddha Publications, Hyderabad, 2002.

REFERENCE BOOKS:

1. Sabina Pillai, Spoken English for my World, Oxford University Press, New Delhi, 2016.
2. K. R. Lakshminarayanan, Speak in English, Scitech Publications, Chennai, 2009.

VIDEO LECTURES:

1. <https://www.britishcouncil.in/programmes/english-partnerships/state/skills-projects/AP-English-Skills>
2. <https://www.fluentu.com/blog/english/websites-to-learn-english/>

WEB RESOURCES:

1. https://study.sagepub.in/kakarla_fec
2. <https://www.theconfidentteacher.com/2018/04/five-useful-vocabulary-websites/>
3. <https://ling.sprachwiss.uni-konstanz.de/pages/home/lfg/resources.html>
4. <https://www.makeuseof.com/tag/improve-communication-skills-7-websites/>

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25LG107602	ESSENTIAL LIFE SKILLS FOR HOLISTIC DEVELOPMENT	2	-	-	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course deals with different types of thinking skills, self-awareness, coping with stress and emotion, transformational skills, group and team dynamics, and leadership.

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

CO1. Understand different life skills required in personal and professional life.

CO2. Analyse well-defined techniques to cope with emotions and stress.

CO3. Apply appropriate thinking and problem-solving methods to solve problems.

CO4. Function effectively in a team and as an individual.

CO5. Demonstrate the qualities of an effective leader.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PSO2	PSO2	PSO2	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	2	-	2	-	3	2
CO2	2	3	-	-	2	-	-	-	-	2	-	2	-	3	2
CO3	2	3	-	-	2	-	-	-	-	2	-	2	-	3	2
CO4	2	2	-	-	2	-	-	-	3	2	-	2	3	3	2
CO5	2	2	-	-	-	-	-	-	-	2	-	3	3	3	2
Course Correlation Mapping	2	3	-	-	2	-	-	-	1	2	-	2	2	3	2

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: OVERVIEW OF LIFE SKILLS (06 Periods)

Meaning and significance of life skills, Life skills identified by WHO: Self-awareness, Empathy, Critical thinking, Creative thinking, Decision making, problem-solving, Effective Communication, interpersonal relationships, coping with stress, coping with emotion. Ethics, Moral & Professional Values: Human Values, Civic Rights, Engineering Ethics, Engineering as Social Experimentation, Environmental Ethics, Global Issues, Code of Ethics like ASME, ASCE, IEEE.

Module 2: STRESS MANAGEMENT (06 Periods)

Stress Management: Stress, reasons, and effects, identifying stress, stress diaries, the four A's of stress management, techniques,

Approaches: action-oriented, emotion-oriented, acceptance oriented, resilience, Gratitude Training,

Coping with emotions: Identifying and managing emotions, harmful ways of dealing with emotions, PATH method, and relaxation techniques.

Module 3: TRANSFORMATIONAL SKILLS (06 Periods)

Creativity, Critical Thinking, Collaboration, Problem Solving, Decision Making, Need for Creativity in the 21st century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity, Critical thinking Vs Creative thinking, Functions of Left Brain & Right brain, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence.

Module 4: GROUP AND TEAM DYNAMICS (06 Periods)

Introduction to Groups: Composition, formation, Cycle, thinking, Clarifying expectations, Problem Solving, Consensus, Dynamics techniques, Group vs Team, Team Dynamics, and Virtual Teams. Managing team performance and managing conflicts, Intrapreneurship.

Module 5: LEADERSHIP (06 Periods)

Leadership framework, entrepreneurial and moral leadership, vision, cultural dimensions. Growing as a leader, managing diverse stakeholders, crisis management. Types of Leadership, Traits, Styles, VUCA Leadership, Levels of Leadership, Transactional vs Transformational Leaders, Leadership Grid, Effective Leaders.

Total Periods: 30

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING:

1. Prepare an attitude test and measure the attitudes of your class.
2. Prepare a Case study on the Campus Interview pressure and stress of students using SWOT analysis.
3. Record and prepare videos of various cultural people and make a comment on their accents.
4. Prepare a short film of a leader of your choice and list out the best qualities.
5. Prepare a presentation on the impact of social media on leadership management.
6. 'Knowledge of present technologies helps us to live a harmonious life.'
Make a video to justify the statement.
7. Identify life skills needed in our day-to-day life and explain their importance.
8. Come up with strategies to become successful in professional life.
9. Find methods and solutions to overcome the self-pity of a person.

10. Identify the persons who are irregular to class. Find out their problems and come up with solutions.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXTBOOK:

1. Dr. K Alex, "Soft Skills". S Chand & Company Pvt.Ltd.2013.
2. Monmohan Joshi, "Soft Skills". Bookboon.com, First Edition, 2017.

REFERENCE BOOKS:

1. Barun K. Mitra. "Personality Development & Soft Skills", First Edition; Oxford Publishers. 2011.
2. Kalyana. "Soft Skill for Managers"; First Edition; Wiley Publishing Ltd. 2015.
3. Shalini Verma. "Development of Life Skills and Professional Practice"; First Edition; Sultan Chand (G/L) & Company, 2014.
4. John C. Maxwell. "The 5 Levels of Leadership", Centre Street, A division of Hachette Book Group Inc. 2014.
5. Daniel Goleman, "Emotional Intelligence"; Bantam, 2006.
6. Remesh S., Vishnu R.G. "Life Skills for Engineers", Ridhima Publications, First Edition, 2016.
7. Butterfield Jeff. "Soft Skills for Everyone", Cengage Learning India Pvt Ltd; 1 edition, 2011.
8. Training in Interpersonal Skills: Tips for Managing People at Work, Pearson Education, India; 6 edition, 2015.
9. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson Education; 1 edition, 2013.

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=xM0fajUI7Bg>
2. <https://www.youtube.com/watch?v=HwLK9dBQn0g>
3. <https://www.youtube.com/watch?v=sxX5LoojdJw>
4. <https://www.youtube.com/watch?v=xJBgqW9-lzc>
5. <https://www.youtube.com/watch?v=QVwTVM1Iv1c>

WEB RESOURCES:

1. <https://www.clarke.edu/campus-life/health-wellness/counseling/articles-advice/developing-a-positive-attitude/>
2. <https://www.skillsyouneed.com/ps/personal-swot-analysis.html>
3. <https://ecampusontario.pressbooks.pub/profcommsontario/chapter/cross-cultural-communication/>
4. <https://thepeakperformancecenter.com/educational-learning/thinking/#:~:text=There%20are%20several%20core%20thinking,storing%20and%20then%20retrieving%20information.>
5. <https://www.webmd.com/anxiety-panic/guide/stage-fright-performance-anxiety>
6. <https://www.ktunotes.in/ktu-syllabus-life-skills/>

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25MG107601	INNOVATION, INCUBATION AND ENTREPRENEURSHIP	2	-	-	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: To sensitize students on the prospects, opportunities, and challenges in entrepreneurship and the potential for value creation from prospective idea

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

- CO1.** Understand the basics of generating new business ideas
- CO2.** Explain the concept of design thinking and product innovation.
- CO3.** Illustrate the roles of digital technology in entrepreneurship.
- CO4.** Understand the need for startup economics and market conditions
- CO5.** Evaluate the reasons for successful entrepreneurship.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PSO2	PSO2	PSO2	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	-	-	-	-	-	-	-	-	3	3	3
CO2	1	1	1	-	-	-	-	-	1	-	-	-	3	3	3
CO3	2	2	1	-	-	-	-	1	-	-	2	-	3	3	3
CO4	3	1	1	-	-	-	-	-	-	-	-	1	3	3	3
CO5	2	2	-	-	-	1	-	-	-	-	-	1	3	3	3
Course Correlation Mapping	2	2	1	1	-	1	-	1	1	-	1	1	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION (06 Periods)

Concept & Definition, Taking product or service ideas to creating value: Why should one choose to become an entrepreneur, Entrepreneurial mind-set, Entrepreneurship

Module 2: PRODUCT INNOVATION (06 Periods)

Product innovation process, engineering design process and the concept of frugal engineering for developing innovative affordable products, effective user-interface.

Module 3: DIGITAL TECHNOLOGY ENTREPRENEURSHIP (06 Periods)

Industry 4.0 landscape and innovations using digital technologies like AI, IOT, AR/VR, Cloud, SAAS, User Applications.

Module 4: STARTUP ECONOMICS & MARKET CONSIDERATIONS (06 Periods)

Economic consideration for starting a venture, Understanding Feasibility analysis, understanding market, targeting customer and positioning product

Module 5: SUCCESSFUL BUSINESS INCUBATION (06 Periods)

Business model innovation, Business process management, competitive advantages, Business model canvas, Bootstrapping.

Total Periods: 30

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING:

1. Create and present a prototype of a new product of your choice.
2. Present at least three cases of successful business Ideas in recent times
3. Discuss in the group Entrepreneurship opportunities in terms of Orientation and Development.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Robert D. Hisrich, Entrepreneurship,
2. Kuratko & Hodgetts, Entrepreneurship- Theory, Process & Practice, Thompson South-Western Publication

REFERENCE BOOKS:

1. Peter Drucker, Innovation and Entrepreneurship, Harper Collins
2. Thomas N. Duening, Robert D. Hisrich and Michael A. Lechter, Technology Entrepreneurship Taking Innovation to the Marketplace, Elsevier
3. Prof. Nigel Cross, Bloomsbury Design Thinking Understanding How Designers Think and Work, 2019 Edition

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc21_mg63/preview
2. https://onlinecourses.nptel.ac.in/noc22_de08/preview

WEB RESOURCES:

1. <https://ciie.iitism.ac.in/files/CIIE-POLICY.pdf>
2. https://www.nios.ac.in/media/documents/249_Enterpreneurship/English_pdf/249_Enterpreneurship_Lesson_16.pdf

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25EE107601	INTELLECTUAL PROPERTY RIGHTS	2	-	-	-	2
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: The course is designed to provide comprehensive knowledge to the students regarding the general principles of intellectual property rights, Concepts and Theories, Criticisms of Intellectual Property Rights, and International Regime Relating to IPR. The course provides awareness on how to protect one's unique creation, claim ownership, knowledge of what falls under the purview of someone's rights and what doesn't, and safeguard their creations and gain a competitive edge over their peers.

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

- CO1.** Understand the need and the concepts of intellectual property right and avenues for filling intellectual property rights.
- CO2.** Understand the legislative practices and protocols for the acquisition of trademarks and the judicial consequences for violating laws of trademark protection.
- CO3.** Understand the legislative practices and protocols for the acquisition of copyrights and the judicial consequences for violating laws of copyright protection.
- CO4.** Understand the fundamentals of patent laws, legislative practices, and protocols for acquisition of trade secrets and the judicial consequences for violating laws of trade secrets protection.
- CO5.** Understand the importance of geographical indications and various laws and protocols for protecting geographical indications.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PSO2	PSO2	PSO2	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	2	3	3	3
CO2	3	-	-	-	1	-	-	3	-	-	-	2	3	3	3
CO3	3	-	-	-	1	-	-	3	-	-	-	2	3	3	3
CO4	3	-	-	-	1	-	-	3	-	-	-	2	3	3	3
CO5	3	-	-	-	1	-	-	3	-	-	-	2	3	3	3
Course Correlation Mapping	3	-	-	-	1	-	-	3	-	-	-	2	3	3	3

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS (06 Periods)

Introduction and the need for intellectual property rights (IPR); types of intellectual property- Design; International organizations, agencies, and treaties.

Module 2: TRADEMARKS (06 Periods)

Introduction to trademark, Purpose, and function of trademarks, acquisition of trademark rights, protectable matter, selecting and evaluating trademark, trademark registration processes.

Module 3: LAW OF COPYRIGHTS (06 Periods)

Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, a notice of copyright, and international copyright law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.

Module 4: TRADESECRETS (06 Periods)

Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

Module 5: GEOGRAPHICAL INDICATIONS (06 Periods)

The Geographical indications law in India, The objectives and features, the registry of geographical indications powers and functions. Types of goods offered. Protection: Agriculture goods, manufactured goods, and natural goods. Registration of indications and the requirements. Prohibition of misleading use of indications of geographical origins, prohibition of dilution of geographical origins.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Should conduct a survey based on the real scenario, where IPR is misused or unethically used and present an article.
2. Prepare an article on the registration processes of IPR practically (copy right/trade mark/ patents).
3. Should study a case of conflict on trademarks/patents and should produce an article mentioning the circumstances and remedial measures.
4. Prepare an article on the latest development in the international intellectual property rights.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Deborah, E. Bouchoux, Intellectual property: The law of Trademarks, Copyright, Patents, and Trade Secrets, Cengage learning, 4th Edition, 2013.
2. Prabuddha Ganguli, Intellectual property right - Unleashing the knowledge economy, Tata McGraw Hill Publishing Company Ltd.
3. Marsha Aechols; Geographical Indications for Food Products, , Wolters, 2008

REFERENCE BOOKS:

1. Neeraj P., & Khusdeep D. Intellectual Property Rights. India, IN: PHI learning Private Limited. 1st Edition 2019.
2. Nithyananda, K V. Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited. 2019

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/110105139>

WEB RESOURCES:

1. Subramanian, N., & Sundararaman, M. (2018). Intellectual Property Rights – An Overview. Retrieved from <http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf>
2. World Intellectual Property Organization. (2004). WIPO Intellectual property Handbook. Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf
3. Cell for IPR Promotion and Management (<http://cipam.gov.in/>)
4. World Intellectual Property Organization (<https://www.wipo.int/about-ip/en/>)
5. Office of the Controller General of Patents, Designs & Trademarks (<http://www.ipindia.nic.in/>)

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25EE107602	FUNDAMENTALS OF RESEARCH METHODOLOGY	2	-	-	-	2
Pre-Requisite	--					
Anti-Requisite	--					
Co-Requisite	--					

COURSE DESCRIPTION: The course is developed for the students to understand the underlying concepts of research methodology and a systematic approach for carrying out research in the domain of interest. The course is emphasized on developing skills to recognize and reflect on the strength and limitations of different types of research; data collection methods, and methods of Processing and analyzing data. The course also emphasizes interpreting the findings and research articulating skills.

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

- CO1.** Understands the underlying concepts of research methodology, types of research and the systematic research process.
- CO2.** Understand the philosophy of research design, types of research design and develop skills for a good research design.
- CO3.** Understand the philosophy of formulation of a research problem, methods of data collection, review of literature and formulation of working hypothesis.
- CO4.** Understand various data processing and analyzing techniques and their significance in the research.
- CO5.** Develop skills to interpret the findings and research articulating skills along with the ethics of research.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PSO2	PSO2	PSO2	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	3	3
CO2	3	-	1	-	-	-	-	-	-	-	-	-	3	3	3
CO3	3	-	-	-	2	1	-	-	-	-	-	-	3	3	3
CO4	3	2	-	-	3	1	-	-	-	-	-	-	3	3	3
CO5	3	-	-	-	-	-	-	-	3	3	-	-	3	3	3
Course Correlation Mapping	3	1	1	-	2	1	-	-	3	3	-	-	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO RESEARCH METHODOLOGY (06 Periods)

Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, and Significance of Research, Research and Scientific Method, Research Process, Criteria of Good Research.

Module 2: RESEARCH DESIGN (06 Periods)

Research design—Basic Principles, Need of research design, Features of good design, Important concepts relating to research design, Different research designs, Basic principles of experimental designs, Developing a research plan.

Module 3: RESEARCH FORMULATION (06 Periods)

Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Data collection – Primary and secondary sources; Critical literature review – Identifying gap areas from literature review, Development of working hypothesis.

Module 4: PROCESSING AND ANALYSIS OF DATA (06 Periods)

Processing Operations, Elements/Types of Analysis, Statistics in Research, Measures of Central Tendency, Measures of Dispersion, Measures of Relationship, Simple Regression Analysis.

Module 5: INTERPRETATION AND REPORT WRITING (06 Periods)

Interpretation: Meaning of interpretation; Techniques of interpretation; Precautions in Interpretation.

Report Writing: Significance, Different Steps, Layout, Types of reports, Mechanics of Writing a Research Report, Precautions in Writing Reports.

Total Periods: 30

EXPERIENTIAL LEARNING:

1. Should conduct a survey based on a hypothesis, analyze the data collected and draw inferences from the data.
2. Should review the literature on the given topic and should identify the scope/gaps in the literature and develop a research hypothesis.
3. Should study a case, formulate the hypothesis and identify an appropriate testing technique for the hypothesis.
4. Study an article and submit a report on the inferences and should interpret the findings of the article.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCE

TEXT BOOKS:

1. C.R. Kothari, Research Methodology: Methods and Techniques, New Age International Publishers, 2nd revised edition, New Delhi, 2004.
2. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.

REFERENCE BOOKS:

1. R. Panneerselvam, Research Methodology, PHI learning Pvt. Ltd., 2009.
2. Singh, Yogesh Kumar. Fundamental of research methodology and statistics. New Age International, 2006.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/121106007>
2. https://onlinecourses.nptel.ac.in/noc22_ge08/preview
3. <https://www.youtube.com/watch?v=VK-rnA3-41c>

WEB RESOURCES:

1. <https://www.scribbr.com/category/methodology/>
2. <https://leverageedu.com/blog/research-design/>
3. <https://prothesiswriter.com/blog/how-to-formulate-research-problem>
4. <https://www.formpl.us/blog/hypothesis-testing>
5. <https://www.datapine.com/blog/data-interpretation-methods-benefits-problems/>
6. <https://leverageedu.com/blog/report-writing/>

SCHOOL CORE

Course Code	Course Title	L	T	P	S	C
25LG207601	TECHNICAL REPORT WRITING	2	-	-	-	2
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course deals with preparing effective technical documents for both written and digital media, with particular emphasis on technical memos, problem-solving and decision-making reports, and organizational, product-support, and technical-information webs.

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

- C01.** Demonstrate knowledge of Technical Report Writing and structures with a scientific attitude.
- C02.** Analyze the process of writing in preparing effective reports.
- C03.** Demonstrate styles of writing for Publication in a Scientific Journal.
- C04.** Apply the process of referencing and editing techniques for effective communication in written documents.
- C05.** Analyze the strategies in the technical report presentation.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PSO2	PSO2	PSO2	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3	-	-	-	-	-	2	-	3	-	-	-	3	3	3
C02	2	3	2	-	-	-	2	-	3	-	-	-	3	3	3
C03	3	-	-	-	-	-	2	-	3	-	-	-	3	3	3
C04	2	-	-	-	3	-	2	-	3	-	-	-	3	3	3
C05	2	3	2	-	2	-	2	-	3	-	-	-	3	3	3
Course Correlation Mapping	2	2	1	-	2	-	2	-	3	-	-	-	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO TECHNICAL REPORT WRITING (06 Periods)

Concepts of Technical Report, Types of Reports, Planning Technical Report Writing, Components of a Technical Report, Report Writing in Science and Technology, Selecting and Preparing a Title, Language Use

Module 2: PROCESS OF WRITING (06 Periods)

Writing the 'Introduction', Writing the 'Materials and Methods', Writing the Findings/Results, Writing the 'Discussion', Preparing and using 'Tables'.

Module 3: STYLE OF WRITING (06 Periods)

Preparing and using Effective 'Graphs', Citing and Arranging References, Writing for Publication in a Scientific Journal.

Module 4: REFERENCING (06 Periods)

Literature citations, Bibliographical data according to ISO standards, Citations in the text, Copyright, and copyright laws, the text of the Technical Report, Using a word processing and desktop publishing (DTP) systems, Document or page layout, hints on editing Typographic details, Cross-references.

Module 5: PRESENTATION (06 Periods)

Presentation with appropriate pointing, Dealing with intermediate questions, Review and analysis of the presentation, Rhetoric tips from A to Z.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Prepare a report on technologies of modern times that enriched the originality of research works and their impacts on society concerning plagiarism.
2. Make PowerPoint presentations on the various style of writing academic reports.
3. Error-free Reports are so important for successful communication and sharing of information. Prepare a detailed chart on proofreading techniques to make a report effective and error-free.
4. Design a logo for a company and write down the copy-right laws for that.
5. Read research articles from any international journal of science and technology and differentiate research writing from other academic and non-academic writings.
1. Write an organizational memo Include a heading, introduction, and summary at the beginning of your memo, and present the details of your discussion in a logical order. Use headings and topic or main-idea sentences to clarify the organization.
2. Prepare an appraisal report on the staff performance of your company.
3. Prepare a PowerPoint presentation on the annual performance report of a company.
4. Critically review and write a report on any one of the recently released products.
5. Read the newspaper and write a detailed report about the content coverage and analyse the factors for the popularity of the newspaper.

RESOURCES

TEXTBOOK

1. RC Sharma Krishna Mohan, "Business Correspondence and Report" McGraw-Hill Publishing. Writing," Tata Company Limited, New Delhi", 3rd Edition, 2005 (reprint).
2. Patrick Forsyth, "How to Write Reports and Proposals", THE SUNDAY TIMES (Kogan Page), New Delhi, Revised 2nd Edition, 2010.

REFERENCE BOOKS:

1. John Seely, "The Oxford Writing & Speaking", Oxford University Press, Indian Edition
2. Anne Eisenberg, "A Beginner's Guide to Technical Communication", McGraw-Hill Education (India) Private Limited, New Delhi, 2013.

VIDEO LECTURES:

1. <https://vimeo.com/143714818>
2. https://digitalmedia.sheffield.ac.uk/media/002.+The+Anatomy+of+a+Technical+Report/1_u8wntcge

WEB RESOURCES:

1. <http://www.resumania.com/arcindex.html>
2. <http://www.aresearchguide.com/writing-a-technical-report.htm>
3. [http://www.sussex.ac.uk/ei/internal/forstudents/engineeringdesign/studyguides/tec report writing](http://www.sussex.ac.uk/ei/internal/forstudents/engineeringdesign/studyguides/tec%20report%20writing)

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
25CA102002	DATABASE MANAGEMENT SYSTEMS	3	-	2	-	4
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This Course provides theoretical concepts and hands-on experience on Database systems, Database design, Relational model, Relational algebra, SQL queries, Constraints and triggers, PL/SQL, Schema refinement and normal forms, Transaction management, Concurrency control, Overview of storage and indexing.

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

- C01.** Analyze and apply the concepts of ER-modelling and normalization to design viable data models for a given problem.
- C02.** Formulate relational database schemas, apply suitable integrity constraints, for querying databases.
- C03.** Use SQL to store, query, and manipulate data in relational databases.
- C04.** Develop PL/SQL blocks to centralize database applications for maintainability and reusability.
- C05.** Analyze transaction processing, concurrency control and storage methods for database management.
- C06.** Work Independently and Communicate Effectively in Oral and Written forms.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
C02	1	3	2	2	3	-	-	-	-	-	-	-	2	3	-
C03	1	2	3	2	3	-	-	-	-	-	-	-	2	3	-
C04	2	3	3	3	3	2	-	-	-	-	-	-	3	2	-
C05	3	3	-	-	-	-	-	-	-	-	-	-	2	3	-
C06	-	-	-	-	-	-	-	-	3	3	-	-	-	-	-
Course Correlation Mapping	2	3	3	2	3	1	-	-	3	3	-	-	2	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO DATABASE SYSTEMS

(08 Periods)

Introduction to Database : Advantage of Database System, File ,systems vs. DBMS View of Data, When not to use a DBMS, Database System Concepts and Architecture, When not to use a DBMS, The database system Environment, Classification of DBMS. Data Models, Schemas, Instances and schemas, Database languages and interfaces, The database system Environment, Different people behind DBMS.

Module 2: ENTITY-RELATIONSHIP MODEL

(08 Periods)

Entity-Relationship Model: Basic Concepts, Constraints, Keys: Primary Key, Super key, Candidate key, Entity Types, Entity Sets, Design issues, Entity-Relationship Diagram, Relations, Relationship types, Roles and Structural Constraints, Weak Entity sets, Extended ER Features, Design of E-R Database Schema, Reduction of an E-R Schema to tables.

Module 3: RELATIONAL MODEL AND CONSTRAINTS

(09 Periods)

Relational Model and Constraints: Relational model Concepts, Structure of Relational Databases, Constraints: Entity integrity, Referential Integrity, Domain Constraints, Assertions, Triggers, Security and Authorization, Authentication and Encryption.

Module 4: RELATIONAL DATABASE LANGUAGES

(10 Periods)

SQL AND PL/SQL: Data definition in SQL, Queries in SQL, Insert, Delete and Update Statements in SQL, Views in SQL, Specifying General Constraints as Assertions, specifying indexes, Embedded SQL. PL /SQL: Introduction.

Module 5: THE RELATIONAL ALGEBRA AND TRANSACTION MANAGEMENT (10 Periods) AND RECOVERY TECHNIQUES

The Relational Algebra: Tuple Relational Calculus, Data Normalization: Functional dependencies, Normal form concepts up to 3rd Normal form.

Transaction Management and Recovery Techniques: Introduction to Transaction Processing, Transaction Concepts and Properties, Schedules, Serializability of Schedules, Conflict and view serializable schedules, Recovery Concepts, Recovery from Transactions, Introduction to Concurrency Control Techniques.

Total Periods: 45

EXPERIENTIAL LEARNING

- 1) Design and analyze an ER-Model for the following use case.

Roadway Travels is in business since 1977 with several buses connecting different places in India. Its main office is in Hyderabad. The company wants to computerize its operations in the following areas:

- a) Reservations
- b) Ticketing
- c) Cancellations

Reservations:

Reservations are directly handled by booking office. Reservations can be made 60 days in advance in either cash or credit. In case the ticket is not available, a wait-listed ticket is issued to the customer. This ticket is confirmed against the cancellation.

Cancellation and Modification:

Cancellations are also directly handled at the booking office. Cancellation charges will be charged. Wait-listed tickets that do not get confirmed are fully refunded.

- 2) a) Implement Single Row functions-Character, Numeric and Date functions.
- b) Implement Data Definition Language commands-Create, Alter, Drop, Truncate, and Rename.
- c) Implement Data Manipulation Language commands-Insert, Select, Update, and Delete.
- 3) Implement various types of integrity constraints-NOT NULL constraint, DEFAULT constraint, UNIQUE constraint, PRIMARY key, FOREIGN key, CHECK constraint.
- 4) a) Implement group functions with different operators such as aggregate operators, group by, having and order by.
- b) Implement nested and correlated nested queries using set operators and set comparison operators.
- 5) a) Creation of views, synonyms, sequence, indexes and save point
- b) Implement various types of joins-outer join and inner join.

Basic PL/SQL:

- 6) Construct PL/SQ block for the following:
- a) To determine whether a number is palindrome
 - b) To determine whether a number is an Armstrong number
 - c) To find greatest of three numbers
 - d) To display Fibonacci series

Control Structures:

- 7) a) Write a programming PL/SQL to update the salary of a specific employee by 8% if the salary exceeds the mid-range of the salary against this job and update up to mid-range if the salary is less than the mid-range of the salary, and display a suitable message.
- b) Write a PL/SQL program to display the description against a student's grade using CASE statement.

Exception Handling:

- 8) a) Develop a PL/SQL program that displays the name and address of a student whose ID is given. If there is no student with the given student ID in the database, the program should raise a run-time exception NO_DATA_FOUND, which should be captured in the EXCEPTION block.
- b) Construct the user-defined exceptions to get the salary of an employee and check it with the job's salary range. If the salary is below the range, raise an exception BELOW_SALARY_RANGE. If the salary is above the range, raise the exception ABOVE_SALARY_RANGE.

Functions:

- 9) a) Write a function that accepts two numbers A and B and performs the following operations.
- o Addition
 - o Subtraction
 - o Multiplication
 - o Division
- b) Write a PL/SQL block that updates salary of an employee in Employee table by using in cr function which takes employee number as argument and calculates increment and returns increment based on the following criteria.
- o If salary <= 3000, increment = 30% of salary
 - o If salary > 3000 and <= 6000, increment = 20% of salary
 - o Else increment = 10% of salary

Procedures:

- 10) a) Write a procedure that accepts two numbers and displays their sum
- b) Write procedures to demonstrate IN, IN OUT and OUT parameters

Cursors:

- 11) a) Write a block in PL/SQL to create a Cursor that displays the employee name and number of jobs he/she has done in the past.
- b) Write a program in PL/SQL to create a cursor to display the name and salary of each employee in the EMPLOYEES table whose salary is less than that specified by a passed-in parameter value.

Triggers:

- 12) Develop a suitable student database application by considering appropriate attributes. Couple of attributes to be maintained is the attendance of a student in each subject for which he/she has enrolled and internal assessment Using TRIGGERS for the following:
- Whenever the attendance is updated, check if the attendance is less than 85%; if so, notify the concerned head of the department.
 - Whenever, the marks in an internal assessment test are entered, check if the marks are less than 40%; if so, notify the concerned head of the department.

RESOURCES**TEXT BOOKS:**

- Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems," McGrawHill, 3rd Edition, 2014.
- Abraham Silberschatz, Henry. F. Korth, S. Sudarshan, "Database System Concepts," McGrawHill, 7th edition, 2019.

REFERENCE BOOKS:

- Ivan Bayross, SQL, PL/SQL: "The Programming Language of Oracle," BPB publications, 4th Edition, 2017.
- Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson, 2015.
- Thomas Connolly, Carolyn Begg, "Database Systems," Pearson, 6th edition, 2019.
- S.K. Singh, "Database System Concepts, Design and Applications," 1st Edition, Pearson Education, 2006.
- Satish Ansani, "Oracle Database 11g: Hands-on SQL and PL/SQL," PHI, 2010.
- Dr. Rajiv Chopra, "Database Management Systems," Sultan Chand, 2016.
- Pranab Kumar Das Gupta, P. Radha Krishna, "Database Management System Oracle SQL and PL/SQL," PHI, 2nd Edition, 2009.

VIDEO LECTURES:

- https://swayam.gov.in/nd1_noc19_cs46/preview
- <https://nptel.ac.in/courses/106105175>
- https://onlinecourses.nptel.ac.in/noc21_cs04/preview
- <https://www.youtube.com/watch?v=MDQxqYVXiVU>
- <https://www.youtube.com/watch?v=c5HAWKX-suM>

WEB RESOURCES:

- <https://www.classcentral.com/course/swayam-introduction-to-database-systems-17660>
- <https://www.scaler.com/topics/dbms/>
- https://www.academia.edu/27988617/Database_Management_System_DBMS_Tutorial
- <https://nptel.ac.in/courses/106104135>
- <https://downloads.mysql.com/docs/mysql-tutorial-excerpt-5.7-en.pdf>
- https://docs.oracle.com/cd/E11882_01/server.112/e40540/intro.htm#CNCPT88786

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
25CA102003	DATA WAREHOUSING AND DATA MINING	3	-	2	-	4

Pre-Requisite Database Management Systems

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Data Mining Fundamentals; Data Preprocessing; Operational Database Systems and Data Warehouses; Mining Frequent Patterns; Classification and Prediction; Clustering; Data warehousing and Mining tools, New Trends and Research Frontiers.

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

CO1. Understand the concepts of Data Warehousing architecture, Multidimensional models and OLAP operations.

CO2. Analyze data preprocessing techniques to produce refined data.

CO3. Apply Association rules and classification techniques for data categorization.

CO4. Make use of clustering techniques for grouping similar data items and identify outliers.

CO5. Design and develop applications using Data Mining trends.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	3	3	-	-	-	-	-	-	-	2	-	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO5	-	-	-	-	-	-	-	-	3	3	-	-	2	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	-	3	3	-	-	2	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO DATA WAREHOUSING ONLINE ANALYTICAL PROCESSING (09 Periods)

Definition of Data warehouse, Differences between Operational Database and Data Warehouse – Multidimensional Data Model - From Tables to Data Cubes. Schemas, Measures, DW Implementation – Efficient Computation of Data Cubes.

Module 2: DATA MINING AND DATA PREPROCESSING (08 Periods)

Data Mining – Motivation, Importance of DM Functionalities, Basic Data Mining Tasks, DM Applications, and Social Implications, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and concept of Hierarchy Generation.

Module 3: ASSOCIATIONS AND CLASSIFICATION (10 Periods)

Basic Concepts, Frequent itemset Mining Methods, pattern evaluation methods- From Association Mining to Correlation Analysis, Classification, Decision Tree Introduction, Bayesian Classification Methods, Rule Based Classification, Prediction: Linear Regression.

Module 4: CLUSTER ANALYSIS (09 Periods)

Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods -k-Means method, Agglomerative method, DBSCAN, STING, introduction to Outlier Analysis.

Module 5: WEB, TEMPORAL AND SPATIAL DATA MINING (09 Periods)

Web Content Mining, Web Structure Mining, Web Usages Mining, Spatial Mining, Generalization and specialization, Spatial Rules, Spatial Classification and Clustering Algorithms, Temporal Mining, Modeling Temporal Events, Times Series, Pattern Detection, Sequences.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Design and implement data acquisition process to perform Source Qualifier Transformation
2. Design and implement data acquisition process to perform Filter Transformation
3. Design and implement data acquisition process to perform Joiner Transformation
4. Design and implement data acquisition process to perform Aggregator Transformation
5. Design and implement data acquisition process to perform Sorter Transformation
6. Design and implement data acquisition process to perform Router Transformation
7. Design and implement data acquisition process to perform Union Transformation
8. Design and implement data acquisition process to perform Transaction control Transformation
9. Design and implement data acquisition process to perform Rank Transformation
10. Design and implement data acquisition process to perform Normalizer Transformation
11. Implement the following Data mining techniques.
 - a) smoothing by bin means
 - b) smoothing by bin medians
 - c) smoothing by bin boundaries

RESOURCES

TEXT BOOKS:

1. Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining: Concepts and Techniques," Elsevier, 3rd Edition, 2013.

REFERENCE BOOKS:

1. K.P. Soman, Shyam Diwakar and V. Ajay, Insight into Data mining Theory and Practice, Easter Economy Edition, Prentice Hall of India, 2006.
2. G. K. Gupta, Introduction to Data Mining with Case Studies, Easter Economy Edition, Prentice Hall of India, 2006.
3. Tan P.N, Steinbach M. and Kumar V., Introduction to Data Mining, Addison-Wesley, 2006.

SOFTWARE/TOOLS:

1. Python
Library :Sci kit Learn;
Computing platform :Jupyter Notebook

VIDEO LECTURES:

1. <http://nptel.ac.in/courses/106106093/35>
2. http://nptel.ac.in/syllabus/syllabus_pdf/106106105.pdf
3. <http://nptel.ac.in/video.php?subjectId=106106093>
4. <http://textofvideo.nptel.iitm.ac.in/video.php?courseId=106106093&p=4>

WEB RESOURCES:

1. <http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/>
2. <https://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-series-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and-Techniques-3rd-Edition-Morgan-Kaufmann-2011.pdf>
3. <https://www.dei.unipd.it/~capri/SI/MATERIALE/DWDM0405.pdf>

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
25CA101004	COMPUTER COMMUNICATION	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course covers basic concepts of data communications, data and signals in Computer communication. Layered Tasks, The OSI Model, TCP/IP Protocol Suite and addressing are used for network modelling. Analog and Digital Signals are used for transmitting of data without attenuation, Distortion and Noise. Multiplexing and Spread spectrum for reliable bandwidth utilization along with IEEE standards and protocols.

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

- CO1.** Demonstrate concepts of data communications, data and signals, network models and protocols & standards in Computer communication.
- CO2.** Apply digital-to-digital conversion, analog-to-digital conversion, digital-to-analog conversion, analog-to-analog conversion for reliable data communication.
- CO3.** Analyze network models, analog and digital signals, periodic analog signals, digital signals, digital transmission, transmission modes and analog transmission for transmitting the data over Communication channel.
- CO4.** Use multiplexing for bandwidth utilization, protocols & standards and Wired LANs(Ethernet) IEEE standards in Computer communication in compliance with communication standards

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	3
CO2	3	2	3	-	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	3	-	3	-	-	-	-	-	-	-	-	-	3
CO4	3	2	2	-	3	3	-	-	-	-	-	-	-	-	3
Course Correlation Mapping	3	3	3	-	3	3	-	-	-	-	-	-	-	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: DATA COMMUNICATIONS AND PROTOCOLS & STANDARDS (09 Periods)

Concepts of Data Communications: Components, Data Representation, Dataflow

Networks: Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks, Interconnection of Networks.

PROTOCOLS AND STANDARDS: Protocols, Standards, Standards Organizations, Internet Standards.

Module 2: NETWORK MODELS (09 Periods)

Layered Tasks: Sender, Receiver, Carrier, Hierarchy.

The OSI Model: Layered Architecture, Peer-to-Peer Processes, Encapsulation.

TCP/IP Protocol Suite: Physical and Data Link Layers, Network Layer, Transport Layer, Application Layer.

Addressing: Physical Addresses, Logical Addresses, Port Addresses, Specific Addresses.

Module 3: DATA AND SIGNALS (09 Periods)

Analog and Digital: Analog and Digital Data, Analog and Digital Signals, Periodic and Non-periodic Signals.

Periodic Analog Signals: Sine Wave, Phase, Wavelength, Time and Frequency Domains, Composite Signals, Bandwidth.

Digital Signals: Bit Rate, Bit Length, Digital Signal as a Composite Analog Signal, Transmission of Digital Signals.

Transmission Impairment: Attenuation, Distortion, Noise.

Module 4: DIGITAL TRANSMISSION (10 Periods)

Digital-To-Digital Conversion: Line Coding, Line Coding Schemes, Block Coding, Scrambling.

Analog-To-Digital Conversion: Pulse Code Modulation (PCM), Delta Modulation(DM).

Transmission Modes: Parallel Transmission, Serial Transmission, Analog Transmission.

Digital-To-Analog Conversion: Aspects of Digital-to-Analog Conversion, Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Quadrature Amplitude Modulation.

Analog-To-Analog Conversion: Amplitude Modulation, Frequency Modulation, Phase Modulation.

Module 5: BANDWIDTH UTILIZATION: MULTIPLEXING AND SPREADING (08 Periods)

Multiplexing: Frequency-Division Multiplexing, Wavelength-Division Multiplexing, Time-Division Multiplexing

Wired LANs(Ethernet):IEEE STANDARDS :Data Link Layer,Physical Layer; STANDARD ETHERNET : MAC Sublayer , Physical Layer; Changes in the standard :Bridged Ethernet , Switched Ethernet , Full-Duplex Ethernet

Total Periods:45

EXPERIENTIAL LEARNING

1. Configure Peer - to - peer network with at least three hosts.
2. Create desired standard network cable including Cross cable and test it by using cable tester.
3. Establishing Connection of Computers Using Wireless Media

RESOURCES

TEXT BOOK:

1. Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, Tata McGraw-Hill, 2013.

REFERENCE BOOKS:

1. William Stallings, "Data and Computer Communications", 10th Edition, Prentice-Hall, 2013.
2. Alberto Leon-Garcia and Indra Widjaja, "Communication Networks - Fundamental Concepts and Key architectures," 2nd Edition, Tata McGraw-Hill, 2004.
3. William Stallings, "Data and Computer Communication," 8th Edition, Pearson Education, 2007.
4. Larry L. Peterson and Bruce S. Davie, "Computer Networks – A Systems Approach," 4th Edition, Elsevier, 2007.
5. Nader F. Mir, "Computer and Communication Networks," Pearson Education, 2007.

SOFTWARE/TOOLS:

1. UTP/STP cable.
2. Connector (Mainly RJ45 connector)
3. Networks toolkit (Mainly Crimping tool.)
4. Line tester or cable tester.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/106105082> : Layered Architectures
2. <https://www.digimat.in/nptel/courses/video/106105082/L35.html>
3. <https://nptel.ac.in/courses/106105082> : Data and Signals
4. <https://nptel.ac.in/courses/106105082> : Digital Signal
5. <https://nptel.ac.in/courses/106105082> : Analog Signals
6. <https://www.digimat.in/nptel/courses/video/106105082/L28.html>

WEB RESOURCES:

1. <https://ncert.nic.in/textbook/pdf/lecs111.pdf>
2. <http://eti2506.elimu.net/Introduction/Books/Data%20Communications%20and%20Networking%20By%20Behrouz%20A.Forouzan.pdf>

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
25CA102004	DATA STRUCTURES	3	-	2	-	4
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on data structure concepts like arrays, stack, queues, trees, graphs and real-time applications of data structures. This course also examines algorithms for sorting, searching graphs, hashing.

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

- CO1.** Analyze and develop solutions using linear data structures such as arrays, linked lists for efficient data organization and manipulation.
- CO2.** Analyze, implement and conduct investigations on data structures such as trees, graphs, hash tables for efficient search and retrieval of data.
- CO3.** Select and apply appropriate techniques for searching and sorting problems.
- CO4.** Apply knowledge to select appropriate data structures for modelling information in data.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	3	3	-	-	-	-	-	-	-	2	-	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: LINKED LISTS

(07 Periods)

Overview of data structures and algorithms, Linear and non-linear data structures, Big O notation, Linked lists Definition, Operations; Single linked lists, Circular linked lists, Doubly linked lists, Sorted lists, Linked lists efficiency, Applications of linked lists.

Module 2: STACKS AND QUEUES

(09 Periods)

Stacks: Definition, Operations, Implementation using arrays and linked lists, Applications Reversing a word, Delimiter matching, Parsing arithmetic expressions.

Queues: Definition, Operations, Applications, Implementation using arrays and linked lists, Circular queue, Double-ended queues, Priority queues.

Module 3: BINARY TREES AND SEARCH TREES

(11 Periods)

Tree terminology, Binary trees, Trees represented as arrays, Binary search trees - Concepts, Advantages, Operations, Finding maximum and minimum values, Efficiency; Balanced and unbalanced trees, AVL search trees Concepts, Operations; Red-Black trees Concepts, Rotations, Inserting a node, Efficiency.

Module 4: SEARCHING AND SORTING

(09 Periods)

Searching: Linear search, Binary search.

Sorting: Bubble sort, Selection sort, Insertion sort, Sorting objects, Shell sort, Partitioning, Quick sort, Merge sort, Heap sort, radix sort, count sort, enumeration sort.

Module 5: GRAPHS AND HASHING

(09 Periods)

Graphs: Concepts, Representation, Operations, Depth-first search, Breadth-first search, Minimum spanning trees.

Hashing: Introduction, Open addressing, Separate chaining, Characteristics of good hash functions - Quick computation, Random and Non-random keys, Folding; Hashing efficiency.

Total Periods: 45

EXPERIENTIAL LEARNING

1. A college has N number of students and the following details of all the students are maintained – register number, name, branch, phone number. Write a program to store the details of the students using a singly linked list. Develop functions to perform the following operations on the data.
 - a) Insert new student's details
 - b) Display the details of the students
 - c) Display the total number of students
 - d) Delete a given student's information

2. Department of CSE has readers club named 'Aalochana'. Students can be granted membership in readers club on their request. Similarly, one may cancel their membership of the club. Members of the club can rent books from the club. Write a program to create data structure to maintain readers club members information (Hall ticket number, name) using singly linked list. In singly linked list, the header node should store details of head of readers club and last node should store details of in-charge of readers club. Develop functions to perform the following operations on the data.
 - a) Store details of head and in-charge of the readers club
 - b) Grant and cancel memberships of students
 - c) Display total number of members
 - d) Display the details of the members
 - e) Display the sorted list of details of the members (sort based on their names in alphabetical order)
3. A company has N number of employees and it maintains the following details of each of its employees: ID, department, salary, phone number. Develop a menu driven program using doubly linked list to store the employees' data. Develop functions to perform the following operations on the data.
 - a) Add and delete employees
 - b) Display total number of employees
 - c) Display details of employees with salary more than Rs. 50,000
 - d) Display the phone number of the employee given the ID
4. a) Alexa has two stacks of non-negative integers, stack and stack where index denotes the top of the stack. Alexa challenges Nick to play the following game:
 - i. In each move, Nick can remove one integer from the top of either stack.
 - ii. Nick keeps a running sum of the integers he removes from the two stacks.
 - iii. Nick is disqualified from the game if, at any point, his running sum becomes greater than some integer max_sum given at the beginning of the game.
 - iv. Nick's final score is the total number of integers he has removed from the two stacks.
 b) Write a program to check whether a string is palindrome or not using stack data structure.
 c) Mostly syntax errors in a computer program arise due to unbalanced braces (such as (), {}, []). Write a program using stack to check whether a given expression has balanced braces or not.
5. a) Develop a menu driven program to perform the following operations on a queue of characters (Array and linked list implementations of queue with maximum size MAX)
 - i) Insert an element
 - ii) Delete an element
 - iii) Display the status
 - iv) Demonstrate overflow and underflow situations (in array implementation)
 b) A restaurant based on its human resources can accept a maximum of N number of food orders. The food orders are served in first come first serve basis. The food orders once placed cannot be cancelled. Write a program to simulate the food ordering and serving system in the restaurant using circular queue.

6. Write a program to perform the following operations on the binary search tree.
 - a) Construct binary search tree by inserting the values {6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2} in the given order.
 - b) Display the nodes of the tree using inorder, preorder and postorder traversal techniques.
 - c) Display the smallest number stored in the tree.
 - d) Search the tree for a given number.
7. There are train paths between cities. If there is a train between city A and city B then there is a route between the cities. The cost of the route is the distance between city A and city B. Represent the train travel route information as a graph. The node can be represented by the name of the city. Write a program to perform the following operations.
 - a) Store the details of train travel route information using adjacency list or adjacency matrix representation.
 - b) Traverse the graph and display the details of all trains between the cities along with the cost using breadth-first method.
 - c) Traverse the graph and display the details of all trains between the cities along with the cost using depth-first method.
8. Store register numbers of students who attended placement training program in a random order in an array. Write a function to search whether a student has attended placement training program or not using
 - a) Linear search
 - b) Binary search
9. A list of customer names could be sorted into alphabetical order by surname, or a list of people could be put into numerical order by age. Sorting a list of items can take a long time, especially if it is a large list. A computer program can be created to do this, making sorting a list of data much easier. Apply proper sorting mechanisms like quick and shell to sort the data.
10.
 - a) Write a program to sort a given set of integers using merge sort.
 - b) Write a program to read the marks obtained by students in a mathematics examination and store the data using a heap data structure. Find out the maximum and minimum marks obtained by the students.
11. Apply suitable data structure concepts (like hashing) for mapping large chunks of data into small tables.
 - a) Separate Chaining Method
 - b) Open Addressing Method
12. Consider an online movie ticket booking system through which customers can book tickets to watch movies at theatres. The database stores the details of each transaction of ticket booking with the details - ID, customer name, customer phone number, movie name, theatre name, date of show, time of show, number of tickets booked, starting seat number, total amount. Write a menu driven program to perform create the database and given an ID, display a client's phone number. Use a hash table implementation to quickly Search through the database.

RESOURCES

TEXT BOOKS:

1. Robert Lafore, "Data Structures & Algorithms in Java," 2nd Edition, Pearson, 2007.
2. Goodrich, Tamassia, Goldwasser, "Data structures & Algorithms in Java," 6th Edition, Wiley, 2014.

REFERENCE BOOKS:

1. John R. Hubbard, "Programming with Java," McGraw Hill, 2nd Edition, 2009.
2. Debasis Samanta, "Classic Data Structures," Prentice Hall, 2nd Edition, 2009.

SOFTWARE/TOOLS:

1. Software: J2SDK 1.7
 - **Eclipse or Net beans**
2. Java compatible web browser

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/106105175>
2. <https://www.edx.org/course/introduction-to-data-structures>
3. <https://github.com/suhassrivats/Udacity-Data-Structures-and-Algorithms>
4. <https://www.linkedin.com/learning/programming-foundations-algorithms>

WEB RESOURCES:

1. <https://www.javatpoint.com/data-structure-tutorial>
2. <https://medium.com/javarevisited/10-data-structure-and-algorithms-articles-programmer-should-read-this-week-585404a9403b>
3. https://www.tutorialspoint.com/data_structures_algorithms/data_structures_algorithms_pdf_version.html
4. <https://www.w3schools.in/data-structures/intro>
5. https://www.tutorialspoint.com/data_structures_algorithms/data_structures_algorithms_tutorial.pdf
6. <https://lecturenotes.in/subject/81/data-structure-using-c-ds>
7. <https://code.tutsplus.com/series/data-structures-succinctly-part-1--cms-551>
8. <https://www.geeksforgeeks.org/data-structures/>
9. <https://visualgo.net/en>

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
25CA102005	PYTHON PROGRAMMING	3	-	2	-	4
Pre-Requisite	PROGRAMMING FOR PROBLEM SOLVING					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on Basics of Python programming, Control structures, Sequences, Sets, Dictionaries, Regular expressions, Functions, File handling, Object-oriented programming, Exception handling.

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

- CO1.** Demonstrate knowledge on Python constructs, sequences, sets and dictionaries to solve basic computational problems.
- CO2.** Apply the concepts of regular expressions for searching patterns in strings.
- CO3.** Develop and use Python modules to provide solutions to problems.
- CO4.** Apply the knowledge of file operations in Python for file processing.
- CO5.** Design applications using object-oriented programming features – encapsulation, inheritance, polymorphism and exception handling.
- CO6.** Work independently to solve problems with effective communication.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	3	-	-	-	-	-	-	-	3	-	-
CO2	3	2	-	-	3	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	3	3	-	-	-	-	-	-	-	3	-	-
CO4	3	2	2	2	3	-	-	-	-	-	-	-	3	-	-
CO5	3	3	3	3	3	-	-	-	-	-	-	-	3	-	-
CO6	-	-	-	-	-	-	-	3	3	-	-	-		-	-
Course Correlation Mapping	3	3	2	2	3	-	-	3	3	-	-	-	3	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO PYTHON PROGRAMMING (07 Periods)

Introduction to Python, Tokens, Variables, Literals, Identifiers, Keywords, Special symbols, Operators, Fundamental datatypes, Expressions, Type conversions, Handling Input and output in Python.

Module 2: CONTROL STRUCTURES (08 Periods)

Selection Statements: if statement, if-else statement, if-elif-else statement, nested-if statement.

Iterative Statements: while loop, for loop, break statement, continue statement, pass and else statements used with loops.

Module 3: SEQUENCES, SETS, DICTIONARIES AND REGULAR EXPRESSIONS (11 Periods)

Sequences: Lists and operations – Creating, Inserting elements, Updating elements, Deleting elements, Searching and sorting, List comprehensions, Nested lists; Tuples – Creating, Searching and sorting, Nested tuples; Strings – Initializing a string and string operations, String handling methods.

Dictionaries: Operations on dictionaries, Dictionary methods

Regular Expressions: Regular expressions, Sequence characters in regular expressions, Special characters in regular expressions.

Module 4: FUNCTIONS AND FILE HANDLING (09 Periods)

Functions: Need for functions, Function definition, Function call, Variable scope and lifetime, Return statement, Positional arguments, Keyword arguments, Default arguments and variable length arguments, Recursive functions, Lambda functions, Generators.

File Handling: Types of files, Opening and closing files, Reading and writing data.

Module 5: OBJECT ORIENTED PROGRAMMING AND EXCEPTION HANDLING (10 Periods)

Object Oriented Programming: Introduction to object-oriented programming, Classes and objects, Inheritance and polymorphism, Abstract Classes and interfaces.

Exception Handling: Errors in a python program, Exceptions, Exception handling, Types of exceptions, Except block, Assert statement, User defined exceptions.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Design a python script to perform the various computations for the amount payable by the customer for Challenger Computers Store. A customer buying two numbers of SSD device, one SSD device cost is Rs. 3575/-. The stores offer 15% of the total cost. The customer has to pay 9% CGST, and 9% SGST. Prepare the Net Amount to be payable by the customer.
2. Design a python script to compute and generate the electricity bill as per the following slab rates. Collect the meter reading inputs, such as current unit and previous unit.

Consumption Units	Rate (in Rupees/Unit)
0-200	CO-PO
201-250	4.5
251-300	5.2
301-400	6.5
Above 400	7.0

3. Design a python script to display the sum of numbers divisible by 4. The code must allow the user to accept a number and add it to the sum if it is divisible by 4. It should repeatedly accepting numbers as long as the user wants to provide an input using an appropriate iterative statement and should display the final sum.
4. Food Corner home delivers vegetarian and non-vegetarian combos to its customer based on order. A vegetarian combo costs Rs.120 per plate and a non-vegetarian combo costs Rs.150 per plate. Their non-veg combo is really famous that they get more orders for their non-vegetarian combo than the vegetarian combo. Apart from the cost per plate of food, customers are also charged for home delivery based on the distance in kms from the restaurant to the delivery point. The delivery charges are as mentioned below:

Distance in kms	Delivery charge in Rs per km
For first 3kms	0
For next 3kms	3
For the remaining	6

5. Given the type of food, quantity (no. of plates) and the distance in kms from the restaurant to the delivery point, write a python program to calculate the final bill amount to be paid by a customer. The below information must be used to check the validity of the data provided by the customer.
 - Type of food must be 'V' for vegetarian and 'N' for non-vegetarian.
 - Distance in kms must be greater than 0.
 - Quantity ordered should be minimum 1.
 - If any of the input is invalid, bill amount should be considered as -1.
6. a) A list has the AP City Names [Tirupati, Kurnool, Kadapa]. Design a python script and perform the operations like, add 3 more AP City names Chittoor, Nellore, Guntur, insert Hyderabad in 3rd position, delete any two city names, update all city names as in Uppercase. Displays the list data, whenever an operation completes.
- b) Design a python script for given an integer tuple, for each element in the tuple, check whether there exists a smaller element on the next immediate position of the tuple. If it exists print the smaller element. If there is no smaller element on the immediate next to the element then print -1.

Example: Input: 4 2 1 5 3 Output: 2 1 -1 3 -1

7. a) Sets n1 has the data {1, 3, 5, 7, 9}, n2 has the data {9, 5, 6, 8}, wd1=set(["Mon", "Tue", "Wed", "Thu", "Fri", "Sat", "Sun"]),
wd2=set(["Mon", "Tue", "Wed"]).

Design a python script to perform intersection, difference, and symmetric difference operations on the sets n1 and n2, and to perform superset, and subset operations on the sets wd1, and wd2.

- b) The dictionary city_pin has the data {'Tirupati': 517101, 'Hyderabad': 500002, 'Chittoor': 517001, 'Nellore': 524001}. Design a python script using lambda function to sort the dictionary on city name and produce the output and sort the dictionary on pincode and produce the output.
- c) The string has the data, Wel_str = "Welcome to AI ML DS". Design a python script to search the pattern "AI" using regular expression search and display the three location numbers of the pattern. First shows the pattern starts location, second shows the pattern end location, and the last shows pattern span locations.
8. a) Design a python script for the mathematical puzzle, Towers of Hanoi. The puzzle has three rods and n disks. To move the entire stack to another rod, obeying the three rules (i) Only one disk can be moved at a time, (ii) Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack i.e., a disk can only be moved if it is the uppermost disk on a stack, (iii) No disk may be placed on top of a smaller disk.
- b) Design a python script to display the numbers that do not appear in the Fibonacci series of n numbers where n is given by the user. (If n is 8 then up to 8 Fibonacci numbers has to be printed Ex: 1 1 2 3 5 8 13 21 and in this series missing numbers should be traced and printed, Ex: missing numbers are: 4 6 7 9 10 11 12 14 15 16 17 18 19).
9. a) Design a function Learner_Age_Days with two formal parameters name, age and it computes Learner's age in days, then displays learners name and age in days.
- (i) Design a driver code to call the function using positional arguments, keyword arguments
- (ii) Apply the necessary changes in Learner_Age_Days function, and design a driver code to call the function using default arguments.
- b) Design a python script using lambda and filter functions to construct an odd numbers list from numbers 1 to 10, and construct a negative numbers list from range of numbers -7 to 7 and to find the biggest number from a numbers list.
10. a) Design a python script to create a new file Collect_Literals_Python.txt, collect the data from the keyboard about the contents of collection literals list, tuple, sets, dictionaries details, then write all the data into that file, and then close that file. Afterwards Open the Collect_Literals_Python.txt file in read mode, read the entire contents of the file Collect_Literals_Python.txt, then display all the contents of that file in monitor.
- b) The file feat_python1.txt has the contents of features of the Python programming language. Design a python script to open that file feat_python1.txt in read mode, open the new file in feat_python2.txt in write mode, then read entire contents of the file feat_python1.txt, then copy all the contents of that file into the new file feat_python2.txt

10. a) Construct a Python script to implement the below requirements. Create a base class Basic_Info with data members name, rollno, gender and two member functions getdata () and display(). Derive a class Physical_Fit from Basic_Info which has data members height and weight and member functions getdata () and display(). Display all the information using object of derived class. Design a Python script to implement the below specifications, compute, and produce required output. Define a class REPORT with the following specification

Private members

Admno :4-digit admission number Name : 20 characters
Marks :A list of 5 floating point values Average : average marks obtained
GETAVG () a function to compute the average obtained in five subjects.

Public members

READINFO () function to accept values for Adno, Name, Marks. Invoke the function GETAVG ().

DISPLAYINFO () function to display all data members of report on the screen. You should give function definitions. Write driver code to demonstrate all the functions.

11. 1. The below scenarios will create Logical Error/Exception, and it will forcibly stop the execution in middle of the program. Design a Python Script to handle these operations exceptions effectively, and avoid to stop the script execution in the middle.
- i. The variable num has the data 100, the value of num dividing by the value 0.
 - ii. To importing a library file matheqn, this library file not available in Python.
 - iii. A num_List has the values[10,20,30].To print the fifth value of num_List[5]
 - iv. A dictionary has the data, Dict_Univ = {'1':"MBU", '2':"Tirupathi", '3':"CSE"}. to print the fifth key value Dict_Univ[5]
2. Design a python script to collect the 10 students Python course mark. Check that entered mark is negative, then throw a user defined exception called Negative, otherwise store into the mark in the List Python_mark[].

RESOURCES

TEXT BOOKS:

1. R. Nageswara Rao, Core Python Programming, 3rd Edition, Dreamtech Press, 2021.
2. Paul J. Deitel, Harvey Deitel, Python for Programmers with Big Data and Artificial Intelligence Case Studies, Pearson, 2019.

REFERENCE BOOKS:

1. Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem Solving Focus, Wiley India, 2016.
2. Christian Hil, Learning Scientific Programming with Python, 2nd Edition, Cambridge University Press, 2020.

SOFTWARE/TOOLS:

1. Python 3.10
2. Jupyter Notebook/JupyterLab/IDLE/Google CoLab

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc19_cs41/preview
2. <https://www.coursera.org/specializations/python>
3. <https://www.coursera.org/learn/python-for-applied-data-science-ai>
4. <https://www.youtube.com/watch?v=WGJJlrtfnfk>
5. https://www.youtube.com/watch?v=_uQrJ0TkZlc
6. <https://www.udemy.com/topic/python/>
7. <https://freevideolectures.com/course/2512/python-programming>

WEB RESOURCES:

1. <https://www.w3schools.com/python/>
2. <https://www.programiz.com/python-programming>
3. <https://www.geeksforgeeks.org/python-programming-language/>
4. <https://www.learnpython.org/>
5. <https://www.javatpoint.com/python-lists>

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
25CA104001	OBJECT ORIENTED PROGRAMMING THROUGH C++	3	-	2	4	5
Pre-Requisite	PROGRAMMING FOR PROBLEM SOLVING					
Anti-Requisite						
Co-Requisite						

COURSE DESCRIPTION: This course provides a detailed discussion on basic characteristics of Object Oriented Programming through C++. It covers basic Object Oriented Programming paradigms like Classes and Objects in custom application development. The OOP concepts types of overloading and inheritance are also covered. It provides hands-on experience in implementation of OOP features and other programming concepts like handling pointers, file and exceptions.

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

- CO1.** Demonstrate the concepts of Object oriented programming.
- CO2.** Apply function and operator overloading techniques for code optimization.
- CO3.** Apply inheritance and virtual functions to implement dynamic binding.
- CO4.** Develop robust applications using exception handling mechanism and file I/O.
- CO5.** Develop reliable applications to solve real world problems using Object oriented programming constructs.
- CO6.** Work independently or in team to solve problems with effective communication.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-	3
CO2	3	2	2	3	2	-	-	-	-	-	-	-	3	-	3
CO3	3	2	2	3	2	-	-	-	-	-	-	-	3	-	3
CO4	3	2	3	3	2	-	1	-	-	-	-	-	3	-	3
CO5	3	2	3	3	2	-	1	-	-	-	-	-	3	-	3
CO6	-	-	-	-	-	-	-	-	3	3	-	-	3	-	3
Course Correlation Mapping	3	2	3	3	2	-	1	-	3	3	-	-	3	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: C++ FUNDAMENTALS

(10 Periods)

Need of Object-Oriented Programming - Comparison of procedural programming and Object-Oriented Programming - Characteristics of Object-Oriented Languages - C++ Programming Basics: Basic Program Construction - Data Types, Variables, Constants - Type Conversion, Operators, Library Functions - Loops and Decisions, Structures - Functions : Simple Functions, Passing arguments, Returning values, Reference Arguments. - Recursion, Inline Functions, Default Arguments - Storage Classes - Arrays, Strings.

Module 2: OOP FUNDAMENTALS

(09 Periods)

Classes and Objects: Classes, Friend functions, Friend classes, Inline functions, Parameterized constructors, Static Class Members, The Scope resolution operator, nested and local classes, Passing Objects to functions, returning objects, object assignment. Arrays, Pointers, References: Array of Objects, Pointers to objects, the This pointer.

Module 3: FUNCTION AND OPERATOR OVERLOADING

(09 Periods)

Function Overloading: Copy Constructors, and Default Arguments: Function Overloading, Overloading Constructors, Copy constructors, Default Function Arguments.

Operator Overloading: Creating a member operator function, operator overloading using a friend function, overloading new and delete, overloading some special operators, and comma operator.

Module 4: INHERITANCE AND VIRTUAL FUNCTIONS

(09 Periods)

Inheritance: Base Class Access Control, Inheritance and protected members, inheriting multiple base classes, constructors, destructors, and inheritance, granting access, virtual base classes.

Virtual Functions: Pointers to objects, Pointers to derived classes, Virtual Functions, Pure Virtual Functions.

Module 5: FILE I/O AND EXCEPTIONS

(08 Periods)

Files: File Pointers - Error handling in File I/O - File I/O with member Functions - Overloading the extraction and Insertion Operators - Multi File Programs

Exceptions: Need of Exceptions, keywords, Simple and Multiple Exceptions - Re-throwing Exception and Exception Specifications, Custom Exception

Total Periods: 45

EXPERIENTIAL LEARNING

1.
 - a. Write a C++ program to identify appropriate data types and variables to find the size of various datatypes. Display the variables along with their size.
 - b. Write a C++ program to take name, address as character array, age as int, salary as float and contains inline functions to set the values and display it.
2.
 - a. Write a C++ program to display names, roll no and grades of 3 students who have appeared in examination. Declare the class of name, roll no and grade. Create an array of class objects, read and display the contents of array.
 - b. Create a class TIME with members hours, minutes, seconds. Take input, add two time objects passing objects to function and display the resultant time in hours, minutes & seconds.
3. Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members. Write a C++ program to read the data of N employee and compute Net salary of each employee (DA=52% of Basic and Income Tax (IT) =30% of the gross salary).

POLYMORPHISM

4.
 - a. Create a base class basic_info with data members name, roll no, sex and two member functions getdata and display. Derive a class physical_fit from basic_info which has data members height and weight and member functions getdata and display. Display all the information using object of derived class.
 - b. Consider two complex number in the form $a+bi$ and $c+dj$, Write a program overload binary + operator to perform addition of the complex numbers.

INHERITANCE

5.
 - a. Write a C++ Program to calculate the area and perimeter of rectangles using concept of Hierarchical inheritance. Area class is derived from base class Rectangle. Perimeter class is also derived from base class Rectangle.
 - b. Write a C++ program to create Employee and Student inheriting from Person using Hierarchical Inheritance. The Person class should contain the common attributes of Employee and Student class.
6. Design three classes STUDENT, EXAM and RESULT. The STUDENT class has data members such as rollno, name. Create a class EXAM by inheriting the STUDENT class. The EXAM class adds data members representing the marks scored in six subjects. Derive the RESULT from the EXAM class and has its own data members such as total marks. Write a C++ program to model this relationship.
7. Create a base class called SHAPE. Use this class to store two double type values. Derive two specific classes called TRIANGLE and RECTANGLE from the base class. Add to the base class, a member function getdata() to initialize base class data members and another member function display to compute and display the area of figures. Make

display a virtual function and redefine this function in the derived classes to suit their requirements. Using these three classes design a program that will accept driven of a TRIANGLE or RECTANGLE interactively and display the area.

FILE I/O

8.
 - a. Write a C++ program named store_temps.cpp that creates a file named raw_temps.txt with temperature data. Fill the file with at least 50 temperature readings.
 - b. Assuming that a text file named FIRST.TXT contains some text written into it, write a function named copyupper() in C++, that reads the file FIRST.TXT and creates a new file named SECOND.TXT contains all words from the file FIRST.TXT in uppercase.
9. Write a C++ program that accepts two file names and produces a new file that is the contents of the first file followed by the contents of the second; that is, the program concatenates the two files.

EXCEPTION HANDLING

10. Add an exception handler (try/catch/throw) to the class that throws an error message (e.g. "value out of range") in the getValue function that is caught and handled in the main program. Implement two version of the program. In version1, throw the error in getValue, catch the error in the main, display an error message in the main, and then allow the program to terminate. In the second version, perform the same basic actions (throw and catch) but keep re-invoking the getValue function from the main program until the user enters a valid value.

PROJECT BASED LEARNING:

11. Faculty shall provide Projects relevant to the contents of the course.

Sample Projects:

Bookshop inventory system

The project is to build the bookshop inventory system in C++ that helps to keep track of all the book records in a shop. Below are the features to be implemented:

- Add new book and the details of the book are:
 - Book ID
 - Name of book
 - Name of Author
 - Number of books
- Delete a book
- Update an existing book detail
- Display summary of all the books
- Search a book

12. **Online Examination Management System**

The project is to build the online examination management system in C++ that helps to conduct online proctored examinations. Below are the features to be implemented:

- Add New Students
- Student Login

- Registration for examination
- Attempting the questions
- Faculty Login
 - Uploading the questions
- Proctor Login
 - Online monitoring of students
- Admin View
 - Consolidation of marks
 - Release of results

RESOURCES

TEXT BOOKS:

1. Herbert Schildt, "C++ - The Complete Reference", 4th edition, Tata McGraw Hill, 2018.
2. E.Balaguruswamy "Object Oriented Programming with C++", 6th edition, Tata McGraw Hill Education, 2015.

REFERENCE BOOKS:

1. Cohoon and Davidson, "C++ Program Design: An introduction to Programming and object – Oriented Design", 3rd Edition, Tata McGraw Hill, 2003.
2. Robert Lafore, "Object-Oriented Programming in C++", 4th edition, Pearson Education, 2008.
3. Walter Savitch, "Problem Solving with C++", 9th edition, Pearson Education, 2015.

SOFTWARE/TOOLS:

1. Software: Dev C++

VIDEO LECTURES:

1. <https://www.coursera.org/learn/c-plus-plus-a#syllabus>
2. <https://www.udemy.com/free-learn-c-tutorial-beginners/>
3. https://onlinecourses.nptel.ac.in/noc21_cs02/preview

WEB RESOURCES:

1. <http://www.cplusplus.com/files/tutorial.pdf>
2. <http://mazonka.com/shared/Strastrup4th.pdf>

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
25CA102006	JAVA PROGRAMMING	3	-	2	-	4
Pre-Requisite	Object Oriented Programming with C++					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION

Representation of Java Classes and methods; Inheritance and Polymorphism using Java, Creation of Packages and Interfaces; Implementation of Utility Classes and Input/output; Exception handling mechanism and multithreading; Event handling techniques and GUI applications by using AWT.

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

- CO1.** Understand the basic concepts of classes, objects, methods of JAVA Programming to build Java applications.
- CO2.** Analyze inheritance and polymorphism to solve real world problems.
- CO3.** Design and develop GUI Applications using AWT.
- CO4.** Apply utility classes, Java collections, exception handling and multithreading concepts to develop real time applications.
- CO5.** Work together to customize the real world applications. Communicate effectively about complex computing activities by writing documentation.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	1	2	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	1	2	2	3	3	-	-	-	-	-	2	-	-	-	3
CO5	-	-	-	-	-	-	2	-	-	-	2	-	3	-	-
Course Correlation Mapping	3	2	2	3	3	-	2	-	-	-	2	-	2	2	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: JAVA BASICS, OPERATORS, OBJECT AND CLASS CONCEPT (09 Periods)

Java Basics : JAVA environment, JAVA program structure, Tokens, Statements, JVM, Constant and Variables, Data Types, Declaration of variables, Scope of variables, Symbolic constants, Type Casting.

Operators: Arithmetic, Relational, Logical assignments, Increment and Decrement, Conditional, Bitwise, Special, Expressions and its evaluation.

Object and Class Concept: Defining a Class, Adding variables and Methods to classes, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, and Nesting of Methods.

Module 2: INHERITANCE, ARRAYS AND INTERFACE (09 Periods)

Inheritance: Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalize Methods, Abstract Methods and Classes, Visibility Control.

Arrays: One Dimensional and Two Dimensional, Strings, Vectors, Wrapper Classes.

Interface: Defining Interface, Extending Interface, Implementing Interface, Accessing Interface Variable.

Module 3: EXCEPTION HANDLING , THREADS AND .PACKAGES (09 Periods)

Exception Handling: Concepts of Exceptions, Types of Exception, Try and Catch keyword, Nested Try and Catch.

Threads: Creating Threads, Extending Threads Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization.

Packages: System Packages, Using System Package, Adding a Class to a Package, Hiding Classes.

Module 4: UTILITY CLASSES AND INPUT/OUTPUT (09 Periods)

Utility Classes: Introduction to Java Collections, Overview of Java Collection Frame Work, Commonly used Collection Classes: Hash Set, Linked Hash Set, Linked List, Stack, Array List, Vector, Hash table;

Input/output: Introduction, Concept of Streams, Stream Classes, Byte Stream Classes, Character Stream Classes, Using Streams, Other Useful I/O Classes, Using the File Class, Input / Output Exceptions, Creation of Files, Reading / Writing Characters, Reading / Writing Bytes.

Module 5: EVENT HANDLING AND GUI PROGRAMMING WITH JAVA (09 Periods)

Event Handling: Delegation Event Model, Event Classes, Sources of Events, Event Listener Interfaces.

GUI Programming with Java: Graphics Programming, Input/Output: Graphics programming: Introduction, The Graphics Class, Lines and rectangles, circles, and Ellipses, Drawing Arcs, Drawing Polygons, Lines Graphs, Using Control Loops in Applets, Drawing Bar Charts.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Write a Java program that prints all real solutions to the quadratic equation $ax^2 + bx + c = 0$. Read in a , b , c and use the quadratic formula. If the discriminant $b^2 - 4ac$ is negative, display a message stating that there are no real solutions.
2. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.
3. Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use StringTokenizer class of java.util)
4. Write a Java program to illustrate method overloading.
5.
 - Write a Java program to implement the matrix ADT using a class. The operations supported by this ADT are:
 - a) Reading a matrix.
 - b) Printing a matrix.
 - c) Addition of matrices.
 - d) Subtraction of matrices.
 - e) Multiplication of matrices.
6. Write a Java program that uses functions to perform the following operations:
 - a. Inserting a sub-string in to the given main string from a given position.
 - b. Deleting n characters from a given position in a given string.
7. Write a Java program that illustrates the following:
 - a) Creation of simple package.
 - b) Accessing a package.
8. Write a Java program that illustrates the following:
 - a) Handling predefined exceptions
 - b) Handling user defined exceptions
9. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
10. Write a java program to demonstrate various GUI components in java (AWT) with appropriate Event Handling.
11. Develop an applet in Java that displays a simple message.
12. Write a Java program that works as a simple calculator. Use a grid layout to arrange Buttons for the digits and for the $+$, $-$, $*$, $/$ operations. Add a text field to display the result.

RESOURCES

TEXT BOOKS:

1. Herbert Schildt, "The Complete Reference Java", Tata McGraw-Hill, 7th Edition, 2007.

REFERENCE BOOKS:

1. B. Eswar Reddy, T. V. Suresh Kumar and P. Ragavan, "Object Oriented Programming with Java," Pearson Sanguine Publications, 2nd Edition, 2011.
2. H. M. Dietel and P. J. Dietel, "Java How to Program," Pearson Education/ PHI, 5th Edition, 2009.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/106105191>
2. <https://www.udemy.com/course/java-tutorial/>
3. <https://www.udemy.com/course/java-the-complete-java-developer-course/>
4. <https://www.udemy.com/course/the-complete-java-development-bootcamp/>

WEB RESOURCES:

1. https://www.tutorialspoint.com/java/java_tutorial.pdf
2. <https://www.iitk.ac.in/esc101/share/downloads/javanotes5.pdf>
3. <https://book.huihoo.com/goalkicker.com/JavaBook/JavaNotesForProfessionals.pdf>

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
25CA102007	COMPUTER GRAPHICS	3	-	2	-	4
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION : Basics of Graphics; Graphical User Interfaces; Three Dimensional Viewing Devices; Virtual Reality systems; Raster-Scan Systems; Random-Scan System; 2-D transformations; 3-D transformations; Graphics Programming.

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

- CO1.** Understand the fundamentals of animation, graphic design and its related technologies to develop the applications.
- CO2.** Analyze the importance of viewing and projections to create user friendly applications.
- CO3.** Design and develop applications related to Computer Graphics using OpenGL.
- CO4.** Apply algorithms to scan, convert the basic geometrical primitives, transformations and clipping.
- CO5.** Work independently or in teams to solve problems with effective Communication.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	1	2	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	1	2	2	3	3	-	-	-	-	-	2	-	-	-	3
CO5	-	-	-	-	-	-	2	-	-	-	2	-	3	-	-
Course Correlation Mapping	3	3	2	3	3	-	2	-	-	-	1	-	2	2	3

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: INTRODUCTION

(07 Periods)

Applications of Graphics: CAD, Presentation Graphics, Computer Art, Entertainment, Education and Training, Visualization, Image Processing.

Module 2: GRAPHICAL USER INTERFACE

(07 Periods)

Overview of Graphics Systems: CRT, Flat Panel Displays, Three-Dimensional Viewing Devices, Virtual Reality systems, Raster-Scan Systems, Random-Scan Systems.

Module 3: INTERACTIVE INPUT DEVICES AND COMPUTER GRAPHICS ALGORITHM

(09 Periods)

Input Devices: Keyboards, Mouse, Data Glove, Digitizers, Touch Panels; Hard Copy Devices: Printers, Plotters.

Output Primitives: Bresenham's Line Algorithm, Midpoint Circle Algorithm; Filled Area Primitives: Boundary-Fill Algorithm, Flood-Fill Algorithm; Character Generation; Homogeneous Coordinates.

Module 4: TWO DIMENSIONAL AND THREE-DIMENSIONAL TRANSFORMATIONS

(12 Periods)

Two Dimensional Geometric Transformations; Translation, Rotation, Scaling, Reflection, Shear;

Two-Dimensional Viewing: Cohen Sutherland Line Clipping Three Dimensional Geometric Transformations; Translation, Rotation, Scaling, Reflection, Shear;

Three-Dimensional Viewing: Projections, Parallel Projections, Perspective Projections, View Volumes and General Projection Transformations.

Module 5: GRAPHICS PROGRAMMING

(10 Periods)

Graphics Programming: OpenGL, Command Syntax, Drawing and filling images, patterns, Filling regular and irregular shapes, Outputting Text, Justifying Text, Animation. Drawing with mouse, Building mouse cursors, freehand drawing using mouse, menus using mouse.

Total Periods:45

EXPERIENTIAL LEARNING

1. Write a program for 2D line drawing as Raster Graphics Display.
2. Write a program for display basic 2D geometric primitives.
3. Write a program to display a filled square.
4. Write a program to display a series of concentric circle sofvaryingradius.
5. Write a program for line draw in gas Raster Graphics Display.
6. Write a program for circle drawing as Raster Graphics Display.
7. Write a program to draw a line using Bresenham line drawing algorithm
8. Write a program to draw a circle using Midpoint algorithm. Modify the same for drawing an arc and sector.
9. Write a program to rotate a point about origin.
10. Write a program to rotate a triangle about origin.

RESOURCES

TEXT BOOKS:

1. D.Hearn,M.P.Baker, "ComputerGraphics C Version," Pearson Education, 2nd Edition.
2. Donald Hearn & M. Pauline Baker, "Computer Graphics with OpenGL", Pearson Education, 4th Edition, 2018.
3. M.Woo, J.Neider, T.Davis, D.Shreiner, "OpenGL ProgrammingGuide," 3rd Edition, Pearson Education.

REFERENCE BOOKS:

1. Edward Angel – "Interactive Computer Graphics – A Top-down Approach using OpenGL", Pearson Education, 5th Edition, 2000
2. Foley, J. D., A. V. Dam, S. K. Feiner, J. F. Hughes, "Computer Graphics Principle and Practices," Addison Wesley Longman, Singapore Pvt. Ltd.,
3. Robert R & Snow D "Flash CS4 Professional Bible," Wiley Publishing.
4. A.V. Dan, F.H. Jones, J.D. Foley, S.K. Feiner, "Computer Graphics Principles & Practices in C", 2nd Edition, Pearson.
5. D. F. Rogers, "Procedural Elements for Computer Graphics", McGraw Hill.
6. D. F. Rogers, & J. A. Adams, "Mathematical Elements for Computer Graphics", 2nd Edition, McGraw Hill.

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc20_cs90/preview
2. <https://digimat.in/nptel/courses/video/106106090/L01.html>
3. <https://www.youtube.com/watch?v=6LjVtIcSbK8>
4. http://www.cse.iitm.ac.in/~vplab/computer_graphics.html

WEB RESOURCES:

1. <https://www.geektonight.com/computer-graphics-notes/>
2. <https://www.dgp.toronto.edu/~hertzman/418notes.pdf>

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
25CA102008	DATA ANALYTICS	3	-	2	-	4
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION:

This course provides a detailed discussion and understanding the need of Big Data Analytics, challenges and different analytical architectures, Installation and understanding of Hadoop Architecture and its ecosystems, Processing of Big Data with Advanced architectures.

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

- CO1.** Ability to explain the foundations, definitions, and challenges of Big Data and various Analytical tools.
- CO2.** Access and Process Data on Hadoop Distributed File System
- CO3.** Manage Job Execution in Hadoop Environment
- CO4.** Ability to understand the importance of Big Data in Social Media and Mining
- CO5.** Analyze the value from the Data

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	-	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	3	-	-	-	-	-	3	3	3	3	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	1	3	1	-	1	-	-	1	3	3	3	3
CO5	3	3	3	3	3	3	-	3	-	-	3	3	3	3	-
Course Correlation Mapping	3	3	3	3	2	1	-	1	-	-	2	2	3	3	2

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO BIG DATA ANALYTICS (09 Periods)

Overview of Big Data Analytics, Data Science, Big Data Characteristics, Architecture of Big Data Systems, Advantages of Big Data and Challenges faced by Big Data Systems.

Module 2: BIG DATA TECHNOLOGIES (09 Periods)

Hadoop's Parallel World – Data discovery – Open source technology for Big Data Analytics – cloud and Big Data – Predictive Analytics – Mobile Business Intelligence and Big Data

Module 3: HADOOP (09 Periods)

Big Data – Apache Hadoop & Hadoop Eco System – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce – Data Serialization.

Module 4: HADOOP ARCHITECTURE (09 Periods)

Hadoop: RDBMS Vs Hadoop, Hadoop Overview, Hadoop distributors, HDFS, HDFS Daemons, Anatomy of File Write and Read., Name Node, Secondary Name Node, and Data Node

Module 5: HDFS and MAP REDUCE FRAMEWORK (09 Periods)

HDFS Architecture, Hadoop Configuration, Map Reduce Framework

Total Periods: 45

EXPERIENTIAL LEARNING

1. Perform setting up and Installing Hadoop in its standalone operating mode
2. Perform setting up and Installing Hadoop in its Pseudo and Fully Distributed operating mode
3. By Using web-based tools to monitor the Hadoop Setup.
4. Perform Hadoop Commands
5. Implement the File Management task by adding the files and directories in Hadoop
6. Implement the Retrieving file task in Hadoop
7. Implement the Removing file task in Hadoop.

RESOURCES

TEXT BOOKS:

1. Big Data Analytics by G Sudha Sadasivam and R. Thirumahal, Oxford Higher Edition.
2. Big Data Analytics, Seema Acharya, Subhasini Chellappan, Wiley 2015.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O'Reilly Media, 2012.

REFERENCE BOOKS:

1. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.
2. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013)

SOFTWARE/TOOLS:

1. Hadoop (<https://hadoop.apache.org/releases.html>)
2. Cassandra (<http://cassandra.apache.org/download/>)

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2. <https://www.upgrad.com/data-science/pg-programme>
3. <https://www.youtube.com/watch?v=CaqJ65CIoMw>

WEB RESOURCES:

1. Big Data Analytics Tutorial (tutorialspoint.com)
2. hackerrank-solutions · GitHub Topics · GitHub
3. What is Big Data - javatpoint
4. What is Big Data? - GeeksforGeeks

PROGRAM CORE

Course Code	Course Title	L	T	P	C
25CA101005	FUNDAMENTALS OF DATA SCIENCE	2	-	-	2
Pre-Requisite	-				
Anti-Requisite	-				
Co-Requisite	-				

COURSE DESCRIPTION: Basic Terminologies of data science, Computation using NumPy, Data exploration using Pandas, Data transformation, Data wrangling, Plotting and visualization using Matplotlib, Data aggregation, Time series analysis.

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

- CO1.** Demonstrate knowledge on the concepts of data science to perform mathematical computations using efficient storage and data handling methods in NumPy.
- CO2.** Apply Data Preparation and Exploration methods using Pandas to perform data manipulation.
- CO3.** Create data visualization using charts, plots and histograms to identify trends, patterns and outliers in data using Matplotlib and Seaborn.
- CO4.** Develop methods to analyze and interpret time series data to extract meaningful statistics.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	3	-	-	-	-	-	-	-	-	3	-
CO2	3	3	2	2	3	-	-	-	-	-	-	-	-	3	-
CO3	3	3	2	3	3	-	-	-	-	-	-	-	-	3	-
CO4	3	3	2	3	3	-	-	-	-	-	-	-	-	3	-
Course Correlation Mapping	3	3	2	2	3	-	-	-	-	-	-	-	-	3	-

Correlation Level: 3-High; 2-Medium; 1-Low

DETAILED SYLLABUS:

Module 1: INTRODUCTION TO DATA SCIENCE

(06 Periods)

Basic terminologies of data science, Types of data, Five steps of data science, Arrays and vectorized computation using NumPy - The NumPy and array: A multidimensional array object, Universal functions: Fast element-wise Array functions, Array-oriented Programming with arrays, File input and output with arrays, Linear algebra, pseudorandom number generation.

Module 2: DATA EXPLORATION WITH PANDAS

(06 Periods)

Process of exploring data, Pandas data structures – Series, Data frame, Index objects; Essential functionality, Summarizing and computing descriptive statistics - Correlation and covariance, Unique values, Value counts and membership; Data loading, Storage, and file formats - Reading and writing data in text format , Binary data formats , Interacting with web APIs, Interacting with databases.

Module 3: DATA CLEANING, PREPARATION AND DATA WRANGLING

(06 Periods)

Handling missing data, Data transformation, String manipulation - String object methods, Regular expressions, Vectorized string functions in Pandas; Data wrangling: join, Combine and reshape - Hierarchical indexing, Combining and merging datasets, Reshaping and pivoting.

Module 4: DATA VISUALIZATION WITH MATPLOTLIB

(06 Periods)

Plotting and visualization- A brief matplotlib API primer, Plotting with Pandas and Seaborn, Other python visualization tools; Data aggregation and Group operations- Group By mechanics, Data aggregation, Apply: General split-apply-combine, Pivot tables and Cross-tabulation.

Module 5: TIME SERIES ANALYSIS

(06 Periods)

Date and time data types and tools, Time series basics, Date ranges, Frequencies, and shifting. Time zone handling, Periods and period arithmetic, Resampling and frequency Conversion – Down sampling, up sampling and interpolation, Resampling with periods; Moving window functions.

Total Periods:30

EXPERIENTIAL LEARNING

1. An illustrative application of utilizing and array operations in the simulation of random walks
2. Explain about Integer Indexing and Panel Data using pandas

RESOURCES

TEXT BOOKS:

1. Wes McKinney, Python for Data Analysis, O'Reilly, 2nd Edition, 2017.

REFERENCE BOOKS:

1. Sinan Ozdemir, Principles of Data Science, Packt Publishers, 2nd Edition, 2018.
2. Rachel Schutt, Cathy O'Neil, Doing Data Science: Straight Talk from the Frontline, O'Reilly, 2014.

VIDEO LECTURES:

1. <https://archive.nptel.ac.in/courses/106/106/106106212/>
2. https://onlinecourses.nptel.ac.in/noc22_cs32/preview

WEB RESOURCES:

1. https://swayam.gov.in/nd1_noc19_cs60/preview
2. <https://towardsdatascience.com/>
3. <https://www.w3schools.com/datascience/>
4. <https://github.com/jakevdp/PythonDataScienceHandbook>

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
25CA101006	SOFTWARE ENGINEERING	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion on concepts of Software Engineering, Software Process Models, Conventional and Agile Process Models, Software Requirements Engineering Process, System Analysis, Architectural Design, User Interface Design and Re-engineering, Software Testing, Risk and Quality Management

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

- CO1.** Demonstrate concepts of software engineering and analyze process models required to develop a software system.
- CO2.** Analyze software requirements and model requirements for the given scenario.
- CO3.** Apply design concepts and metrics for software development.
- CO4.** Apply testing strategies and techniques for quality software.
- CO5.** Analyze risks in software development life cycle and apply risk strategies to mitigate risks.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	-	-	-	3	3	2	-	-	2	-	3	-	-
CO3	2	3	3	2		2	2	-	-	-	3	-	3	-	-
CO4	2	-	-	-	2	3	-	-	-	-	-	-	3	-	-
CO5	2	3	-	-	2	3	-	-	-	-	-	-	3	-	-
Course Correlation Mapping	2	3	2	2	1	3	2	2	-	-	2	-	3	-	-

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: SOFTWARE PRODUCT AND SDLC (11 Periods)

Software Engineering Fundamentals, Definition of Software Products, Phases of Software Development Life Cycle, Software Development Paradigm, Software Life Cycles Models: Build and Fix Model, Waterfall Model, Prototype Model, Iterative Model, Evolutionary Model, Spiral Model.

Module 2: SOFTWARE REQUIREMENT SPECIFICATION (SRS) (07 Periods)

Need for SRS-Requirement process, Problem Analysis using UML (Unified Modelling Language) and Data dictionary, Characteristics of SRS, Components of an SRS. IEEE standard for SRS.

Module 3: SOFTWARE DESIGN PRINCIPLES (09 Periods)

Software Design, Design Process, Design Principles: Abstraction, Refinement, Modularity, Information Hiding, Modular Design: Effective Modular Design and Functional Independence, Cohesion, Coupling, Top down and Bottomup Strategies, Coding: Coding Standard and Guidelines, Testing: Black Box Testing and White Box Testing.

Module 4: SOFTWARE RELIABILITY AND REUSABILITY (08 Periods)

Software reliability metrics , Software reliability Specification , Statistical testing ,Reliability Growth modeling, Fault avoidance & tolerance, Exception handling & defensive programming , Software development with reuse, Software' development for reuse , Generator based reuse, Application System Portability.

CASE TOOLS AND PROJECT MANAGEMENT

Module 5: FUNDAMENTALS: (10 Periods)

Relevance of CASE Tool, Building block for CASE Tools, Integrated Case Tool Environment, Generation of CASE Tool, High End and Low End CASE Tools.

Definition of Project, Project Specification and Parameters, COCOMO model, Principles, of Project Management, Project Management Life Cycle, Program Management Plan: Concept, Elements, Planning Issues, Benefits of Program Management..

Total Periods: 45

EXPERIENTIAL LEARNING

1. Identify Functional and Non-Functional Requirements for:
 - a. Online Ticket Reservation for Railways
 - b. Recruitment Procedure for Software Industry

2. **Online Ticket Reservation for Railways**

Problem Statement: Computer plays an integral part of the day in today's life. It makes the entire job easier and faster, every job is computerized so as the ticket reservation we can book over the online ticket reservation system. During the booking of the ticket reservation passenger has to select origin, date of journey, destination, class of train etc. The reservation counter keeps track of passenger's information. Thus the system will have all the details about the trains and facilities provided by them. There are various trains with the different level of convenience for the passengers. The whole database will be maintained by database administrator. There are varieties of trains where the passengers can select the train according to the convenience for their destination journey. The journey could be within the state or across the India. Each train has the three types of classes i.e. Sleeper class, First class and the AC compartment. Design the application for the above problem description. Model using Visual modelling tools in different views i.e. component view, Deployment view.

3. **Recruitment Procedure for Software Industry**

Problem Statement: In the software industry the recruitment procedure is the basic thing that goes in the hand with the requirement as specified by the technical management team. HR first gives an advertisement in leading Newspapers, Journals, Weeklies and Websites. The job seekers can apply for it through by Post or by e-mail to the company. The technical skill and the experience of the candidates are reviewed and the short listed candidates are called for the interview. There may be different rounds for interview like the written test, technical interview, and HR interview. After the successful completion of all rounds of interview, the selected candidates' names are displayed. Meanwhile HR gives all the details about the salary, working hours, terms and conditions and the retirement benefit to the candidate. Model using Visual modelling tools in different views i.e. Use case view, logical view

RESOURCES

TEXT BOOKS:

1. Roger S. Pressman, "Software Engineering - A Practitioner's Approach," McGraw-Hill International Edition, 8th Edition, 2015.
2. Ian Sommerville, "Software Engineering," Pearson Education, 9th Edition, 2011.

REFERENCE BOOKS:

1. Grady Booch, James Rumbaugh and Ivar Jacobson, "The Unified Modeling Language User Guide," 2nd Edition, Pearson Education, 2000
2. K. K. Aggarwal and Yogesh Singh, "Software Engineering," New Age International Publishers, 3rd Edition, 2007.
3. Shelly Cashman Rosenblatt, "Systems Analysis and Design," Thomson Publications, 6th Edition, 2006.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/106105087/>
2. <https://nptel.ac.in/courses/106105182/>

WEB RESOURCES:

1. Agile Modeling : <https://www.techtarget.com/searchsoftwarequality/definition/agile-software-development>
2. Functional and Non-Functional Requirements:
<https://www.linkedin.com/learning/software-design-developing-effective-requirements/functional-vs-non-functional>

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
25CA101007	USER EXPERIENCE / INTERFACE (UX/UI) DESIGN	2	-	-	-	2

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: User experience (UX), usability and UI design.

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

- C01.** Understand Importance and Characteristics of User interface design
- C02.** Create User Interface Design process AND Business functions
- C03.** Design System menus, navigation schemes
- C04.** Demonstrate screen-based controls and device-based controls
- C05.** Identify prototypes and test plans of user interface

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
C02	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
C03	3	2	3	3	3	-	-	-	-	-	-	-	2	-	3
C04	3	3	3	3	3	-	-	3	-	-	-	-	2	-	3
C05	-	-	-	-	-	-	-	-	3	3	-	3	2	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	3	3	3	-	3	2	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: THE IMPORTANCE OF USER INTERFACE: (06 Periods)

Defining the User Interface, The Importance Of Good Design, The Benefits of Good Design, A Brief History of The Human-Computer Interface-Introduction of The Graphical User Interface, The Blossoming of The World Wide Web, A Brief History of Screen Design

CHARACTERISTICS OF GRAPHICAL AND WEB USER INTERFACES: The Graphical User Interface, The Web User Interface, Principles of User Interface Design.

Module 2: THE USER INTERFACE DESIGN PROCESS: (06 Periods)

Obstacles and Pitfalls in the Development Path, Usability, The Design Team.

KNOW YOUR USER OR CLIENT: Understanding How People Interact with Computers, Important Human Characteristics in Design, Perception, Memory, Sensory Storage, Visual Acuity, Human Considerations in Design-The User's Knowledge and Experience.

Module 3: UNDERSTAND THE BUSINESS FUNCTION: (06 Periods)

Business Definition and Requirements Analysis, Determining Basic Business Functions, Design Standards or Style Guides, System Training and Documentation Needs.

UNDERSTAND THE PRINCIPLES OF GOOD SCREEN DESIGN: Human Considerations In Screen Design, Interface Design Goals, Statistical Graphs

Module 4: DEVELOP SYSTEM MENUS AND NAVIGATION SCHEMES: (06 Periods)

Structures of Menu, Functions Of Menus, Formatting And Phrasing Of Menus, Navigating Menus, Kinds Of Graphical Menus, Window Characteristics, Components Of A Window, Types Of Windows, Window Operations, Web Systems.

Module 5: SELECTING THE PROPER DEVICE-BASED CONTROLS: (06 Periods)

Characteristics of Device-Based Controls, Presentation Controls, Write Clear Text and Messages, Provide Effective Feedback and Guidance and Assistance, Create Meaningful Graphics, Icons And Images.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Plan and conduct a usability test for a specific feature of a digital product.
2. Evaluate the accessibility of an existing website or application. Identify potential accessibility issues and propose design changes to enhance inclusivity.

RESOURCES

TEXT BOOKS:

1. The Essential Guide to User Interface Design, Second Edition, Wilbert O. Galitz, 2002.

REFERENCE BOOKS:

1. User Interface Design, A Software Engineering Perspective, Soren Lauesen.
2. User Interface Design and Evolution, Debbie Stone, Caroline Jarrett, Mark Woodroffe, Shailey Minocha, 2005

VIDEO LECTURES:

1. <https://www.coursera.org/learn/UXdesign>
2. <https://www.edx.org/course/UX-design>
3. <https://www.udemy.com/course/UX>

WEB RESOURCES:

1. <https://www.coursera.org/articles/ui-vs-ux-design>
2. <https://www.simplilearn.com/how-to-become-ui-ux-designer-article>
3. <https://intellipaat.com/blog/ui-ux-design-tutorial/>

PROGRAM core

Course Code	Course Title	L	T	P	S	C
25CA102009	UNIX SHELL PROGRAMMING	2	-	2	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on how to understand and make effective use of Unix utilities and Shell scripting language (bash) to solve Problems and to write Shell programming to automate the shell commands and to develop the skills necessary to write systems programs related to file system and managing process creation and to learn various powerful text editors in Unix/Linux.

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

- CO1.** Develop a deeper understanding of operating systems, their functions and services.
- CO2.** Understanding the basic set of commands and utilities in Linux/UNIX systems.
- CO3.** Learn the Linux/UNIX library functions and system calls.
- CO4.** Effectively use Text editors for shell programs and Shell Scripts.
- CO5.** Describe the work with UNIX utilities and to develop shell scripts.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	-	-	-	-	-	-	-	2	-	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	3	3	-	-	-	-	-	-	-	2	-	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO5	-	-	-	-	-	-	-	-	3	3	-	-	2	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	-	3	3	-	-	2	-	3

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: UNIX ENVIRONMENT

(06 Periods)

The operating system, The UNIX operating system, knowing your system, The UNIX Architecture, features of UNIX, locating commands, internal and external commands, command structure, understanding the man documentation.

Module 2: UNIX COMMANDS

(06 Periods)

Cal, date, echo, printf, bc, script, Email basics, mailx, passwd, who, uname, tty, sty. **The process:** Processbasics, **ps:**Processstatus, mechanism of process creation,internal and external commands, running jobs in background, process states and Zombies, **nice**, killing processes with signals, job control, **cron, time**.

Module 3: FILESYSTEMANDITS ATTRIBUTES

(06 Periods)

Listing file attributes, directory attributes, file owner ship, file permissions, directory permissions, changingfileownership,filesystemandInodes,hardlinks,symboliclinks,locatingfiles, Modification and access time.

Module 4: THEVIEDITOR

(06 Periods)

VI Basics, Input mode-Entering and Replacing text, Saving and Quitting – The ex-mode, Navigation, Editing text, Undoing Last Editing Instructions, Repeating the last command, searching text in the editor, Substitution - search and replace.

Module 5: SHELL SCRIPT

(06 Periods)

Basic types of statements in a shell script, How do you execute a shell script, Examples of simple scripts, Working with script variables, including command- line arguments, Command substitution, Expressions involving variables, Other forms of input to shell variables or commands in a script, Flow-of-control statements

Total Periods: 30

EXPERIENTIAL LEARNING

1. Working with unix commands
2. Working with vi editor
3. Creating document in vi editor
4. Practicing–How to compile and run Cor C++programs
5. Shell programs Basics
6. Shell programs using decision statements, loops, positional variables
7. Shell programs using arrays and strings
8. Shell program applying UNIX commands
9. Shell program with functions
10. Shell program for file operations

RESOURCES

TEXT BOOKS:

1. Sumitabha Das, Your UNIX/LINUX: The Ultimate Guide , Edition 2012,Tata McGraw Hill.
2. Yashwanth Kanitkar, Unix Shell programming, BPB Publications, First Edition.

REFERENCE BOOKS:

1. Andrew Mallett-Mastering Linux Shell Scripting, 2015, PACKT Publisher.
2. Paul Love, Joe Merlino, Craig Zimmerman, Jeremy C. Reed, Paul Weinstein. Beginning Unix, 2015, Wiley Publisher.

SOFTWARE/TOOLS:

1. <https://learn.microsoft.com/en-us/windows/wsl/install>
2. <https://www.geeksforgeeks.org/essential-linuxunix-commands/>

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=k4Ww6gFeF0M>
2. <https://www.youtube.com/watch?v=vLPdBp9vv9Y>
3. <https://www.youtube.com/watch?v=lqYSCSgFefM&list=PL6UwySlcwEYIZGsbXnUxsojD0yeUA67lb>

WEB RESOURCES:

1. <https://www.unixtutorial.org/basic-unix-commands>
2. <https://www.udemy.com/course/bash-shell-scripting-crash-course-for-beginners>
3. <https://www.javatpoint.com/basic-unix-commands>
4. <https://www.geeksforgeeks.org/essential-linuxunix-commands>

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
25CA101008	MACHINE LEARNING	3	-	-	-	3
Pre-Requisite	Data Warehousing and Data Mining					
Anti-Requisite	-					
Co-Requisite	-					

COURSEDESCRIPTION: This course provides a detailed discussion and hands-on experience on Introduction to machine learning, Bayesian concept learning, Supervised learning, Unsupervised learning, Artificial neural networks, Ensemble learning.

COURSEOUTCOMES: After successful completion of this course, the student will be able to:

- CO1.** Analyze the process of machine learning modeling and evaluation to automatically infer a general description for a given learning problem.
- CO2.** Analyze the underlying mathematical models within machine learning algorithms and learning tasks.
- CO3.** Design and implement machine learning solutions for classification, regression, and clustering problems.
- CO4.** Design and implement efficient neural architectures to model patterns for a given learning problem.
- CO5.** Develop intelligent solutions to solve societal problems related to computer vision, information security, healthcare and other areas.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	3	3	-	-	-	-	-	-	-	2	-	3
CO4	3	3	3	3	3	-	-	3	-	-	-	-	2	-	3
CO5	-	-	-	-	-	-	-	-	3	3	-	3	2	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	3	3	3	-	3	2	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT:

Module 1: INTRODUCTION TO MACHINE LEARNING

(09 Periods)

Machine Learning: Human learning, Types of human learning, Machine learning, Types of machine learning, Applications of machine learning, Issues in machine learning. Preparing to Model: Machine learning activities, Types of data, Exploring structure of data, Data quality and remediation.

Module 2: MODELING AND EVALUATION, BAYESIAN CONCEPT

(09 Periods)

LEARNING

Modeling and Evaluation: Selecting a model, Training a model, Model representation and interpretability, Evaluating performance of a model, Improving performance of a model. Feature Engineering: Feature transformation, Feature subset Selection. Bayesian Concept Learning: Introduction, Importance, Bayes' theorem, Bayes' theorem and concept learning, Bayesian belief network.

Module 3: SUPERVISED LEARNING

(10 Periods)

Classification: Classification model, Classification learning steps, K-Nearest Neighbor, Support vector machines, Decision Tree - Decision tree representation, Problems for decision tree learning, Decision tree learning algorithm, Hypothesis space search, Inductive bias in decision tree learning, Issues in decision tree learning. Regression: Introduction, Simple linear regression, Improving accuracy of the linear regression model, Multiple linear regression, Assumptions and problems in regression analysis, Polynomial regression model, Logistic regression.

Module 4: UNSUPERVISED LEARNING

(07 Periods)

Introduction, Unsupervised vs supervised learning, Applications of unsupervised learning, Clustering as a machine learning task, Types of clustering techniques, Partitioning methods, KMedoids, Hierarchical clustering, DBSCAN.

Module 5: ARTIFICIAL NEURAL NETWORKS, ENSEMBLE LEARNING

(10 Periods)

Artificial Neural Networks: Neural network representations, Appropriate problems for neural network learning, Perceptrons, Multilayer networks and Backpropagation algorithm, Convergence and local minima, Representational power of feedforward networks, Hypothesis space search and inductive bias, Hidden layer representations, Generalization, Overfitting, Stopping criterion. Ensemble Learning: Bagging, Boosting, Gradient boosting.

Total Periods:45

EXPERIENTIAL LEARNING

1. Introduction to Python machine learning libraries.
2. Use Naïve Bayes classifier to solve the credit card fraud detection problem.
3. Implement K-Nearest Neighbor algorithm to solve classification problem.
4. Implement CART algorithm for decision tree learning. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. Explore the problem of overfitting in decision tree and develop solution using pruning technique.
5. Perform Exploratory Data Analysis on the given dataset. Implement CART algorithm for decision tree learning. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
6. Train an SVM Classifier with Linear Kernel. Use an appropriate data set for building the SVM Classifier and apply this knowledge to classify a new sample.

7. Build linear regression and multiple regression models to predict the price of the house (Boston House Prices Dataset).
8. Build a polynomial regression model for predicting the salary of the employees.
9. Build a neural network that will read the image of a digit and correctly identify the number.
10. Solve classification problem by constructing a feedforward neural network using Backpropagation algorithm. (Wheat Seed Data)

RESOURCES

TEXT BOOKS:

1. Tom M. Mitchell, Machine Learning, McGraw Hill, 2013.
2. Saikat Dutt, Subramanian Chandramouli, Amit kumar das, Machine Learning, Pearson, 2019.

REFERENCE BOOKS:

1. Manaranjan Pradhan, U Dinesh Kumar, Machine Learning Using Python, Packt Publishing, 2019.
2. Aurelien Geron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, 2nd Edition, O'Reilly, 2019.
3. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, 4th Edition, 2020.
4. Shai Shalev Shwartz, Shai Ben David, and Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press, 2014.

SOFTWARE/TOOLS:

1. Python
2. Scikit-learn/Keras/TensorFlow

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/106106202/>
2. <https://www.coursera.org/learn/machine-learning>
3. https://onlinecourses.nptel.ac.in/noc23_cs18/preview
4. https://onlinecourses.nptel.ac.in/noc23_cs87/preview
5. https://onlinecourses.nptel.ac.in/noc23_ee87/preview
6. <https://www.coursera.org/learn/ntumlone-algorithmicfoundations>
7. <https://www.coursera.org/specializations/machine-learning-introduction>
8. <http://ndl.iitkgp.ac.in/document/YkxIRXFvZXJrTDBkVzVVZi9ESJl6eXpRZkxRc2lhOWhIVXBhUVVWaXZINDNyZUVldU9LdlYvd20wbkQ4MC92UQ>
9. <https://www.coursera.org/learn/unsupervised-learning-recommenders-reinforcementlearning>

WEB RESOURCES:

1. <https://www.ibm.com/topics/machine-learning>
2. <https://www.simplilearn.com/tutorials/machine-learning-tutorial/what-is-machine-learning>
3. https://www.w3schools.com/python/python_ml_getting_started.asp
4. <https://developers.google.com/machine-learning/crash-course>
5. <https://www.greenteapress.com/thinkstats/>
6. <https://info.deeplearning.ai/machine-learning-yearning-book>
7. <https://www.kaggle.com/code/kanncaa1/machine-learning-tutorial-for-beginners>
8. <https://machinelearningmastery.com/machine-learning-in-python-step-by-step/>

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
25CA102010	WEB DESIGNING USING HTML, CSS, JAVASCRIPT	2	-	2	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This Subject is useful for Making own Web page and how to host own web site on internet. Along with that Students will also learn about the protocols involve in internet technology.

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

- C01.** Understand and apply the basic html markups in designing web pages.
- C02.** Create the Dynamic web pages.
- C03.** Understand and apply cascading style sheets to web pages
- C04.** Identify the engineering structural design of XML and parse tree
- C05.** Understand and apply the JavaScript concepts in designing web pages

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3	3	3	3	3	-	-	-	-	3	-	-	3	3	-
C02	3	3	3	3	3	-	-	-	-	3	3	3	3	3	-
C03	3	3	2	3	3	-	-	-	-	3	-	-	3	3	-
C04	3	3	3	3	3	-	-	-	-	3	3	3	3	3	-
C05	3	3	3	3	3	-	-	-	-	3	3	3	3	3	3
Course Correlation Mapping	3	3	3	3	3	-	-	-	-	3	2	2	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO HTML

(06 Periods)

Web Basics and Overview: Introduction to Internet, World Wide Web, Web Browsers, URL, MIME, HTTP, Web Programmers Toolbox. HTML Common tags: List, Tables, images, forms, frames.

Module 2: CASCADING STYLE SHEETS (CSS)

(06 Periods)

Style sheets: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2

Module 3: DHTML

(06 Periods)

Dynamic HTML, Document Object Model, Features of DHTML, CSSP (Cascading Style Sheet Positioning) and JSSS (JavaScript assisted Style Sheet), Layers of Netscape, The ID Attribute, DHTML Events.

Module 4: XML

(06 Periods)

XML: Introduction to XML, Defining XML tags, their attributes and values, Document type definition, XML Schemas, Document Object model, XHTML Parsing XML Data - DOM and SAX parsers in java

Module 5: JAVA SCRIPT

(06 Periods)

Objects, Methods, Events and Functions, Tags, Operators, Data Types, Literals and Type Casting in JavaScript, Programming Construct, Array and Dialog Boxes, Relating JavaScript to DHTML, Dynamically Changing Text, Style, Content.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Create HTML Pages contains
 - a. Basic text formatting Elements
 - b. Block and Inline Elements
2. Create Html pages Contains
 - a. Different Types of LISTS
 - b. Text Processing Tags
3. Create HTML Pages Contains links and Navigation
 - a. How to link between pages of your site
 - b. How to link to other sites
 - c. How to structure the folders on your website
 - d. How to link to specific parts of a page in your site
4. Create HTML Pages contains Table element.
5. Create HTML Pages with Form elements.
6. Apply Different types of CSS to the HTML pages.
 - a. Styling Text.
 - b. Styling LINKS.
 - c. Styling Backgrounds.
 - d. Styling Lists.

e. Styling Tables.

7. Simple JavaScript Programs for the following
 - a. Functions.
 - b. Control Statements.
 - c. Loop Statements.
8. Handling JavaScript Events.
 - a. Window Events.
 - b. User Events (Actions performed on HTML FORM elements using Keyboard and Mouse)
9. Sample Java Script Programs to work with BUILT-IN Objects.

RESOURCES

TEXT BOOKS:

1. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech.
2. Java Script, D.Flanagan, O'Reilly, SPD.

REFERENCE BOOKS:

1. Web Design with HTML, CSS, JavaScript and jQuery Set, Jon Duckett, Wiley Publications
2. Beginning Web Programming-Jon Duckett WROX
3. Internet and World Wide Web – How to program, Dietel and Nieto, Pearson.
4. JavaScript and JQuery: Interactive Front-End Web Development, Jon Duckett, Wiley Publications

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/106106156>
2. <https://www.youtube.com/watch?v=8ew1LgfWV6s>

WEB RESOURCES:

1. <https://www.geeksforgeeks.org/web-technology/>
2. <https://www.javatpoint.com/html-tutorial>
3. https://www.tutorialspoint.com/web_developers_guide/web_basic_concepts.htm
4. <https://woz-u.com/blog/what-web-technologies-should-i-learn/>

PROGRAM CORE

Course Code	Course Title	L	T	P	S	C
25CA102011	BIG DATA PROGRAMMING	2	-	2	-	3

Pre-Requisite Java Programming/Python Programming

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION:

Introduction to big data, big data analytics, hadoop and hadoop infrastructure, hadoop map reduce framework, hadoop implementation and hadoop eco system tools, hadoop project environment

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

- CO1.** Understand the fundamentals of Big cloud and data architectures.
- CO2.** Analyze methods of loading voluminous data into Big Data framework using Flume and Sqoop
- CO3.** Demonstrate the functions of Map Reduce Framework on any huge amount of data
- CO4.** Apply Ecosystem tools for querying structured and unstructured Data.
- CO5.** Manage Data using HBase Framework.

CO-PO-PSO Mapping Table:

Cours Outcomes	Program Outcomes												Program Specific Outcomes		
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	3	3	-	-	-	-	-	-	-	2	-	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO5	-	-	-	-	-	-	-	-	3	3	-	-	2	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	-	3	3	-	-	2	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION

(06 Periods)

Introduction to Big Data - Challenges of Conventional Systems - Nature of Data - Small data - Medium data -Big Data - Small data vs Big data - Sources of Big Data - Big Data Characteristics - Big Data Analytics - Importance of Big Data, Big Data in the Enterprise - Big Data Enterprise Model - Building a Big Data Platform - Big data in Social and Behavioral sciences

Module 2: HDFS, HADOOP AND HADOOP INFRASTRUCTURE

(06 Periods)

Hadoop and Databases - Typical Datacenter Architecture - Adding Hadoop to the Mix - Key Benefit - Flexibility: Complex Data Processing - HDFS - Hadoop Infrastructure - Architecture - Different in Data Model and Computing Model - HDFS Files and Blocks, Components of HDFS - Hadoop framework - HDFS - Map Reduce Framework - Data Loading techniques - Hadoop Cluster Architecture - Hadoop Configuration files - Hadoop Cluster modes - Single Node - Multi Node - Fully distributed node.

Module 3: HADOOP MAP REDUCE FRAMEWORK

(06 Periods)

Relationship between Map Reduce and HDFS - Relationship between Map Reduce and HDFS - Clients, Data Nodes, and HDFS Storage - Map Reduce workloads. Hadoop framework - Hadoop data types - Hadoop map reduce Paradigm - Map and Reduce Tasks - Map reduce Execution framework - Practitioners and Combiners - Input formats (Input Splits and Records, Text Input, Binary Input, Multiple Inputs)- Output Formats (Text Output, Binary Output, Multiple Output)- Hadoop Map reduce programming - Advanced Map reduce concepts - Counters, Custom Writable - Unit testing framework - Error Handling - Tuning - Advanced Map reduce.

Module 4: HADOOP IMPLEMENTATION AND HADOOP ECO SYSTEM TOOLS

(06 Periods)

Hadoop Implementation - Job Execution - Hadoop Data Types - Job Configurations - Input and Output Formats -ECO system tools - Pig's Data Model, Pig Latin, Developing & Testing Pig Latin Scripts - Writing Evaluation, Filter, Load & Store Functions - Hive - Hive Architecture - Comparison with Traditional Database - HiveQL: Data Types, Operators and Functions - Hive Tables - Querying Data - Advance Hive, NoSQL Databases - HBase - Loading Data in Hbase - Querying Data in Hbas

Module 5: HADOOP PROJECT ENVIRONMENT

(06 Periods)

HBase: Introduction to HBase, Client API's and their features, Available Client, HBase Architecture, Map Reduce -Integration. HBase: Advanced Usage, Schema Design, Advance Indexing, Coprocessors, Hadoop 2.0 -MRv2 - YARN - Name Node High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN, Upgrade your existing MRv1 code to MRv2, Programming in YARN framework-cover Apache Oozie Workflow Scheduler for Hadoop

Total Periods: 30

EXPERIENTIAL LEARNING

1. Installation of Single Node Hadoop Cluster on Ubuntu
2. Hadoop Programming: Word Count Map Reduce Program Using Eclipse
3. Implanting Matrix Multiplication Using One Map-Reduce Step.
4. Implementing Relational Algorithm on Pig.
5. Implementing database operations on Hive.
6. Implementing Bloom Filter using Map-Reduce

7. Implementing Frequent Item set algorithm using Map-Reduce.
8. Implementing Clustering algorithm using Map-Reduce
9. Implementing Page Rank algorithm using Map-Reduce

RESOURCES

TEXT BOOKS:

1. WA Gmob, "Big Data and Hadoop", Kindle Edition, 2013
2. Strata, "Big Data Now", O'Reily Media Inc., Kindle Edition, 2012.
3. Eric Miller, "A Overview of Map Reduce and its impact on Distributed Data", Kindle Edition, 2012.

REFERENCE BOOKS:

1. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications," Wiley Publications, 2014.
2. Paul Zikopoulos, IBM, Chris Eaton and Paul Zikopoulos "Understanding Big Data: Analytics for Enterprise Class Hadoop and streaming Data," The McGraw Hill Companies, 2012.

SOFTWARE/TOOLS:

1. **Jdk tool**

VIDEO LECTURES:

1. <https://youtu.be/nnnloKX5r84>
2. https://youtu.be/g_x4D2V1MP4
3. <https://youtu.be/4ClrUJr0G30>
4. <https://youtu.be/icCA1RNDFKs>

WEB RESOURCES:

1. <https://www.simplilearn.com/introduction-to-big-data-and-hadoop-tutorial>
2. https://hadoop.apache.org/docs/r1.2.1/hdfs_design.html
3. <https://www.developer.com/java/understanding-mapreduce-types-and-formats.html>
4. https://prismoskills.appspot.com/lessons/System_Design_and_Big_Data/Chapter_01-_Hadoop.jsp
5. <https://www.simplilearn.com/introduction-to-zookeeper-tutorial>
6. <https://www.simplilearn.com/introduction-to-big-data-and-hadoop-tutorial>
7. <https://www.simplilearn.com/introduction-to-big-data-and-hadoop-tutorial>
8. https://hadoop.apache.org/docs/r1.2.1/hdfs_design.html
9. <https://www.developer.com/java/understanding-mapreduce-types-and-formats.html>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA101009	DECISION SUPPORT SYSTEMS	3	-	-	-	3

Pre-Requisite Software Engineering

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Decision Support Systems Development, Collaborative Computing Technologies, Enterprise Information Systems, Knowledge Acquisition, Representation & Reasoning, Advanced intelligence system, Implementing MSS in the E-Business ERA and Integration, Impacts and the future of management support systems.

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

- CO1.** Understand the concepts of DSS and its corresponding systems, technologies and their framework for the implementation of computerized DSS.
- CO2.** Analyze the configuration and modeling of DSS and MSS to provide the structure of the decision trees.
- CO3.** Apply collaborative computing technologies, enterprise information systems and knowledge management systems developing Decision Support Systems.
- CO4.** Make use of Artificial Intelligence and expert systems for knowledge acquisition, representation and reasoning in rule based systems.
- CO5.** Implement Management Support Systems in E-Business, E-Commerce, L Commerce, Intra-business, Legal and Ethical Issues in E-commerce.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	3
CO2	2	3	-	-	-	-	-	-	-	-	-	-	2	-	3
CO3	2	3	2	1	-	-	-	-	-	-	-	-	2	-	3
CO4	3	3	3	1	-	-	-	-	-	-	-	-	2	-	3
CO5	2	3	2	-	-	2	-	-	-	-	-	-	2	-	3
Course Correlation Mapping	3	3	2	1	-	2	-	-	-	-	-	-	2	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: DECISION MAKING AND COMPUTERIZED SUPPORT (09 Periods)

Management support systems: Managers and Decision-Making ,Managerial Decision-Making and Information Systems ,Managers and Computer Support, Computerized Decision Support and the Supporting Technologies, A Framework for Decision Support ,The Concept of Decision Support Systems, Group Support Systems ,Enterprise Information System, Knowledge Management Systems, Expert Systems, Artificial Neural Networks, Advanced Intelligent Decision Support Systems, Hybrid Support Systems.

Decision making systems modeling- support: Phases of decision Making Process.

Module 2: DECISION SUPPORT SYSTEMS (09 Periods)

Decision Support Systems: DSS Configurations, What Is a DSS, Characteristics and Capabilities of DSS, Components of DSS, The User, DSS Hardware, DSS Classifications.

Modeling and Analysis: MSS Modeling, Static and Dynamic Models, Certainty, Uncertainty, and Risk. Decision Analysis of a Few Alternatives (Decision Tables and Decision Trees), The Structure of MSS Mathematical Models.

Module 3: COLLABORATIVE COMPUTING TECHNOLOGIES (09 Periods)

Collaborative Computing Technologies: Group Support Systems, Group Decision-Making, Communication and Collaboration, Communication Support, Group Support Systems, Group Support Systems Technologies, Group systems Meeting room and Online, The GSS Meeting Process.

Enterprise Information Systems: Concepts and Definitions, The Evolution of Executive and Enterprise Information Systems, Executive Roles and Information Needs.

Module 4: INTELLIGENT DECISION SUPPORT SYSTEMS (09 Periods)

Artificial Intelligence and Expert Systems: Concepts and Definitions of Artificial Intelligence, Evolution of Artificial Intelligence, The Artificial Intelligence Field, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems.

Knowledge Acquisition, Representation & Reasoning: Methods of Knowledge Acquisition from Experts, Knowledge Verification and Validation, Representation of Knowledge, Reasoning in Rule-Based Systems.

Module 5: IMPLEMENTING MSS IN THE E-BUSINESS ERA (09 Periods)

Implementing MSS in the E-Business ERA: E-Commerce Mechanisms: Auctions and Portals, Business-to-Consumer Applications, Market Research, e-CRM, and Online Advertising, Intrabusiness, Business-to-Employees, and People-to-People, E-Government, E-Learning, and Customer-to-Customer EC, M-Commerce, L-Commerce, and Pervasive Computing, Legal and Ethical Issues in E-Commerce.

Total Periods:45

EXPERIENTIAL LEARNING

1. Components of a Decision Support System
2. What are 8 Decision Support System Examples To Guide Decision-Making
3. Explain the attributes, characteristics, components and benefits.

RESOURCES

TEXT BOOKS:

1. Efraim Turban, Jay EAronsonand Ting-PengLiang, Decision Support Systems and Intelligent Systems, Prentice Hall India, 7thEdition, 2007.

REFERENCE BOOKS:

1. V. S. Janakiraman and K. Sarukesi, Decision Support Systems, PHI Learning, 1st Edition, 2009.
2. Efrem G Mallach, Decision Support Systems and Data Warehouse Systems, McGraw Hill, 2008.

VIDEO LECTURES:

1. <http://nitttrc.edu.in/nptel/courses/video/110104168/L40.html>
2. <https://archive.nptel.ac.in/courses/110/106/110106150/>

WEB RESOURCES:

1. https://www.tutorialspoint.com/management_information_system/decision_support_system.htm
2. <https://www.toppers4u.com/2020/11/decision-support-systems-components.html>
3. https://onlinecourses.nptel.ac.in/noc20_mg59/preview

PROGRAM ELECTIVE

Course code	Course Title	L	T	P	S	C
25CA101010	ADVANCED DATABASES	3	-	-	-	3
Pre-Requisite	Database Management Systems					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION

Parallel Databases; Object-Based Databases; Distributed Databases; XML; Emerging Database Technologies and Applications.

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

- CO1.** Understand the concepts of parallelism to design parallel systems on multicore processors.
- CO2.** Apply object oriented concepts to design object based databases.
- CO3.** Design distributed databases by analyzing various data fragmentations.
- CO4.** Create XML databases for web based applications.
- CO5.** Implement emerging database technologies for the development of applications.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	-	3	-	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	3	-	3
CO3	3	2	3	3	3	-	-	-	-	-	-	-	3	-	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	3	-	3
CO5	-	-	-	-	-	-	-	-	3	3	-	-	3	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	-	3	3	-	-	3	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: PARALLELDATABASES (09 Periods)

Introduction, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Query Optimization, Design of Parallel Systems, Parallelism on Multicore Processors.

Module 2: OBJECT-BASEDDATABASES (09 Periods)

Overview, Complex Data Types, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multi set Types in SQL, Object-Identity and Reference Types in SQL, Implementing O-R Features, Persistent Programming Languages, Object-Relational Mapping, Object-Oriented versus Object-Relational.

Module 3: DISTRIBUTEDDATABASES (09 Periods)

Features of Distributed versus Centralized Databases, Reference Architecture for Distributed Databases, Types of Data Fragmentation, Integrity Constraints in Distributed databases, Distributed Database Design.

Module 4: XML (09 Periods)

Structure of XML data, XML Document Schema, Querying and Transformation, Application Program Interfaces to XML, Storage of XML Data, XML Applications. (graph database)

Module 5: EMERGINGDATABASETECHNOLOGIESANDAPPLICATION (09 Periods)

Mobile Database, Geographic Information Systems, Genome Data Management, Multimedia Database; NoSQL-An Overview of NoSQL, Characteristics of NoSQL, NoSQL Storage Types.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Evaluate the security of a database system.
2. Plan and execute the migration of a database from one system to another
3. Design a distributed database system for a scenario involving multiple data centers.

RESOURCES

TEXT BOOKS:

1. A.Silberschatz,H.F.KorthandS.Sudarshan,"DatabaseSystemConcepts," TataMcGraw Hill, 7thEdition,2019.
2. StefandCeriandGiuseppePelagatti,"DistributedDatabasesPrinciplesandSystems," McGraw Hill, 1stEdition,2008.

REFERENCE BOOKS:

1. Ramea Elmasri and Shamkant B. Navathe," Fundamentals of database Systems," Pearson Education, 5thEdition, 2007.
2. Gaurav Vaish, "Getting Started with NoSQL," Packt Publishing, 1stEdition,2013.

VIDEO LECTURES:

1. <https://youtu.be/7M0CdMfUEmQ>
2. <https://youtu.be/tFS0qiimHPY>
3. <https://youtu.be/yTZBtde3zoI>

WEB RESOURCES:

1. <https://www.geeksforgeeks.org/difference-between-centralized-database>
2. <https://www.geeksforgeeks.org/parallelism-in-query-in-dbms>
3. <https://www.geeksforgeeks.org/object-based-databases>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA102012	LINUX Administration	2	-	2	-	3
Pre-Requisite	Computer Communication					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION

Concepts on Linux Programming; Basic Commands in Linux; Shell Programming; Process, Signals and File System Structure; Inter process Communications and Socket Programming for Client-Server Interaction.

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

- CO1.** Demonstrate the basic knowledge of Linux commands and file handling utilities by using Linux shell environment.
- CO2.** Analyze the program arguments, environment variables and different types of information in Linux environment to maintain network programming.
- CO3.** Design interactive shell scripts related to Linux Environment for solving specified computational problems.
- CO4.** Apply system calls for process management and commands to manage file system.
- CO5.** Make use of processes, threads and signals to create and manage new processes.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	-	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	3	-	-	-	-	-	3	3	3	3	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	3	3	3	-	3	-	-	3	3	3	3	3
CO5	3	3	3	3	3	3	-	3	-	-	3	3	3	3	-
Course Correlation Mapping	3	3	3	3	3	2	-	2	-	-	3	3	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO LINUX

(06 Periods)

The GNU project and the Free Software Foundation, Linux distributions, Programming Linux - Linux programs, Text editors, The C Compiler; Basic commands -- cat, tail, head, sort, nl, uniq, grep, cut, paste, join, tee, pg, comm, cmp, diff, cp, mv, ln, rm, unlink, tty, clear, date, cal, mkdir, rmdir, du, df, find, umask, ps, who, sed

Module 2: LINUX ENVIRONMENT

(06 Periods)

Program arguments - getopt, getopt_long. Environment variables - Use of environment variables, The environmental variable, Time and Date, User information, Host information.

Module 3: SHELL PROGRAMMING

(06 Periods)

Necessity of shell programming, Pipes and redirection - Redirecting output, Redirecting input, Pipes, The Shell as a programming language - Interactive programs, Creating a script, Making a script executable, Shell syntax - Variables, Conditions, Control structures, Functions, Commands, Command execution.

Module 4: FILE SYSTEM STRUCTURE

(06 Periods)

Linux File Structure and Commands: File structure - Directories, Files and devices, System calls and Device drivers; Library functions - Low-level file access, write, read and open commands, Initial permissions, Other system calls for managing files; File and directory maintenance commands - chmod, chown, unlink, link, symlink, mkdir, rmdir, chdir, getcwd.

Module 5: PROCESS AND SIGNALS

(06 Periods)

Process structure - Process table, Viewing processes, System processes, Process scheduling; Starting new processes - Waiting for a process, Zombie processes, Input and output redirection, Threads; Signals - Sending signals, Signal sets.

Total Periods: 30

EXPERIENTIAL LEARNING

1. To Install Ubuntu Linux
2. General Purpose Utilities Commands
3. File System, Text Processing Commands And Vi Editor
4. Sed, Grep, Egrep, Fgrep
5. Basic Shell Scripting
6. Shell Scripting

RESOURCES

TEXT BOOKS:

1. Neil Matthew and Richard Stones, Beginning Linux Programming, Wiley Dreamtech, 4th4thEdition, 2008.
2. Sumitabha Das, Your UNIX: The Ultimate Guide, Tata McGraw.

REFERENCE BOOKS:

1. Richard Petersen, Linux: The Complete Reference, Tata McGraw w-Hill, 6thEdition, 2007.
2. YashwanthKanitkar, Unix Shell programming, BPB Publications, 1stEdition.

SOFTWARE/TOOLS:

1. Ubuntu.
2. Linuxmint.

VIDEO LECTURES :

1. <https://www.youtube.com/watch?v=Wgi-OfbP2Gw>.
2. <https://www.youtube.com/watch?v=bz0ZCUv5rYo>.

WEB RESOURCES:

1. <https://www.javatpoint.com/linux-tutorial>.
2. <https://www.guru99.com/unix-linux-tutorial.html>.
3. <https://www.simplilearn.com/linux-programming-for-beginners-article>.

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA101011	INTERNET OF THINGS	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Basic concepts of IoT, evolution, characteristics, advantages and disadvantages of IoT, ADC and DAC Principle, IoT sensors and actuators, working with arduino board, applications of IoT in different domains.

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

CO1. Understand the basic concepts of IoT to work with IoT environment.

CO2. Analyze the principles of ADCs and DACs to implement in the development of devices.

CO3. Design IoT devices with sensors and actuator technologies for effective results.

CO4. Make use of the Arduino board to develop IoT devices for different domains.

CO5. Develop various IoT related used cases and applications to solve real world problems.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	3	-	-	3	3	-
CO2	3	3	3	3	-	-	-	-	-	3	3	3	3	3	-
CO3	3	3	2	3	-	-	-	-	-	3	-	-	3	3	-
CO4	3	3	3	3	-	-	-	-	-	3	3	3	3	3	-
CO5	3	3	3	3	-	-	-	-	-	3	3	3	3	3	3
Course Correlation Mapping	3	3	3	3	-	-	-	-	-	3	3	3	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: BASICS OF IOT

(08 Periods)

Definition of "Internet of Things", Technological trends which have led to IoT, impact of IoT on society, History of IOT, How IOT works, IOT Applications, Characteristics of IoT, Challenges of IoT, Advantages of IoT, Disadvantages IOT, evolution of IOT.

Module 2: ADCS AND DACS

(11 Periods)

DAC principle, weighted register DAC, R L1,L2,L3 -2R ladder DAC, performance characteristics of DAC, ADC principle, flash ADC, successive approximation ADC, counter type ADC, dual slope ADC, performance characteristics of ADC.

Module 3: IOT SENSORS AND ACTUATORS

(09 Periods)

Various IOT Sensors and actuators and technologies, Temperature sensors Moisture sensors, Light sensors, Acoustic and noise sensors, Water level sensors, Proximity sensors, motion sensors, Gyroscope, Chemical sensors, Image sensors.

Module 4: ARDUINO BOARD

(07 Periods)

Introduction to Arduino board, interfacing sensors and actuators to Arduino board.

Module 5: IOT USE CASES AND APPLICATIONS

(10 Periods)

Smart homes, wearables, smart city, smart grid, industrial internet, connected cars, connected health, smart retail, smart supply chain, smart farming.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Compare and contrast different communication protocols used in IoT.
2. Discuss how sensor data is collected, processed, and transmitted to a central hub.
3. Identify potential security risks in an IoT ecosystem and propose strategies to mitigate these risks.

RESOURCES

TEXT BOOKS:

1. Internet of Things: A Hands-on Approach Arshdeep Bahga and Vijay Madisetti Universities Press 2nd Edition.
2. Internet of Things: Architecture and Design Principles Rajkamal McGraw Hill Education 1st edition.

REFERENCE BOOKS:

1. IoT Fundamentals Networking Technologies, Protocols and Use Cases for Internet of Things David Hanes , Gonzalo Salgueiro Cisco Press Kindle Edition 2017
2. Designing the Internet of Things Adrian McEwen, Hakim Cassimally Paperback 1st edition
3. Analytics for the Internet of Things (IoT) Andrew Minter Kindle Edition 1st edition

VIDEO LECTURES :

1. [http://www.nptel.ac.in/\(https://youtu.be/WUYAjxnwjU4?list=PLaxu2gn9WXMf_In5pMvxjf043jzof4-i&t=13\)](http://www.nptel.ac.in/(https://youtu.be/WUYAjxnwjU4?list=PLaxu2gn9WXMf_In5pMvxjf043jzof4-i&t=13))
2. [http://www.iitk.ac.in/\(https://youtu.be/p7kYStiASLo?list=PLbRMhDVUMngdcL\)](http://www.iitk.ac.in/(https://youtu.be/p7kYStiASLo?list=PLbRMhDVUMngdcL))

WEB RESOURCES:

1. [http://www.nptel.ac.in/\(https://nptel.ac.in/courses/108108098/\)](http://www.nptel.ac.in/(https://nptel.ac.in/courses/108108098/))
2. [http://www.edureka.com/\(https://youtu.be/LHmzVL5bm8?list=PL9ooVrP1hQOGccf\)](http://www.edureka.com/(https://youtu.be/LHmzVL5bm8?list=PL9ooVrP1hQOGccf))

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA101012	DIGITAL FORENSICS	3	-	-	-	3
Pre-Requisite	Computer Communication					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION

Computer Forensics Fundamentals, Types of Computer Forensics Technology; Types of Computer Forensics Systems, Vendor and Computer Forensics Services; Computer Forensics Evidence and Capture; Computer Forensics Analysis, Reconstructing Past Events, Networks; Countermeasures.

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

- CO1.** Understand the concepts of Computer Forensics and Techniques.
- CO2.** Analyze the types of Computer Forensics Systems and Services.
- CO3.** Apply Data Recovery, Evidence Collection and Data Seizure, Computer Image Verification and Authentication for Computer Forensics Evidence and Capture
- CO4.** Design Computer Forensics for Reconstructing Past Events and Networking Forensics Scenarios.
- CO5.** Make use of Countermeasures and tools for Computer Forensics.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	-	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	3	-	-	-	-	-	3	3	3	3	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	1	3	1	-	1	-	-	1	3	3	3	3
CO5	3	3	3	3	3	3	-	3	-	-	3	3	3	3	-
Course Correlation Mapping	3	3	3	3	3	1	-	1	-	-	2	3	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO COMPUTER FORENSICS (09 Periods)

Introduction to Computer Forensics, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps Taken by Computer Forensics Specialists, Who Can Use Computer Forensic Evidence.

Module 2: TYPES OF COMPUTER FORENSICS TECHNOLOGY (09 Periods)

Types of Military Computer Forensic Technology, Types of Law Enforcement: Computer Forensic Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques, Hidden Data and How to Find It, Spyware and Adware, Encryption Methods and Vulnerabilities, Protecting Data from Being Compromised, Internet Tracing Methods, Security and Wireless Technologies, Avoiding Pitfalls with Firewalls, Biometric Security Systems.

Module 3: FORENSIC SYSTEMS (09 Periods)

Internet Security Systems, Intrusion Detection Systems, Firewall Security Systems, Storage Area Network Security Systems, Network Disaster Recovery Systems, Public Key Infrastructure Systems, Wireless Network Security Systems, Satellite Encryption Security Systems, Instant Messaging (IM) Security Systems, Net Privacy Systems, Identity Management Security systems, Identity Theft, Biometric Security Systems, Homeland Security Systems.

Module 4: COMPUTER FORENSICS AND EVIDENCE (09 Periods)

Data Recovery Defined, Data Backup and Recovery, The Role of Backup in Data Recovery, The Data-Recovery Solution, Hiding and Recovering Hidden Data Why Collect Evidence, Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts.

Module 5: FORENSIC ANALYSIS AND COUNTERMEASURES (09 Periods)

Discovery of Electronic Evidence -Electronic Document Discovery: A Powerful New Litigation Tool Identification of Data-Time keeping, Forensic Identification and Analysis of Technical Surveillance Devices, Weapons of the Future, The Global Positioning System, Snoop, Sniff, and Snuff Tools, Email Wiretaps Like Carnivore Can Steal Sensitive Correspondence, IW Weapons of the Future, Nanotechnology

Total Periods: 45

EXPERIENTIAL LEARNING

1. Simulate a scenario where a cybercrime has occurred. Outline the step-by-step process for collecting digital evidence from various sources such as computers, smartphones, and cloud storage.
2. Analyze a corrupted file system to recover data relevant to an investigation. Discuss the tools and techniques used in file system forensics and how they contribute to reconstructing digital artifacts.
3. Investigate a network security incident. Analyze network logs, packet captures, and other relevant data to identify the source of an attack. Discuss the challenges and Methodologies in network forensics.

RESOURCES

TEXT BOOK:

1. John R. Vacca, Computer Forensics –Computer Crime scene Investigation, Cengage Learning, 2nd Edition, 2010.

REFERENCE BOOKS:

1. Darren R. Hayes, A Practical Guide to Computer Forensics Investigations, Pearson Education, 1st Edition, 2015.
2. Cory Altheide and Harlan Carvey, DigitalForensics with Open Source Tools, Elsevier, 2011.

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=giv0DQDSsjQ>
2. <https://www.youtube.com/watch?v=aujOftqpptI>
3. https://onlinecourses.swayam2.ac.in/cec20_lb06/preview

WEB RESOURCES:

1. https://uomustansiriyah.edu.iq/media/lectures/6/6_2019_03_13!10_35_05_PM.pdf
2. <https://www.smartworld.com/notes/computer-forensics-pdf-notes-cf/>

PROGRAM ELECTIVE

Course code	Course Title	L	T	P	S	C
25CA101013	COMPUTER NETWORKS	3	-	-	-	3
Pre-Requisite	Computer Communications					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Concepts of Computer Networks, The Physical Layer, The Data Link Layer, The Network Layer, The Transport Layer, The Application Layer.

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

- CO1.** Understand the concepts of Networking, reference models, transmission media.
- CO2.** Apply error and flow control techniques and implement congestion control mechanisms and transport protocols for reliable data communication.
- CO3.** Analyze design issues of layers, techniques for quality of service, elements of transport and application Protocols ensuring the communication procedures.
- CO4.** Examine the layered and e-mail architectures, networking protocols and e-mail message formats in compliance with communication standards.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	3
CO2	2	2	3	1	3	1	-	-	-	-	-	-	-	-	3
CO3	2	3	3	-	2	2	-	-	-	-	-	-	-	-	3
CO4	-	1	1	-	-	2	-	-	-	-	-	-	-	-	2
Course Correlation Mapping	2	2	3	1	2	2	-	-	-	-	-	-	-	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: NETWORK CONCEPTS AND PHYSICAL LAYER (09 Periods)

Network Concepts: Uses of Computer Networks, Network Hardware, Network Software, Reference Models-OSI, TCP/IP. **The Physical Layer:** Guided Transmission media-Magnetic Media, Twisted Pairs, Coaxial Cable, Fiber Optics. Wireless Transmission-The Electromagnetic Spectrum, Radio Transmission, Infrared Transmission and Light Transmission

Module 2: THE DATA LINK LAYER (09 Periods)

The Data Link Layer: Data Link layer design issues, Error Detection and Correction, Elementary Data Link Protocols - Unrestricted simplex protocol, Simplex stop-and-wait protocol, Simplex protocol for a noisy channel. Sliding Window protocols - One-bit sliding window protocol, Protocol using Go back N, Protocol using Selective Repeat.

Module 3: THE NETWORK LAYER (10 Periods)

Network layer design issues, Routing Algorithms-Optimality principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Congestion Control Algorithms, Internetworking, The Network layer in the Internet-The IP Version 4 protocol, IP Addresses.

Module 4: THE TRANSPORT LAYER (10 Periods)

The Transport service, Elements of Transport protocols -Addressing, Connection Establishment, Error Control and Flow Control, Multiplexing and Crash recovery, Remote Procedure Call, Connectionless Transport: UDP, Principles of Reliable Data transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion Control.

Module 5: THE APPLICATION LAYER (07 Periods)

DNS - The Domain name space, Resource records and Name servers; Electronic Mail-Architecture and services, the user agent, message formats, message transfer and Final Delivery.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Write a C program to implement the algorithm for parity method for error control.
2. Write a C program to implement the algorithm on hamming method for error correction (both single and block errors).
3. Write a C program to implement the algorithm for check sum computation

RESOURCES

TEXT BOOK:

1. Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks," Pearson Education, 5th Edition, 2015.

REFERENCE BOOKS:

1. Behrouz A. Forouzan, "Data Communications and Networking," The McGraw-Hill, 4th Edition, 2011.
2. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach," Pearson Education, 6th Edition, 2017.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/106/105/106105081/>
2. https://www.youtube.com/watch?v=6_PINy02_g0

WEB RESOURCES:

1. <https://www.cisco.com/c/en/us/solutions/small-business/resource-center/networking/networking-basics.html>
2. <https://memberfiles.freewebs.com/00/88/103568800/documents/Data.And.Computer.Communications.8e.WilliamStallings.pdf>
3. [https://www01.ibm.com/servers/resourcelink/svc0302a.nsf/pages/zVMV7R1sc246333/\\$file/kijl0_v7r1.pdf](https://www01.ibm.com/servers/resourcelink/svc0302a.nsf/pages/zVMV7R1sc246333/$file/kijl0_v7r1.pdf)
4. <http://ns2simulator.com/ns2-tcp-congestion-control/>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA102013	NETWORK ADMINISTRATION	2	-	2	-	3
Pre-Requisite	Computer Communication					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION

Network administrator professional ethics, Recent trends in network administration, Hardware features and strategies of Work Station, Server and Service launch and disaster recovery, infrastructure maintenance, service recommendations of upgrading, centralizing, monitoring, email, print, data storage, web maintenance, preparing enterprise level network.

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

- CO1.** Understand the importance of Network Administration and the recent trends in administration.
- CO2.** Analyze the features and strategies of hardware in service launch and disaster recovery.
- CO3.** Design the architecture for the creation of data centers.
- CO4.** Apply techniques to configure types of services in networking.
- CO5.** Implement different utility commands of Linux and create enterprise level network setup.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	3	-	-	-	-	-	-	-	-	3	-	3
CO2	3	3	2	-	2	-	2	-	-	-	-	2	3	-	3
CO3	3	2	3	2	1	-	-	-	-	-	2	-	3	-	2
CO4	2	2	3	2	-	-	-	2	-	-	-	-	3	2	-
CO5	3	3	-	3	3	-	-	-	-	-	3	-	-	-	3
Course Correlation Mapping	3	3	2	3	1	-	2	2	-	-	1	2	3	2	3

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: NETWORK ADMINISTRATOR (06 Periods)

Network administrator as a Profession, Network administrator professional ethics, Recent trends in network administration.

Module 2: WORK STATION, SERVER AND SERVICES (06 Periods)

Workstation: Architecture design, Hardware strategies, OS installation.

Servers: Hardware Strategies, Hardware Features & Specifications.

Service: Requirements, Planning and Engineering, Service Launch, Disaster Recovery.

Module 3: INFRASTRUCTURE (06 Periods)

Network Architecture, Network Operations, Data centers overview.

Module 4: SERVICE RECOMMENDATION (06 Periods)

Server Upgrade, Centralizing a service, Service Monitoring, Namespaces, Email Service, Print Services, Data Storage, Backup and Restore, Software Repository, Web Services.

Module 5: ENTERPRISE LEVEL NETWORK (06 Periods)

Preparing procurement plan/document for enterprise level network setup.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Installation and configuration of VM Ware.
2. Installing OS in VM Ware.
3. Implement Directory command in Linux.
4. Implement Network Command in Linux.
5. Implement File Handling utilities in Linux.
6. Write shell script to generate Fibonacci Series.
7. Write shell script to find factorial of a number.
8. Write shell script to find whether the given input is palindrome or not.
9. Write shell script to generate student grade sheet.
10. Write shell script to generate electricity bill.

RESOURCES

TEXT BOOK:

1. Thomas A. Limoncelli, Christina J. Hogan, Strata R. Chalup, "The Practice of System and Network Administration," Addison-Wesley Professional, 3rd Edition.

REFERENCE BOOKS:

1. Jordan Krause, "Mastering Windows Server 2019: The complete guide for IT Professionals to install and manage Windows Server 2019 and deploy new capabilities," Packt, 2nd Edition, 2019.
2. MD. Tanvir Rahman, "Ubuntu and Centos Linux Server Administration," 2019.
3. Sumitabha Das, "UNIX-Concepts & Applications," Tata McGraw Hill, 4th Edition, 2017.

VIDEO LECTURES:

1. <https://www.udemy.com/topic/unix/>
2. <https://www.coursera.org/learn/unix>

WEB RESOURCES:

1. <https://cs3157.github.io/www/2022-9/guides/unix-setup.html>
2. <https://www.cyberciti.biz/tips/unix-linux-programming-faqs-howto.html>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA102014	OPEN SOURCE PROGRAMMING	2	-	2	-	3
Pre-Requisite	Java Programming					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION : HTML, Creating Table, frames, Style, Display Properties, Linux Essential Commands , File system, Shell Script, Java script, Data type, Arrays, Operators and Expressions, Loops, functions, Dialog box, MY SQL , Database and Tables ,Table, PHP Scripting, File and Folder Access– Cooking–Sessions , MySQL .

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

- CO1.** Understanding the HTML Tags
- CO2.** Demonstrate Linux and Shell Scripting.
- CO3.** Apply control statements for different logics on java script.
- CO4.** Discuss to maintain database using Mysql
- CO5.** Design applications using PHP.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	1	2	1
CO2	3	2	3	2	-	-	-	-	-	-	-	-	2	2	1
CO3	3	2	2	2	3	-	-	-	-	-	-	-	1	1	2
CO4	1	2	3	2	3	-	-	-	-	-	-	-	2	1	-
CO5	1	2	3	2	-	-	-	-	-	-	-	-	3	2	-
Course Correlation Mapping	2	2	2	2	1	-	-	-	-	-	-	-	2	2	1

Correlation Level: 3-High 2-Medium 1-Low

COURSE CONTENT

Module 1: HTML

(06 Periods)

Introduction to HTML, List, Creating Table, Linking document frames, Graphics to HTML Doc , Style sheet, Style sheet basic, Adding style to document, Style sheet properties, Font, text, list, color and background color, box, Display Properties.

Module 2: LINUX

(06 Periods)

Introduction : Linux Essential Commands – File system Concept – Standard Files – The Linux Security Model – Vi Editor – Partitions Creation – Shell Introduction – String Processing – Investigation and Managing Processes–Network Clients–Installing Application.

Module 3: JAVASCRIPT

(06 Periods)

Introduction to Java script –Advantages of Java script –JavaScript Syntax-Data type- Variable– Array – Operators and Expressions- Loops - functions – Dialog box.

Module 4: MYSQL

(06 Periods)

Introduction to MY SQL – The show Databases and Table – The USE command – Create Database and Tables – Describe Table – Select, Insert, Update, and Delete statement – Some Administrative detail – Table Joins – Loading and Dumping a Database.

Module 5: PHP

(06 Periods)

PHP Introduction – General Syntactic Characteristics – PHP Scripting – Commenting your code – Primitives, Operations and Expressions – PHP Variables – Operations and Expressions Control Statement – Array – Functions – Basic Form Processing – File and Folder Access – Cooking – Sessions – Database Access with PHO – MySQL - MySQL Functions – Inserting Records – Selecting Records – Deleting Records – Update Records.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Write a java script to design a simple calculator to perform the following operations- sum, product, difference, and quotient
2. Write a java script that calculates the squares and cubes of the numbers from 0 to 10 and outputs html text that displays the resulting values in an html table format.
3. Develop and demonstrate a html5 file that includes java script script that uses functions for the following problems
 - i. Parameter: a string
 - ii. Output: the position in the string of the left-most vowel
 - iii. Parameter: a number
 - iv. Output: the number with its digits in the reverse order
4. Write a php program to sort the student records which are stored in the database using Selection sort.

5. Write the php programs to Implement simple calculator.
6. Write a shell script that accept a list of file names as arguments count and report the Occurrence of each word.
7. Write a shell script to find the factorial of given integer
8. Write a shell script that list the all files in a directory.
9. a) Write a shell script that accept a file name starting and ending line numbers as Arguments and display all the lines between given line no.
b) Write a shell script that delete all lines containing a specified word.
10. Write the php programs to perform the following operations:
 - a) Find the transpose of a matrix.
 - b) Multiplication of two matrices.
 - c) Addition of two matrices.

RESOURCES

TEXT BOOKS:

1. T. A. Powell, Complete Reference HTML (Third Edition), TMH, 2002.
2. Unix Concepts and Applications by Sumitabha Das, Tata McGraw Hill Education, 2006.

REFERENCE BOOKS:

1. The official Ubuntu Book, 8th Edition.
2. Setting Up LAMP : Getting Linux, Apache, MySQL, and PHP and Working Together", Eric Resebrook, Eric Filson, Published by John Wiley and Sons, 2004.
3. Bayross, Web Enable Commercial Application Development Using HTML, DHTML, Java script, Pen CGI, BPB Publications, 2000
4. J. Jaworski, Mastering Java script, BPB Publications, 1999.

VIDEO LECTURES:

1. <https://www.coursera.org/learn/open-source-software-development-methods>
2. <https://www.udemy.com/course/oss-developers/>

WEB RESOURCES:

1. Docker Project Home: <http://www.docker.com>
2. Linux kernel Home: <http://kernel.org>
3. Open Source Initiative: <https://opensource.org/>
4. Linux Documentation Project: <http://www.tldp.org/>
5. Github: <https://help.github.com/>
6. The Linux Foundation: <http://www.linuxfoundation.org/>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA102015	SCRIPTING LANGUAGES	2	-	2	-	3
Pre-Requisite	Python Programming					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Scripting language's flexibility has allowed developers to create innovative software. Most engineering students were required to learn the scripting languages to promote their study and complex problem solving in order to keep up-to - date with the competition.

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

- CO1.** Ability implement basic JavaScript programs with simple and composite data types
- CO2.** Ability to write simple JavaScript code to automate system administration tasks and rapidly develop simple applications using object models and event handling Mechanisms.
- CO3.** Design client side validation using JavaScript.
- CO4.** Create patterns and evaluate it using PHP script.
- CO5.** Ability to implement the authentication methods to enable security for the web application.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	-	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	3	-	-	-	-	-	3	3	3	3	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	1	3	1	-	1	-	-	1	3	3	3	3
CO5	3	3	3	3	3	3	-	3	-	-	3	3	3	3	-
Course Correlation Mapping	3	3	3	3	3	1	-	1	-	-	2	3	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO JAVASCRIPT (06 Periods)

Introduction to JavaScript: adding JavaScript to XHTML documents-Usage considerations-History and uses of java script- Core language features: Variables- basic data types- Composite types: objects, arrays, functions Expressions-flow control-Loops.

Module 2: OBJECT MODELS AND EVENT HANDLING (06 Periods)

JavaScript regular expressions: Reg Expobject-String methods for Regular expressions-Advanced regular expressions-Limitations-Object model Document object-simple event handling-Standard document object model Event Handling.

Module 3: APPLIED JAVASCRIPT (06 Periods)

Windows, frames, overlays-Form handling-User interface elements-Ajax and remote JavaScript-Browser management-Media management-Trends and practices-writing quality code-Security-Security policy-Performance.

Module 4: FUNDAMENTALS OF PHP (06 Periods)

Introduction-simple PHP program-Converting between data types-Arithmetic operators-Initializing and manipulating arrays-String comparisons-String processing with regular expressions-Reusing code and writing functions.

Module 5: OBJECT ORIENTED PHP AND WEB APPLICATION SECURITY (06 Periods)

Object Oriented PHP-Error and exception handling-Form processing and business logic- Reading from a database-Cookies-Dynamic content-Web application security risks-Building a secure web application-Implementing authentication methods with PHP. Interacting with file system and server network and protocol functions-Session control-Integrating java script and PHP

Total Periods: 30

EXPERIENTIAL LEARNING

1. Write a Ruby script to create a new string which is n copies of a given string where n is a nonnegative integer
2. Write a Ruby script which accept the radius of a circle from the user and compute the parameter and area.
3. Write a Ruby script to print odd numbers from 10 to 1
4. Write a Ruby script to print the elements of a given array
5. Write a TCL script to find the factorial of a number
6. Write a TCL script that multiplies the numbers from 1 to 10
7. Write a Perl script to find the largest number among three numbers.
8. Write a Perl script to print the multiplication tables from 1-10 using subroutines.
9. Write a Perl script to print the file in reverse order using command line arguments

RESOURCES

TEXT BOOKS:

1. Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", Third Edition, London, ISBN:9780072253573, 2013
2. Harvey Deitel, Paul Deitel, Abbey Deitel, "Internet and World Wide Web How To Program", fifth edition, Pearson Education, ISBN: 13:978-0-273-76402-1, 2012.

REFERENCE BOOKS:

1. David Flanagan, "JavaScript: The Definitive Guide", Sixth Edition, O'Reilly Media, ISBN: 978-0-596-80552-4, 2012.
2. Luke Welling, Laura Thomson, " PHP and MySQL Web Development", fifth edition, Addison Wesley, ISBN: ISBN 13: 9780321833891, 2016.

VIDEO LECTURES:

1. <https://archive.nptel.ac.in/courses/117/106/117106113/>
2. <https://www.coursera.org/specializations/introduction-scripting>

WEB RESOURCES:

1. <https://www.coursera.org/in/articles/scripting>
2. <https://www.engati.com/glossary/scripting-language>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA102016	PROGRAMMING WITH C#	2	-	2	-	3
Pre-Requisite	Programming for Problem Solving					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Introduction to .NET and Building blocks to the .NET Platform; Concepts of C# Programming; Implementation of interfaces, creating custom delegates and Events.

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

- CO1.** Understand .NET Framework, principles of C#, Microsoft Visual C# and Visual Studio.
- CO2.** Using of basic concepts like Arrays, strings, enumerators in program.
- CO3.** Implementing Object oriented Programming Concepts.
- CO4.** Using of Delegates, events handling and error handling concepts.
- CO5.** Implementing the thread concepts and using of libraries.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	-	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	3	-	-	-	-	-	3	3	3	3	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	1	3	1	-	1	-	-	1	3	3	3	3
CO5	3	3	3	3	3	3	-	3	-	-	3	3	3	3	-
Course Correlation Mapping	3	3	3	3	3	1	-	1	-	-	2	3	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

DETAILED SYLLABUS:

Module 1: INTRODUCTION TO .NET IDE (06 Periods)

Introduction to Visual Studio ,Benefits of the .NET platform, Building blocks of the .NET platform, Overview of .NET assemblies, Common type system, Common language specification, Platform-independent nature of .NET, The role of the .NET framework, Building .NET application using visual studio, Common Language Runtime (CLR)

Module 2: INTRODUCTION TO C# (06 Periods)

Introducing C#, Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations.

Module 3: OBJECT ORIENTED ASPECTS OF C# (06 Periods)

Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading.

Module 4: C# ADVANCED FEATURES (06 Periods)

Delegates ,Lambdas, lambda Expressions, Events ,Event Publisher, Event Listener, Regular Expressions, Generics, Collections, Errors and Exceptions, Reflection.

Module 5: MULTITHREADED AND CONFIGURING .NET ASSEMBLIES (06 Periods)

Namespace-System, Input Output, Multi-Threading: Thread Life cycle, Steps to create a Thread, Private Assemblies, Shared Assemblies, and Versioning.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Write a program to C# to find the smallest single digit factor for a given value.
2. Write a program in C# to print a number if it is prime; otherwise display the largest factor of that number.
3. Write a program in C# to find the magnitude of a number.
4. Program in C# to find the second largest element in a single dimensional array.
5. Write a C# program to reverse a given string.
6. Write a C# program to which reads a set of strings into the rows a two dimensional array and then prints the string having more number of vowels.
7. Write a C# programs to demonstrate the concepts of Structures and Enumerations.
8. Write a C# programs to demonstrate the concepts of Constructors and Inheritance.
9. Write a C# programs to demonstrate the concepts of Polymorphism.
10. Write a C# programs to demonstrate the concepts of Partial classes and Extension methods.
11. Program in C# to build a class which implements an interface which already exists

12. Write a C# programs to demonstrate the concepts of Delegates.
13. Write a C# program to implement Assemblies.
14. Write a C# program to implement Multithreading and Thread Synchronization

RESOURCES

TEXT BOOKS:

1. Balagurusamy, "Programming with C#", TMH
2. Andrew Troelsen, "Pro C# 5.0 and the .NET 4.5 Framework," 6th Edition, Apress, 2013

REFERENCE BOOKS:

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, "Professional C# and .NET 4.5", Wiley, First Edition 2012
2. "C# for Programmers", Deitel and Deitel, Pearson
3. "Programming C#, 3rd Edition " Jesse Liberty , O'really
4. "Understanding .NET", Chappell, David, , Addison Wesley, 2006.

VIDEO LECTURES:

1. <https://www.udemy.com/course/c-net-for-beginners/>
2. <https://openclassrooms.com/en/courses/5670356-learn-programming-with-c>

WEB RESOURCES:

1. <https://www.w3schools.com/cs/index.php>
2. <https://learn.microsoft.com/en-us/dotnet/csharp/programming-guide/>
3. <https://www.programiz.com/csharp-programming>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA102017	PHP AND MYSQL PROGRAMMING	2	-	2	-	3

Pre-Requisite Java Programming

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course is designed to understand advanced Scripting languages like PHP and MYSQL in web technologies to develop interactive, dynamic and scalable web applications for societal needs.

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

CO1. To understand basic Bundle server installation & functionality.

CO2. To understand the basic Web Programming: including PHP programming

CO3. Apply PHP technologies for handling device independent web application development.

CO4. To understand the PHP web forms for sending data across server.

CO5. To understand the database programming using PHP and MYSQL.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	-	-	-	3	3	3
CO2	3	3	3	3	3	-	-	-	-	-	3	3	3	3	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-	3	-	3
CO4	3	3	3	3	3	3	-	3	-	-	3	3	3	3	3
CO5	3	3	3	3	3	3	-	3	-	-	3	3	-	3	3
Course Correlation Mapping	3	3	3	3	3	2	-	2	-	-	3	3	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: BASICS OF PHP

(06 Periods)

Basic Knowledge of websites, Introduction of Dynamic Website, Introduction to PHP, Why and Scope of PHP, XAMPP and WAMP Installation.

Module 2: INTRODUCTION TO PHP

(06 Periods)

Data Types, Variables, Constants, Expressions, String Interpolation, Control Structures, Functions, Arrays, Embedding PHP Code in Web Pages, Object Oriented PHP.

Module 3: HANDLING HTML FORM WITH PHP

(06 Periods)

Capturing Form, Data Dealing with Multi-value field, and Generating File uploaded form, redirecting a form after submission

Module 4: PHP WEB FORMS

(06 Periods)

PHP Web forms: PHP and Web Forms, Sending Form Data to a Server, Working with Cookies and Session Handlers

Module 5: PHP WITH MYSQL

(06 Periods)

Interacting with the Database, Prepared Statement, and Database Transactions.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Installation of WAMP/XAMPP web server.
2. Deploy and navigate web pages of online book store using WAMP/XAMPP web server.
3. Write a PHP program to read user name and favorite color from the HTML form. Display the name of the user in green color and sets user favorite color as a background for the web page.
4. Write a PHP code to read the username and password entered in the Login form of the online book store and authenticate with the values available in cookies. If user enters a valid username and password, welcome the user by username otherwise display a message stating that, entered details are invalid.
5. Write a PHP code to read user details entered through the registration web page and store the same into MySQL database.
6. Write a PHP code for storing books details like Name of the book, author, publisher, edition, price, etc into MySQL database. Embed a PHP code in catalogue page of the online book store to extract books details from the database.

RESOURCES

TEXT BOOKS:

1. Kogent Learning Solutions Inc, HTML 5 Black Book: Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and JQuery, Dreamtech Press, First Edition, 2011
2. W. Jason Gilmore, Beginning PHP and MySQL, APress, Fourth Edition, 2011.

REFERENCE BOOKS:

1. Snig Bahumik, Bootstrap Essentials, PACKT Publishing, First Edition, 2015. (e-book)
2. Thomas A. Powell, The Complete Reference: HTML and CSS, Tata McGraw Hill, Fifth Edition, 2010.
3. Andrea Tarr, PHP and MySQL, Willy India, First Edition, 2012.

SOFTWARE/TOOLS:

1. A apache Tomcat
2. Eclipse

VIDEO LECTURES:

1. https://onlinecourses.swayam2.ac.in/aic20_sp32/preview
2. <https://www.coursera.org/courses?query=php>

WEB RESOURCES:

1. <https://www.tutorialspoint.com/php/index.htm>
2. <https://www.javatpoint.com/php-tutorial>
3. <https://www.geeksforgeeks.org/php-tutorials/>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA101014	GAME THEORY	3	-	-	-	3

Pre-Requisite Computer Graphics

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Basics of Game theory, Dominant Strategies, Nash Equilibrium, Mixed Strategies and Probability, Static games and Strategic Interactions, Dynamic games and Sequential Rationality, Bargaining and Negotiation, Auction theory, Oligopoly and market competition, Cooperative Game Theory, Applications of game theory in various fields (economics, politics, biology, etc.)

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

- CO1.** Understand the concepts of game theory, dominant strategies and applications of Nash equilibrium and extensive form representation of games.
- CO2.** Select appropriate strategies for the development of applications and interactions.
- CO3.** Analyze the working of Dynamic games and sequential rationality, bargaining theory and evolutionary game theory.
- CO4.** Apply Auction theory and Mechanism design, Oligopoly and different models to meet the industrial organization.
- CO5.** Design and develop applications of game theory in various domains using different models, strategies and theories.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	-	3
CO2	1	3	1	-	2	-	-	-	-	-	-	-	3	-	3
CO3	-	3	2	2	-	-	-	-	-	-	-	-	3	3	2
CO4	-	2	3	2	2	-	-	-	-	-	-	-	3	3	-
CO5	-	-	3	3	-	-	-	-	-	-	-	-	-	-	3
Course Correlation Mapping	2	3	3	2	1	-	-	-	-	-	-	-	3	2	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO GAME THEORY, DOMINANT STRATEGIES (10 Periods) AND NASH EQUILIBRIUM & EXTENSIVE FORM GAMES AND PERFECT INFORMATION

Introduction to Game Theory: Overview of game theory and its applications, Types of games: simultaneous, sequential, and repeated games, Payoff matrix and strategies.

Dominant Strategies and Nash Equilibrium: Dominant strategies and their implications, Nash equilibrium concept and its applications, Finding Nash equilibrium in simple games.

Extensive Form Games and Perfect Information: Extensive form representation of games, Sub-game perfection and backward induction, Examples of extensive form games.

Module 2: MIXED STRATEGIES AND PROBABILITY & STATIC GAMES (09 Periods) AND STRATEGIC INTERACTIONS

Mixed Strategies and Probability: Introduction to mixed strategies, Computing mixed strategy equilibrium, Applications of mixed strategies in games.

Static Games and Strategic Interactions: Static games and their strategic interactions, Best response and dominated strategies, Strategies for cooperative and non-cooperative games.

Module 3: DYNAMIC GAMES AND SEQUENTIAL RATIONALITY, (09 Periods) BARGAINING AND NEGOTIATION AND EVOLUTIONARY GAME THEORY

Dynamic Games and Sequential Rationality: Sequential games and decision trees, Perfect and imperfect information, Sub-game perfect Nash equilibrium.

Bargaining and Negotiation: Introduction to bargaining theory, Nash bargaining solution, Alternatives to the Nash bargaining solution.

Evolutionary Game Theory: Introduction to evolutionary game theory, Replicator dynamics, Evolutionary stability and the concept of fitness.

Module 4: AUCTIONS AND MECHANISM DESIGN AND OLIGOPOLY AND (09 Periods) MARKET COMPETITION

Auctions and Mechanism Design: Auction theory and types of auctions, Revenue equivalence and optimal bidding strategies, Mechanism design and incentive compatibility.

Oligopoly and Market Competition: Oligopoly and market structure, Cournot and Bertrand models, Game theory in industrial organization.

Module 5: COOPERATIVE GAME THEORY AND GAME THEORY (08 Periods) APPLICATIONS AND WRAP-UP

Cooperative Game Theory: Cooperative games and coalitional behavior, Core, Shapley value, and Nash bargaining solution, Applications of cooperative game theory.

Game Theory Applications and Wrap-up: Applications of game theory in various fields (economics, politics, biology, etc.).

Total Periods: 45

EXPERIENTIAL LEARNING

1. List the applications of Game theory in education.
2. Description of evolution of different game theories.

RESOURCES

TEXT BOOKS:

1. Steven Tadelis "Game Theory: An Introduction" Princeton University Press, 2013.
2. Robert Gibbons "Game Theory for Applied Economists" Princeton University Press, 1992.
3. Martin J. Osborne and Ariel Rubinstein "A Course in Game Theory" MIT Press, 1994.

REFERENCE BOOKS:

1. Roger B. Myerson "Game Theory: Analysis of Conflict", Harvard University Press, 2013.
2. Kevin Leyton-Brown and Yoav Shoham "Essentials of Game Theory: A Concise, Multidisciplinary Introduction" Morgan & Claypool Publishers, 2008.
3. Herbert Gintis "Game Theory Evolving: A Problem-Centered Introduction to Modeling Strategic Interaction" Princeton University Press, Second Edition, 2009.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/110104063>
2. <https://www.coursera.org/learn/game-theory-1>

WEB RESOURCES:

1. <https://plato.stanford.edu/entries/game-theory/>
2. <https://www.gametheory.net/>
3. <https://ocw.mit.edu/courses/sloan-school-of-management/>
4. <http://www.gametheoryexplorer.org/>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA101015	CLOUD COMPUTING	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Virtualization, Cloud Computing Fundamentals, Deployment Models; Cloud Computing Architecture; Cloud Computing Mechanisms; Cloud Security; Working with Clouds; and Case Studies.

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

- CO1.** Understand the importance of virtualization and how this has enabled the development of Cloud Computing.
- CO2.** Analyze the cloud computing models, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
- CO3.** Implement different types of Virtualization technologies and Service Oriented Architecture systems
- CO4.** Apply modern technologies & tools of Cloud Computing in solving resource sharing problems in industry.
- CO5.** Identify security and privacy issues in cloud computing.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	2	3	2	1	-	-	-	-	-	-	-	-	-	3	-
CO4	3	3	3	1	-	-	-	-	-	-	-	-	-	3	-
CO5	2	3	2	-	-	2	-	-	-	-	-	-	-	3	-
Course Correlation Mapping	2	3	2	1	-	2	-	-	-	-	-	-	-	3	-

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO VIRTUALIZATION

(07 Periods)

Virtualization: Introduction to Virtualization, objectives of virtualization, benefits of virtualized technology, Adding guest Operating system.

Virtualization Technologies: Ubuntu, VMware, Microsoft Hyper-V.

Module 2: DEFINING CLOUD COMPUTING

(10 Periods)

Defining Cloud Computing: Defining Cloud Computing, Cloud Types - The NIST model, The Cloud Cube Model, Deployment models, Service models, Benefits of cloud computing, Disadvantages of cloud computing, Assessing the Role of Open Standards.

Understanding Cloud Architecture: Exploring the Cloud Computing Stack, Compos ability, Infrastructure, Platforms, Connecting to the Cloud.

Module 3: UNDERSTANDING SERVICES AND APPLICATIONS

(10 Periods)

Understanding Services And Applications By Type: Defining Infrastructure as a Service (IaaS), IaaS workloads, Pods, aggregation, and silos, Defining Platform as a Service (PaaS), Defining Software as a Service (SaaS), SaaS characteristics.

Understanding Abstraction and Virtualization: Using Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Virtual machine types, VMware vSphere.

Module 4: EXPLORING PLATFORM AS A SERVICE

(10 Periods)

Using Amazon Web Services: Understanding Amazon Web Services, Amazon Web Service Components and Services, Working with the Elastic Compute Cloud (EC2), Amazon Machine Images, Pricing models, System images and software, Creating an account and instance on EC2.

Managing the Cloud: Administrating the Clouds, Management responsibilities, Lifecycle management, Emerging Cloud Management Standards, DMTF cloud management standards, Cloud Commons and SMI.

Module 5: Understanding Cloud Security

(08 Periods)

Understanding Cloud Security: Securing the Cloud, The security boundary, Security service boundary, Security mapping, Securing Data, Brokered cloud storage access, Storage location and tenancy, Encryption, Auditing and compliance, Establishing Identity and Presence, Identity protocol standards, Windows Azure identity standards, Presence.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Compare Cloud Delivery Models.
2. Compare Cloud Deployment Models
3. Impact of cloud computing on real world environment.

RESOURCES

TEXT BOOKS:

1. Barrie Sosinsky, "Cloud Computing Bible," Wiley India Pvt Ltd, 1st Edition, 2011.
2. Ivanka Menken Ivanka Menken, "Cloud Computing Virtualization Specialist Complete Certification Kit - Study Guide Book", Emereo Publishing, 2nd Edition, 2012.

REFERENCE BOOKS:

1. Anthony T. Velte, Toby J. Velte Robert Elsenpeter, "Cloud Computing: A practical Approach", Tata Mc Graw Hill, ISBN: 9780071626941, 1st Edition, 2010.
2. John W. Rittinghouse, James F. Ransome, "Cloud Computing implementation, Management and Security", CRC Press, ISBN: 9788120341609, Taylor & Francis group, 1st Edition 2010.
3. George Reese, "Cloud Application Architectures", Oreilly publishers, 1st Edition, 2010.
4. David S. Linthicum, "Cloud Computing and SOA Convergence in your Enterprise", Addison- Wesley, 1st Edition, 2010.

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2. <https://www.coursera.org/specializations/cloud-computing>
3. <https://www.udemy.com/course/introduction-to-cloud-computing-on-amazon-aws-for-beginners/>

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2. [https:// trailhead.salesforce.com/en/home](https://trailhead.salesforce.com/en/home)
3. <https://mkyong.com/tutorials/google-App- engine-tutorial/>
4. <https://www.awsacademy.com>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA102018	MS AZURE ADMINISTRATION	2	-	2	-	3
Pre-Requisite	Cloud Computing					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Azure AD objects, access control, Azure subscriptions and governance, Configure access to storage, Azure storage accounts, Azure files and Azure blob storage, Create and configure Virtual Machines, Containers, Monitoring and backup resources.

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

- C01.** Understand the concepts of Azure identities and governance in the maintenance of users and their roles.
- C02.** Analyze the problems to implement and manage storage.
- C03.** Design & Deploy Azure compute resources.
- C04.** Apply techniques to configure and manage virtual networking.
- C05.** Implement backup and recovery techniques in MS Azure.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3	-	-	3	-	-	-	-	-	-	-	-	3	-	3
C02	3	3	2	-	2	-	2	-	-	-	-	2	3	-	3
C03	3	2	3	2	1	-	-	-	-	-	2	-	3	3	2
C04	2	2	3	2	-	-	-	2	-	-	-	-	3	2	-
C05	-	-	-	3	3	2	2	-	-	-	3	-	-	-	3
Course Correlation Mapping	3	2	2	3	1	2	1	2	-	-	1	2	3	1	3

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: MANAGE AZURE IDENTITIES AND GOVERNANCE (06 Periods)

Manage Azure AD objects: Create users and groups, Manage licenses in Azure AD, Create administrative units, Manage user and group properties, Manage device settings and device identity, Perform bulk updates, Manage guest accounts, Configure self-service password reset.

Manage access control: Create custom role-based access control (RBAC) and Azure AD roles, Provide access to Azure resources by assigning roles at different scopes, Interpret access assignments.

Manage Azure subscriptions and governance: Configure and manage Azure policy, Configure resource locks, Apply and manage tags on resources, Manage resource groups, Manage subscriptions, Manage costs by using alerts, budgets, and recommendations, Configure management groups.

Module 2: IMPLEMENT AND MANAGE STORAGE (06 Periods)

Configure access to storage: Configure network access to storage accounts, Create and configure storage accounts, Generate shared access signature tokens, Configure stored access policies, Manage access keys, Configure Azure AD Authentication for a storage account, Configure storage encryption.

Manage data in Azure storage accounts: Create import and export jobs, Manage data by using Azure Storage Explorer and AzCopy, Implement Azure Storage redundancy, Configure object replication.

Configure Azure files and Azure blob storage: Create an Azure file share, Configure Azure Blob Storage, Configure storage tiers, Configure blob lifecycle management.

Module 3: DEPLOY AND MANAGE AZURE COMPUTE RESOURCES (06 Periods)

Automate deployment of resources by using templates: Modify an ARM template, Deploy a template, Save a deployment as an ARM template, Deploy virtual machine (VM) extensions.

Create and configure VMs: Create a VM, Manage images by using the Azure Compute Gallery, Configure Azure Disk Encryption, Move VMs from one resource group to another, Manage VM sizes, Add data disks, Configure VM network settings, Configure VM availability options, Deploy and configure VM scale sets.

Create and configure containers: Configure sizing and scaling for Azure Container Instances, Configure container groups for Azure Container Instances, Create and configure Azure Container Apps, Configure storage for Azure Kubernetes Service (AKS), Configure scaling for AKS, Configure network connections for AKS, Upgrade an AKS cluster.

Create and configure an Azure App Service: Create an App Service plan, Configure scaling settings in an App Service plan, Create an App Service, Secure an App Service, Configure custom domain names, Configure backup for an App Service, Configure networking settings, Configure deployment settings.

Module 4: CONFIGURE AND MANAGE VIRTUAL NETWORKING

(06 Periods)

Configure virtual networks: Create and configure virtual networks and subnets, Create and configure virtual network peering, Configure private and public IP addresses, Configure user-defined network routes, Configure Azure DNS.

Configure secure access to virtual networks: Create and configure network security groups (NSGs) and application security groups (ASGs), Evaluate effective security rules, Implement Azure Bastion, Configure service endpoints, Configure private endpoints.

Configure load balancing: Configure Azure Application Gateway, Configure an internal or public load balancer, Troubleshoot load balancing.

Monitor virtual networking: Monitor on-premises connectivity, Configure and use Azure Monitor for Networks, Use Azure Network Watcher, Troubleshoot external networking, Troubleshoot virtual network connectivity.

Module 5: MONITOR AND MAINTAIN AZURE RESOURCES

(06 Periods)

Monitor resources by using Azure Monitor: Configure and interpret metrics, Configure Azure Monitor Logs, Query and analyze logs, Set up alerts and actions, Configure monitoring of VMs, storage accounts, and networks by using VM insights.

Implement backup and recovery : Create an Azure Recovery Services vault, Create an Azure Backup vault, Create and configure backup policy, Perform backup and restore operations by using Azure Backup, Configure Azure Site Recovery for Azure resources, Perform failover to a secondary region by using Azure Site Recovery, Configure and review backup reports.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Manage Azure AD Identities
2. Manage Subscriptions and RBAC
3. Manage Governance via Azure Policy
4. Manage Azure Resources by Using ARM Templates
5. Implement Virtual Networking
6. Implement Intersite Connectivity
7. Implement Network Traffic Management
8. Manage Azure Storage
9. Manage Virtual Machines
10. Implement Data Protection

RESOURCES

TEXT BOOKS:

1. Harshul Patel, Michael Washam, Jonathan Tuliani and Scott Hoag, "Microsoft Azure Administrator," Microsoft Press, 1st Edition, 2021.
2. Jim Cheshire, "Microsoft Azure Fundamentals," Microsoft Press, 2nd Edition, 2020.

REFERENCE BOOKS:

1. IT Specialist, "Hands-On Labs Based on Real World Case Studies: AZ-104: The Complete Beginner's Guide to Mastering Microsoft Azure Services," Microsoft, 1st Edition, 2021.
2. Henry Stromm, "Learn Microsoft Azure for Beginners," Kindle, 2020.
3. Timothy L. Warner, "Microsoft Azure ForDummie," For Dummies, 1st Edition, 2020.

VIDEO LECTURES:

1. <https://elearn.nptel.ac.in/shop/iit-workshops/ongoing/introduction-to-data-engineering-using-azure/>
2. <https://www.coursera.org/specializations/microsoft-azure-fundamentals-az-900>
3. <https://www.udemy.com/course/microsoft-certified-azure-administrator/>

WEB RESOURCES:

1. <https://github.com/MicrosoftLearning/AZ-104-MicrosoftAzureAdministrator/blob/master/Instructions/Labs>
2. <https://learn.microsoft.com/en-us/training/modules/configure-azure-active-directory/>
3. <https://learn.microsoft.com/en-us/training/modules/configure-user-group-accounts/>
4. <https://www.edusum.com/microsoft/az-104-microsoft-azure-administrator>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA102019	CLOUD PRACTITIONER	2	-	2	-	3

Pre-Requisite Cloud Computing

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION:

A Course provides a detailed discussion on Fundamental of Cloud and AWS Environment. Able to work with AWS Resources along with various services of core computing, Database, and Networking of AWS adopting EC2 Pricing Models. A course also covers to Automate AWS Workloads with the Imperative Approach and the Declarative Approach with launch Configurations and Launch Templates, Auto Scaling Groups, Scaling Actions and Configuration Management.

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

- CO1.** Understand the concepts of Cloud and AWS Environment, Cloud Architectures to work with AWS in Virtual Private Cloud.
- CO2.** Apply AWS resources to work with AWS Management Console for AWS Console Mobile Application.
- CO3.** Analyze core compute services, EC2 pricing models, core storage and database services for AWS Implementation.
- CO4.** Identify and use core networking services for automating AWS Workload with AWS CLI, EC2 in cloud.
- CO5.** Work independently or in team to solve problems with effective communications.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	-	-	3	3
CO2	3	3	3	-	3	-	-	-	-	-	-	-	-	3	3
CO3	3	3	-	-	3	-	-	-	-	-	-	-	-	3	3
CO4	2	3	3	-	3	-	-	-	-	-	-	-	-	3	3
CO5	-	-	-	-	-	-	-	-	3	-	3	-	-	3	3
Course Correlation Mapping	3	3	3	-	3	-	-	-	3	-	3	-	-	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: FUNDAMENTAL OF CLOUD AND AWS ENVIRONMENT (06 Periods)

Fundamental of Cloud: Concepts of Cloud Computing, Highly Available and Scalable Resources, Professionally Secured Infrastructure, Metered Payment Model.

AWS Environment: AWS Regions, Regionally Based Services, Globally Based Services, Service Endpoint, Availability Zones, Availability Zone Designations, Availability Zone Networking, Availability Zones and High Availability, Edge Locations, Edge Locations and CloudFront, Regional Edge Cache Locations, The AWS Shared Responsibility Model, Managed Resources, Unmanaged Resources, Service Health Status, AWS Acceptable Use Policy.

Module 2: WORKING WITH AWS RESOURCES (06 Periods)

Working with AWS Resources: The AWS Management Console, Accessing the AWS Management Console, Opening a Service Console, Working with Shortcuts, Selecting a Region, The Account Name Menu, Resource Groups, Tag Editor, Tagging Strategies, The AWS Console Mobile Application, The AWS Command Line Interface, Requirements, Installation, Software Development Kits, Mobile Software Development Kits, Internet of Things Device Software Development Kits, CloudWatch, CloudWatch Metrics. CloudWatch Alarms, CloudWatch Dashboards, CloudWatch Logs, CloudWatch Events, API and Non-API Events, Management and Data Events, Event History, Trails, Log File Integrity Validation.

Module 3: THE CORE COMPUTE SERVICES AND EC2 PRICING MODELS (06 Periods)

The Core Compute Services: Deploying Amazon Elastic Compute Cloud Servers, Amazon Machine Images, EC2 Instance Types, Server Storage: Elastic Block Store and Instance, Store Volumes.

EC2 Pricing Models: Simplified Deployments through managed Services, Amazon Lightsail, AWS Elastic Beanstalk, Deploying Container and Serverless Workloads, Containers, Serverless Functions.

Module 4: THE CORE STORAGE SERVICES (06 Periods)

The Core Storage Services: Simple Storage Service, Objects and Buckets, S3 Storage Classes, Access Permissions, Encryption, Object Life Cycle Configurations, S3 Glacier, Archives and Vaults, Retrieval Options, AWS Storage Gateway, File Gateways, Volume Gateways, Tape Gateways, AWS Snowball, Hardware Specifications, Security, Snowball Edge.

Module 5: THE CORE DATABASE SERVICES (06 Periods)

The Core Database Services: Database Models, Relational Databases, Structured Query Language, Non-relational (No-SQL) Databases, Amazon Relational Database Service, Database Engines Licensing, Instance Classes, Scaling Vertically, Storage, Scaling Horizontally with Read Replicas, High Availability with Multi-AZ, Backup and Recovery, Determining Your Recovery Point Objective, DynamoDB, Items and Tables, Scaling Horizontally.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Amazon User Account Creation by access URL with account number. Add Security credentials with Enabling Multi-Factor Authentication to Secure Your Access.
2. Create an EC2 instance and invoke Ubuntu operating system with a set of configuration on amazon web services under IaaS.
3. Create New Amazon Elastic Block Store (Amazon EBS) EBS Volume to EC2 Instance for provides persistent block storage volumes for use with Amazon EC2 instances in the AWS Cloud.
4. Creating Amazon Machine Image (AMI) for provides the information required to launch an instance, which is a virtual server in the cloud.
5. Create your First EC2 windows instance, Assign Elastic IP Addresses to Instance (Static IP Address)
6. Amazon Elastic File System: Amazon Elastic File System (Amazon EFS) provides simple, scalable file storage for use with Amazon EC2. With Amazon EFS, storage capacity is elastic, growing and shrinking automatically as to add and remove files, to applications to store as they require, when they need it.
7. Create AWS S3 Bucket – (Object Storage) Amazon Simple Storage Service (Amazon S3) which is storage for the Internet. Use Amazon S3 to store and retrieve any amount of data at any time, from anywhere on the web.
 - i) AWS S3 Lifecycle Management
 - ii) S3 Bucket Replication to Cross-Region
 - iii) S3 Bucket Policies to control Access

RESOURCES

TEXT BOOKS:

1. Ben Piper and David Clinton "AWS Certified Cloud Practitioner," John Wiley & Sons, Inc., ISBN: 978-1-119-49070-8, 2019.
2. Cloud Practitioner (CLF-C01) Cert Guide, 1/E by Anthony Sequeira, PEARSON INDIA
3. AWS Certified Cloud Practitioner by Neville Dawson, Dilaber Consulting Ltd

REFERENCE BOOKS:

1. Dennis Hutten "AWS: The Beginners Guide to Amazon Web Services", ASIN: B0757XM97V, 2017.
2. Gordon Wong, "AWS Basics: Beginner's Guide," Createspace Independent Pub, ISBN: 978- 1542885751, February 2017.
3. Aurobindo Sarkar and Amit Shah, "Learning AWS," ISBN:978-1784394639, Packt Publishing, 2015
4. Bernard Golden, "Amazon Web Services for Dummies, ISBN: 978- 1118571835, Dummies; 1st edition, 2013.
5. Andreas Wittig and Michael Wittig "Amazon Web Services in Action", Manning; 2nd edition, 2018.

SOFTWARE/TOOLS:

1. Amazon EC2
2. Amazon S3
3. Amazon DynamoDB
4. AWS Aurora

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=SOTamWNgDKc>
2. <https://www.youtube.com/watch?v=3hLmDS179YE>
3. <https://www.youtube.com/watch?v=XjPUyGKRjZs>

WEB RESOURCES:

1. https://docs.aws.amazon.com/ec2/index.html?nc2=h_ql_doc_ec2
2. <https://aws.amazon.com/training/digital/aws-cloud-practitioner-essentials/>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA101016	CRYPTOGRAPHY	3	-	-	-	3
Pre-Requisite	Computer Networks					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Cryptographic protocols; Encryption techniques for confidentiality; Mathematics of symmetric and asymmetric algorithms; Hash functions for integrity; digital signature schemes.

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

- CO1.** Apply cryptographic protocols to ensure authentication in network systems.
- CO2.** Analyze the efficiency of cryptographic techniques based on security attacks.
- CO3.** Choose suitable key management scheme for efficient key exchange between the authenticated parties.
- CO4.** Implement algorithms using information, complexity, and number theories for ensuring the security requirements-CIA.
- CO5.** Evaluate Message Digest and Secure Hash Algorithms using hash functions for data Integrity.
- CO6.** Analyze well known digital signature algorithms for securing communication.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-		-	-	-	-	-	-	-	-	-	3
CO2	1	3	1	-	1	-	-	-	-	-	-	-	-	-	3
CO3	3	3	1	-		-	-	-	-	-	-	-	-	-	3
CO4	2	2	3	1	1	-	-	-	-	-	-	-	-	-	1
CO5	2	2	3	1	1	-	-	-	-	-	-	--	-	-	2
CO6	3	3	-	-	-	-	-	-	-	-	-	-	-	-	3
Course Correlation Mapping	3	3	2	1	1	-	-	-	-	-	-	-	-	-	3

Correlation Level: 3 - High

2 - Medium

1 - Low

DETAILED SYLLABUS

Module 1: FOUNDATIONS OF CRYPTOGRAPHY

(09 Periods)

FOUNDATIONS OF CRYPTOGRAPHY: Steganography, Substitution ciphers and Transposition Ciphers, One Time Pads.

Protocol Building Blocks: Introduction to protocols, communications using symmetric Cryptography, One-Way Hash Functions, Communications Using Public-Key Cryptography, Digital Signatures with Encryption.

Module 2: CRYPTOGRAPHIC TECHNIQUES

(09 Periods)

CRYPTOGRAPHIC TECHNIQUES: Key Management, Electronic Codebook Mode, Block Replay, Cipher Block Chaining Mode, Stream Ciphers, Cipher-Feedback Mode, Synchronous Stream Ciphers, Output-Feedback Mode, Counter Mode, Choosing a Cipher Mode, Interleaving, Block Ciphers versus Stream Ciphers.

Module 3: MATHEMATICS FOR CRYPTOGRAPHIC ALGORITHMS

(11 Periods)

MATHEMATICS FOR CRYPTOGRAPHIC ALGORITHMS: Mathematical background: Information Theory, Complexity Theory, Number Theory, Factoring, Prime Number Generation, Discrete Logarithms in a Finite Field, Data Encryption Standard (DES), DES decryption, Security of DES, Public Key Algorithms: RSA.

Module 4: HASH FUNCTIONS

(08 Periods)

HASH FUNCTIONS: One Way Hash Functions, MD4, MD5, Secure Hash Algorithm (SHA), Security of SHA, Message Authentication Codes (MAC).

Module 5: DIGITAL SIGNATURES

(08 Periods)

DIGITAL SIGNATURES: Digital Signature Algorithm (DSA), Security of DSA, Discrete Logarithm Signature Schemes, Diffie-Hellman Key exchange.

Total Periods:45

EXPERIENTIAL LEARNING

1. Implement the following Poly-alphabetic Ciphers and analyze its attack resiliency.
a) Hill cipher b. Vigenere
2. Implement the following block cipher modes and analyze the role of Initialization Vector(IV)
a) counter mode b. Output Feedback mode
3. Implement a stream cipher algorithm with running key generator.

RESOURCES

TEXT BOOKS:

1. Bruce Schneier, "Applied Cryptography: Protocols, Algorithms and Source Code in C",

REFERENCE BOOKS:

1. Alfred J Menezes, Paul C van Oorschot and Scott A. Vanstone, "Handbook of Applied Cryptography", CRC Press, New York, 2010.
2. Wenbo Mao, "Modern Cryptography Theory and Practice", Pearson Education, 2004

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc22_cs03/preview
2. <https://www.coursera.org/specializations/applied-crypto>
3. <https://www.udemy.com/course/du-cryptography/>

WEB RESOURCES:

1. <https://www.udacity.com/course/applied-cryptography--cs387>
2. <https://www.classcentral.com/course/udacity-applied-cryptography-326>
3. <https://www.classcentral.com/course/udacity-applied-cryptography-326>
4. https://wiki.openssl.org/index.php/Command_Line_Uutilities
5. <https://www.sslshopper.com/article-most-common-openssl-commands.html>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA101017	CYBER SECURITY	3	-	-	-	3
Pre-Requisite	Computer Networks					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Cybercrime, Cyber offenses, Phishing, Identity theft, Cybercrime in mobile and wireless devices, Organizational measures for handling mobile devices, Security implications on using mobile devices, Tools and methods used in cybercrime, Forensics of computer and organizational implications.

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

- CO1.** Analyze the methods of cybercrime, information security, cyber criminals.
- CO2.** Illustrate the Cyber offenses, Categories of cybercrime and how criminals plan the attacks.
- CO3.** Investigate tools used for cybercrime to protect computational assets
- CO4.** Illustrate the concepts of Cyber forensics, Digital Forensics Science, Digital Evidence, Collecting Electronic Evidence, Network Forensics.
- CO5.** Study the IPR issues, web threats for organizations, security and privacy implications, social computing and the associated challenges for organizations.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	3	3	-	-	-	-	-	-	-	2	-	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO5	-	-	-	-	-	-	-	-	3	3	-	-	2	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	-	3	3	-	-	2	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: CYBERCRIME

(09 Periods)

Cybercrime and information security, Cybercriminals, Classifications of cybercrimes, Legal perspectives of cybercrime, Indian perspective of cybercrimes, Cybercrime and the Indian ITA 2000, Global perspective on cybercrimes

Module 2: CYBEROFFENSES AND ATTACKS

(09 Periods)

Cyber offenses: Categories of cybercrime, How criminals plan the attacks, Social engineering, Cyber stalking, Cyber cafe and cybercrimes, Botnets, Attack vector

Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft)

Module 3: TOOLS AND METHODS USED IN CYBERCRIME

(09 Periods)

Proxy servers and anonymizers, Password cracking, Key loggers and spywares, Virus and worms, Trojan horses and backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow, Attacks on wireless networks.

Module 4: COMPUTER FORENSICS

(09 Periods)

Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Digital Forensics Life Cycle -The Digital Forensics Process, The Phases in Computer Forensics/Digital Forensics, Precautions to be Taken when Collecting Electronic Evidence, Network Forensics.

Module 5: ORGANIZATIONAL IMPLICATIONS

(09 Periods)

Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social computing and the associated challenges for organizations, Forensics best practices for organizations.

Total Periods:45

EXPERIENTIAL LEARNING

1. Steps to attack a victim computer by using "ProRat" trojan tool
2. Perform the packet sniffing mechanism by download the "wire shark" tool and extract the packets
3. Perform the task of creating mail messages by using fake mail id by using the "fake mailer" website (<https://emkei.cz>)

RESOURCES

TEXT BOOKS:

1. Nina Godbole, SunitBelapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley.

REFERENCE BOOKS:

1. Nilakshi Jain, Ramesh Menon, Cyber Security and Cyber Laws, Wiley, 2020.
2. Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, CybersecurityEssentials, 1st Edition, Sybex, 2018.
3. ErdalOzkaya, Cybersecurity: The Beginner's Guide, 1st Edition, Packt Publishing, 2019.

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc23_cs127/preview
2. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview
3. <https://www.coursera.org/learn/foundations-of-cybersecurity>

WEB RESOURCES:

1. Yuri Diogenes, ErdalOzkaya, Cybersecurity: Attack and Defense Strategies, 2nd Edition, Packt Publishing, 2019.
2. <http://www.ignou.ac.in/upload/Announcement/programmedetails.pdf>
3. Alessandro Parisi, Hands-On Artificial Intelligence for Cybersecurity, Packt Publishing, 2019.

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA101018	ETHICAL HACKING	3	-	-	-	3
Pre-Requisite	Computer Networks					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Ethical hacking, Network and computer attacks, Foot printing, Social engineering, Port scanning, System hacking, Sniffers, Denial of service, Hacking web servers, Wireless hacking, Cryptography, Network Protection System.

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

- CO1.** Demonstrate knowledge on the computer security, social engineering and the intent of ethical hacking.
- CO2.** Select and apply foot printing and port scanning tools to discover vulnerabilities of the computer system.
- CO3.** Investigate hacking techniques and tools to maintain computer security.
- CO4.** Analyze cryptosystems and network protection systems for information security and intrusion prevention.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	-	-	3	3
CO2	3	3	3	-	3	-	-	-	-	-	-	-	-	3	3
CO3	3	3	-	-	3	-	-	-	-	-	-	-	-	3	3
CO4	2	3	3	-	3	-	-	-	-	-	-	-	-	3	3
Course Correlation Mapping	3	3	3	-	3	-	-	-	-	-	-	-	-	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: ETHICAL HACKING, NETWORK AND COMPUTER ATTACKS (09 Periods)

Introduction to Ethical Hacking: The role of security and penetration testers, Penetration-Testing methodologies, What you can and cannot do legally.

Network and Computer Attacks: Malicious software, Trojans, Backdoors, Viruses, and Worms, Protection against malware attacks, Intruder attacks on networks and computers, Addressing physical security.

Module 2: TCP/IP CONCEPTS AND SOCIAL ENGINEERING (09 Periods)

TCP/IP Concepts: Overview of TCP/IP – Application layer, Transport layer, Internet layer; IP addressing – Planning IP address assignments, IPv6 addressing.

Social Engineering: What is social engineering, What are the common types of attacks, Understand insider attacks, Understand identity theft, Describe phishing attacks, Understand online scams, Understand URL obfuscation, Social engineering countermeasures?

Module 3: FOOTPRINTING AND PORT SCANNING (09 Periods)

Foot printing: Using web tools for footprinting, Conducting competitive intelligence, Using domain name system zone transfers.

Port Scanning: Port scanning, Using port scanning tools, Conducting ping sweeps, Understanding scripting.

Module 4: SYSTEM HACKING (09 Periods)

System hacking -Password cracking techniques, Types of passwords, Key loggers and other spyware technologies, Escalating privileges, Root kits, How to hide files, Steganography technologies, How to cover your tracks and evidences; Sniffers-Protocols susceptible to sniffing, Active and passive sniffing, ARP poisoning, Ethereal capture and display filters, MAC flooding, DNS spoofing techniques, Sniffing countermeasures; Denial of Service - Types of DoS attacks, How DDoS attacks work, How BOTs/BOTNETs work, Smurf attack, SYN flooding, DoS/DDoS counter measures; Session hijacking-Spoofing vs. hijacking, Types of session hijacking, Sequence prediction, Steps in performing session hijacking, Preventing session hijacking.

Module 5: CRYPTOGRAPHY, NETWORK PROTECTION SYSTEMS (09 Periods)

Cryptography: Understanding Cryptography basics, Symmetric and asymmetric algorithms, Public key infrastructure, Cryptography attacks. Network Protection Systems: Understanding routers, Firewalls, Honeypots.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Analyze Windows Server 2019 vulnerabilities as reported by CVE.
2. Write a detailed report on Memory Corruption Vulnerability.
3. Conduct a vulnerability assessment on a simulated network. Identify and prioritize potential vulnerabilities.
4. Develop a plan to remediate the vulnerabilities while considering their severity and impact.

RESOURCES

TEXT BOOKS:

1. Michael T. Simpson, Kent Backman, James E. Corley, Hands-On Ethical Hacking and Network Defense, 3rd Edition, Cengage Learning, 2017.
2. Kimberly Graves, CEH: Official Certified Ethical Hacker Review Guide, Wiley, 2007.

REFERENCE BOOKS:

1. Michael Gregg, Certified Ethical Hacker (CEH) Certguide, 3rd Edition, Pearson, 20

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc22_cs13/preview
2. <https://www.youtube.com/watch?v=t8nwQ6At0CU&list=PL7AT7LU4byRKMBCEWpeZ4QO d2VWvdIHXU>

WEB RESOURCES:

1. <https://snyk.io/ethical-hacking-resources/>
2. <https://www.hackerone.com/ethical-hacker/useful-online-resources-new-hackers>
3. <https://hackernoon.com/top-resources-to-learn-ethical-hacking>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA102020	OBJECT ORIENTED SYSTEM DESIGN	2	-	2	-	3
Pre-Requisite	Software Engineering					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Introduction to object oriented concepts, methods, models, Conceptual Model of UML, Architecture, S/W Development Life Cycle, UML Diagrams, Analysis process, Design process.

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

- CO1.** Understand the object-oriented concepts and modelling.
- CO2.** Design the architecture and defining class objects for the system.
- CO3.** Design the various diagrams for representation of system.
- CO4.** Analyzing the constructed system by using various SDLC approaches.
- CO5.** Designing various system process component models.
- CO6.** Work in dependently or in teams to solve problems with effective Communication.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO2	1	3	3	3	3	-	-	-	-	-	-	-	-	3	2
CO3	1	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO4	1	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO5	-	3	-	3	-	2	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Course Correlation Mapping	2	3	3	3	1	2	3	-	-	-	-	-	-	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: OBJECT ORIENTED CONCEPTS AND MODELING (06 Periods)

What is Object Orientation? (Introduction to class, Object, inheritance, polymorphism)

Model : Importance of Modeling, Object Oriented Modeling

Object oriented system development: Function/data methods, Object oriented analysis, Object oriented construction, Object oriented testing

Identifying the elements of an object model: Identifying classes and objects, Specifying the attributes, Defining operations ,Finalizing the object definition.

Module 2: INTRODUCTION TO UML, BASIC AND ADVANCED STRUCTURAL MODELING (06 Periods)

Introduction to UML: Overview of UML, Conceptual Model of UML, Architecture, S/W Development Life Cycle.

Basic and Advanced Structural Modeling: Classes Relationship, Common mechanism, Diagrams, Class diagram ,Advanced classes, Advanced Relationship, Interface, Types and Roles, Packages, Object Diagram

Module 3: BASIC BEHAVIORAL MODELING AND ARCHITECTURAL MODELING (06 Periods)

Use cases, Use Case Diagram, Interaction Diagram, Sequence Diagram, Activity Diagram, State Chart Diagram, Collaboration Diagram, Components Diagram and Deployment Diagram

Module 4: OBJECT ORIENTED ANALYSIS (06 Periods)

Iterative Development, Understanding requirements, Unified process and UP Phases: Inception, Elaboration, Construction, Transition, Agile UP

Module 5: OBJECT ORIENTED DESIGN (06 Periods)

Generic Components of OO Design Model, System Design Process: Partitioning the Analysis Model, Concurrency and Subsystem Allocation, Task Management Component, Data Management Component, Resource Management Component, Inter Subsystem Communication, Object Design process.

Total Periods:30

EXPERIENTIAL LEARNING

1. Identify Use Cases and develop the Use Case model.
2. Identify the business activities and develop an UML Activity diagram.
3. Identity the conceptual classes and develop a domain model with UML Class diagram.
4. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
5. Draw the State Chart diagram.

6. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
7. Implement the Technical services layer.
8. Implement the Domain objects layer.
9. Implement the User Interface layer.
10. Draw Component and Deployment diagrams.
11. Draw the System architecture and UML diagrams for any on the following cases
Suggested domains:
 - a. Library management system
 - b. Hospital management system
 - c. ATM system
 - d. Transport System
 - e. Book bank System
 - f. Exam Registration System
 - g. Stock maintenance system.
 - h. Online course reservation system
 - i. E-ticketing System
 - j. Credit card processing
 - k. e-book management system
 - l. Recruitment system
 - m. Foreign trading system
 - n. Conference Management System
 - o. BPO Management System

RESOURCES

TEXT BOOKS:

1. Object-Oriented Systems Analysis and Design Using UML By Simon Bennett, Ray Farmer, Steve McRobb, 2010
2. Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education Asia.

REFERENCE BOOKS:

1. The Unified Modeling Language User Guide by Grady Booch, James Raumbaugh, Ivar Jacobson.
2. Object Oriented Software Engineering by Ivar Jacobson
3. Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education Asia

VIDEO LECTURES:

1. <https://archive.nptel.ac.in/courses/106/105/106105153/>
2. https://onlinecourses.nptel.ac.in/noc19_cs48/preview
3. https://onlinecourses.nptel.ac.in/noc20_cs84/preview

WEB RESOURCES:

1. <http://ndl.ethernet.edu.et/bitstream/123456789/90366/3/Revised%20OOSAD%20Module2%20020.pdf>
2. <https://online.stanford.edu/courses/cs108-object-oriented-systems-design>
3. <https://www.w3computing.com/systemsanalysis/object-oriented-systems-analysis-design/>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA102021	SOFTWARE TESTING AND AUTOMATION	2	-	2	-	3
Pre-Requisite	Software Engineering					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Black-Box Testing and White-Box Testing; Software Testing Life Cycle; Software Testing Principles; Test Cases; Bug Reporting, Advanced Testing concepts; Automated Software Testing; Automate Testing of Web Applications; Selenium;

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

- CO1.** Understand the basic concepts of software testing and the need for software testing
- CO2.** Design Test planning and different activities in involved test planning
- CO3.** Design effective test cases that can uncover critical defects in the application
- CO4.** Carry out advanced types of testing
- CO5.** Automate the software testing using Selenium and Test NG

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	2	1	1	3	2	-	-	-	3	2	3
CO2	2	3	1	1	1	2	2	1	2	-	-	-	1	2	3
CO3	2	2	1	3	1	1	3	1	2	-	-	-	2	3	2
CO4	2	1	3	2	1	1	1	1	2	-	-	-	3	1	2
CO5	2	2	1	3	1	1	3	2	1	-	-	-	2	1	3
Course Correlation Mapping	2	3	2	2	2	2	2	2	3	-	-	-	2	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: FOUNDATIONS OF SOFTWARE TESTING (06 Periods)

Why do we test Software?, Black-Box Testing and White-Box Testing, Software Testing Life Cycle, V-model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errors and Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing.

Module 2: TESTPLANNING (06 Periods)

The Goal of Test Planning, High Level Expectations, Intergroup Responsibilities, Test Phases, Test Strategy, Resource Requirements, Tester Assignments, Test Schedule, Test Cases, Bug Reporting, Metrics and Statistics.

Module 3: TESTDESIGNAND EXECUTION (06 Periods)

Test Objective Identification, Test Design Factors, Requirement identification, Testable Requirements, Modeling a Test Design Process, Modeling Test Results, Boundary Value Testing, Equivalence Class Testing, Path Testing, Data Flow Testing, Test Design Preparedness Metrics, Test Case Design Effectiveness, Model-Driven Test Design, Test Procedures, Test Case Organization and Tracking, Bug Reporting, Bug Life Cycle.

Module 4: ADVANCED TESTINGCONCEPTS (06 Periods)

Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Testing, Configuration Testing, Compatibility Testing, Usability Testing, Testing the Documentation, Security testing, Testing in the Agile Environment, Testing Web and Mobile Applications.

Module 5: TESTAUTOMATIONAND TOOLS (06 Periods)

Automated Software Testing, Automate Testing of Web Applications, Selenium: Introducing Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports.

Total Periods:30

EXPERIENTIAL LEARNING

1. Develop the test plan for testing commerce web/mobile application(www.amazon.in)
2. Design the test cases for testing thee-commerce application
3. Test thee -commerce application and report the defectsinit.
4. Develop the test plan and design the test cases for an inventory control system.
5. Execute the test cases against a client server or desktop application and Identify the defects.
6. Test the performance of thee-commerce application.
7. Automate the testing of e-commerce applications using Selenium.

8. Integrate Test NG with the above test automation.
9. Mini Project: Build a data-driven framework using Selenium and Test NG.
 - a. Build Page object Model using Selenium and Test NG.
 - b. Build BDD framework with Selenium, Test NG and Cucumber.

RESOURCES

TEXT BOOKS:

1. Yogesh Singh, "Software Testing", Cambridge University Press, 2012
2. Unmesh Gundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide" Second Edition 2018

REFERENCE BOOKS:

1. Glenford J. Myers, Corey Sandler, Tom Badgett, The Art of Software Testing, 3rd Edition, 2012, John Wiley & Sons, Inc.
2. Ron Patton, Software testing, 2nd Edition, 2006, Sams Publishing Paul C. Jorgensen, Software Testing: A Craftsman's Approach, Fourth Edition, 2014, Taylor & Francis Group.
3. Carl Cocchiaro, Selenium Framework Design in Data-Driven Testing, 2018, Packt Publishing.
4. Elfriede Dustin, Thom Garrett, Bernie Gaurf, Implementing Automated Software Testing, 2009, Pearson Education, Inc.
5. Satya Avasarala, Selenium Web Driver Practical Guide, 2014, Packt Publishing.
6. Varun Menon, Test NG Beginner's Guide, 2013, Packt Publishing.

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc22_cs61/preview
2. https://onlinecourses.nptel.ac.in/noc23_cs38/preview
3. <https://www.coursera.org/specializations/software-testing-automation>

WEB RESOURCES:

1. <https://online.umn.edu/software-testing-and-automation>
2. <https://shiftasia.com/column/software-testing-automation-and-the-misconceptions/>
3. <https://link.springer.com/book/10.1007/978-3-031-22057-9>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA102022	.NET TECHNOLOGIES	2	-	2	-	3

Pre-Requisite Object Oriented Programming with C++

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: .NET Framework, C# Programming; Object-oriented concepts with C#, Exception handling; Interfaces, Generics, Delegates and Events in C#; Database access with ADO.NET; ASP.NET MVC , ASP.NET Web API.

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

CO1. Demonstrate knowledge on C# and .NET platform concepts.

CO2. Understand OOPS concepts and exception handling mechanisms.

CO3. Identify generic, event handling principles.

CO4. Apply ADO.NET concepts for data management

CO5. Design web applications with ASP.NET.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	-	-	-	2	-	3
CO2	3	-	3	3	3	-	-	-	-	-	-	-	2	-	3
CO3	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO5	-	3	3	-	3	-	-	-	-	-	-	-	2	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO C# AND .NET PLATFORM: (06 Periods)

The Philosophy of .NET: Key Benefits of .NET platform, Building blocks of the .NET platform, Overview of .NET assemblies, Common type system, Common language specification.

Building C# Applications: Building C# applications on windows, Building .NET applications on a Non-windows OS, Anatomy of a Simple C# Program, System. Console class.

Module 2: OBJECT ORIENTED PROGRAMMING WITH C# AND EXCEPTION HANDLING: (06 Periods)

Object Oriented Programming with C#: C# class type, Constructors, The role of the this keyword, The static keyword, Pillars of OOP, C# access modifiers, C# encapsulation services, The basic mechanics of inheritance, The details of Inheritance.

Understanding Structured Exception Handling: The role of .NET exception handling, The simplest possible example, System-level exceptions, Application level exceptions

Module 3: INTERFACES, GENERICS AND EVENTS (06 Periods)

Interfaces: Understanding interface types, Defining custom interfaces, Implementing an interface.

Generics: Role of generic type parameters, Creating custom generic methods, Creating custom generic structures and classes.

Module 4: ADO.NET AND ORM ENTITY FRAMEWORK (06 Periods)

Definition of ADO.NET, ADO.NET data providers, ADO.NET namespaces, Connected layer of ADO.NET, Data readers, Working with Create, Update, and Delete Queries, Creating a Console-Based Client Application.

Module 5: INTRODUCING ASP.NET MVC AND INTRODUCING ASP.NET WEB API (06 Periods)

Introducing ASP.NET MVC: MVC Pattern, The ASP.NET MVC Application Template, Routing, Adding an application using DAL, Controllers and Actions, The Razor View Engine, MVC Views, The Display Data Annotation, Razor Templates, Working with Forms.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Program to display the addition, subtraction, multiplication and division of two number using console application.
2. Program to display the first 10 natural numbers and their sum using console application.
3. Program to display the addition using the windows application.
4. Write a program to convert input string from lower to upper and upper to lower case.

5. Write a program to simple calculator using windows application.
6. Write a program working with Page using ASP.Net.
7. Write a program working with forms using ASP.NET.
8. Write a program to connectivity with Oracle database.
9. Write a program to access data source through ADO.NET.
10. Write a program to manage the session.

RESOURCES

TEXT BOOKS:

1. Andrew Troelsen and Philip Japikse, Pro C# 7 With .NET and .NET Core, Apress, 8th Edition, 2017

REFERENCE BOOKS:

1. Christian Nagel, Jay Glynn and Morgan Skinner, Professional C# 5.0 and .NET 4.5.1, WROX Publications, 1st Edition, 2014.
2. Mathew Mac Donald, The Complete Reference ASP.NET, TATA McGraw Hill, 1st Edition, 2010.

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=kdPtNMb8tPw>
2. <https://www.youtube.com/watch?v=8ew1LgfWV6s>

WEB RESOURCES:

1. https://www.tutorialspoint.com/dotnet_core/index.htm
2. <https://www.javatpoint.com/net-framework>
3. <https://www.simplilearn.com/dot-net-programming-certification-training-course>
4. <https://www.coursera.org/courses?query=net>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA102023	WEB APPLICATIONS DEVELOPMENT USING PHP	2	-	2	-	3

Pre-Requisite Web Designing Using HTML, CSS, JavaScript

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Topics covered include- distributed system models, different cloud service models, service oriented architectures, cloud programming and software environments, Resource management.

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

- CO1.** Understand fundamentals and various paradigms of computing
- CO2.** Demonstrate cloud characteristics and models.
- CO3.** Identify the ways in which the cloud can be programmed and deployed.
- CO4.** Recognize the services and platform of cloud
- CO5.** Design different cloud services from different vendors.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	2	-	3
CO2	3	-	3	3	3	-	-	-	-	-	-	-	2	-	3
CO3	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO5	-	3	3	-	3	-	-	-	-	-	-	-	2	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: HTML (06 Periods)

Introduction: Fundamentals of HTML, Working with Text, Organizing Text in HTML, Working with Links and URLs, Creating Tables, Working with Images, Canvas, Forms, Frames and Multimedia.

HTML5: Introduction, HTML5 Document Structure, Creating Editable Content, Checking Spelling Mistakes, Exploring Custom Data Attributes, Client-Side Storage, Drag and Drop Feature, Offline Web Applications, Web Communications, Cross-Document Messaging and Desktop Notifications.

Module 2: CSS AND JAVASCRIPT (06 Periods)

CSS: Introduction, CSS Selectors, Inserting CSS in an HTML document, Backgrounds, Fonts, and Text Styles, Creating Boxes, Displaying, Positioning and Floating Elements, Features of CSS3, Media Queries.

Javascript: Overview of JavaScript, JavaScript Functions, Events, Image Maps and Animations, JavaScript Objects, Working with Browser and Document Objects, JQuery - Introduction, JQuery Selectors, Events.

Module 3: INTRODUCTION TO PHP (06 Periods)

Lexical structure, data types, variables, expressions and operators, flow control statements, embedding PHP in web pages.

Module 4: FUNCTIONS AND STRINGS (06 Periods)

FUNCTIONS: Calling a function, defining a function, variable scope, function parameters, return values.

STRINGS: quoting string constants, printing strings, cleaning strings, comparing strings, regular expressions.

Module 5: ARRAYS (06 Periods)

Indexed versus associative arrays, identifying elements in array, storing data in arrays, multi-dimensional arrays, extracting multiple values, converting between arrays and variables, traversing arrays.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Install and configure PHP, web server, MYSQL
 - a. Write a program to print "welcome to PHP".
 - b. Write a simple PHP program using expressions and operators
2. Write a PHP program to demonstrate the use of decision making control structures using Switch statement
 - a. IF statement
 - b. IF-else statement
3. Write a PHP program to demonstrate the use of looping structures using:
 - a. While statement
 - b. Do-while statement
 - c. For statement
 - d. For each statement
4. Write a PHP program for creating and manipulating

- a. Indexed array
 - b. Associative array
 - c. Multidimensional array
- 5. Write a PHP program to- string functions.
 - a. Calculate length of string
 - b. Count the number of words in string
 - c. Write a simple PHP program to demonstrate use of various built-in
- 6. Design a web page using form controls: Text box, Radio button, Check box, Buttons
- 7. Design a web page using form controls: List box, Combo box, Hidden field box
- 8. Develop web page with data validation

RESOURCES

TEXT BOOKS:

1. Kevin tatroe&Peter Macintyre "Programming PHP", O'REILLY, 4th Edition.
2. Kogent Learning Solutions Inc, HTML 5 Black Book: Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and JQuery, Dreamtech Press, First Edition, 2011.Press, 2018

REFERENCE BOOKS:

1. Snig Bahumik, Bootstrap Essentials, PACKT Publishing, First Edition, 2015. (e-book)
2. Thomas A. Powell, The Complete Reference: HTML and CSS, Tata McGraw Hill, Fifth Edition, 2010
3. Andrea Tarr, PHP and MySQL, Willy India, First Edition, 2012.
4. Chris Hay, Brian Prince, "Azure in Action" Manning Publications [ISBN: 9781935182481], 2010.
5. Henry Li, "Introducing Windows Azure" Apress; 1 edition [ISBN: 978-14302-2469- 3], 2009.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=PGvrnas2_Pk
2. <https://www.youtube.com/watch?v=hx38tnIYGIA>

WEB RESOURCES:

1. <https://www.javatpoint.com/php-tutorial>
2. <https://www.guru99.com/php-practical-example.html>
3. <https://www.geeksforgeeks.org/build-a-grocery-store-web-app-using-php-with- mysql/>
4. <https://www.cleart.com/php-web-application-development-php-web- development.html>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA102024	MULTIMEDIA SYSTEMS	2	-	2	-	3
Pre-Requisite	Web Applications Development using PHP					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Multimedia and its applications, Global structure of Multimedia, Medium, Multimedia system and properties, Characteristics of a Multimedia system, Overview sound system, producing digital audio, Music and speech, Speech Generation, Speech Analysis, Uses of images and Graphics, Digital Video, Video signal representation, Need for Data Compression, Compression Basics.

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

- CO1.** Apply the knowledge of the basic fundamentals components of Multimedia.
- CO2.** To get familiar with Multimedia file formats and standards.
- CO3.** Understanding the video formats and types of animation.
- CO4.** Understand the basics of text, Image and Video compression.
- CO5.** Understand the various compression algorithms for multimedia content.
- CO6.** Work independently or in teams to solve problems with effective Communication.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	-	-	-	3	-	1	-	3	2	3
CO2	3	3	3	3	3	-	-	-	3	-	2	-	3	2	3
CO3	1	3	3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	2	2	1	1	-	-	-	-	-	-	-	2	2	2
CO5	3	2	2	1	2	-	-	-	-	-	-	-	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Course Correlation Mapping	3	3	3	2	2	-	-	-	2	-	2	-	2	2	3

Correlation Levels: 3: High; 2: Medium; 1: Low

DETAILED SYLLABUS

Module 1: INTRODUCTION TO MULTIMEDIA

(06 Periods)

Multimedia and its applications, Global structure of Multimedia, Medium, Multimedia system and properties, Characteristics of a Multimedia system, Challenges for Multimedia Systems, Components of Multimedia System, Multimedia building blocks, Scope of Multimedia.

Module 2: SOUND/AUDIO SYSTEM

(06 Periods)

Overview sound system, Producing digital audio, Music and speech, Speech Generation, Speech Analysis, Speech Transmission, Representation of audio files, Computer Music - MIDI, MIDI versus Digital Audio.

Module 3: IMAGES AND GRAPHICS

(06 Periods)

Uses of images and Graphics, Digital Image Representation, Image and graphics Format, Working with image and graphics, Image Synthesis, analysis and Transmission.

Module 4: VIDEO AND ANIMATION

(06 Periods)

Digital Video, Video signal representation, Computer Video Format, Computer- Based animation, Animation Language, Timeline and frame-based animation, Timeline and Tween-Based animation, Methods of controlling Animation, Display of Animation, Transmission of Animation

Module 5: DATA COMPRESSIONS

(06 Periods)

Need for Data Compression, Compression Basics, Storage Space, Coding Requirements, Lossless and Lossy Compression techniques, Source, Entropy and Hybrid Coding, Lossy Sequential OCT- based Mode, Expanded Lossy OCT-based Mode, JPEG and MPEG Compression.

Total Periods:30

EXPERIENTIAL LEARNING

1. Create a simple painting program using Flash or equivalent.
2. Create a simple animated banner using Flash or equivalent.
3. Design an object dragging program.
4. Prepare a photo album using Flash or equivalent.
5. Create animated buttons which is used for web design using Adobe Photoshop or equivalent.
6. Design image mapping using Flash or equivalent.
7. Create image morphing using adobe Photoshop or equivalent.
8. Make animations using macromedia Flash or equivalent.
9. Create animated Gifs for use as banners, titles and buttons.

10. Create short film in Flash or equivalent using any theme.
11. To perform animation using any animation software.
12. To perform image editing using basic tool, masking effect and rendering effects using Photoshop or equivalent.

RESOURCES

TEXT BOOKS:

1. Ralf Steinmetz and Klara Nahrstedt , Multimedia: Computing, Communications and Applications, Pearson Education Asia
2. Multimedia: Making It Work, Tay Vaughan, 7th Edition, Tata Mc-Graw Hill. 2008.
3. John F. Koegel Buford, Multimedia Systems, Pearson Education Asia.

REFERENCE BOOKS:

1. Rajneesh Aggarwal & B. B Tiwari, "Multimedia Systems", Excel Publication, New Delhi, 2007.
2. Li & Drew, "Fundamentals of Multimedia", Pearson Education, 2009.
3. Parekh Ranjan, "Principles of Multimedia", Tata McGraw-Hill, 2007
4. Anirban Mukhopadhyay and Arup Chattopadhyay, "Introduction to Computer Graphics and Multimedia", Second Edition, Vikas Publishing House.

VIDEO LECTURES:

1. <https://www.coursera.org/lecture/internet-of-things-multimedia/multimedia-technologies-YQGDv>
2. <https://www.udemy.com/course/graphic-designing-course-for-special-needs-people/>

WEB RESOURCES:

1. <https://nptel.ac.in/courses/117105083>
2. https://archive.nptel.ac.in/content/storage2/courses/117105083/pdf/ssg_m1l1.pdf

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA102025	GAME DESIGN AND DEVELOPMENT	2	-	2	-	3
Pre-Requisite	Python Programming					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Genres of Games, Basics of 2D and 3D Graphics for Game Avatar, Game Components, Character Development, Storyboard Development for Gaming – Script Design, Rendering Concept, Pygame Game development.

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

- CO1.** Explaining the concepts of 2D and 3d Graphics.
- CO2.** Design game design documents.
- CO3.** Implementation of gaming engines.
- CO4.** Survey gaming environments and frameworks.
- CO5.** Implement a simple game in Pygame.
- CO6.** Work independently or in teams to solve problems with effective Communication.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	-	-	-	-	-	-	-	2	2	2
CO2	1	2	2	1	2	-	-	-	-	-	-	-	2	2	1
CO3	1	1	1	2	1	-	-	-	-	-	-	-	2	2	2
CO4	3	3	1	3	3	-	-	-	-	-	-	-	2	2	3
CO5	3	3	2	1	3	-	-	-	-	-	2	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Course Correlation Mapping	2	2	2	2	3	-	-	-	-	-	1	-	2	2	3

Correlation Levels: 3: High; 2: Medium; 1: Low

DETAILED SYLLABUS

Module 1: 3D GRAPHICS FOR GAME DESIGN

(06 Periods)

Genres of Games, Basics of 2D and 3D Graphics for Game Avatar, Game Components – 2D and 3D Transformations – Projections – Color Models – Illumination and Shader Models – Animation –Controller Based Animation.

Module 2: GAME DESIGN PRINCIPLES

(06 Periods)

Character Development, Storyboard Development for Gaming – Script Design – Script Narration, Game Balancing, Core Mechanics, Principles of Level Design – Proposals – Writing for Preproduction, Production and Post – Production.

Module 3: GAME ENGINE DESIGN

(06 Periods)

Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine– Collision Detection – Game Logic – Game AI – Path finding.

Module 4: OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS

(06 Periods)

Pygame Game development – Unity – Unity Scripts –Mobile Gaming, Game Studio, Unity Single player and Multi-Player games

Module 5: GAME DEVELOPMENT USING PYGAME

(06 Periods)

Developing 2D and 3D interactive games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating music and sound – Asset Creations – Game Physics algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based arcade Games – Puzzle Games.

Total Periods:30

EXPERIENTIAL LEARNING

1. Installation of a game engine, e.g., Unity, Unreal Engine, familiarization of the GUI.
2. Conceptualize the theme for a 2D game.
3. Character design, sprites, movement and character control
4. Level design: design of the world in the form of tiles along with interactive and collectible objects.
5. Design of interaction between the player and the world, optionally using the physics engine.
6. Developing a 2D interactive using Pygame
7. Developing a Puzzle game
8. Design of menus and user interaction in mobile platforms.
9. Developing a 3D Game using Unreal
10. Developing a Multiplayer game using unity

RESOURCES

TEXT BOOKS:

1. Sanjay Madhav, "Game Programming Algorithms and Techniques: A Platform Agnostic Approach", Addison Wesley, 2013.
2. Will McGugan, "Beginning Game Development with Python and Pygame: From Novice to Professional", Apress, 2007.

REFERENCE BOOKS:

1. Paul Craven, "Python Arcade games", Apress Publishers, 2016.
2. David H. Eberly, "3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics", Second Edition, CRC Press, 2006.
3. Jung Hyun Han, "3D Graphics for Game Programming", Chapman and Hall/CRC, 2011.

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc22_cs77/preview
2. https://onlinecourses.nptel.ac.in/noc19_ge32/preview
3. <https://archive.nptel.ac.in/courses/106/101/106101237/>

WEB RESOURCES:

1. <https://guides.library.unt.edu/game-design/resources>
2. <https://alexiamandeville.medium.com/the-game-design-resource- guidee19bb237877>

PROGRAM ELECTIVE

Course Code	COURSE TITLE	L	T	P	S	C
25CA102026	MACHINE LEARNING AND AI USING PYTHON	2	-	2	-	3

Pre-Requisite Python Programming

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course helps to understand the basics of Introduction to artificial intelligence, Designing intelligent agents, Solving general purpose problems, Search in complex environments, machine learning in data science and various machine learning algorithms. The proposed course will combine theory and practice to enable the student to gain the necessary knowledge to work on real time problems.

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

- CO1.** Architect intelligent agents using artificial intelligence techniques and principles.
- CO2.** Analyze and interpret the problem, identify suitable solutions using heuristic functions, optimization algorithms and search algorithms.
- CO3.** Build Linear Regression models for given dataset
- CO4.** Implementation of clustering algorithms on data models and build recommendation System

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	3	3	-	-	-	-	-	-	-	2	-	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

DETAILED SYLLABUS: COURSE

CONTENT

Module 1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE (06 Periods)

Foundations of artificial intelligence, History of artificial intelligence, State of the art, Risks and benefits of AI, Intelligent agents – Agents and environments, The concept of rationality, Structure of agents.

Module 2: PROBLEM SOLVING BY SEARCHING (06 Periods)

Problem solving agents, Search algorithms, Uninformed search strategies, Informed search strategies – Greedy best-first search, A* search; Heuristic functions

Module 3: LINEAR REGRESSION (06 Periods)

Basic facts of linear regression, Model representation for a single variable, Cost Function, Gradient Descent for Linear Regression, Multivariate Linear Regression, Implementation of linear regression, Case studies of linear regression using data set.

Module 4: LOGISTIC REGRESSION (06 Periods)

Basic facts and implementation of logistic regression, Classification, Hypothesis Representation, Decision Boundary, Cost function, Multi-classification, solve a case study to predict output using existing data set.

Module 5: DECISION TREE (06 Periods)

Introduction - Constructing Decision Trees - Regression Tree and Classification Tree - Attribute Selection Measures, Entropy, Information Gain, Gini Index.

Total Periods: 30

EXPERIENTIAL LEARNING

1. Design and implement agent programs for Table-driven agents using the agent function of vacuum-cleaner world. The agent cleans the current square if it is dirty, otherwise it moves to the other square
2. Implement agent programs for Simple reflex agents and Model-based reflex agents using the agent function of vacuum-cleaner world.
3. Solve the travelling sales man problem using Hill Climbing search algorithm.
4. Design and implement solution for 8-puzzle problem using Greedy Best First Search.
5. Find the shortest path between a starting location and destination location in a graph using A* search algorithm
5. Use python to predict employee attrition in a firm and help plan their manpower (take dataset from Kaggle)
6. Create customer clusters using different market strategies on a dataset
7. Make a movie recommendation system

RESOURCES

TEXT BOOKS:

1. Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, 4 th Edition, 2020.
2. Pradhan, Manaranjan, and U. Dinesh Kumar. Machine Learning Using Python. Wiley, 2020.
3. Jose, Jeeva. Introduction to Machine Learning. Khanna Book Publishing Co., 2020

REFERENCE BOOKS:

1. Stephen Lucci , Danny Kopec, Artificial Intelligence in the 21st Century, Mercury Learning and Information, 3rd Edition,2018.
2. Rich, Knight, Nair: Artificial intelligence, Tata McGraw Hill, Third Edition, 2009.
3. Mukhopadhyay, Sayan. Advanced Data Analytics Using Python: With Machine Learning, Deep Learning and NLP Examples. 1st ed. edition. Apress, 2018
4. Monte F. Hancock, Jr. Practical Data Mining. 1st edition. Auerbach Publications, 2011.

SOFTWARE/TOOLS:

1. Google CoLab
2. Programming Language : Python 3.8
3. Machine Learning Library : Tensor Flow 2.1 and Keras

VIDEO LECTURES:

1. <https://youtu.be/SfigNnIRyIM>
2. <https://youtu.be/nmWGhb9E4es>
3. <https://youtu.be/YwlBCZVdpmI>
4. https://youtu.be/wefc_36d5mU
5. <https://youtu.be/VImxF-9jk1E>

WEB RESOURCES:

1. <https://searchenterpriseai.techtarget.com/definition/AI>
2. https://www.w3schools.com/python/python_ml_getting_started.asp
3. <https://realpython.com/python-ai-neural-network/>

PROGRAM ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA101019	ARTIFICIALINTELLIGENCE	3	-	-	-	3
Pre-Requisite	Artificial intelligence					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Introduction to artificial intelligence, Designing intelligent agents, Solving general purpose problems, Search in complex environments, Probabilistic reasoning, Represent knowledge and reason under uncertainty, Robotics, Ethics and safety in AI.

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

- CO1.** Architect intelligent agents using artificial intelligence techniques and principles.
- CO2.** Analyze and interpret the problem, identify suitable solutions using heuristic functions, optimization algorithms and search algorithms.
- CO3.** Select and apply appropriate knowledge representation to build Bayesian network models to reason under uncertainty.
- CO4.** Investigate robot hardware and frameworks for intelligent robotic perception.
- CO5.** Demonstrate knowledge on ethical implications of intelligent machines for providing privacy, trust, security and safety.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PO1 2	PSO1	PSO 2	PSO3
CO1	3	1	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
CO4	3	-	-	-	-	1	-	-	-	-	-	-	-	-	3
CO5	-	-	-	-	-	1	-	2	-	-	-	-	-	-	3
Course Correlation Mapping	3	2	1	-	-	1	-	2	-	-	-	-	-	-	3

Correlation Level: 3-High; 2-Medium; 1-Low

COURSE CONTENT

Module 1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE (10 Periods)

Foundations of artificial intelligence, History of artificial intelligence, State of the art, Risks and benefits of AI, Intelligent agents – Agents and environments, the concept of rationality, Structure of agents.

Module 2: PROBLEM SOLVING BY SEARCHING (09 Periods)

Problem solving agents, Search algorithms, Uninformed search strategies, Informed search strategies – Greedy best-first search, A* search; Heuristic functions.

Module 3: SEARCHING COMPLEX ENVIRONMENTS (09 Periods)

Local search algorithms and optimization problems – Hill-climbing search, simulated annealing, Local beam search, Evolutionary algorithms; The minimax search algorithm, Alpha-Beta pruning, Move ordering; Monte Carlo tree search.

Module 4: PROBABILISTIC REASONING (09 Periods)

Representing Knowledge in an uncertain domain, Semantics of Bayesian networks, Probabilistic reasoning over time – Time and uncertainty, Inference in temporal models, Hidden Markov models, Kalman Filter.

Module 5: ROBOTICS, ETHICS AND APPLICATIONS (08 Periods)

Robotics: Robots, Robot hardware, Robotic perception, Alternative robotic frameworks, AI applications – Language Models

Ethics and Safety in AI: Limits of AI, Ethics of AI – Surveillance, security and privacy, Trust and transparency, AI safety.

Total Periods:45

EXPERIENTIAL LEARNING

Real-World Case Study Analysis on

1. AI in healthcare
2. AI in finance or e-commerce (credit scoring, dynamic pricing)

RESOURCES

TEXT BOOKS:

1. Zhongzhi SHI, Advanced Artificial intelligence, World Scientific Publishing Co. Pte. Ltd, 3rd edition, ISBN 9789811293986 (hardcover) ,3rd edition.

REFERENCE BOOKS:

1. Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, 4th (2020) edition, Pearson publications.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, **Deep Learning, MIT Press**

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=1HpYwa52LeY>
2. <https://www.youtube.com/watch?v=kOkehUZrjBM>
3. https://www.youtube.com/playlist?list=PLxf3-FrL8GzRALeq_9BtdQclN6SF4bTCG

WEB RESOURCES:

1. <https://people.engr.tamu.edu/guni/csce625/slides/AI.pdf>
2. <https://dokumen.pub/advanced-artificial-intelligence-3nbsped-9789811293986-9789811293993-9789811294006.html>
3. <https://nou.edu.ng/coursewarecontent/CIT%20903%20Advanced%20Artificial%20Intelligence0.pdf>
4. <https://home.schoolnutritionandfitness.com/index.jsp/uploaded-files/M2E709/AdvancedArtificialIntelligenceBook.pdf>

SPECIALIZATION ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA101020	INTRODUCTION TO VIRTUAL REALITY	3	-	-	-	3

Pre-Requisite Computer Graphics

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a discussion on Introduction to Virtual Reality, 3D Graphic Basics, Computing Architectures for VR, modelling, Huma Factors in VR.

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

- CO1.** Demonstrate the concepts of Virtual Reality platforms and Applications.
- CO2.** Analyze the 3D graphics coordinate systems, transforms and matrices.
- CO3.** Design the Computing Architectures for virtual Reality using Graphics Benchmarks.
- CO4.** Applying the Geometric Modelling, Kinematics modelling, Physical modelling and Behavior modeling.
- CO5.** Implement the concepts of human factors for developing the Virtual Reality applications.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	1	3	2	2	3	-	-	-	-	-	-	-	2	3	-
CO3	1	2	3	2	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	3	3	2	-	-	-	-	-	-	3	2	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	2	3	-
Course Correlation Mapping	2	3	3	2	3	2	-	-	-	-	-	-	2	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO VIRTUAL REALITY (10 Periods)

Stereoscopic Displays - Motion Tracking Hardware - Input Devices - Computing Platforms - Virtual Reality Applications.

Module 2: 3D GRAPHICS BASICS (09 Periods)

3D Coordinate Systems - Meshes, Polygons, and Vertices - Materials, Textures, and Lights - Transforms and Matrices - Cameras, Perspective, Viewports, and Projections - Stereoscopic Rendering.

Module 3: COMPUTING ARCHITECTURES FOR VR (10 Periods)

The Rendering Pipeline - The Graphics Rendering Pipeline - The Haptics Rendering Pipeline - PC Graphics Architecture - PC Graphics Accelerators - Graphics Benchmarks

Module 4: MODELLING (08 Periods)

Geometric Modelling - Virtual Object Shape - Object Visual Appearance - Kinematics Modelling - Physical Modelling - Behaviour Modelling

Module 5: HUMAN FACTORS IN VR (08 Periods)

Usability Engineering Methodology - VR Health and Safety Issues - Direct Effects of VR Simulations on Users - Cyber sickness - Traditional VR Applications - Emerging Applications of VR

Total Periods: 45

EXPERIENTIAL LEARNING:

1. A virtual Study Use Case- NICE, An Educational Experience
2. Study the use of Virtual Reality at NASA
3. Sweeping coverage of eye movements

RESOURCES

TEXT BOOKS:

1. Tony Parisi – Learning Virtual Reality, O'Reilly Media, Inc., 2015, ISBN- 9781491922835

REFERENCE BOOKS:

1. Grigore C. Burdea, Philippe Coiffet - Virtual Reality Technology, 2nd Edition Wiley- IEEE Press, ISBN: 978-0-471-36089-6 July 2003

VIDEO LECTURES:

1. https://onlinecourses.swayam2.ac.in/nou23_ge34/preview
2. <https://archive.nptel.ac.in/courses/121/106/121106013/>
3. <https://www.udemy.com/course/virtual-reality-a-quick-introduction/>

WEB RESOURCES:

1. <https://www.geeksforgeeks.org/virtual-reality-introduction/>
2. <https://msl.cs.uiuc.edu/vr/vrch1.pdf>

SPECIALIZATION ELECTIVES

Course Code	Course Title	L	T	P	S	C
25CA102027	GRAPHICS AND ANIMATION TOOLS USING OPENSOURCE SOFTWARE	3	-	2	-	4

Pre-Requisite Introduction to 3D Computer Animation

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: The objective of this course is the students would be able to create an advertisement to promote the products online also get aware to create websites with animated graphics, Intensive interfaces.

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

- CO1.** Understand computer operations using Fedora Linux Operating System
- CO2.** Understand the computer operations using application packages for Office Automation
- CO3.** design Brochure using multimedia Software Flash Package and its tool to
- CO4.** Design Animated Document, Movie, Video clips etc

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	1	3	2	2	3	-	-	-	-	-	-	-	2	3	-
CO3	1	2	3	2	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	3	3	2	-	-	-	-	-	-	3	2	-
Course Correlation Mapping	2	3	3	2	3	2	-	-	-	-	-	-	2	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: OPEN SOURCE SOFTWARE (08 Periods)

Introduction to Concept Of Open Source, Introducing Linux, Exploring Features Of Linux, Overview of Linux Distributions: Ubuntu, Debian, Gentoo, Knoppix, Suse And Opensuse, Yellow Dog Linux, Slackware, Mandrive, Freespire And Xandros, Fedora, Introducing The Fedora Desktop, K Desktop Environment, Gnome Desktop Environment, Working With Files And Directories: Introduction To Linux File And Directory Structure, Basic Linux Commands, Creating, Copying, Removing Files, Linux File Permission, Creating, Removing Directory, Applying Permission On Directories, Working With Storage Media.

Module 2: OPEN OFFICE SUITE (08 Periods)

Overview of Internet and Linux – based Mozilla Firefox, Features of Mozilla Firefox, Interface of Mozilla Firefox, Browsing the Internet with Mozilla Firefox, Setting Preferences in Mozilla Firefox, Viewing the History of visited Websites, use of Search Engine, Creating Blog, Introducing and working with E-Mail and Chat, Quitting Mozilla Firefox, Introduction to Open Office Suite, Exploring an Interface of OpenOffice.org Writer, Working with Document: Saving, Closing, Editing Documents in Writer: Find and replace feature, Auto Correct, Word Completion features, Spelling and Grammar Checker, Hyperlinks, Merging Documents, Saving Changes to a document.

Module 3: INTRODUCTION TO FLASH (10 Periods)

Overview of FLASH, FLASH environment, Creating new FLASH document, User interface of FLASH, FLASH workspace, Menu bar, Time line, Property Panel, Motion Editor Panel, Saving files: As uncompressed XML – based format, As Template, Drawing Modes in FLASH, Drawing tools: Stage and Pasteboard, Oval, Rectangle and Polystar, Line tool and it's Properties, Pencil tool and it's Properties, Pen Tool, Brush tool, Lock skill, Align tool, Eraser tool, Adding Color, Stroke, Fill, Bucket tool, Dropper tool, Gap Controls, Transform, Magnifier tool, Hand Tool, Zoom Control, Selection tools: Lasso tool, Magic wand, Arrow tool, Original Fill, Snap, Straighten, Rotate.

Module 4: TEXT, GRADIENTS, SYMBOLS (10 Periods)

Text Tools : Expanding Textbox, Font, Font size, Font Color, Effect, Alignment, Paragraph, Text field, Modifying Text, Gradients: Custom, Linear, Radial, Creating a Static Symbol, Tint, Alpha, Brightness, Editing Symbols

Module 5: ANIMATION, TWEENING, BUTTONS (09 Periods)

Animation Techniques : Basics of Animation, Introduction to key Frames and Tweens, Types of Frames, Motion, Layer, Skinning, Controller, Shadow, Motion Tweening, Tween Scaling, Rotate, Easing, Creating Shape, Multiple Layers, Buttons : Button Timeline, Up State, Over State, Down State, Introduction to Movie Clip, Actions

Total Periods: 45

EXPERIENTIAL LEARNING

1. Convert an image object into a symbol and adding basic movement using motion tweening.
2. Convert one object into another object using create motion tween and then shape.
3. Convert one text into another text using create motion tween and then shape.
4. Create a path for object to move one place to another place with the help of Motion Guide.

5. Create a text animation with the help of color, shapes.
6. Create a ripple masking effect of any one object with the help of create motion tween and Mask
7. Create a line dance effect with the help of line tool, shape and Hint option.
8. Create a masking effect with the help of one object, create motion tween and Mask.
9. Create one movie clip with the help of Library, Create Motion Tween and one object.
10. Create a CW/CCW effect of any object with the help of Gradient, Shape, Create Tween Motion.

RESOURCES

TEXT BOOKS:

1. Linux and Open Office Course Kit, Vikas Gupta, Dreamtech Press
2. Flash – 3rd Edition, Michael Lennox, Techmedia

REFERENCE BOOKS:

1. Flash web design-the art of motion graphics, BPB Publication
2. Web Designing, Computer Jagat Publications

SOFTWARE / TOOL:

1. FEDORA LINUX, FLASH 8

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/117105083>
2. https://onlinecourses.swayam2.ac.in/ntr20_ed15/preview

WEB RESOURCES:

1. https://onlinecourses.swayam2.ac.in/cec20_cs08/preview
2. <https://www.classcentral.com/course/swayam-graphics-and-animation-development-january-2022-23776>

SPECIALIZATION ELECTIVES

Course Code	Course Title	L	T	P	S	C
25CA102028	USER INTERFACE DESIGN	3	-	2	-	4
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides fundamental user interface design principles and methodologies such as layout, controls and navigation. Students will learn the tools and techniques of Photoshop and Illustrator in order to create user interface animations.

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

- CO1.** Gain insight into the basic theories and current research topics in user-centred interaction design
- CO2.** Be able to create user interface animations with the aid of Photoshop and Illustrator
- CO3.** Develop an interactive mockup website and mobile with the design ideas in a constructive manner
- CO4.** Develop the ability to construct Navigation that enables users to easily accomplish user interface design tasks

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	1	3	2	2	3	-	-	-	-	-	-	-	2	3	-
CO3	1	2	3	2	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	3	3	-	-	-	-	-	-	-	3	2	-
Course Correlation Mapping	2	3	3	2	3	-	-	-	-	-	-	-	2	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

MODULE 1: INTRODUCTION TO PHOTOSHOP (09 Periods)

Introduction to Photoshop - Raster graphics - Performance Optimization - Color Calibration
Workspace overview - Photoshop controls - Interface - Layers and Panels - Navigation Pan -
Rotate View tool - Navigator panel - Zoom in or out - Fit an image to the screen- Photoshop
Tools - Usability features - Masks in UI Design - Lights and Shadows - Emphasis and Blending

MODULE 2: COLOR SCHEME (10 Periods)

Color Scheme - Primary Color - Secondary colors - Neutral colors - Brainstorm - Typography -
Web Safe Fonts - Font Themes - Size - Color and Contrast - Tracking - Leading - Soft Buttons -
3D Buttons - Realistic Buttons - Web Template Design - Components of a Web Page

MODULE 3: LOGO DESIGN PRINCIPLES (10 Periods)

Logo Design Principles - Purpose - Target audience - Planning essentials - Web Layout Design -
Rule of third - Rule of odds - Poster Design Principles - F shaped pattern - Visual Hierarchy -
User friendly - Photoshop Etiquette - Stretching text and images - Proofread - Make easy to
find

MODULE 4: UI ILLUSTRATIONS (08 Periods)

UI Illustrations - Creating visual triggers - Creative storytelling - Emotional appeal - Aesthetic
satisfaction - Mobile GUI Design - Mobile GUI Guidelines - Android UI Design - Screen
Components - IOS UI Design - Animations - UI Animations in Photoshop - UI Animation in
Illustrator.

MODULE 5: WEB DESIGN (08 Periods)

Mockup Design - Responsive Web Design - Setting the stage - Basic mechanics - Typography
and Layout - Navigation patterns - Advanced Enhancement -Performance - Page Designs -
Metro UI Design - Mascot Design - Characters Purpose - Unique features - Exporting for Web,
Mobile, Print - Design Optimization

Total Periods: 45

EXPERIENTIAL LEARNING

1. Design a UI for a Game website
2. Design a UI for a female centric website
3. Design a UI suitable for both mobile and PC
4. Design a UI for a horror themed website
5. Design a one pager UI for a website
6. Design a one pager UI for a mobile
7. Design a mascot for an imaginary brand
8. Design a UI compatible for IOS
9. Design a mock-up website for a service sector company
10. Design a mobile (Android and IOS) mock-up website for an online store

RESOURCES

TEXT BOOKS:

1. Diana MacDonald, "Practical UI Patterns for Design Systems: FastTrack Interaction Design for a Seamless User Experience", Apress, 2019.
2. Jenifer Tidwell, "Designing Interfaces: Patterns for Effective Interaction Design" Second Edition, O'Reilly Media, Inc., 2010.

REFERENCE BOOKS:

1. R. Moore "UI design with Adobe Illustrator", Berkely, California: Adobe Press, 2013.
2. Lesa Snider, "Photoshop CS6: The Missing Manual", 2nd Edition, O'Reilly Media Publisher, 2012

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc21_ar05/preview
2. <https://www.coursera.org/specializations/user-interface-design>

WEB RESOURCES:

1. <https://www.usability.gov/what-and-why/user-interface-design.html>
2. <https://www.coursera.org/in/articles/what-is-a-user-interface-ui-designer-guide>

SPECIALIZATION ELECTIVES

Course Code	Course Title	L	T	P	S	C
25CA101021	INTRODUCTION TO AUGMENTED REALITY GRAPH	3	-	2	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a discussion on Introduction to Virtual Reality, 3D Graphic Basics, Computing Architectures for VR, modelling, Huma Factors in VR.

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

- CO1.** Gain Knowledge on the basic and advanced concepts of Augmented reality platforms and Applications.
- CO2.** Analyze the concepts of tracking.
- CO3.** Implement the concepts of computer vision for augmented reality which mapping
- CO4.** Apply the calibration and registration for augmented reality and visual coherence

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	1	3	2	2	3	-	-	-	-	-	-	-	2	3	-
CO3	1	2	3	2	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	3	3	-	-	-	-	-	-	-	3	2	-
Course Correlation Mapping	2	3	3	2	3	-	-	-	-	-	-	-	2	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

MODULE 1: INTRODUCTION TO AUGMENTED REALITY (09 Periods)

History – Multimodal Displays - Visual Perception - Requirements and Characteristics - Spatial Display Model - Visual Displays

MODULE 2: TRACKING (10 Periods)

Tracking, Calibration, and Registration - Coordinate Systems - Characteristics of Tracking Technology - Stationary Tracking Systems - Mobile Sensors - Optical Tracking

MODULE 3: COMPUTER VISION FOR AUGMENTED REALITY (10 Periods)

Marker Tracking - Multiple-Camera Infrared Tracking - Natural Feature Tracking by Detection - Incremental Tracking - Simultaneous Localization and Mapping.

MODULE 4: CALIBRATION AND REGISTRATION (08 Periods)

Camera Calibration - Internal Camera Parameters - Correcting Lens Distortion - Display Calibration - Single Point Active Alignment Method - Head-Mounted Display Calibration Using a Pointing Device - Hand-Eye Calibration - Registration - Geometric Measurement Distortions - Error Propagation - Latency - Filtering and Prediction.

MODULE 5: VISUAL COHERENCE (08 Periods)

Registration - Occlusion - Occlusion Refinement - Probabilistic Occlusion - Model-Free Occlusion - Photometric Registration - Image-Based Lighting - Light Probes - Offline Light Capturing

Total Periods: 45

EXPERIENTIAL LEARNING

1. Investigate the historical evolution of augmented reality. How has it evolved over time, and what were the key milestones in its development?
2. Explore the spectrum between real and virtual worlds. Provide examples of technologies that fall within this spectrum and discuss their relationship with augmented reality.
3. Identify and discuss real-world applications of augmented reality. How is AR being used across various industries, and what impact does it have on user experiences?
4. Examine the various sensory displays in augmented reality hardware. How do audio displays, haptic displays, and visual displays contribute to enhancing the user's AR experience?
5. Delve into the role and architecture of processors in augmented reality hardware. How do processors contribute to the overall functionality of AR devices?
6. Explore the characteristics of tracking technology in augmented reality. How does tracking, calibration, and registration enhance the precision and accuracy of AR devices?
7. Conduct an experiment using marker tracking in augmented reality. Discuss the advantages and limitations of marker-based tracking in various scenarios.
8. Analyze the major components of augmented reality software systems. How do these components work together to create a seamless AR experience?

9. Implement a markerless tracking approach in a real-world scenario. Discuss the challenges and benefits of markerless tracking, providing examples of successful implementations.
10. Investigate different types of markers used in augmented reality, such as template markers and 2D barcode markers. Compare their advantages and disadvantages in specific contexts.

RESOURCES

TEXT BOOKS:

1. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016), ISBN-10: 9332578494
2. Allan Fowler-AR Game Development, 1st Edition, A press Publications, 2018, ISBN 978-1484236178

REFERENCE BOOKS:

1. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0

VIDEO LECTURES:

1. <https://www.coursera.org/learn/ar>
2. <https://www.coursera.org/courses?query=augmented%20reality>
3. https://www.udemy.com/course/develop-augmented-reality-book-ar-business-card-with-unity/?gad_source=1&gclid=EAIaIQobChMIv4yp

WEB RESOURCES:

1. <http://pire.fiu.edu/publications/Augmented.pdf>
2. <https://b-u.ac.in/sites/b-u.ac.in/files/latest-attachments/2.pdf>

SPECIALIZATION ELECTIVES

Course Code	COURSE TITLE	L	T	P	S	C
25CA101022	GRAPH THEORY AND COMBINATORICS	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course introduces design thinking in product innovation. This course is intended to familiarize Introduction to Graph Theory, Graphy Theory, Trees, Directed Graph, Combinatorics.

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

C01. The objective of the course is to explain basic concepts in combinatorial graph theory.

C02. Define how graphs serve as models for many standard problems.

C03. Discuss the concept of graph, tree, Euler graph, cut set and Combinatorics.

C04. See the applications of graphs in science, business and industry.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	2	1	1	2	-	-	-	-	-	-	-	-	1	2	1
C02	2	1	1	1	-	-	-	-	-	-	-	-	1	1	1
C03	2	1	-	-	-	-	-	-	-	-	-	-	1	2	1
C04	2	1	-	2	-	-	-	-	-	-	-	-	1	1	1
Course Correlation Mapping	2	1	1	2	-	-	-	-	-	-	-	-	1	2	1

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

MODULE 1: INTRODUCTION TO GRAPH THEORY

(08 Periods)

Basic Terminology, Walks, Paths, Circuits, Connectedness, Handshaking Lemma, Isomorphism, Sub Graphs, Reach Ability, Union and Interaction of Graphs.

MODULE 2: GRAPH THEORY

(09 Periods)

Euler Graph, Shortest Path Problem, Hamiltonian Graph, Traveling Salesman Problem, Bipartite Graphs

MODULE 3: TREES

(09 Periods)

Introduction to Trees, Rooted Trees, Path Length in Rooted Trees, Spanning Trees, Fundamental Circuits, Spanning Trees of a Weighted Graph, Cut Sets and Cut Vertices, Fundamental Cut Set, Minimum Spanning Tree

MODULE 4: DIRECTED GRAPH

(10 Periods)

Directed Graphs and Connectedness, Directed Trees, Network Flows, Max Flow-Mincut Theorem, Matrix Representation of a Graph, Planar Graphs: Combinational and Geometric Duals, Kuratowski's Graphs, Detection of Planarity, Thickness and Crossing.

MODULE 5: COMBINATORICS

(09 Periods)

Partitions, Counting Functions, Number of Partitions into Odd or Unequal Parts. Necklaces, Euler's Function, Set of Symmetries, Enumeration in the Odd and Even Cases.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Program to find the number of vertices, even vertices, odd vertices and number of edges in a Graph.
2. Program to Find Union, Intersection and ring-sum of 2 graphs.
3. Program to Find Minimum Spanning tree Using Prim's Algorithm
4. Program to Find Minimum Spanning tree Using Kruskal's Algorithm
5. Program to find Shortest Path between 2 Vertices using Dijkstra Algorithm

RESOURCES

TEXT BOOKS:

1. C.L. Liu, Elements of Discrete Mathematics, Tata McGraw Hill, 2nd Edition, 2000.
2. N. Deo, Graph Theory with Applications to Engineering and Computer Science, PHI publication, 3rd edition, 2009.

REFERENCE BOOKS:

1. Harikishan, Shivraj Pundir and Sandeep Kumar, Discrete Mathematics, Pragati Publication, 7th Edition, 2010.
2. Colmun, Busby and Ross, Discrete Mathematical Structure, PHI Publication, 6th Edition, 2009.

VIDEO LECTURES:

1. https://ocw.mit.edu/courses/18-217-graph-theory-and-additive-combinatorics-fall-2019/video_galleries/video-lectures/
2. <https://www.math.uvic.ca/~noelj/combinatoricsLectures.html>

WEB RESOURCES:

1. https://www.whitman.edu/mathematics/cgt_online/cgt.pdf
2. http://www.cectl.ac.in/images/pdf_docs/studymaterial/cse/s5/gtc1.pdf
3. <https://iuuk.mff.cuni.cz/~ipenev/KGLectureNotes.pdf>

SPECIALIZATION ELECTIVES

Course Code	Course Title	L	T	P	S	C
25CA102029	ANIMATION DESIGN	3	-	2	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a discussion on fundamental principles and tools of animation and media. Skills in 2D production, motion graphics, stop motion and basic traditional animation.

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

- CO1.** Understand the fundamental principles and tools of animation and media
- CO2.** Develop the skills in 2D production, motion graphics, stop motion and basic traditional animation
- CO3.** Create animated sequences from the development of the original concept through design to final film or video production
- CO4.** Coordinate and manage the production of a student film, including the aspects of cinematography, art direction and editing.

CO-PO-PSO- PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	1	3	2	2	3	-	-	-	-	-	-	-	2	3	-
CO3	1	2	3	2	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	3	3	-	-	-	-	-	-	-	3	2	-
Course Correlation Mapping	2	3	3	2	3	-	-	-	-	-	-	-	2	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

MODULE 1: INTRODUCTION TO 2D ANIMATION (09 Periods)

Introduction to 2D Animation - Basic concepts of 2D techniques - Principles of motion study - 2D Workflow Script - Storyboard - Concept art - Animation-Introduction to workspace - Understanding document types - Setting up projects and changing project types - Introduction to panels - Working with timeline

MODULE 2: CREATING STRUCTURES (10 Periods)

Strokes and fills - Creating lines and Shapes - Object drawing mode - Pen tool drawing states - Adjusting segments - Arranging objects - Exporting art

MODULE 3: WORKING WITH FILTERS (10 Periods)

Working with timeline - Working with libraries - Symbols - Instances - Editing properties - Graphic filters - Filters overview - Animated filters - Working with filters

MODULE 4: 2D ANIMATION AND FRAMES (08 Periods)

Basic 2D Animation - Animating transformation - Motion path - Nested Animations - Adding frames - Moving key frames - Motion tween animations - Tween span - Property key frame - Tween able objects and properties

MODULE 5: FRAME ANIMATION (08 Periods)

Frame by Frame animation - Converting classic motion tweens - Using onion skinning - Shape tweens - Mask layer - Unlink layers - Motion Editor - Property curves - Applying presets and custom eases - Resultant curve - Exporting the final output - Different file formats

Total Periods: 45

EXPERIENTIAL LEARNING

Implement the following in 2D Animation:

1. Ball bouncing across the screen
2. Character jumping
3. Walk cycle
4. Run cycle
5. Flour sack jumping
6. Kicking a ball
7. Character thinking
8. Variations for face expressions
9. Change a character emotion (Happy to sad, sad to angry etc.,)
10. Object falling into a body of water

RESOURCES

TEXT BOOKS:

1. Williams, Richard , "The Animator's Survival Kit: A Manual of Methods, Principles and Formulas for Classical, Computer, Games, Stop Motion and Internet Animators", 4th Edition, Macmillan , 2009
2. Jean Ann Wright, "Animation Writing and Development: From Script Development to Pitch (Focal Press Visual Effects and Animation)" 1st Edition, Taylor & Francis, 2013.

REFERENCE BOOKS:

1. Preston J. Blair, "Animation 1: Learn to Animate Cartoons Step by Step", 2003
2. Russell Chun, "Adobe Animate CC Classroom in a Book (2018 release), 1st Edition, Adobe Press, 2018

VIDEO LECTURES:

1. https://onlinecourses.swayam2.ac.in/cec20_cs08/preview
2. <https://nptel.ac.in/courses/106102065>

WEB RESOURCES:

1. <https://www.dgp.toronto.edu/~patrick/csc418/notes/tutorial11.pdf>
2. https://web.stanford.edu/class/cs248/pdf/class_03_animation.pdf

SPECIALIZATION ELECTIVES

Course Code	Course Title	L	T	P	S	C
25CA102030	INTRODUCTION TO 3D COMPUTER ANIMATION	3	-	2	-	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: The objective of this course is to develop the skill & knowledge in 3D Computer Animation. Students will understand the function either as an entrepreneur or can take up jobs in the multimedia and animation industry, video studios, edit set-up and other sp. effects sectors.

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

- C01.** Describe Computer-based Animation& Getting Started with Max.
- C02.** Understand 3D Modeling concepts.
- C03.** Use Simulation & Effects concepts for Animation
- C04.** Analyze and understand the Lighting & Camera
- C05.** Acquire knowledge of Texturing with Max

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
C02	1	3	2	2	3	-	-	-	-	-	-	-	2	3	-
C03	1	2	3	2	3	-	-	-	-	-	-	-	2	3	-
C04	2	3	3	3	3	2	-	-	-	-	-	-	3	2	-
C05	3	3	-	-	-	-	-	-	-	-	-	-	2	3	-
Course Correlation Mapping	2	3	3	2	3	2	-	-	-	-	-	-	2	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

MODULE 1: COMPUTER-BASED ANIMATION & GETTING STARTED (08 Periods) WITH MAX

Definition of Computer-based Animation, Basic Types of Animation: Real Time, Non-real-time, Definition of Modelling, Creation of 3D objects. Exploring the Max Interface, Controlling & Configuring the Viewports, Customizing the Max Interface & Setting Preferences, Working with Files, Importing & Exporting, Selecting Objects & Setting Object Properties, Duplicating Objects, Creating & Editing Standard Primitive & extended Primitives objects, Transforming objects, Pivoting, aligning.

MODULE 2: 3D MODELLING (08 Periods)

Modeling with Polygons, using the graphite, working with XRefs, Building simple scenes, Building complex scenes with XRefs, using assets tracking, deforming surfaces & using the mesh modifiers, modeling with patches & NURBS

MODULE 3: SIMULATION & EFFECTS (10 Periods)

Bind to Space Warp object, Gravity, wind, displace force object, deflectors, FFD space warp, wave, ripple, bomb, Creating particle system through parray, understanding particle flow user interface, how to particle flow works, hair & fur modifier, cloth & garment maker modifiers.

MODULE 4: LIGHTING & CAMERA (10 Periods)

Configuring & Aiming Cameras, camera motion blur, camera depth of field, camera tracking, using basic lights & lighting Techniques, working with advanced lighting, Light Tracing, Radiosity, video post, mental ray lighting etc.

MODULE 5: TEXTURING WITH MAX (09 Periods)

Using the material editor & the material explorer, creating & applying standard materials, adding material details with maps, creating compound materials & material modifiers, unwrapping UVs & mapping texture, using atmospheric & render effects etc.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Introduction to 3D Studio Max.
 - a) Exploring the Max Interface
 - b) Creating & Editing Standard Primitive Objects
 - c) Creating & Editing Extended Primitive Objects
 - d) Working with Files, Importing & Exporting
2. 2D Splines, Shapes & Compound Objects.
 - a) Understanding 2D Splines & Shape
 - b) Convert 2D to 3D object using extrude, bevel, loft, terrain etc.
 - c) Using Morph, Scatter, conform, connect compound objects.
 - d) Using Boolean, Proboolean & Procutter
3. 3D Modelling
 - (a) Modelling with polygon objects
 - (b) Building Simple & Complex Scene
 - (c) Using Mesh Modifier
 - (d) Modelling with patches & NURBS

4. Simulation & Effects
 - a) Bind to space warp objects
 - b) Using Gravity & Wind
 - c) Using FFD, wave, ripple, bomb
 - d) Using Particle System
 - e) Using Particle Flow
 - f) Using Hair & Fur Modifier
 - g) Cloth & Garment Maker
5. Lighting & Camera
 - a) Configuring & Aiming Cameras
 - b) Using Camera Motion Blur & Depth of Field
 - c) Using Basic lights 6.4 Using Light tracing, radiosity
 - d) Video Post
 - e) Mental Ray Lighting
6. Texturing with Max
 - a) Using Material Editor
 - b) Create & Apply standard material
 - c) Material Modifier
 - d) unwrapping UVs
 - e) Mapping texture
 - f) Using atmospheric & render effects

RESOURCES

TEXT BOOKS:

1. TedBoardman, 3d'sMax5Fundamentals, Techmedia Publishers
2. Michelebousquet, Modelrig,Animatewith3d'smax6, Manyworldproduction

REFERENCE BOOKS:

1. Michael E. Mortenson, 3D Modelling, Animation, and Rendering, Createspace
2. Boris Kulagin, 3ds Max 8 from Modelling to Animation, Bpb Publication

VIDEO LECTURES:

1. https://onlinecourses.swayam2.ac.in/cec20_cs08/preview
2. <https://www.coursera.org/learn/introduction-to-3d-modeling>

WEB RESOURCES:

1. <https://www.upwork.com/resources/what-is-3d-animation>
2. <http://ilearntoanimate.com/animation-resources/>

SPECIALIZATION ELECTIVES

Course Code	Course Title	L	T	P	S	C
25CA102031	DIGITAL IMAGE PROCESSING	3	1	2	-	5
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Image Fundamentals, Image Transforms, Image enhancement in spatial and frequency domains, Restoration of images corrupted by noise, Image Compression models with coding, Segmenting images based on properties and Color image processing.

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

- CO1.** Apply various transformations on images by analyzing basic operations on images.
- CO2.** Apply various image enhancement techniques in spatial and frequency domains.
- CO3.** Apply restoration techniques based on noise models and degradation function to restore the images, pertaining to health and societal applications.
- CO4.** Analyze various coding techniques for compression to reduce redundancies in images.
- CO5.** Analyze various segmentation techniques on images for societal applications.
- CO6.** Analyze various color models for different types of images.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	1	3	2	2	3	-	-	-	-	-	-	-	2	3	-
CO3	1	2	3	2	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	3	3	2	-	-	-	-	-	-	3	2	-
CO5	3	3	2	2	2	2	2	-	-	-	-	-	1	-	-
CO6	3	3	-	-	2	-	-	-	-	-	-	-	-	3	-
Course Correlation Mapping	2	3	3	2	3	1	2	-	-	-	-	-	2	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

MODULE 1: DIGITAL IMAGE FUNDAMENTALS (08 Periods)

Fundamental steps in Image Processing, Image sampling & quantization, some basic relationships between pixels, Arithmetic operations, Logical operations, Spatial operations.

Image Transforms: 2D-DFT, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar-Transform, Slant Transform and KL Transform, properties of image transforms.

MODULE 2: IMAGE ENHANCEMENT (08 Periods)

Basic Intensity transformation functions, Histogram processing, Fundamentals of Spatial Filtering, Smoothing spatial filters, Sharpening spatial filters, Combining spatial Enhancement methods. Basics of filtering in frequency domain, Correspondence between filtering in the spatial and frequency domains, Image smoothing using frequency domain filters, Image sharpening using frequency domain filters, Holomorphic filtering

MODULE 3: IMAGE RESTORATION (10 Periods)

Image degradation/Restoration model, Noise models, Restoration in the presence of Noise only- spatial filtering - mean, order- statistic and adaptive filters. Estimating the degradation function, Inverse filtering, Weiner filtering, Constrained least squares filtering.

MODULE 4: IMAGE COMPRESSION (10 Periods)

Classification of redundancy in Images, Image Compression models, Run length coding, Arithmetic coding, Dictionary based compression, bit-plane coding, Transform based coding, Fidelity Criteria, JPEG 2000.

MODULE 5: IMAGE SEGMENTATION AND COLOR IMAGE PROCESSING (09 Periods)

Detection of discontinuities- Point, line and edge Detection. Thresholding- global thresholding, adaptive thresholding. Region based Segmentation. Color image fundamentals - RGB, HSI models, conversions, Pseudo Color Image Processing, Color transformations.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Simulation and Display of an Image, Negative of an Image(Binary & Gray Scale)
2. Implementation of Relationships between Pixels
3. Implementation of Transformations of an Image
4. Contrast stretching of a low contrast image, Histogram, and Histogram Equalization
5. Display of bit planes of an Image
6. Display of FFT(1-D & 2-D) of an image
7. Computation of Mean, Standard Deviation, Correlation coefficient of the given Image
8. Implementation of Image Smoothing Filters(Mean and Median filtering of an Image)
9. Implementation of image sharpening filters and Edge Detection using Gradient Filters
10. Image Compression by DCT,DPCM, HUFFMAN coding

RESOURCES

TEXT BOOKS:

1. Rafael C. Gonzalez & Richard E. Woods, Digital Image Processing, Pearson Education, 4th Edition, 2018.
2. Anil K. Jain, Fundamentals of Digital Image processing, Prentice Hall, 2007

REFERENCE BOOKS:

1. S Jayaraman, S Esakkirajan, T Veerakumar, Digital Image Processing, Tata McGraw Hill Education, Second Edition, 2020.
2. Vipula Singh, Digital Image Processing with MATLAB & LabVIEW, Elsevier, 2019.

VIDEO LECTURES:

1. <https://archive.nptel.ac.in/courses/117/105/117105135/>
2. <https://archive.nptel.ac.in/noc/courses/noc20/SEM2/noc20-ee75/>

WEB RESOURCES:

1. <https://www.coursera.org/learn/digital>
2. https://www.imageprocessingplace.com/root_files_V3/students/students.htm
3. <https://archive.nptel.ac.in/courses/106/105/106105032/>

SPECIALIZATION ELECTIVES

Course Code	Course Title	L	T	P	S	C
25CA104002	ADVANCED COMPUTER GRAPHICS	2	-	2	4	4

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: To Introduce various Graphics Applications in real world scenario, familiar with image fundamentals and animations and learn more about 2D, 3D and Curve applications

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

- CO1.** Compare various graphics algorithm used in 2D and 3D
- CO2.** Understand fundamentals of graphics used in various real life applications.
- CO3.** Understand and identify the performance characteristics of graphics algorithms.
- CO4.** Design basic graphics application programs, including animation
- CO5.** Acquire familiarity with the relevant mathematics of computer graphics
- CO6.** Design applications that display graphic images to given specifications

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	1	3	2	2	3	-	-	-	-	-	-	-	2	3	-
CO3	1	2	3	2	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	3	3	2	-	-	-	-	-	-	3	2	-
CO5	3	3	2	2	2	2	2	-	-	-	-	-	1	-	-
CO6	3	3	-	-	2	-	-	-	-	-	-	-	-	3	-
Course Correlation Mapping	2	3	3	2	3	2	2	-	-	-	-	-	2	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

MODULE 1: REVIEW OF 2D AND 3D GRAPHICS (06 Periods)

Transformations, Windowing, Clipping, 3D geometry, primitives and transformations, Rotation about an arbitrary axis, Parallel and perspective projection, Viewing parameters, 3D clipping and viewing transformation.

MODULE 2: CURVES AND FRACTALS (06 Periods)

Polygon Meshes, Parametric Cubic curves: B-spline, Bezier, Hermite. Parametric Bicubic Surfaces, Quadric surfaces, Fractals: fractal lines and surfaces Applications.

MODULE 3: ACHROMATIC AND COLORED LIGHT (06 Periods)

Achromatic light, Gamma correction, Halftone, approximation, Chromatic Color, CIE chromaticity diagram, Color models for Raster Graphics. Using Color in Computer Graphics.

MODULE 4: ILLUMINATION AND SHADING (06 Periods)

Surface detail, shadows and Transparency, Inter object Reflections, Illumination Models, Extended Light Sources, Recursive Ray Tracing.

MODULE 5: ANIMATION AND GRAPHICS HARDWARE (06 Periods)

Introduction, morphing, character animation and facial animation, Special-purpose computer graphics processors and accelerators.

Total Periods: 30

EXPERIENTIAL LEARNING

1. To perform open GL program for Bezier Curve.
2. To perform Bezier curve with c0 and c1 continuity.
3. To Draw cube with or without back face culling.
4. To perform Hermite Curve.
5. To perform program for diffuse illumination
6. To perform program for sphere with Back face culling.
7. To perform program for Ambient and diffuse light source.
8. To perform program for ambient & specular & diffuse light source.
9. To perform program for Diffuse only light source.
10. To perform Z buffer visible surface Algorithm

PROJECT BASED LEARNING

The students have to select the problems and solve using the concept of computer Graphics.

1. Ambient light simulation in 3D Object

2. Visualization of the digits of PI
3. Client Server Architecture Simulation
4. Super ellipse visualization
5. Mandelbrot set visualization
6. Visualization of A* Shortest Path finding Algorithm
7. Fibonacci Spiral (Golden Ratio) Visualisation

RESOURCES

TEXT BOOKS:

- 1 Computer Graphics: principals and practice Foley, vanDam, Feiner Hughes Addison Wesley
- 2 Mathematical Elements of Graphics Roges Tata McGrow Hill

REFERENCE BOOKS:

1. Computer Graphics Donald Hearn and M.Pauline Baker Prentice Hall India
2. Procedural Elements-Computer Graphics, David Rogers, TMH
3. Principals of Computer graphics, Shalini Govil-pal, springer

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc20_cs90/preview
2. <https://nptel.ac.in/courses/106106090>

WEB RESOURCES:

1. <https://www.coursera.org/learn/interactive-computer-graphics>
2. <https://www.coursera.org/learn/interactive-computer-graphics>

SPECIALIZATION ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA101023	Responsible AI Artificial Intelligence	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: The design, development, and deployment of AI interacts with a wide range of values, including fairness, privacy, transparency, autonomy, and well-being. While AI as a technical field is advancing rapidly, enabling applications across domains and sectors, the frameworks, regulations, and ethical tools necessary to realize the promise of AI while promoting and protecting values are not robust. This course develops an understanding of the current legal, regulatory, and ethical landscape, and develops the tools necessary to responsibly engage with AI.

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

- CO1.** To be able to learn foundations of AI.
- CO2.** To be able to evaluate AI systems on explainability and interpretability.
- CO3.** To be able to enforce fairness in models and remove bias in data.
- CO4.** To be able to preserve the privacy of individuals while learning from them.
- CO5.** To be able to develop responsible AI modules for given practical problems and estimate the tradeoff with accuracy.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	3
CO2	3	2	3	-	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	3	-	3	-	-	-	-	-	-	-	-	-	3
CO4	3	2	2	-	3	3	-	-	-	-	-	-	-	-	3
CO5	3	2	3	-	3	2	-	-	-	-	-	-	-	-	3
Course Correlation Mapping	3	3	3	-	3	2	-	-	-	-	-	-	-	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: FOUNDATIONS OF RESPONSIBLE AI

(09 Periods)

Fundamentals of Artificial Intelligence, overview of AI scopes and Applications, Need for ethics in Artificial Intelligence, Ethical Artificial Intelligence frame work, Artificial Intelligence for Society and Humanity, Concepts of Artificial Intelligence and Responsible Artificial Intelligence, common Artificial Intelligence myths.

Module 2: INTERPRETABILITY AND EXPLAINABILITY

(09 Periods)

Explainable and interpretable AI, Development of explainable systems, evaluation of AI systems on explain ability and interpretability, Development of a testing plan to measure explain ability, Interpretability through simplification and visualization, Intrinsic interpretable methods, Post Hoc interpretability, Explain ability through causality, Model agnostic Interpretation.

Module 3: FAIRNESS AND BIAS

(09 Periods)

Importance of fairness and bias in AI, Creation of fair AI systems, Evaluation and critique AI systems for fairness and bias, policies for fairness training, Different fairness levels and Sources of Biases, Exploratory data analysis, limitation of a dataset, Pre-processing, in processing and post processing to remove bias, Group fairness and Individual fairness, Counterfactual fairness.

Module 4: ETHICS, ACCOUNTABILITY AND PRIVACY PRESERVATION

(10 Periods)

Auditing AI models, fairness assessment, Principles for ethical practices, Definition of privacy in the context of AI systems, Attack models, Privacy-preserving Learning, Differential privacy, Federated learning, Evaluation of AI/ML system designs through a privacy lens, Apply privacy by design methodologies, Implementation of data minimization principles.

Module 5: RESPONSIBLE GENERATIVE AI AND CASE STUDY

(08 Periods)

Responsible Generative AI: Definition of Generative AI and LLMs, Uses and capabilities of Generative AI, Assessment of risks and ethical concerns associated with the use of LLMs, Identification of AI-generated text with different techniques, Interpretation of copyright implications of using LLMs, Design of guidelines for ethical LLM use, Recommendation systems, Medical diagnosis, Hiring/ Education, Computer Vision, Natural Language Processing.

Total Periods:45

EXPERIENTIAL LEARNING

1. Design guidelines for ethical LLM use
2. Case study on Medical diagnosis, Hiring/ Education and Computer Vision

RESOURCES

TEXT BOOK:

1. Virginia Dignum, "Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way" Springer Nature, 04-Nov-2019; ISBN-10 : 3030303705, ISBN-13 : 978-3030303709

REFERENCE BOOKS:

1. Christoph Molnar "Interpretable Machine Learning".Lulu, 1st edition, March 24, 2019; eBook. ISBN-10 : 0244768528, ISBN-13 : 978-0244768522 [available online]
2. "Silja Voenekey, Philipp Kellmeyer, Oliver Mueller, Wolfram Burgard, " the cambridge handbook of responsible artificial intelligence" Cambridge University Press, October 2022,online ISBN: 9781009207898,DOI : <https://doi.org/10.1017/9781009207898>

SOFTWARE/TOOLS:

1. **AI Fairness 360 (AIF360)** – by IBM
2. **Fairlearn** – by Microsoft
3. LIME (Local Interpretable Model-agnostic Explanations)
4. **What-If Tool** (by Google, for TensorBoard)

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc24_cs42/preview
2. <https://www.youtube.com/watch?v=DA7ldX6OIG4>
3. <https://www.microsoft.com/en-us/ai/responsible-ai>
4. <https://www.youtube.com/watch?v=h8PYkfCUO0o>
5. <https://www.youtube.com/watch?v=1MXcLgyOO9w>

WEB RESOURCES:

1. <https://www.cambridge.org/core/books/cambridge-handbook-of-responsible-artificial-intelligence/EF02D78934D18B9A22A57A46FF8FFAFC>
2. <https://cse.iitpkd.ac.in/courses/ds5604-Responsible-Artificial-Intelligence>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25EC101701	AI IN HEALTHCARE	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion on Concepts of Artificial Intelligence (AI) in Healthcare; The Present State and Future of AI in Healthcare Specialties; The Role of Major Corporations in AI in Healthcare; Applications of AI in Healthcare.

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

- CO1.** Understand the fundamental concepts of AI in Healthcare sector.
- CO2.** Analyse the present state and future of AI in Healthcare specialties for different scenarios.
- CO3.** Apply design concepts and metrics for AI in Healthcare.
- CO4.** Demonstrate basic concepts and terminologies of future applications of Healthcare in AI.
- CO5.** Develop AI applications through AI techniques for healthcare

CO-PO Mapping Table

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	2	-	-	-	-	-	-
CO2	2	3	-	-	2	-	-	-	-
CO3	2	-	2	-	-	-	-	-	-
CO4	2	-	-	2	-	-	-	-	-
CO5	-	-	3	-	-	-	-	-	-
Course Correlation Mapping	2	3	3	2	2	-	-	-	-

Correlation Levels: **3: High; 2: Medium; 1: Low**

COURSE CONTENT

Module 1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE IN (08 Periods) HEALTHCARE

Introduction to AI in Healthcare, Benefits & Risks, AI in the health sector, AI versus human intelligence, The future of AI in health sector, AI & Neural networks.

Module 2: THE PRESENT STATE & FUTURE OF AI IN HEALTHCARE (10 Periods) SPECIALTIES

Artificial Intelligence in: preventive healthcare, Radiology, Pathology, Surgery, Anesthesiology, Psychiatry, Cardiology, Pharmacy, Dermatology, Dentistry, Orthopedics, Ophthalmology.

Module 3: THE ROLE OF MAJOR CORPORATIONS IN AI IN (08 Periods) HEALTHCARE

IBM Watson, The role of Google & Deep mind in AI in Healthcare, Baidu, Facebook & AI in Healthcare, Microsoft & AI in Healthcare.

Module 4: FUTURE OF HEALTHCARE IN AI (10 Periods)

Evidence-based medicine, personalized medicine, Connected medicine, Virtual Assistants, Remote Monitoring, Medication Adherence, Accessible Diagnostic Tests, Smart Implantable, Digital Health and Therapeutics, Incentivized Wellness, Block chain, Robots, Robot-Assisted Surgery, Exoskeletons, Inpatient Care, Companions, Drones, Smart Places, Smart Homes, Smart Hospitals.

Module 5: APPLICATIONS OF AI IN HEALTHCARE (09 Periods)

Case Study 1: AI for Imaging of Diabetic Foot Concerns and Prioritization of Referral for Improvements in Morbidity and Mortality.

Case Study 2: Outcomes of a Digitally Delivered, Low-Carbohydrate, Type 2 Diabetes Self-Management.

Case Study 3: Delivering A Scalable and Engaging Digital Therapy.

Case Study 4: Improving Course Outcomes for Junior Doctors through the Novel Use of Augmented and Virtual Reality for Epilepsy.

Case Study 5: Big Data, Big Impact, Big Ethics: Diagnosing Disease Risk from Patient Data.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Analyze how the artificial intelligence is used to predict the disease result and Prognosis Assessment of a patient.
2. How does drug discovery happen and how does AI is helping in drug discovery and Labs.
3. Justify that artificial intelligence provides engineering solutions for early detection and Diagnosis of diseases.
4. Demonstrate the prediction of bladder volume of a patient.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Dr. Parag Mahajan, Artificial Intelligence in Healthcare, Med Manthra Publications, First Edition 2019.
2. Arjun Panesar, Machine Learning and AI for Healthcare Big Data for Improved Health, A press Publications, 2019.

REFERENCE BOOKS:

1. Michael Matheny, Sonoo Thadaney Israni, Mahnoor Ahmed, and Danielle Whicher, Artificial Intelligence in Health Care: The Hope, the Hype, the Promise, the Peril, National Academy of Medicine Publication, First Edition 2019.

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=-aHBwTQQyNU>
2. <https://intellipaath.com/blog/artificial-intelligence-in-healthcare/>

WEB RESOURCES:

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6616181/>
2. <https://www.ibm.com/topics/artificial-intelligence-healthcare>
3. <https://builtin.com/artificial-intelligence/artificial-intelligence-healthcare>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CM101701	BANKING AND INSURANCE	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Introduction to Banking; Bank-Customer Relationship; Electronic Payment System and Business Models; Introduction to Risk and Insurance; Insurance Overview.

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

- CO1.** Demonstrate the importance of Banking and functions of the Reserve Bank of India and its role in the country's sustainable development.
- CO2.** Demonstrate the role, relationships, and operations between Banker and Customer.
- CO3.** Demonstrate the Online Banking system, various types of Electronic Payments, and Business models.
- CO4.** Demonstrate the concept of risk and principles, functions, and, types of Insurance companies.
- CO5.** Understand the principles of insurance and its functions.

CO-PO Mapping Table

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	-	-	-	-	2	-	-	1
CO2	3	-	-	-	-	2	-	-	1
CO3	3	-	-	-	-	2	-	-	1
CO4	3	-	-	-	-	2	-	-	1
CO5	3	-	-	-	-	2	-	-	1
Course Correlation Mapping	3	-	-	-	-	2	-	-	1

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO BANKING

(09 Periods)

Meaning - Importance of banking- Functions of banking - Reserve Bank of India: Functions – Role of RBI in sustainable development.

Module 2: BANK-CUSTOMER RELATIONSHIP

(09 Periods)

Debtor-creditor relationship, deposit products or services, payment, and collection of cheques. Accounts – Types of accounts, the procedure for opening and closing an account - Loans and Advances- principles of lending.

Module 3: ELECTRONIC PAYMENT SYSTEM&BUSINESS MODELS

(09 Periods)

Introduction to Online Banking - types of e-payment system, e-cash, NEFT, RTGS, Credit cards, Electronic Wallet and Debit cards. **Business models-** B2B, B2C, C2C, and B2G.

Module 4: INTRODUCTION TO RISK AND INSURANCE

(09 Periods)

Insurance: Definition, Insurance as risk mitigation mechanism, elements of insurance. Concept of risk, risk Vs uncertainty.

Module 5: INSURANCE OVERVIEW

(09 Periods)

Principles of insurance - insurance types - LIC & GIC – insurance functions, IRDA - Insurance Players in India.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Make a PowerPoint presentation on the banking system in India.
2. Submit a report on the working of insurance companies.
3. Prepare a report on the functions of RBI & IRDA in India.
4. Submit a report on electronic banking facilities provided by Indian banks.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Ranganadha Chary, A.V. and Paul, R.R., Banking and Financial system, Kalyani Publisher, New Delhi, 3rd edition, 2016.
2. Sharma, R.K., Shashi K. Gupta and Jagwant Singh, Banking and Insurance, Kalyani Publishers, New Delhi, 17th edition, 2014

REFERENCES BOOKS:

1. Indian Institute of Banking & Finance, Digital Banking, Taxman Publications Pvt. Ltd., 2016 edition, 2016.
2. Jyotsna Sethi and Nishwan Bhatia, Elements of Banking and Insurance, PHI Learning Pvt. Ltd., 2nd edition, 2012.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=a1_p8zhbAfE
2. https://www.youtube.com/watch?v=bxNw9VB5Y_0

WEB RESOURCES:

1. <https://unacademy.com/content/railway-exam/study-material/economics/importance-of-banking-sector-in-the-country/>
2. <https://www.geeksforgeeks.org/life-insurance-meaning-elements-and-types-of-life-insurance-policies/>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25DS101701	BIOINFORMATICS	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course focus on Biological Data Acquisition, Databases, Data Processing, Methods of Analysis, Applications of Bio-informatics.

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

- CO1.** Understand basic biological data acquisition in bioinformatics.
- CO2.** Identify the proper databases for the information search by choosing the biological databases and also submission and retrieval of data from databases.
- CO3.** Analyze the results of bioinformatics data using text and sequence-based searching techniques.
- CO4.** Analyze the secondary and tertiary structures of proteins by applying different alignment programs
- CO5.** Design biological databases by using contextual knowledge on bioinformatics.

CO-PO Mapping Table

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-
CO5	3	2	3	3	-	-	-	-	-
Course Correlation Mapping	3	3	3	3	-	-	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: BIOLOGICAL DATA ACQUISITION (09 Periods)

Biological information, Retrieval methods for DNA sequence, protein sequence and protein structure information

Module 2: DATABASES (09 Periods)

Format and Annotation: Conventions for database indexing and specification of search terms, Common sequence file formats. Annotated sequence databases - primary and secondary sequence databases, protein sequence and structure databases.

Module 3: DATA PROCESSING (09 Periods)

Data – Access, Retrieval and Submission: Standard search engines; Data retrieval tools – Entrez, DBGET and SRS; Submission of (new and revised) data; Sequence Similarity Searches: Local and global. Distance metrics. Similarity and homology. Scoring matrices, PAM and BLOSUM

Module 4: METHODS OF ANALYSIS (09 Periods)

Dynamic programming algorithms, Needleman-Wunsch and Smith-waterman. Heuristic Methods of sequence alignment, FASTA and BLAST; Multiple Sequence Alignment and software tools for pair wise and multiple sequence alignment, CLUSTAL program, Prediction of Tertiary structure of proteins.

Module 5: APPLICATIONS (09 Periods)

Genome Annotation and Gene Prediction; ORF finding; Phylogenetic Analysis, Genomics, Proteomics, Genome analysis – Genome annotation, DNA Microarray, computer aided drug design (CADD).

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Calculate the dynamic programming matrix and one or more optimal alignment(s) for the sequences GAATTC and GATTA, scoring +2 for a match, -1 for a mismatch and with a linear gap penalty of $d = 2$.
2. Determine whether the RNA string GGACCACCAGG should be folded into two substructures.
3. Discuss how to carry out the multiple sequence alignment of the following three sequences: TTTTAAAA, AAAACCCC, CCCCTTTT.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Lesk, A. K., Introduction to Bioinformatics, Oxford University Press, 4th Edition, 2013
2. Dan Gusfield, Algorithms on Strings, Trees and Sequences: Computer Science and Computational Biology, Cambridge University Press, 1997.

REFERENCE BOOKS:

1. Baldi, P. and Brunak, S., Bioinformatics: The Machine Learning Approach, MIT Press, 2nd Edition, 2001.
2. Mount, D.W., Bioinformatics Sequence and Genome Analysis, Cold Spring Harbor Laboratory Press, 2nd Edition, 2004.
3. Tindall, J., Beginning Perl for Bioinformatics: An introduction to Perl for Biologists, O'Reilly Media, 1st Edition, 2001.

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=liNblw4x50E>
2. <https://www.youtube.com/watch?v=eZfyWdHnzR0>

WEB RESOURCES:

1. <https://www.britannica.com/science/bioinformatics>
2. <https://www.ebi.ac.uk/training/online/courses/bioinformatics-terrified/what-bioinformatics/>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25BS101701	BIOLOGY FOR ENGINEERS	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion on Introduction to living organisms, Proteins, Nucleic acids and enzymes, Genetics and Molecular biology, Recombinant DNA technology, Human physiology and applied biology.

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

- CO1.** Identify difference between cells, Cellular components and their functions.
- CO2.** Understand Proteins, Nucleic acids structure and function and also Mechanism of enzyme action.
- CO3.** Identify Central dogma of Molecular biology and processes of Molecular Biology.
- CO4.** Understand Recombinant DNA technology and its importance in creating new Animals and Plants.
- CO5.** Understand basics and Mechanism of different Physiological process including nerve function and applications of biological sciences.

CO-PO Mapping Table

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-
Course Correlation Mapping	3	2	-	-	-	-	-	-	-

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: LIVING ORGANISMS (09 Periods)

Comparison of biological organisms with manmade systems, Classification of living organisms, Cellular basis of life, differences between prokaryotes and eukaryotes, classification on the basis of carbon and energy sources, molecular taxonomy

Module 2: PROTEINS, NUCLEIC ACIDS AND ENZYMES (10 periods)

Biomolecules, structure, function and Classification of proteins, structure, function and Classification of and Nucleic acids, Enzymes, Enzyme nomenclature, Classification of Enzymes and Mechanism of Enzyme action, Industrial applications of enzymes, Fermentation and its industrial applications

Module 3: GENETICS AND MOLECULAR BIOLOGY (11 Periods)

Mendel's laws, single gene disorders in humans, Genetic code, DNA replication, Transcription, Translation.

Module 4: RECOMBINANT DNA TECHNOLOGY (08 Periods)

Recombinant DNA Technology: recombinant vaccines, transgenic microbes, plants and animals, animal cloning, biosensors, biochips.

Module 5: HUMAN PHYSIOLOGY AND APPLIED BIOLOGY (07 Periods)

Fundamentals of Human physiology, neurons, synaptic and neuromuscular junctions, Introduction to EEG, DNA fingerprinting, DNA Micro array and Genomics.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Identify the Cell and Cellular organelle spotters and write the functions of spotters identified
2. Prepare a table of Enzymes and their importance.
3. Assignments on Central dogma of Molecular biology
4. Identify different organs in the organ system diagrams.
5. Assignments on photosynthesis.
6. Quiz related to organ system and functions.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Rajiv Singal, Gaurav Agarwal, Biology for Engineers, CBS, 2019.
2. S. Sing and T. Allen, Biology for Engineers, Vayu Education of India, 2014.

REFERENCE BOOKS:

1. B. Alberts, A. Johnson et al., The molecular biology of the cell, Garland Science, 6th edition, 2014
2. A. T. Johnson, Biology for Engineers, CRC press, 2011.

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=N0Y386SVGN8>
2. <https://www.youtube.com/watch?v=1Pzk-UqilW4>
3. <https://www.youtube.com/watch?v=208pMhKoQeo>

WEB RESOURCES:

1. Structure and function of Proteins: <https://nptel.ac.in/courses/104102016/16>
2. Enzyme catalysis: <https://nptel.ac.in/courses/103103026/module3/lec35/4.html>
3. Biochips: <https://nptel.ac.in/courses/112104029/3>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25LG101701	BUSINESS COMMUNICATION AND CAREER SKILLS	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Nature and Scope of Communication, Corporate Communication, Writing Business Messages & Documents, Careers & Résumés, and Interviews.

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

- CO1.** Demonstrate knowledge of professional communication by analyzing and applying the styles and strategies of business communication in Communication Networks, Interpersonal, and Informal communication.
- CO2.** Analyze the limitations of communication by applying and demonstrating corporate and cross-cultural communication strategies effectively in a business context and Crisis Management situations.
- CO3.** Apply appropriate strategies and techniques in writing business messages, business letters, and résumé for effective professional communication and career building.
- CO4.** Demonstrate appropriate communication techniques and answering strategies by analyzing the expectations during presentations and interviews.

CO-PO Mapping Table

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	1	-	2	-	-	-	3	-
CO2	1	2	-	2	-	-	-	3	-
CO3	1	-	-	2	-	-	-	3	-
CO4	1	2	-	2	-	-	-	3	-
Course Correlation Mapping	2	2	-	2	-	-	-	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: NATURE AND SCOPE OF COMMUNICATION (09 Periods)

Introduction – Communication Basics – Functions of Communication – Communication Networks – Interpersonal Communication – Informal Communication – Communication Barriers – Roles of a Manager.

Module 2: CORPORATE COMMUNICATION (09 Periods)

Introduction – Corporate Communication – Cross-Cultural Communication; Concept & Styles – Corporate Communication Strategy – Corporate Citizenship – Crisis Communication: Case Study.

Module 3: WRITING BUSINESS MESSAGES & DOCUMENTS (09 Periods)

Introduction – Importance of Written Business Communication – Types of Business Messages – Five Main Stages of Writing Business Messages – Business Letter Writing – Kinds of Business Letters – Common Components of Business Letters – Strategies for Writing the Body of a Letter.

Module 4: CAREERS AND RÉSUMÉS (09 Periods)

Introduction – Career Building – Résumé Formats: Traditional, Electronic and Video Résumé – Sending Résumés – Follow-up Letters – Business Presentations and Speeches: Planning – Structuring – Organizing – Delivery.

Module 5: INTERVIEWS (09 Periods)

Introduction – General Preparation for an Interview – Success in an Interview – Important Non-verbal Aspects – Types of Interviews – Styles of Interviewing – Types of Interviewing – Online Recruitment Process.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. People often get confused in identifying or using English vocabulary on most occasions. Prepare a list of confusing words and find methods to overcome the difficulties in using those words to uplift the career of professionals.
2. Organizations and institutions use modern technology in communicating with their colleagues, clients, and stakeholders. Make a PowerPoint presentation on the modern communication system of any organization and its role in the success of the organization and its career.
3. As a student in the modern technological world, organizing or attending webinars is inevitable. Analyze the pros and cons of video conferencing by organizing webinars and preparing a report.
4. Form a team and act as a team leader. Prepare a performance appraisal report of the team using visual aids to support the presentation.
5. Make a detailed study on social networking and its impact on modern business and career.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Meenakshi Raman, Prakash Singh, Business Communication, Oxford University Press, New Delhi, 2nd edition, 2012.
2. Neera Jain, Sharma Mukherji, Effective Business Communication, Tata Mc Graw–Hill

REFERENCE BOOKS:

1. Courtland L. Bovee et al., Business Communication Today, Pearson, New Delhi, 2011.
2. Krizan, Effective Business Communication, Cengage Learning, New Delhi, 2010.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/110105052>
2. https://edurev.in/courses/14522_Business-Communication-The-Ultimate-Guide

WEB RESOURCES:

1. <http://www.career.vt.edu/interviewing/TelephoneInterviews.html>
2. http://job-search-search.com/interviewing/behavioral_interviews
3. <https://goo.gl/laEHOY> (dealing with complaints)
4. <http://www.adm.uwaterloo.ca/infocecs/CRC/manual/resumes.html>
5. <https://goo.gl/FEMGXS>
6. <http://www.resumania.com/arcindex.html>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CE101701	CIVIL ENGINEERING AND THE SOCIETY	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion on introduction to civil engineering, aesthetics of historic and modern civil engineering structures, unpredictable nature and the civil engineering; civil engineering solutions for the problems of traffic, pollution, water and waste management; building sustainable smart cities.

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

- CO1.** Analyze principles of civil engineering to basic civil engineering problems following ethics and latest developments considering society, environment and sustainability besides communicating effectively in graphical form.
- CO2.** Analyze aesthetics of historic and modern civil engineering structures to solve complex civil engineering problems using tools and techniques by following ethics and latest trends considering society, environment and sustainability besides communicating effectively in graphical form.
- CO3.** Analyze unpredictable nature and the role of civil engineering to solve complex civil engineering problems using tools and techniques by following ethics and considering society, environment and sustainability besides communicating effectively in graphical form.
- CO4.** Analyze civil engineering solutions for the problems of traffic, pollution, water and waste management to solve complex problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.
- CO5.** Analyze the building principles of sustainable smart cities to solve complex problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	3	-	-	3	2	-	1	1
CO2	3	3	-	2	2	2	-	1	1
CO3	3	3	-	2	2	2	-	1	-
CO4	3	3	-	2	2	2	-	1	-
CO5	3	3	-	2	2	2	-	1	-
Course Correlation Mapping	3	3	-	2	2	2	-	1	1

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO CIVIL ENGINEERING (07 Periods)

Philosophy of civil engineering, Disciplines of civil engineering, Evolution of construction and civil engineering in the world; Civil engineer - Duties and responsibilities, Role of Civil engineer in the society; Civil engineering materials and their applications, Latest advancements in civil engineering.

Module 2: AESTHETICS OF HISTORIC AND MODERN CIVIL ENGINEERING STRUCTURES (09 Periods)

Aesthetics in civil engineering structures; Aesthetic principles and techniques - Analysis of materials, textures and colors in aesthetic design, Integration of aesthetics with structural engineering principles; Historic civil engineering structures - Case studies of iconic historic structures (e.g. Colosseum, Taj Mahal, Eiffel Tower); Modern civil engineering structures - Exploration of contemporary iconic structures (e.g. Burj Khalifa, Sydney Opera House, Golden Gate Bridge); Integration of aesthetics and functionality - Ethical considerations in balancing aesthetics, functionality and sustainability; Future trends in aesthetic engineering.

Module 3: UNPREDICTABLE NATURE AND THE CIVIL ENGINEERING (09 Periods)

Unpredictable nature, Examples of unpredictable natural disasters - Earthquakes, Floods, Landslides, Hurricanes, Tsunamis, Impacts of unpredictable natural events on infrastructure; Role of civil engineering; Resilience in civil engineering - Strategies for building resilient structures, Risk assessment and analysis, Incorporating safety factors, Using robust construction materials, Implementing redundancy and backup systems, Sustainable design practices; Case studies of successful resilient designs.

Module 4: CIVIL ENGINEERING SOLUTIONS FOR THE PROBLEMS OF TRAFFIC, POLLUTION, WATER AND WASTE MANAGEMENT (11 Periods)

Introduction to urban challenges and sustainable development; Traffic management solutions - Causes and impacts of traffic congestion, Intelligent transportation systems; Pollution control and environmental engineering, Sources and types of urban pollution, Air quality monitoring and control strategies, Water pollution control, Noise pollution management, Sustainable construction practices to reduce pollution; Water resource management, Water demand and supply management in urban areas, Rainwater harvesting techniques, Water conservation and wastewater treatment technologies; Waste management strategies, Solid waste generation and disposal challenges, Waste-to-energy conversion technologies, Case studies of successful waste management initiatives; Integration and synergies among Solutions, Multi-disciplinary approach for holistic solutions.

Module 5: BUILDING SUSTAINABLE SMART CITIES (09 Periods)

Smart city; Elements of smart city infrastructure – Buildings, Mobility, Energy, Water, Waste management, Health and digital layers; Need for an integrated approach; Role of science, technology and innovation in the implementation of smart infrastructure; Smart infrastructure design principles and policies; Case studies: Gujarat International Finance Tech-City in India.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Group discussion on compatibility of modern construction materials compared to that of traditional civil engineering materials
2. Poster presentation on historic and modern civil engineering structures.
3. Submit a case study report on Life Cycle Analysis (LCA) of any one of the historic civil engineering structures.
4. Submit a case study report on the theme of severity of the natural disasters on the Civil engineering structures.
5. Debate on challenges, limitations and solutions for design and implementation of smart city.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. David Muir Wood., Civil Engineering: A Very Short Introduction, Oxford University Press, 1st Edition, 2012.
2. Roger Scruton, The Aesthetics of Architecture, Princeton University Press, 2nd Edition, 2013.

REFERENCE BOOKS:

1. Anubha Kaushik and C. P. Kaushik, Perspectives in Environmental Studies, New Age International (P) Ltd Publications, 6th Edition, 2018.
2. Sang Lee (Editor), Aesthetics of Sustainable Architecture, 010 publishers, 1st Edition, 2013.
3. Marc Kushner, The Future of Architecture in 100 Buildings, Simon and Schuster, 1st Edition, 2015.
4. Nicholas J. Garber and Lester A. Hoel, Traffic and Highway Engineering, Nelson Engineering, 1st Edition, 2008.
5. Stephen M. Wheeler and Timothy Beatley, Sustainable Urban Development, Reader Routledge Urban Reader Series, 3rd Edition, 2014.
6. Larry W. Mays, Water Resources Engineering, Wiley India Private Limited, 3rd Edition, 2011.
7. Hans Straub, A History of Civil Engineering: An Outline from Ancient to Modern Times, The MIT Press, 4th Edition, 1964.
8. Brian Vanden Brink, Iconic: Perspectives on the Man-Made World, Down East Books, Illustrated Edition, 2012.

VIDEO LECTURES:

1. <https://archive.nptel.ac.in/courses/123/105/123105001/>
2. https://onlinecourses.nptel.ac.in/noc22_ce42/preview
3. https://onlinecourses.nptel.ac.in/noc19_ce31/preview
4. https://onlinecourses.nptel.ac.in/noc20_ce07/preview

WEB RESOURCES:

1. <https://bregroup.com/insights/aesthetics-in-architecture-how-beauty-and-design-are-inspiring-each-other/>
2. <https://keckwood.com/news-updates/how-civil-engineers-help-during-disaster-recovery/#:~:text=Civil%20engineers%20provide%20humanitarian%20and,shortages%20to%20hard%2Dhit%20communities>
3. <https://smartcities.gov.in/>
4. <https://www.twi-global.com/technical-knowledge/faqs/what-is-civil-engineering>
5. <https://www.ice.org.uk/engineering-resources/knowledge-resources/water-and-waste-water-management>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25SS101701	CONSTITUTION OF INDIA	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides and in-depth knowledge about Constitution of India's Preamble and its Philosophy; Union Legislature; Federalism in India; Judiciary and Public Services; Nation Building. The students can gain first-hand information and knowledge about these dynamics and accordingly act based on these sources in their professional and routine activities.

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

- CO1.** Demonstrate knowledge in the Parliamentary proceedings, Election Commission, Public Services and Foreign Policy of India.
- CO2.** Apply the reasoning informed by the various aspects of the Constitution and its provisions to assess societal issues and the consequent responsibilities relevant to the professional engineering practice.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	1	-	-	-	2	-	-	-	-
CO2	2	-	-	-	-	3	-	-	-
Course Correlation Mapping	2	-	-	-	2	3	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: PREAMBLE AND ITS PHILOSOPHY

(09 Periods)

Introduction to Indian Constitution; Evolution of Indian Constitution; preamble and its philosophy

Module 2: UNION LEGISLATURE

(09 Periods)

The Parliament, Parliamentary Structure, Process of Legislation; President of India – Powers and Functions; Prime Minister and Council of Ministers; Constitution Amendment Procedure.

Module 3: FEDERALISM IN INDIA

(09 Periods)

Centre-State Administrative Relationship; Governors – Powers and Functions; State Legislature – Composition and powers; Chief Ministers – Powers and Functions; The Election Commission – Powers and Functions.

Module 4: JUDICIARY AND PUBLIC SERVICES

(09 Periods)

The Union Judiciary – Supreme Court and High Court; Fundamental Rights and Duties All India Services – Central Civil Services – State Services – Local Services.

Module 5: INTERNATIONAL PARTICIPATION

(09 Periods)

Foreign Policy of India; International Institutions Influence: UNO, WTO, WHO, SAARC, International Summits: BRICS, NSS, UNEP – India's Role in International Negotiations; Environmentalism in India.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Review newspapers and submit a report on critical analysis of Indian Civil Servants exercise of powers, in the wake of constitutionally assigned authority.
2. Visit your village Panchayat office or Municipality office and generate a report on your observations about maintained Constitutional symbolism.
3. Watch few videos on recent Indian Independence Day and Republic Day celebrations as marked in New Delhi and present a detailed report, by considering the following aspects:
 - a) Comparatively analyze the speeches of the President of India and Prime Minister of India as delivered on these two occasions.
 - b) Compare these two events relevance in terms of Indian Armed Forces presence.
 - c) Observe, compare and analyse 'flag code' relevance as marked in these two events.
4. Watch a few videos on recent 'proceedings' of any state Legislative Assembly session and submit a detailed report.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Brij Kishore Sharma, Introduction to the Constitution of India, Prentice Hall of India, 2005.

REFERENCE BOOKS:

1. Mahendra Pal Singh, V. N. Shukla's, Constitution of India, Eastern Book Company, 2011.
2. Pandey J. N., Constitutional Law of India, Central Law Agency, 1998.

VIDEO LECTURES:

1. Doctrine of Basic Structure: <https://www.youtube.com/watch?v=cvUf9ZeEe8Y>
2. Significance of the Constitution: https://www.youtube.com/watch?v=vr1Dc_-ZKbQ

WEB RESOURCES:

1. The Constitution of India: <https://www.youtube.com/watch?v=of2SoO8i8mM>
2. Protection of Constitutional Democracy:
<https://www.youtube.com/watch?v=smJ99cdPrns>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CM101702	COST ACCOUNTING AND FINANCIAL MANAGEMENT	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Cost accounting; cost sheet & preparation of cost sheet; standard costing & variance analysis; financial management & ratio analysis; introduction to investment.

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

- CO1.** Demonstrate the concepts of Cost Accounting and Management Accounting and the elements of costing.
- CO2.** Determine the Cost of Production for pricing decisions.
- CO3.** Apply the Standard Costing and Variance techniques for the control of the cost of production
- CO4.** Analyze the Profitability and financial condition of an organization using Ratios.
- CO5.** Apply Capital Budgeting techniques for making investment decisions in an organization.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	-	-	2	-	1	-	-	-
CO2	3	-	-	2	-	1	-	-	-
CO3	3	-	-	2	-	1	-	-	-
CO4	3	-	-	2	-	1	-	-	-
CO5	3	-	-	2	-	1	-	-	-
Course Correlation Mapping	3	-	-	2	-	1	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: COST ACCOUNTING

(09 Periods)

Meaning of Cost and Cost Accounting, Objectives, Scope, Advantages, and Disadvantages – Cost Accounting Vs Management Accounting – Elements of Costing – Installation of costing system – Material Control, Labor Control, Overhead Control.

Module 2: COST SHEET & PREPARATION OF COST SHEET

(09 Periods)

Analysis of Cost – Preparation of cost sheet, estimate, tender, and quotation (Simple problems) – Importance of Costing while pricing the products

Module 3: STANDARD COSTING & VARIANCE ANALYSIS

(09 Periods)

Introduction to Standard Costing & Variances – Variance Analysis: Material variances, Labor variances (Simple Problems).

Module 4: FINANCIAL MANAGEMENT & RATIO ANALYSIS

(09 Periods)

Meaning, Objectives - Nature and Scope, Importance of FM – Ratio Analysis: Types of Ratios: Solvency Ratios, Liquidity Ratios, Turnover Ratios, and Profitability Ratios - Financial Statement Analysis through Ratios (Simple Problems).

Module 5: INTRODUCTION TO INVESTMENT

(09 Periods)

Investment - Meaning and Definition- concept of risk and returns - Capital budgeting techniques – Security Analysis and Portfolio Management (Basic concepts).

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. e a report on the role of cost accountants in the growth of a company.
2. To visit the manufacturing unit to observe how they used various techniques for analyzing the financial health of a company.
3. Prepare a report on factors influencing the form of business organization.
4. Prepare the cost sheet with practical examples of any two manufacturing companies.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. S.P. Jain and K.L. Narang: Cost Accounting, Kalyani Publishers, Ludhiana, 10th edition, 2016.
2. I.M. Pandey, Financial Management, Vikas Publishing House Pvt. Ltd., 14th edition, 2016.

REFERENCE BOOKS:

1. The Institute of Company Secretaries of India, Cost and Management Study Material, New Delhi.
2. CA Saravana Prasath, Cost Accounting and Financial management, Wolters Kluwer India Pvt. Ltd., New Delhi, 2018.

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=ESqO8sFgQa0&list=PLLhSIFdZcUVE2kzOhEubO9rkvUOAgZbz>
2. <https://www.youtube.com/watch?v=tzasFmP1CpAhttps://www.youtube.com/watch?v=tzasFmP1CpA>

WEB RESOURCES:

1. https://www.tutorialspoint.com/accounting_basics/management_versus_cost_accounting.htm
2. <https://www.netsuite.com/portal/resource/articles/financial-management/financial-management.shtml>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CB101701	CYBER LAWS AND SECURITY	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion on Cyber Crimes and Indian IT Act; Cyber Offenses; Tools and Methods used in Cyber Crime; Phishing and Identity Theft; Indian and Global Perspective on Cyber Crimes and Cyber Security; Organizational Implications on Cyber Security; IPR Issues; Cyber

Crime and Terrorism; Cyber Crime Illustrations

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

CO1. Demonstrate knowledge in Cyber security, Cybercrimes and its related laws in Indian and Global Act.

CO2. Analyze the legal perspectives and laws related to cybercrimes in Indian context.

CO3. Apply security and privacy methods in development of modern applications and in organizations to protect people and to prevent cybercrimes.

CO4. Solve Cyber security issues using privacy policies and Use antivirus tools to minimize the impact of cyber threats.

CO5. Apply security standards for the implementation of Cyber Security and laws.

CO-PO Mapping Table

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-
CO3	3	2	3	-	-	-	-	-	-
CO4	3	2	3	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-
Course Correlation Mapping	3	2	3	-	-	-	-	-	-

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO CYBER CRIMES AND OFFENSES (09 Periods)

Cyber Crimes: Introduction, Definition, Origin, Cybercrime and information security, Cyber criminals, Classifications of cybercrimes, The legal perspectives and Indian perspective, Cybercrime and Indian ITA 2000, Global perspective on cybercrimes.

Cyber Offenses: Introduction, Criminals planning on attacks, social engineering, Cyber stalking, Cyber Cafe and crimes, Botnets.

Module 2: TOOLS AND METHODS USED IN CYBER CRIME AND (09 Periods) PHISHING AND IDENTITY THEFT

Introduction, Proxy servers and Anonymizers, Phishing, Password cracking, Key loggers and Spywares, Virus, Worms and Ransomware, Trojan horses and Backdoors, Steganography, DoS and DDoS attacks.

Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).

Module 3: CYBER CRIMES AND CYBER SECURITY-LEGAL (08 Periods) PERSPECTIVES

Introduction, Cyber laws in Indian context, The Indian IT act, Challenges to Indian law and Cybercrime scenario in India, Consequences of not addressing the weakness in IT act, Digital signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber law, Technology and Students in India scenario.

Module 4: CYBER SECURITY-ORGANIZATIONAL IMPLICATIONS (10 Periods)

Introduction, Web threats for organizations – evils and perils, Security and privacy implications from cloud computing, Social Media Marketing-Security risks and Perils for organizations, social computing and associated challenges for organizations, Protecting people's privacy in organization, Organizational guidelines for internet usage, Safe computing and Usage policy, Incident handling and best practices.

Module 5: CYBER CRIME AND TERRORISM AND ILLUSTRATIONS (09 Periods)

Cyber Crime & Terrorism: Introduction, Intellectual property in the cyber space, The ethical dimension of cybercrimes, The psychology, Mindset and skills of hackers and cyber criminals, Sociology of cyber criminals, Information warfare.

Cyber Crime Illustrations: Indian banks lose millions of rupees, Justice vs. Justice, Parliament attack, The Indian case of online gambling, Bank and credit card related frauds, Purchasing goods and services scam, Nigerian 419 scam.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. The Cyber Security Risks on social media – Learn from Case Studies: <https://www.rswebsols.com/tutorials/internet/cyber-security-risks-social-media>
2. SIX automates key cybersecurity tasks to actively protect itself against social media threats: <https://www.hootsuite.com/resources/six-group-case-study>
3. Important Cyber Law Case Studies: <https://www.cyberalegalservices.com/detail-casestudies.php>

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Nina Gobole, Sunit Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley India, 2011.

REFERENCE BOOKS:

1. Prashant Mali, Cyber Law and Cyber Crimes, Snow White Publications Pvt. Ltd., 2013.
2. Alfred Basta and et al, Cyber Security and Cyber Laws, Cengage Learning India 2018

VIDEO LECTURES:

1. Learn Cyber Security | Cyber Security Training:
<https://www.youtube.com/watch?v=PIHnamdwGmw>
2. Cyber Security for Beginners: <https://www.youtube.com/watch?v=4RE4d23tDFw>

WEB RESOURCES:

1. <https://study.com/academy/course/computer-science-110-introduction-to-cybersecurity.html>
2. <https://www.pandasecurity.com/en/mediacenter/panda-security/types-of-cybercrime/>
3. <https://mediasmarts.ca/digital-media-literacy/digital-issues/cyber-security/cyber-security-spam-scams-frauds-identity-theft>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25EE101701	ELECTRICAL SAFETY AND SAFETY MANAGEMENT	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: The course deals with the various aspects of potential risk due to electrical shock; safety precautions to be followed while working in hazardous zones; safe practices while handling various electrical equipment and during maintenance; and relevant electrical safety standards and Indian rules and acts.

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

- CO1.** Understand the Indian electricity rules, regulations and various standards to be maintained for the safety of life and equipment.
- CO2.** Understand the potential effects of electrical shock and safety measures to protect against such risk.
- CO3.** Understand the safety aspects and safe practices to be followed while installing residential, commercial, and agricultural appliances.
- CO4.** Identify various hazardous working zones and take necessary precautionary measures while working in such areas.
- CO5.** Follow safety measures during installation, testing and commissioning, and maintenance of electrical equipment/plant.

CO-PO Mapping Table

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	-	-	1	1	3	-	-	1
CO2	3	-	-	1	2	-	-	-	1
CO3	3	-	-	1	2	-	-	-	1
CO4	3	-	-	2	2	2	-	-	1
CO5	3	-	-	-	2	2	-	-	1
Course Correlation Mapping	3	-	-	1	2	3	-	-	1

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INDIAN ELECTRICITY RULES AND ACTS, AND THEIR (10 Periods) SIGNIFICANCE

OSHA standards of electrical safety, Basic electrical safety rules as per OSHA; Objectives and scope of IE acts and IE rules, Ground clearance and Section Clearances, Clearance in transmission and distribution lines, Significance of Equipment Earthing, Earthing of equipment bodies, structures and non-current carrying metallic parts, Earthing of system neutral; Rules regarding first aid and firefighting facility, Electrical safety general requirements as per IE rules.

Module 2: INTRODUCTION TO ELECTRICAL SAFETY AND SAFETY (10 Periods) MANAGEMENT

Electric Safety: Terms and definitions, objectives of safety and security measures, Hazards associated with electric current and voltage, Protection against electrical hazards and types, Effect of current on the human body, Principles of electrical safety and approach to prevent accidents.

Electric shocks and its prevention: Primary and secondary electrical shocks, possibilities of getting an electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, Safety precautions in LV installations and electric plant.

Module 3: ELECTRICAL SAFETY IN RESIDENTIAL, COMMERCIAL, (08 Periods) AND AGRICULTURAL INSTALLATIONS

Introduction—Wiring and fitting; Domestic appliances—water tap giving a shock, shock from wet wall, fan firing shock; multi-storied building, Temporary installations, Agricultural pump installation; Do's and Don'ts for safety in the use of domestic electrical appliances; Principles of safety management in electrical plants, safety auditing, and economic aspects.

Module 4: ELECTRICAL SAFETY IN HAZARDOUS AREAS (07 Periods)

Hazardous zones—class 0, 1 and 2; Sparks, flashovers and corona discharge in electrical plants; equipment for hazardous locations; scope for live line work, principles of live line maintenance, special tools for live line maintenance, safety instructions for working on HV lines/apparatus.

Module 5: SAFETY DURING INSTALLATION TESTING AND (10 Periods) MAINTENANCE

Safety during installations: Preliminary preparations, preconditions for the start of installation work and safe sequence, safety aspects during installations of Transformers and Rotating machines.

Safety during testing: Purpose of commissioning checks and tests, equipment tests, high voltage energization tests, performance and acceptance tests, and safety aspects during commissioning.

Safety during maintenance: Operators' safety, Types of safety maintenance, Safety procedures, safety precautions during maintenance, and planning of maintenance.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Study and submit a report on various electrical safety standards followed in abroad countries.
2. Visit a nearby industry and submit a report on various safety measures followed in the industry.
3. Study and submit a report on standard practices followed during the maintenance/commissioning of the electrical apparatus in any industry.
4. Collect information about various safety/alert sign boards and the relative measures for a particular situation.
5. Should practice preliminary first aid assistance such as Cardiopulmonary resuscitation (CPR) and shall demonstrate.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Rao, Prof. H.L. Saluja, Electrical Safety, Fire Safety Engineering and Safety Management, Khanna Publishers. New Delhi, 2nd Edition, 2018 Reprint.

REFERENCE BOOKS:

1. Cadick, John, Mary Capelli-Schellpfeffer, and Dennis K. Neitzel, Electrical safety Handbook, McGraw-Hill Education, 2012.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=g-ofq7i_u48

WEB RESOURCES:

1. <https://cercind.gov.in/Act-with-amendment.pdf>
2. <https://www.edapp.com/blog/electrical-safety-training-topics/>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25MG101701	ENTREPRENEURSHIP FOR MICRO, SMALL AND MEDIUM ENTERPRISES	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: To understand the setting up and management of MSMEs and initiatives of Government and other institutions support for growth and development of MSMEs

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

- CO1.** Understand the basic of SME and challenges of MSMEs
- CO2.** Explain the opportunities to Set-Up SSI/SME Units and role of rural & women entrepreneurship.
- CO3.** Illustrate roles of various institutions supporting MSMEs.
- CO4.** Understand Management of MSME, NPA & sickness units
- CO5.** Understand role of Government in Promoting Entrepreneurship

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	1	2	-	-	-	-	-	-
CO2	1	1	2	-	2		1	-	-
CO3	2	2	1	-	-	1	-	-	-
CO4	3	1	2	-	-	-	-	-	2
CO5	2	2	1	-	-	-	-	-	1
Course Correlation Mapping	2	2	2	-	2	1	1	-	2

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION2

(07 Periods)

Concept & Definition, Role of Business in the modern Indian Economy SMEs in India, Employment and export opportunities in MSMEs. Issues and challenges of MSMEs

Module 2: MSME SETTING

(09 Periods)

Identifying the Business opportunity, Business opportunities in various sectors, formalities for setting up an enterprise - Location of Enterprise - steps in setting up an enterprise - Environmental aspects in setting up, Incentives and subsidies.

Module 3: MSME SUPPORTING INSTITUTIONS

(09 Periods)

Forms of Financial support, long term and short-term financial support, Sources of Financial support, Development Financial Institutions, Investment Institutions, Central level institutions, State level institutions, other agencies, Commercial Bank - Appraisal of Bank for loans

Module 4: MANAGEMENT OF MSME

(10 Periods)

Management of Product Line; Communication with clients - Credit Monitoring System - Management of NPAs - Restructuring, Revival and Rehabilitation of MSME, Problems of entrepreneurs - sickness in SMI - Reasons and remedies -- Evaluating entrepreneurial performance

Module 5: ENTREPRENEURSHIP PROMOTION

(10 Periods)

MSME policy in India, Agencies for Policy Formulation and Implementation: District Industries Centers (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB)

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Present a case study on MSMEs Business Strategies.
2. Collect the data about nearby MSMEs and Present their structures in a PPT
3. Discuss in the group MSMEs opportunities in terms of Orientation and Development.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Vasant Desai, Small Scale Industries and Entrepreneurship, Himalaya Publishing House, 2003.
2. Poornima M Charanthimath, Entrepreneurship Development Small Business Enterprises, Pearson, 2006.

REFERENCE BOOKS:

1. Suman Kalyan Chaudhury, Micro Small and Medium Enterprises in India Hardcover, Raj Publications, 2013.
2. Aneet Monika Agarwal, Small and medium enterprises in transitional economies, challenges and opportunities, DEEP and DEEP Publications
3. Paul Burns & Jim Dew Hunt, Small Business Entrepreneurship, Palgrave Macmillan publishers, 2010.

VIDEO LECTURES:

1. <https://sdgs.un.org/topics/capacity-development/msmes>
2. <https://blog.tatanexarc.com/msme/msme-schemes-in-india-for-new-entrepreneurs-and-start-ups/>

WEB RESOURCES:

1. ncert.nic.in/textbook/pdf/kebs109.pdf
2. <https://www.jetir.org/papers/JETIR1805251.pdf>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CE101702	ENVIRONMENTAL POLLUTION AND CONTROL	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion on fundamentals of air pollution, dispersion of pollutants, effects and control of air pollution, water pollution, soil pollution and control, and municipal solid waste management.

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

- C01.** Analyze air and noise pollution using appropriate tools and techniques to solve complex environmental issues following relevant standards considering society, environment and sustainability besides communicating effectively in graphical form.
- C02.** Analyze air and noise pollution control measures using appropriate tools and techniques to solve complex environmental issues following relevant standards and latest developments considering society, environment and sustainability besides communicating effectively in graphical form.
- C03.** Analyze water pollution and its control measures using appropriate tools and techniques to solve complex environmental issues following relevant standards and latest developments considering society, environment and sustainability besides communicating effectively in graphical form.
- C04.** Analyze soil pollution and its control measures using appropriate tools and techniques to solve complex environmental issues following relevant standards and latest developments considering society, environment and sustainability besides communicating effectively in graphical form.
- C05.** Analyze solid waste and its management measures using appropriate tools and techniques to solve solid waste disposal issues following relevant standards and latest developments considering society, environment and sustainability besides communicating effectively in graphical form.

CO-PO Mapping Table

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
C01	2	3	-	2	3	2	-	1	-
C02	2	3	-	2	3	2	-	1	1
C03	2	3	-	2	3	2	-	1	1
C04	2	3	-	2	3	2	-	1	1
C05	2	3	-	2	3	2	-	1	1
Course Correlation Mapping	2	3	-	2	3	2	-	1	1

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: AIR AND NOISE POLLUTION (08 Periods)

Air Pollution: Scope, Significance, Classification, Sources – Line, Area, Stationary, Mobile; Effects of air pollutants on man, material and vegetation; Global effects of air pollution; Air pollution meteorology - Lapse rate, Inversion, Plume pattern; Dispersion of air pollutants - Dispersion models and applications; Ambient air quality standards.

Noise Pollution: Sound pressure, Power and intensity, Impacts of noise, permissible limits of noise pollution, measurement of noise, Noise standards.

Module 2: AIR AND NOISE POLLUTION CONTROL (10 Periods)

Self-cleansing properties of the environment, Dilution method, Control at source, Process changes and equipment modifications, Control of particulates – Types of equipment, Design and operation - Settling chambers, Centrifugal separators, Bag house filters, Wet scrubbers, Electrostatic precipitators; Control of gaseous pollutants – Adsorption, Absorption, Condensation, Combustion; Control of air pollution from automobiles, Control of noise pollution, Case studies, Latest developments in the air and noise pollution control.

Module 3: WATER POLLUTION AND CONTROL (10 Periods)

Water pollution – Sources, Causes, Effects; Surface and groundwater quality – Physical, Chemical, Biological; Drinking water quality standards, Water purification – Processes, engineered systems – Aeration, Solids separation, Settling operations, Coagulation, Softening, Filtration, Disinfection; Wastewater – Sources, Causes, Effects, Treatment process and disposal – Primary, Secondary, Tertiary; Case studies, Latest developments in the water pollution control.

Module 4: SOIL POLLUTION AND CONTROL (08 Periods)

Soil pollutants, Sources of soil pollution, Causes, Effects and control of soil pollution, Diseases caused by soil pollution, Methods to minimize soil pollution, Effective measures to control soil pollution, Soil quality standards, Case studies, Latest developments in the soil pollution control.

Module 5: MUNICIPAL SOLID WASTE MANAGEMENT (09 Periods)

Municipal solid waste – Types, Composition and characteristics; Methods of collection and transportation; Methods of disposal – Open dumping, Sanitary landfill, Composting and Incineration; Utilization - 6R Concept, Recovery and recycling and Energy Recovery; Latest developments in solid waste management.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Explain plume patterns due to air pollution and meteorology effects and draw a neat sketch of plume pattern from any chimney that you have observed in recent times.
2. Compare the different air pollution control equipment used in India and draw a neat sketch line diagram of equipment you have seen in any of your industrial visit.
3. Submit a study report on Coagulation, Flocculation, Sedimentation, Filtration and Disinfection in your own words after watching a YouTube video on water treatment.
4. Enumerate the effective measures to control soil pollution with any two case studies.

5. Submit a report on case studies on the use of 6Rs concept of Municipal Solid Waste Management.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Peavy, H. S, Rowe, D. R., and Tchobanoglous, G., Environmental Engineering, McGraw Hill Inc., 1985.
2. C. S. Rao, Environmental Pollution Control Engineering, New Age International Pvt. Ltd., 2nd Edition, 2007.
3. Ibrahim A. Mirsa, Soil Pollution: Origin, Monitoring & Remediation, Springer, UK, 2nd Edition, 2008.

REFERENCE BOOKS:

1. M. N. Rao and H. V. N. Rao, Air Pollution, Tata McGraw-Hill Education Pvt. Ltd., 19th Edition, 2010.
2. Daniel Vallero, Fundamentals of Air Pollution, Academic Press (Elsevier), 5th Edition, 2014.
3. S. M. Khopkar, Environmental Pollution Monitoring and Control, New Age International Pvt. Ltd., 2nd Edition, 2007.
4. V. M. Domkundwar, Environmental Engineering, Dhanpat Rai & Co. Pvt. Ltd., New Delhi, 2014.

VIDEO LECTURES:

1. <https://archive.nptel.ac.in/courses/123/105/123105001/>
2. <https://archive.nptel.ac.in/courses/105/107/105107213/>
3. <https://archive.nptel.ac.in/courses/103/107/103107084/>

WEB RESOURCES:

1. <https://www.lkouniv.ac.in/site/writereaddata/siteContent/202005012116016435Ranvijay-Pratap-Singh-Environmental-Pollution.pdf>
2. [https://www.deshbandhucollege.ac.in/pdf/resources/1585622878_HIST_\(HONS.\)_II_Env-Pollution.pdf](https://www.deshbandhucollege.ac.in/pdf/resources/1585622878_HIST_(HONS.)_II_Env-Pollution.pdf)
3. https://www.jica.go.jp/jica-ri/IFIC_and_JBICI-Studies/english/publications/reports/study/topical/health/pdf/health_08.pdf
4. https://www.iitr.ac.in/wfw/web_ua_water_for_welfare/education/proceeding_of_short-term_training/diploma/Environmental_Sciences_May_24-28_2007/Lecture_notes/Env_Pollution-rb.pdf
5. https://anits.edu.in/online_tutorials/es/Unit%203.pdf

UNIVERSITY ELECTIVE**Course Code****Course Title****L T P S C****25EC101702****ESSENTIALS OF VLSI**

3 - - - 3

Pre-Requisite -**Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: This course contains the topics that make student realize the need for Testing. The various types of testing along with Fault Modeling. Test methods for evaluation and test generation algorithms, Delay Tests, IDDQ Tests for testing the circuits, Ad-Hoc DFT Methods, Scan Based Designs, Built-In Self-Test.

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

- CO1.** Understand the importance of Testing, fault models and related theorems.
- CO2.** Analyze various test methods as applicable to digital circuits.
- CO3.** Appraise the various combinational and sequential circuit test generation algorithms for functional verification of digital circuits
- CO4.** Assess delay test algorithms and IDDQ test algorithms for at-speed testing of CMOS Integrated Circuits.
- CO5.** Recognize the concepts and architectures for Built-In Self-Test to satisfy industry specifications.

CO-PO Mapping Table

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-
CO4	3	3	2	2	2	3	-	-	-
CO5	3	-	-	-	-	3	-	-	-
Course Correlation Mapping	3	3	2	2	2	3	-	-	-

Correlation Levels:**3: High;****2: Medium;****1: Low**

COURSE CONTENT

Module 1: INTRODUCTION TO VLSI (09 Periods)

Levels of Abstraction, VLSI Design Flow, MOS Transistor - Characteristics, $I_{DS} - V_{DS}$ Relation, NMOS and CMOS Logic – Logic Gates Design, NMOS and CMOS Fabrication Process.

Module 2: CMOS CIRCUIT DESIGN PROCESS (10 Periods)

MOS Layers, Stick Diagrams, NMOS and CMOS Design Styles, Lambda based Design Rules, NMOS and CMOS Layouts for Inverter and Universal Gates, Sheet Resistance, Capacitance and Delay Calculations, Effects of Scaling.

Module 3: SUBSYSTEM DESIGN (11 Periods)

Adders – Manchester Carry Chain Adder, Carry Look Ahead Adder, Carry Select Adder, Carry Skip adder, Barrel Shifter, Multiplier – Array Multiplier, Booth Multiplier.

Module 4: PROGRAMMABLE HARDWARE (06 Periods)

Design Styles, Programmable Interconnects, Field Programmable Gate Arrays, Complex Programmable Logic Devices, Cell based Design Methodology.

Module 5: DESIGN FOR TESTABILITY (09 Periods)

Ad-Hoc DFT Methods, Full Scan Design, Partial Scan Design, Random Logic BIST – Test-per-Clock and Test-per-Scan BIST Systems; Boundary Scan Standard – TAP Controller and Port.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Develop and Illustrate D – algorithm for Sequential Circuits.
2. Illustrate the applicability of existing testing algorithms for circuits with multiple stuck-at-faults.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Michael L. Bushnell, Vishwani D. Agrawal, Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits, Kluwer Academic Publishers, Springer US, New York, 2006.

REFERENCE BOOKS:

1. Miron Abramovici, Melvin A. Breur, Arthur D. Friedman, Digital Systems Testing and Testable Design, Wiley, Jaico Publishing House, 1st Edition, 2001.
2. Alfred L. Crouch, Design for Test for Digital ICs & Embedded Core Systems, Pearson Education, 1st Reprint Edition, 2007.
3. Robert J. Feugate, Jr., Steven M. McIntyre, Introduction to VLSI Testing, Prentice Hall, 1st Illustrated Edition, 1998.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/117105137>
2. <https://nptel.ac.in/courses/117103125>
3. <https://nptel.ac.in/courses/106103016>
4. <https://archive.nptel.ac.in/courses/106/103/106103116/>

WEB RESOURCES:

1. <https://www.electronics-tutorial.net/vlsi-design-for-testability/IC-Testing.html>
2. <https://alexromanov.github.io/2022/08/14/what-is-testability/>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CB101702	INTRODUCTION TO ETHICAL HACKING	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on ethical hacking overview, role of security and penetration testers, foot printing, reconnaissance and scanning networks, enumeration and vulnerability analysis, system hacking, network protection systems.

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

- C01.** Understand and recognize role of security and penetration testers to protect the system from malware attacks.
- C02.** Apply the foot printing tools to find the vulnerabilities in the system.
- C03.** Analyze vulnerabilities to find the system security loopholes or flaws in networked systems within a given range of IP
- C04.** Apply the web attackers tools to assess the website's security
- C05.** Identify the possible incidents and threats, alert administrators, and prevent potential attacks using IDS

CO-PO Mapping Table

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
C01	3	2	-	-	-	-	-	-	-
C02	3	2	-	-	-	-	-	-	-
C03	3	3	3	-	-	-	-	-	-
C04	3	3	3	2	-	-	-	-	-
C05	3	2	3	2	-	-	-	-	-
Course Correlation Mapping	3	3	3	2	-	-	-	-	-

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: INTRODUCTION

(10 Periods)

Ethical Hacking Overview, Role of Security and Penetration Testers. Penetration, Testing Methodologies, Laws of the Land, Overview of TCP/IP, The Application Layer, The Transport Layer, The Internet Layer, IP Addressing, Network and Computer Attacks, Malware, Protecting Against Malware Attacks, Intruder Attacks, Addressing Physical Security.

Module 2: FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS

(09 Periods)

Foot printing Concepts, Foot printing through Search Engines, Web Services, Social Networking Sites, Website, Email, Competitive Intelligence, Foot printing through Social Engineering, Foot printing Tools, Network Scanning Concepts, Port-Scanning Tools, Scanning Techniques, Scanning Beyond IDS and Firewall

Module 3: ENUMERATION AND VULNERABILITY ANALYSIS

(09 Periods)

Enumeration Concepts, NetBIOS Enumeration, SNMP, LDAP, NTP, SMTP and DNS Enumeration, Vulnerability Assessment Concepts, Desktop and Server OS Vulnerabilities, Windows OS Vulnerabilities, Tools for Identifying Vulnerabilities in Windows, Linux OS Vulnerabilities, Vulnerabilities of Embedded Oss.

Module 4: SYSTEM HACKING

(10 Periods)

Hacking Web Servers, Web Application Components, Vulnerabilities, Tools for Web Attackers and Security Testers Hacking Wireless Networks, Components of a Wireless Network, Wardriving, Wireless Hacking, Tools of the Trade.

Module 5: NETWORK PROTECTION SYSTEMS

(07 Periods)

Access Control Lists, Cisco Adaptive Security Appliance Firewall, Configuration and Risk Analysis Tools for Firewalls and Routers, Intrusion Detection and Prevention Systems, Network, Based and Host-Based IDSs and IPSs, Web Filtering, Security Incident Response Teams, Honeypots.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. List out various ways used to Protect Yourself from Hackers.
2. Demonstrate how do White Hackers work?
3. Demonstrate the bug bounty program.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Michael T. Simpson, Kent Backman, and James E. Corley, Hands-On Ethical Hacking and Network Defense, Course Technology, Delmar Cengage Learning, 2010.
2. Patrick Engebretson, The Basics of Hacking and Penetration Testing, SYNGRESS, Elsevier, 2013.

REFERENCE BOOKS:

1. Dafydd Stuttard and Marcus Pinto, The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, Wiley, 2nd Edition, 2011.
2. Justin Seitz, Black Hat Python: Python Programming for Hackers and Pentesters, 2nd Edition, 2014.

VIDEO LECTURES:

1. <https://www.coursera.org/learn/ethical-hacking-essentials-ehe>
2. <https://www.udacity.com/course/ethical-hacker-nanodegree--nd350>

WEB RESOURCES:

1. <https://github.com/PacktPublishing/Python-Ethical-Hacking>
2. <https://www.youtube.com/watch?v=x3IwvPvDpKE>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25BS101703	FORENSIC SCIENCE	3	-		-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion on Concepts of Forensic Science, Tools and Techniques in Forensic Science, Forensic Photography, Crime Scene Management, Crime Scene Management Laws and Forensic Science.

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

- C01.** Understand the basic concepts of Forensic science.
- C02.** Apply various tools and techniques in forensic science for crime investigation.
- C03.** Understand Forensic Photography fundamentals.
- C04.** Perform Crime scene investigation, scene reconstruction and prepare reports.
- C05.** Understand Legal aspects of Forensic Science.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
C01	3	-	-	-	-	-	-	-	-
C02	3	3	2	2	2	-	-	-	-
C03	3	3	-	-	-	-	-	-	-
C04	3	3	2	2	2	-	-	-	-
C05	3	3	2	2	2	-	-	-	-
Course Correlation Mapping	3	3	2	2	2	-	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION (09 Periods)

Introduction, Need, Scope, Concepts and Significance of Forensic Science, History and Development of Forensic Science, Laws and Basic principles of Forensic Science, Branches of forensic science, Organizational set-up of a Forensic Science Laboratory. Investigative strategies. Expert testimony and eye-witness report.

Module 2: TOOLS AND TECHNIQUES IN FORENSIC SCIENCE (09 Periods)

Basic principles of microscopy, spectroscopy, chromatography, Electrophoresis, Enzyme Linked Immunosorbent Assay (ELISA), Radio Immuno Assay (RIA). Measuring and optical instruments. Research methodologies; Formation of research design on a specific problem. Central tendency and Dispersion. Test of significance. Analysis of variance, Correlation and Regression.

Module 3: FORENSIC PHOTOGRAPHY (08 Periods)

Basic principles of Photography, Techniques of black & white and color photography, cameras, lenses, shutters, depth of field, film; exposing, development and printing techniques; Different kinds of developers and fixers; UV, IR, fluorescence illumination guided photography; Modern development in photography- digital photography, working and basic principles of digital photography; Surveillance photography. Videography and Crime Scene & laboratory photography.

Module 4: CRIME SCENE MANAGEMENT (11 Periods)

Crime scene investigations, protecting and isolating the crime scene; Documentation, sketching, field notes and photography. Searching, handling and collection, preservation and transportation of physical evidences, Chain of custody and Reconstruction of scene of crime. Report writing.

Module 5: LAW AND FORENSIC SCIENCE (08 Periods)

Legal aspects of Forensic Science: Forensic Science in the Criminal Justice System, The Criminal Investigation Process, Production of Evidence: The Subpoena, The Rules of Evidence, Authentication of Evidence: The Chain of Custody, The Admissibility of Evidence, Laboratory Reports, Examples of Analysis and Reports, Expert Testimony, Getting into Court, Testifying, Being a Witness and an Expert, Considerations for Testimony.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Study of Computer Forensics and different tools used for forensic investigation
2. Identify and list the steps for hiding and extract any text file behind an image file/ Audio file using Command Prompt

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Houck M.M and Siegel J.A, Fundamentals of Forensic Science, Elsevier, 2nd edition, 2010.
2. Sharma B.R, Forensic Science in Criminal Investigation and Trials, Universal Publishing Co., New Delhi, 2003.

REFERENCE BOOKS:

1. Nanda B.B and Tewari, R.K, Forensic Science in India- A vision for the Twenty First Century, Select Publisher, New Delhi, 2001.
2. James, S.H and Nordby, J.J, Forensic Science- An Introduction to Scientific and Investigative Techniques, CRC Press, USA, 2003.
3. Saferstein, Criminalistics, An Introduction of Forensic Science, Prentice Hall Inc, USA, 2007.
4. Barry, A.J. Fisher, Techniques of Crime Scene Investigation, CRC Press, New York, 7th edition, 2003.

VIDEO LECTURES:

1. [//nptel.ac.in/courses/106106178](http://nptel.ac.in/courses/106106178)
2. <https://www.youtube.com/watch?v=X5fo1H7bc0g>

WEB RESOURCES:

1. [//www.nist.gov/forensic-science](http://www.nist.gov/forensic-science)
2. <https://www.coursera.org/learn/forensic-science>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25SS101702	GENDER AND ENVIRONMENT	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Gender and the environment relationship, Gendered Roles in the Family & Community, Gender and sustainable development, Gender in environmental justice, Gender & Environmental Security.

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

- CO1.** Apply the knowledge of gender & environmental connections by analyzing key issues and topics within global environmental politics in environmental decision-making.
- CO2.** Demonstrate knowledge of the concepts of gender and sustainable development through debates and policy documents.
- CO3.** Analyze the concept of environmental security and justice by identifying the sources of insecurity.

CO-PO Mapping Table

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	3	3	-	-	-	-	-
CO2	3	-	-	-	-	2	3	1	-	2	-	-
CO3	3	1	-	-	-	3	3	-	-	-	-	2
Course Correlation Mapping	3	1	-	-	-	3	3	1	-	2	-	2

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: GENDER AND ENVIRONMENT RELATIONSHIP

(09 Periods)

Introduction – Gender and Environment – Development of gender roles – Society, gender & environment – Understanding environmental politics – Gender-environment connections–Eco-feminism – Cultural eco-feminism – Social eco-feminism – Feminist political ecology

Module 2: GENDERED ROLES IN THE FAMILY & COMMUNITY

(09 Periods)

Organization of the household – Domestic division of labour – Food: growing, harvesting, shopping, preparing, and cooking

Gender & Power – Planning – Politics – NGO – Gendering of environmental protest – Environmental decision-making

Module 3: GENDER AND SUSTAINABLE DEVELOPMENT

(09 Periods)

Concept of sustainability & its achievement – Concept of sustainable development – Ecological Modernization – Gender & sustainability debates – Gender & sustainable development debates – Gender in policy documents – Gender, poverty & equity in sustainable development

Module 4: GENDER IN ENVIRONMENTAL JUSTICE

(09 Periods)

Normative Concerns (Fairness, Inequality & Justice) –Making sense of Environmental justice – Ecological debt, Transnational harm, & human rights – Ecological justice – Gender &Environmental Justice – Gender, Vulnerability & risk – Women in environmental justice movements – Knowledge & participation – Gender, sustainability & justice as guiding concepts.

Module 5: GENDER AND ENVIRONMENTAL SECURITY

(09 Periods)

Connections between security & the environment – **Gender, environment & security:** Sustainability as security – poverty & insecurity – Insecurity as injustice – Competing ways of thinking security – Reflecting on sources of insecurity – **Case Study** – Food Security -**Case Study** – The impacts of natural disasters

Total Periods: 45

EXPERIENTIAL LEARNING

1. Prepare a poster presentation on the impact of globalization on family structure and society.
2. Prepare a presentation on the family setup of different countries and their peculiar customs.
3. Prepare poster presentation on "Ancient hominines walked like humans but climbed like apes."
4. Find out the problems of present society and being part of future generations how you may help to strengthen environmental security.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Nicole Detraz, *Gender and the Environment*, Polity Press, Cambridge, UK. 2017
- Susan Buckingham- Hatfield, *Gender and Environment*, Rutledge, London. 2000

REFERENCE BOOKS:

1. Promillakapur ed., *Empowering Indian Women*, Publication Division, Government of India, New Delhi. 2000.
2. Ronnie Vernooy, Ed., *Social and Gender Analysis Natural Resource Management: Learning Studies and Lessons from Asia*, Sage, New Delhi. 2006
3. Swarup Hemlata and Rajput, Pam, *Gender Dimensions of Environmental and Development Debate: The Indian Experience*, In Sturat S. Nagel, (ed). *India's Development and Public Policy*. Ashgate, Burlington. 2000

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25SS101703	INDIAN ECONOMY	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Introduction; Elementary Economic Analysis; Economic Planning; Time Value of Money; Value Analysis/Value Engineering.

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

- CO1.** Understand the basic concepts of economics, economic analysis, economic planning and strata.
- CO2.** Demonstrate knowledge in capital budgeting, evaluation of engineering projects, depreciation policy and familiarize with the concepts of value analysis vs value engineering.
- CO3.** Analyze and apply financial information for the evaluation of finance.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	-	-	-	-	2	-	-	-
CO2	3	-	-	-	-	2	-	-	2
CO3	3	-	-	-	-	2	-	-	2
Course Correlation Mapping	3	-	-	-	-	2	-	-	2

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION

(09 Periods)

Economics-Flow in an Economy, Law of Supply and Demand; Micro and Macro Economics; Relationship between Science, Engineering, Technology and Economic Development; Concept of Engineering Economics-Types of Efficiency, Definition and Scope of Engineering Economics.

Module 2: ELEMENTARY ECONOMIC ANALYSIS

(09 Periods)

Economic Analysis – Meaning, Significance, Simple Economic Analysis; Material Selection for a Product, Substitution of Raw Material; Design Selection for a Product; Material Selection-Process Planning, Process Modification.

Module 3: ECONOMIC PLANNING

(09 Periods)

Introduction - Need for Planning in India, Five-year plans (1951-2012), NITI Aayog (from 2014 onwards); Inclusive Growth-Meaning, Significance, Need for inclusive growth in India, Strategy for more inclusive growth, Challenges and Prospects; Employment and Inclusive Growth in India, Role of engineers in sustaining inclusive growth.

Module 4: TIME VALUE OF MONEY

(12 Periods)

Concepts and Application; Capital Budgeting-Traditional and Modern Methods; Simple and Compound Interest, Cash Flow Diagram, Principle of Economic Equivalence; Evaluation of Engineering Projects - Present Worth Method, Future Worth Method, Annual Worth Method, Internal Rate of Return Method, Cost-benefit Analysis in Public Projects; Depreciation Policy-Depreciation of Capital Assets, Causes of Depreciation, Straight Line Method and Declining Balance Method.

Module 5: VALUE ANALYSIS/VALUE ENGINEERING

(06 Periods)

Introduction-Value Analysis, Value Engineering, Functions, Aims; Value Analysis vs Value Engineering; Value Engineering Procedure- Advantages, Application Areas.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Prepare a poster presentation on the impact of globalization on family structure and society.
2. Prepare a presentation on family setups of different countries and their peculiar customs if any.
3. Prepare a poster presentation on "Ancient hominin walked like a human but climbed like an ape."
4. Find out the problems of present society and being part of future generations and how you may help to strengthen environmental security.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Panneerselvam. R., Engineering Economics, PHI Learning Private Limited, New Delhi, 2nd edition, 2013.
Jain. T. R., V. K. Ohri, O. P. Khanna., Economics for Engineers, VK Publication, 1st edition, 2015.

REFERENCE BOOKS:

1. DuttRudar & Sundhram K. P. M., Indian Economy, S. Chand, New Delhi, 62nd revised edition, 2010.
2. Misra, S. K. & V. K. Puri., Indian Economy: Its Development Experience, Himalaya Publishing House, Mumbai, 32nd edition, 2010.

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25SS101704	INDIAN HISTORY	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Introduction; Ancient India; Classical and Medieval era; Modern India; India after independence.

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

- CO1.** Demonstrate contextual knowledge in the evolution of ancient and medieval Indian History and acquire an awareness of societal and cultural transformation.
- CO2.** Analyze the situations before and after Independence and assess the societal reforms implemented in India after Independence.
- CO3.** Practice culture transformations and appreciate its influence to adapt themselves in global scenarios.

CO-PO Mapping Table

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	-	-	-	-	1	-	-	-
CO2	1	2	-	-	-	1	-	-	-
CO3	1	1	-	-	-	2	-	-	-
Course Correlation Mapping	2	1	-	-	-	2	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO INDIAN HISTORY (08 Periods)

Elements of Indian History; History Sources: Archaeology, Numismatics, Epigraphy & Archival research; Methods used in History; History & historiography; Sociological concepts-structure, system, organization, social institutions, Culture and social stratification (caste, class, gender, power), State & Civil Society.

Module 2: ANCIENT INDIA (09 Periods)

Mohenjo-Daro civilization; Harappa civilization; Mauryan Empire.

Module 3: CLASSICAL & MEDIEVAL ERA (12 Periods)

Classic Era (200 BC - 1200 AD); Hindu - Islamic Era (1200 - 1800 AD).

Module 4: MODERN INDIA (06 Periods)

Age of Colonialism (17th - 19th centuries); First war of Indian Independence; Freedom Struggle (1857-1947)

Module 5: INDIA AFTER INDEPENDENCE (1947) (10 Periods)

The Evolution of the Constitution and Main Provisions; Consolidation of India as a Nation; Politics in the States; Indian economy; Modernization and globalization, Secularism and communalism, Nature of development, Processes of social exclusion and Inclusion, Changing Nature of Work and Organization.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Prepare a write-up on how to safeguard ancient monuments.
2. Analyze the most famous historically important place you visited.
3. Prepare a presentation on the ancient Seven Wonders of the World with their significance and how they are destroyed.
4. Prepare a presentation on "Wars of the past not only destroyed people and their livelihood but also the people's tradition and culture."
5. Prepare a poster on "Continents that No Longer Exist" with causes

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. K. Krishna Reddy, Indian History, Tata McGraw-Hill, 21st reprint, 2017.

REFERENCE BOOKS:

1. Guha, Ramachandra, India after Gandhi, Pan Macmillan, 2007.
2. Romila Thapar, Early India, Penguin India, New Delhi 2002.

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25SS101705	INDIAN TRADITION AND CULTURE	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Basic traits of Indian Culture; Humanistic Reforms under Jainism and Buddhism; Culture in the medieval period; Socio Religious reforms in Indian Culture; Reform movements for harmonious relations.

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

- CO1.** Demonstrate knowledge of Vedic and Upanishadic culture and society to consider human aspirations, values and theories.
- CO2.** Understand the contributions of Buddhism and Jainism to Indian culture.
- CO3.** Examine the cultural conditions and achievements of India under Mouryas and Guptas.
- CO4.** Analyze social religious reforms and reform movements.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	-	-	-	-	1	-	-	-
CO2	3	-	-	-	-	1	-	-	2
CO3	2	-	-	-	-	3	-	-	-
CO4	2	-	-	-	-	3	-	-	2
Course Correlation Mapping	3	-	-	-	-	2	-	-	2

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: BASIC TRAITS OF INDIAN CULTURE (08 Periods)

Meaning and definition and various interpretations of culture - Culture and its features - The Vedic and Upanishad culture and society - Human aspirations and values in these societies - Chaturvidha purushardhas, Chaturashrma and Chaturvarna theory.

Module 2: HUMANISTIC REFORMS UNDER JAINISM AND BUDDHISM (09 Periods)

Salient features of Jainism - contributions of Jainism to Indian culture - Contributions of Acharya and Maha Pragma - Buddhism as a humanistic culture - The four noble truths of Buddhism - Contributions of Buddhism to Indian culture.

Module 3: CULTURE IN THE MEDIEVAL PERIOD (09 Periods)

Unifications of India under Mouryas and Guptas and their cultural achievements - Cultural conditions under satavahanas - Contributions to Pallavas and cholas to art and cultural achievements of Vijayanagara rulers

Module 4: SOCIO RELIGIOUS REFORMS IN INDIAN CULTURE (09 Periods)

Western impact on India - Introduction of Western education - social and cultural awakening and social reform movements of Rajaramohan Roy - Dayanandha Saraswathi - Anne Besant (theosophical society).

Module 5: REFORM MOVEMENTS FOR HARMONIOUS RELATIONS (09 Periods)

Vivekananda, Eswarchandra Vidyasagar and Veeresalingam - emancipation of women and struggle against caste - Rise of Indian nationalism - Mahatma Gandhi - Non-violence and satyagraha and eradication of untouchability.

Total Periods: 45

EXPERIENTIAL LEARNING

1. Identify different cultural festivals of Indian States and prepare a write-up on their uniqueness.
2. India has a rich history with numerous architectural wonders. Prepare a report on any three famous architectural wonders in India.
3. Explore the diverse flavors of Indian cuisine and prepare a poster on the different dishes and their distinctiveness.
4. India is a country of Unity in Diversity. Make a PowerPoint presentation on different traditional dresses of various cultural people.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Valluru Prabhakaraiah, Indian Heritage and Culture, Neelkamal Publications Pvt. Ltd. Delhi, 1/e, reprint 2015.

REFERENCE BOOKS:

1. L. P. Sharma, History of Ancient India, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
2. L. P. Sharma, History of Medieval India, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
3. The Cultural Heritage of India Vol-I, II, III, IV, V, The Ramakrishna Mission Institute of Culture, Calcutta

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25EC101703	INSTRUMENTATION IN INDUSTRIES	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion on measurement of various parameters like displacement, force, torque, acceleration, velocity, density, viscometer, hygrometers, temperature, pressure, level and flow.

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

- CO1.** Select appropriate displacement, force and torque measuring devices for specific measurement application.
- CO2.** Identify suitable acceleration, velocity and density measuring devices for specific measurement application.
- CO3.** Apply suitable viscometer and hygrometer for measurement of viscosity, humidity and moisture for a specific application.
- CO4.** Select appropriate temperature and pressure transducer for an industrial requirement.
- CO5.** Identify appropriate level and flow transducer for measurement of level and flow for a specific application.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	-	3	-	-	-	-	-
CO2	3	2	-	3	-	-	-	-	-
CO3	3	2	-	3	-	-	-	-	-
CO4	3	2	-	3	-	-	-	-	-
CO5	3	2	-	3	-	-	-	-	-
Course Correlation Mapping	3	2	-	3	-	-	-	-	-

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: DISPLACEMENT, FORCE & TORQUE MEASUREMENT (08 Periods)

Displacement Measurement: Introduction, Strain gauge, LVDT, Capacitive Gauges and applications.

Force Measurement: Introduction, Analytical Balance, Spring Balance, Load cells.

Torque Measurement: Introduction, Strain gauge, Relative angular twist and applications.

Module 2: ACCELERATION, VELOCITY & DENSITY MEASUREMENT (08 Periods)

Acceleration Measurement: Introduction, LVDT, Piezoelectric, Strain gauge and Variable reluctance type accelerometers and applications.

Velocity Measurement: Introduction, Revolution Counter, Capacitive Tacho, Drag-cup Type, Tacho and Stroboscope and applications.

Density Measurement: Introduction, Pressure type densitometers, Float type densitometers, Ultrasonic densitometer and gas densitometer.

Module 3: VISOCITY, HUMIDITY & MOISTURE MEASUREMENT (09 Periods)

Viscosity Measurement: Introduction, friction tube viscometer, say bolt's viscometer, rotameter viscometer, Searle's rotating cylinder, cone and plate viscometer.

Humidity Measurement: Introduction, Dry and wet bulb psychrometers, Resistive and capacitive type hygrometers

Moisture Measurement: Introduction, Thermal Conductivity and Capacitive sensors, Applications of moisture measurement, Moisture measurement in solids.

Module 4: TEMPERATURE & PRESSURE MEASUREMENT (10 Periods)

Temperature Measurement: Definitions and standards, RTD, Thermistor, Thermocouples: Laws of thermocouple, Reference junctions' compensation, Radiation fundamentals, Radiation methods of temperature measurement, Total radiation pyrometers, Optical pyrometers, Applications.

Pressure Measurement: Introduction, manometer and its types, elastic transducers Bourdon tube, diaphragm, bellows, electrical types, resistive, inductive and capacitive, Thermal conductivity gage, Ionization gage, Sound level meter, Microphone, Applications.

Module 5: LEVEL & FLOW MEASUREMENT (10 Periods)

Level Measurement: Introduction, Gauge Glass technique, Float Types – Float-and- tape method, Float-and-shaft method, Magnetic float types. Electrical types – Resistance switch type, Inductive and Capacitance type. Ultrasonic methods. Applications

Flow Measurement: Introduction, Head types – Orifice, Venturi, Flow Nozzle. Rotameter & types. Coriolis flow meter, Gyroscopic flow meter, Liquid bridge mass flow meter, Calorimetric flow meter. Electromagnetic flow meter, Ultrasonic flow meter, Hotwire anemometer type. Applications.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Record temperature from RTD and convert temperature in to voltage.
2. Measure the speed of rotating shaft using stroboscope.
3. Record level of the tank using suitable device.
4. Measure the flow rate of water in boiler plant.
5. Measure the displacement using LVDT.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. K. Sawhney, A Course in Electrical and Electronics Measurements and Instrumentation, Dhanpat Rai and Sons, New Delhi, 19th Revised Edition, 2013
2. D. Patranabis, Principles of Industrial Instrumentation, TMH, 3rd Edition, 2010.

REFERENCE BOOKS:

1. Ernest Doebelin & Dhanesh Manik, Measurement Systems, McGraw Hill International, 6th Edition, 2011.

VIDEO LECTURES:

1. <https://www.vlab.co.in/>
2. <https://archive.nptel.ac.in/courses/103/103/103103135/>
3. <https://nptel.ac.in/courses/103103135>

WEB RESOURCES:

1. https://www.tutorialspoint.com/electronic_measuring_instruments/index.htm
2. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/108105064/lec1.pdf
3. <https://www.ibiblio.org/kuphaldt/socratic/sinst/book/liii.pdf>.

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25AI101701	INTRODUCTION TO ARTIFICIAL INTELLIGENCE	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on Introduction to Artificial Intelligence, designing intelligent agents, solving general purpose problems, Search in complex environments, Represent knowledge, Robotics, Ethics.

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

- CO1.** Design and architect intelligent agents using Artificial Intelligence Techniques and principles
- CO2.** Analyze the usage of Knowledge representation techniques in Artificial Intelligence
- CO3.** Analyze and interpret the problem, identify suitable solutions using heuristic functions and search algorithms
- CO4.** Investigate robot hardware and frameworks for intelligent robotic perception.
- CO5.** Demonstrate knowledge on ethical implications of intelligent machines for providing privacy, trust, security and safety.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	1	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-
CO4	3	-	-	-	-	1	-	-	-
CO5	-	-	-	-	-	1	-	2	-
Course Correlation Mapping	3	3	2	-	-	1	-	2	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE (09 Periods)

Foundations of artificial intelligence, History of artificial intelligence, State of the art, Risks and benefits of AI, Intelligent agents – Agents and environments, The concept of rationality, Structure of agents.

Module 2: KNOWLEDGE & REASONING (09 Periods)

Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

First-Order Logic - Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution.

Module 3: PROBLEM SOLVING BY SEARCHING (09 Periods)

Problem solving agents, Search algorithms, Uninformed search strategies, Informed search strategies – Greedy best-first search, A* search; Heuristic functions.

Module 4: SEARCH IN COMPLEX ENVIRONMENTS (09 Periods)

Local search algorithms and optimization problems – Hill-climbing search, Simulated annealing, Local beam search, Evolutionary algorithms; Optimal decisions in games – The minimax search algorithm, Optimal decisions in multiplayer games, Alpha-Beta pruning, Move ordering; Monte Carlo tree search.

Module 5: ROBOTICS (09 Periods)

Robots, Robot hardware, Robotic perception, Alternative robotic frameworks, Application domains.

Limits of AI, Ethics of AI – Surveillance, security and privacy, Fairness and bias, Trust and transparency, AI safety

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

1. Design and implement agent programs for Table-driven agents using the agent function of vacuum-cleaner world. The agent cleans the current square if it is dirty, otherwise it moves to the other square.
2. Implement agent programs for Simple reflex agents and Model-based reflex agents using the agent function of vacuum-cleaner world.
3. Solve the travelling sales man problem using Hill Climbing search algorithm

(Note: It's an indicative one. The Course Instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXT BOOKS:

1. Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, 4th Edition, 2020.

REFERENCE BOOKS:

1. Stephen Lucci, Danny Kopec, Artificial Intelligence in the 21st Century, Mercury Learning and Information, 3rd Edition, 2018
2. Rich, Knight, Nair, Artificial intelligence, Tata McGraw Hill, Third Edition, 2009.
3. Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Education, 2017.
4. Saroj Kaushik, Artificial Intelligence, Cengage Learning, 2011.

SOFTWARE/TOOLS:

1. Python
2. pandas, matplotlib

VIDEO LECTURES:

1. <https://searchenterpriseai.techtarget.com/definition/AI-Artificial-Intelligence>
2. <http://aima.cs.berkeley.edu/>
3. <https://ai.google/education/>
4. <https://www.coursera.org/courses?query=artificial%20intelligence>
5. <https://www.edureka.co/blog/artificial-intelligence-with-python/>

WEB RESOURCES:

1. <http://www.airesources.org/>
2. <https://allthingsai.com/>
3. <https://designmodo.com/ai-tools-designers/>
4. <https://www.ulethbridge.ca/teachingcentre/chatgpt-ai-resources>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25DS101702	INTRODUCTION TO DATA SCIENCE	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion on Introduction to Data Science; Data Collection and Data Pre-Processing, Exploratory Data Analytics, Model Development, and Model Evaluation.

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

- C01.** Demonstrate knowledge on Data science concepts.
- C02.** Perform data collection and pre-processing.
- C03.** Perform exploratory data analytics.
- C04.** Design and develop data visualization models.
- C05.** Evaluate performance of data models.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
C01	3	-	-	-	-	-	-	-	-
C02	2	2	3	-	2	-	-	-	-
C03	2	2	2	-	2	-	-	-	-
C04	2	3	2	-	2	-	-	-	-
C05	3	2	2	-	2	-	-	-	-
Course Correlation Mapping	3	2	2	-	2	-	-	-	-

Correlation Levels: 3: High 2: Medium 1: Low

COURSE CONTENT

Module 1: INTRODUCTION

(09 Periods)

Introduction to Data Science, Evolution of Data Science, Data Science Roles, Stages in a Data Science Project, Applications of Data Science in various fields, Data Security Issues.

Module 2: DATA COLLECTION AND DATA PRE-PROCESSING

(09 Periods)

Data Collection Strategies, Data Pre-Processing- Overview, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization.

Module 3: EXPLORATORY DATA ANALYTICS

(09 Periods)

Descriptive Statistics, Mean, Standard Deviation, Skewness and Kurtosis, Box Plots, Pivot Table, Heat Map, Correlation Statistics, ANOVA.

Module 4: MODEL DEVELOPMENT

(09 Periods)

Simple and Multiple Regression, Model Evaluation using Visualization, Residual Plot, Distribution Plot, Polynomial Regression and Pipelines, Measures for In-sample Evaluation, Prediction and Decision Making.

Module 5: MODEL EVALUATION

(09 Periods)

Generalization Error, Out-of-Sample Evaluation Metrics, Cross Validation, Overfitting, Under Fitting and Model Selection, Prediction by using Ridge Regression, Testing Multiple Parameters by using Grid Search.

Total Periods:45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. **Use Case:** A human can express his emotions in any form, such as the face, gestures, speech and text. The detection of text emotions is a content-based classification problem. Detecting a person's emotions is a difficult task, but detecting the emotions using text written by a person is even more difficult as a human can express his emotions in any form. Recognizing this type of emotion from a text written by a person plays an important role in applications such as chatbots, customer support forum, customer reviews etc. So, you have to train a machine learning model that can identify the emotion of a text by presenting the most relevant emoji according to the input text.
2. **Use Case:** Customer Personality Analysis is a detailed analysis of a company's ideal customers. It helps a business to better understand its customers and makes it easier for them to modify products according to the specific needs, behaviours and concerns of different types of customers.
You have to do an analysis that should help a business to modify its product based on its target customers from different types of customer segments. For example, instead of spending money to market a new product to every customer in the company's database, a company can analyze which customer segment is most likely to buy the product and then market the product only on that particular segment.

(Note: It's an indicative one. The Course Instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXT BOOKS:

1. Cathy O'Neil and Rachel Schutt, Doing Data Science, O'Reilly, 2015

REFERENCE BOOKS:

1. David Dietrich, Barry Heller, Beibei Yang, Data Science and Big Data Analytics, EMC 2013.
2. Davy cielen, Introducing Data Science, Manning Publications, 2022.
3. Chirag Shah, A Hands-on Introduction to Data Science, Cambridge University Press, 2020

VIDEO LECTURES:

1. [//www.youtube.com/watch?v=JL_grPUnXzY&list=PLeo1K3hjS3us_ELKYSj_Fth2tIEkdKXvV](https://www.youtube.com/watch?v=JL_grPUnXzY&list=PLeo1K3hjS3us_ELKYSj_Fth2tIEkdKXvV)
2. <https://www.youtube.com/watch?v=-ETQ97mXXF0>

WEB RESOURCES:

1. [//swayam.gov.in/nd1_noc19_cs60/preview](https://swayam.gov.in/nd1_noc19_cs60/preview)
2. [//towardsdatascience.com/](https://towardsdatascience.com/)
3. <https://www.w3schools.com/datascience/>
4. [//github.com/jakevdp/PythonDataScienceHandbook](https://github.com/jakevdp/PythonDataScienceHandbook)
5. [//www.kaggle.com](https://www.kaggle.com)

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25AI101702	INTRODUCTION TO MACHINE LEARNING	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion on Introduction to machine learning, Bayesian concept learning, Supervised learning, Unsupervised learning, Artificial neural networks.

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

- CO1.** ze the process of machine learning modelling and evaluation to automatically infer a general description for a given learning problem.
- CO2.** Analyze the underlying mathematical models within machine learning algorithms and learning tasks.
- CO3.** Design and implement machine learning solutions for classification, regression, and clustering problems.
- CO4.** Design and implement efficient neural architectures to model patterns for a given learning problem.
- CO5.** Develop intelligent solutions to solve societal problems related to computer vision, information security, healthcare and other areas.

CO-PO Mapping Table

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-
CO3	2	3	3	3	3	-	-	-	-
CO4	3	3	3	1	-	-	-	-	-
CO5	1	3	3	3	3	3	-	-	-
Course Correlation Mapping	3	3	3	3	3	3	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO MACHINE LEARNING (10 Periods)

Machine Learning: Human learning, Types of human learning, Machine learning, Types of machine learning, Applications of machine learning, Issues in machine learning, Machine learning activities, Types of data, selecting a model, training a model, Model representation and interpretability, evaluating performance of a model, Improving performance of a model.

Module 2: BAYESIAN CONCEPT LEARNING (07 Periods)

Introduction, Importance, Bayes' theorem, Bayes optimal classifier, Naïve Bayes classifier, Applications of Bayes classifier.

Module 3: SUPERVISED LEARNING (10 Periods)

Classification: Classification model, Classification learning steps, K-Nearest Neighbor, Decision Tree, Support vector machines.

Regression: Introduction, Simple linear regression, Improving accuracy of the linear regression model, Multiple linear regression, Assumptions and problems in regression analysis.

Module 4: UNSUPERVISED LEARNING (09 Periods)

Introduction, Unsupervised vs supervised learning, Applications of unsupervised learning, Clustering as a machine learning task, Types of clustering techniques, Partitioning methods, K-Medoids, Hierarchical clustering, DBSCAN.

Module 5: ARTIFICIAL NEURAL NETWORKS (09 Periods)

Artificial neuron, Types of activation functions, Early implementations of ANN, Architectures of neural network, Learning process in ANN, Backpropagation.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Use Naïve Bayes classifier to solve the credit card fraud detection problem.
2. Build a neural network that will read the image of a digit and correctly identify the number.

(Note: It's an indicative one. The Course Instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXT BOOKS:

1. Tom M. Mitchell, Machine Learning, McGraw Hill, 1997.
2. Saikat Dutt, Subramanian Chandramouli, Amit Kumar das, Machine Learning, Pearson, 2019.

REFERENCE BOOKS:

1. Manaranjan Pradhan, U Dinesh Kumar, Machine Learning Using Python, Packet Publishing, 2019.
2. Aurelien Geron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, O'Reilly, 2nd Edition, 2019.
3. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, 4th Edition, 2020.
4. Shai Shalev Shwartz, Shai Ben David, Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press, 2014.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/106106202/>
2. <https://www.coursera.org/learn/machine-learning>
3. https://onlinecourses.nptel.ac.in/noc23_cs18/preview
4. https://onlinecourses.nptel.ac.in/noc23_cs87/preview
5. https://onlinecourses.nptel.ac.in/noc23_ee87/preview
6. <https://www.coursera.org/learn/ntumlone-algorithmicfoundations>
7. <https://www.coursera.org/specializations/machine-learning-introduction>
8. <http://ndl.iitkgp.ac.in/document/YkxIRXFvZXJrTDBkVzVVZi9ESjl6eXpRZkxRc2lhOWhlVXBhUVVWaXZINDNyZUVldU9ldlYvd20wbkQ4MC92UQ>
9. <https://www.coursera.org/learn/unsupervised-learning-recommenders-reinforcement-learning>

WEB RESOURCES:

1. <https://www.ibm.com/topics/machine-learning>
2. <https://www.simplilearn.com/tutorials/machine-learning-tutorial/what-is-machine-learning>
3. https://www.w3schools.com/python/python_ml_getting_started.asp
4. <https://developers.google.com/machine-learning/crash-course>
5. <https://www.greenteapress.com/thinkstats/>
6. <https://info.deeplearning.ai/machine-learning-yearning-book>
7. <https://www.kaggle.com/code/kanncaa1/machine-learning-tutorial-for-beginners>
8. <https://machinelearningmastery.com/machine-learning-in-python-step-by-step/>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CS101701	INTRODUCTION TO PYTHON PROGRAMMING	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course is aimed at offering the fundamental concepts of Python scripting language to the students. It starts with the basics of Python programming and deals with lists, dictionaries, functions, exceptions and files. The objective of this course is to enable the students to develop the applications using the concepts of Python.

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

- CO1.** Understand the basic terminology used in computer programming to write, compile and debug programs in Python programming language.
- CO2.** Use appropriate data type for handling user data and write optimized programs using the functions, and statements.
- CO3.** Manage the exceptions raised during the program execution and avoid abrupt termination of the program execution.
- CO4.** Process files and solve real world problems using classes and objects in the Python programming environment.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	3	3	-	2	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-
CO4	2	3	3	-	2	2	-	-	-
Course Correlation Mapping	3	3	3	-	2	2	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: DATA TYPES AND INPUT/OUTPUT

(09 Periods)

Internal working of Python, Python character set, Tokens, Python Core Data Types (list, set, tuple, and dictionary), The print () function, Assignment of values to variables, The input () function, The eval () function.

Module 2: OPERATORS AND CONTROL STATEMENTS

(09 Periods)

Operators- Arithmetic Operators, Operator precedence and Associativity, Bitwise operator, the compound assignment operator; Decision statements- Boolean operators, Boolean Expressions and Relational operators, Decision making statements; Loop Control Statements- while loop, range () function, for loop; break statement, continue statement.

Module 3: FUNCTIONS AND LISTS

(09 Periods)

Functions- Syntax and basics of a function, Use of a function, Parameters and arguments in a function, the local and global scope of a variable, the return statement, Recursive functions, the lambda function; Lists- Creating Lists, Accessing the elements of a List, List slicing, Python in-built functions for lists, List Comprehension, List Methods, passing list to a function, Returning a list to function.

Module 4: TUPLES, SETS AND DICTIONARIES

(09 Periods)

Tuples - Creating tuples, tuple() function, Inbuilt functions for tuples, Indexing and Slicing, Operations on tuples, Passing variable length arguments to tuples, Sort tuples, Traverse tuples from a list, The zip () function, The Inverse zip(*) function; Sets - Creating sets, The set in and not in operator, The Python Set Class, Set operations; Dictionaries - Basics of Dictionaries, Creating a Dictionary, Adding and replacing values, Retrieving values, Formatting dictionaries, Deleting items, Comparing two dictionaries, Methods of dictionary class, Traversing dictionaries, Nested dictionaries, Traversing nested dictionaries.

Module 5: V FILES

(09 Periods)

File Handling- Opening a file, Writing Text, closing files, writing numbers to a file, Reading Text, reading numbers from a file, appending data, seek () function.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Calculator: Create a basic calculator program that can perform addition, subtraction, multiplication, and division operations. You can enhance it by adding more functionality, such as handling decimal numbers or including additional mathematical operations.
2. Develop recursive functions to solve problems that involve self-referential definitions.
3. Develop program to create dictionaries, add, retrieve and delete items from dictionaries.
4. Word Counter: Design a program that counts the number of words, characters, or lines in a given text file. You can also include additional features like finding the most common words or displaying statistics about the text.

5. Tic-Tac-Toe: Implement a two-player tic-tac-toe game where users take turns marking Xs and Os on a 3x3 grid. Determine the winner or detect a tie by checking the board after each move.
6. Dice Rolling Simulator: Create a program that simulates rolling dice. Allow the user to specify the number of dice to roll and display the results. You can also add features like keeping track of the roll history or calculating the probability of certain outcomes.

(Note: It's an indicative one. The Course Instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXTBOOKS:

1. Namdev kamthane and Amit Ashok Kamthane, Programming and Problem solving with PYTHON, McGraw Hill Education, 1st Edition, 2016.

REFERENCE BOOKS:

1. Downey, Think Python, Green Tea Press, 1st Edition, 2016.
2. Chhun, Core Python Programming, Prentice Hall, 3rd Edition, 2013.
3. Keith A. Lambert, Fundamentals of Python, Cengage, 2nd Edition, 2015.

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc19_cs41/preview
2. <https://www.coursera.org/specializations/python>
3. <https://www.coursera.org/learn/python-for-applied-data-science-ai>
4. <https://www.youtube.com/watch?v=WGJJrtnfpk>
5. https://www.youtube.com/watch?v=_uQrJ0TkZlc
6. <https://www.udemy.com/topic/python/>
7. <https://freevideolectures.com/course/2512/python-programming>

WEB RESOURCES:

1. <https://www.w3schools.com/python/>
2. <https://www.programiz.com/python-programming>
3. <https://www.geeksforgeeks.org/python-programming-language/>
4. <https://www.javatpoint.com/python-lists>
5. <https://www.learnpython.org/>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CB101704	INTRODUCTION TO INTERNET OF THINGS	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course is emphasized on the Architecture of IoT and Summarize the roles of various organizations for IoT, To Develop simple applications using Arduino and Rasberry, Test for errors in the application, Predict the market value, Experiment with embedded boards for creating IoT prototypes, to understand the domain specific IoTs and IoT system management.

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

- C01.** Understand the fundamental concepts of IoT and physical computing.
- C02.** Demonstrate knowledge on variety of embedded boards and IoT Platforms
- C03.** Understand the communication protocols in IoT communications.
- C04.** Demonstrate knowledge on Domain specific IoT applications.
- C05.** Understand the IoT System management and network management protocols.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
C01	3	-	-	-	-	-	-	-	-
C02	3	3	3	-	-	-	-	-	-
C03	3	2	-	-	-	-	-	-	-
C04	3	3	3	-	-	-	-	-	-
C05	3	2	2				-	-	-
Course Correlation Mapping	3	3	3	-	-	-	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: OVERVIEW OF IOT

(09 Periods)

The Internet of Things: An Overview, The Flavour of the Internet of Things, The “Internet” of “Things”, The Technology of the Internet of Things, Enchanted Objects, who is Making the Internet of Things?

Design Principles for Connected Devices: Calm and Ambient Technology, Privacy, Web Thinking for Connected Devices, Affordances.

Prototyping: Sketching, Familiarity, Costs Vs Ease of Prototyping, Prototypes and Production, Open-source Vs Close source, Tapping into the community.

Module 2: EMBEDDED DEVICES

(09 Periods)

Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, Mobile phones and tablets, Plug Computing: Always-on Internet of Things

Module 3: COMMUNICATION IN THE IOT

(09 Periods)

Internet Communications: An Overview, IP Addresses, MAC Addresses, TCP and UDP Ports, Application Layer Protocols

Prototyping Online Components: Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols Protocol

Module 4: DOMAIN SPECIFIC IOTS

(09 Periods)

Introduction: Home automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle

Module 5: IOT AND M2M

(09 Periods)

Introduction- M2M, Difference between IoT and M2M, SDN and NFV for IoT

IoT System Management with NETCONF-YANG: Need for IoT Systems Management, Simple network management protocol (SNMP), Network operator requirements, NETCONF, YANG.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Design and Simulate LED 7-Segment Display interfacing with Arduino.
 - (b) Design and Simulate Servo motor interfacing with Arduino.
2.
 - (a) Design and Simulate ultrasonic sensor and LCD interfacing with Arduino.
 - (b) Design and Simulate Flame Sensor interfacing with Arduino.

(Note: It's an indicative one. The Course Instructor may change the activities and the same shall be reflected in Course Handout)

RESOURCES

TEXT BOOKS:

1. I McEwen, Hakim Cassimally, Designing the Internet of Things, Wiley Publications, 2012
2. Deep Bahga, Vijay Madisetti, Internet of Things: A Hands-On Approach, Universities Press, 2014.

REFERENCE BOOKS:

1. Arun Raj, Anupama C. Raman, The Internet of Things, Enabling technologies and use cases, CRC Press.

VIDEO LECTURES:

1. <http://www.digimat.in/nptel/courses/video/106105166/L01.html>
2. <http://www.youtube.com/watch?v=oBZnySDgst8>

WEB RESOURCES:

1. <http://www.arduino>
2. <https://www.raspberrypi.org/>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25ME101705	MATERIAL SCIENCE	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Materials Structure and Constitution of Alloys; Heat treatment of steels; Properties of ferrous materials and its alloys; Properties of non-ferrous materials and its alloys; Properties and applications of Ceramics, Polymers and Composite materials.

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

- CO1.** Ability to understand and apply the principles of materials science to analyze and design materials for specific applications.
- CO2.** Analyze the properties of materials and enhance the same through heat-treatment processes.
- CO3.** Demonstrate the knowledge of ferrous and Non-ferrous materials and its alloys for engineering applications.
- CO4.** Understand the relationship between materials properties and structure at the atomic and molecular level.
- CO5.** Demonstrate the knowledge of Ceramics, Polymers, and Composite materials for suitable engineering applications.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	3	1	-	-	-	-	1	-
CO2	3	3	1	-	-	-	-	1	-
CO3	3	1	-	-	-	-	-	-	-
CO4	3	1	-	-	-	-	-	-	-
CO5	3	1	-	-	-	-	-	-	-
Course Correlation Mapping	3	2	1	-	-	-	-	1	-

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: MATERIALS STRUCTURE AND CONSTITUTION OF ALLOYS (09 Periods)

Materials Structure: Space lattice, Unit cells and Metallic crystal structures (SC, BCC, FCC and HCP), Crystal defects: Point, Line, Interstitial and Volume, Primary and secondary Bonding in materials.

Constitution of Alloys: Necessity of Alloying, Gibbs's phase and Hume Rothery rule, Iron Iron-carbide diagram and its microstructural aspects.

Module 2: HEAT TREATMENT OF STEELS (09 Periods)

Annealing, Normalizing, Tempering, Carburization and Hardening-Aus tempering, Martempering, Carburizing, Nitriding, Cyaniding, Carbo-Nitriding, Flame and Induction Hardening, Vacuum and Plasma Hardening, Time-Temperature-Transformation Diagrams and Continuous Cooling Transformation Diagrams.

Module 3: FERROUS MATERIALS AND ALLOYS (09 Periods)

Steels: Structure, properties, classifications and applications of plain steels, Specifications of steels, Structure, properties, classifications and applications of low alloy steels, Hadfield Manganese steels, Stainless steel and Tool steels.

Cast iron: Structure, properties and applications of Gray cast iron, White cast iron, Malleable cast iron, Nodular cast iron and Alloy cast iron.

Module 4: NON-FERROUS MATERIALS AND ALLOYS (09 Periods)

Structure, properties and applications of Copper and its alloys, Aluminium and its alloys, Titanium and its alloys, Nickel and its alloys, Magnesium and its alloys, Refractory and Precious metals.

Module 5: CERAMICS, POLYMERS AND COMPOSITES MATERIALS (09 Periods)

Ceramics: Classifications, Properties and Applications, Glass-ceramics, Polymers: Classification, Properties and Applications, Polymerization Reaction,

Composites: Classifications, Properties and Applications of Polymer matrix composites, Ceramic matrix composites, Metal matrix composites and Nanocomposites.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Laboratory experiments allow students to apply theoretical concepts and learn how to conduct experiments safely and effectively. Some examples of laboratory experiments include mechanical testing of materials, heat treatment of metals, and microscopy analysis of materials.
2. Various characterization techniques such as X-ray diffraction, scanning electron microscopy, and transmission electron microscopy can provide valuable insights into the structure and properties of materials. Students can gain hands-on experience with these techniques by conducting experiments and analyzing the results.

(Note: It's an indicative one. Course instructor may change the activities and the same shall be reflected in course handout)

RESOURCES

TEXT BOOKS:

1. V. Raghavan, Materials Science & Engineering, Prentice Hall of India, 5th edition, 2004.
2. R. Balasubramaniam, Callister's, Materials Science & Engineering, John Wiley and Sons, 2nd edition, 2014.

REFERENCE BOOKS:

1. Sidney H. Avner, Introduction to Physical Metallurgy, Tata McGraw Hill, 2nd edition, 1997.
2. George E Dieter, Mechanical Metallurgy, Tata McGraw Hill, 3rd edition, 2013.
3. Kodigre V D, Material Science and Metallurgy, Everest Publishing House, 31st edition, 2011.

VIDEO LECTURES:

1. <https://ocw.mit.edu/courses/materials-science-and-engineering/3-012-fundamentals-of-materials-science-fall-2005/lecture-notes/>
2. <https://nptel.ac.in/courses/116/104/116104045/>
3. https://www.youtube.com/watch?v=tsX-VYvkiJ8&list=PLJV_OG0NLkV8VRNFk-0AyDZz1pZym6V8j
4. <https://www.khanacademy.org/science/materials-science>

WEB RESOURCES:

1. <https://www.doitpoms.ac.uk/tlplib/teachers.php>
2. <https://www.springer.com/journal/10853>
3. <http://dmse.mit.edu/>
4. <http://dmse.mit.edu/>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25LG201701	PERSONALITY DEVELOPMENT	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course gives awareness to students about the various dynamics of personality development.

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

CO1. Demonstrate knowledge in Self-Management and Planning Career.

CO2. Use the functional knowledge in attitudes and thinking strategies.

CO3. Understand and apply soft skills for professional success.

CO4. Work effectively as an individual and as a member in diverse teams.

CO5. Communicate effectively in public speaking in formal and informal situations.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	1	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-
CO3	2	2	-	3	-	-	-	2	-
CO4	1	1	-	-	-	-	3	3	-
CO5	-	-	-	-	-	-	-	3	-
Course Correlation Mapping	2	2	3	3	-	-	3	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: SELF-ESTEEM & SELF-IMPROVEMENT (09 Periods)

Know Yourself – Accept Yourself; Self-Improvement: Plan to Improve - Actively Working to Improve Yourself- Exercises- case studies

Module 2: DEVELOPING POSITIVE ATTITUDES (09 Periods)

How Attitudes Develop – Attitudes are Catching – Improve Your Attitudes – Exercises- case studies

Module 3: SELF-MOTIVATION & SELF-MANAGEMENT (09 Periods)

Show Initiative – Be Responsible Self-Management; Efficient Work Habits – Stress Management – Employers Want People Who can Think – Thinking Strategies- Exercises- case studies

Module 4: GETTING ALONG WITH THE SUPERVISOR (09 Periods)

Know your supervisor – Communicating with your Supervisor – Special Communication with your Supervisor – What Should you Expect of Your Supervisor? – What your supervisor expects of you - Moving Ahead Getting Along with your Supervisor- Exercises- case studies

Module 5: WORKPLACE SUCCESS (09 Periods)

First Day on the Job – Keeping Your Job – Planning Your Career – Moving Ahead- Exercises- case studies

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. List out the self-improvements in you on the charts and explain in detail.
2. Discuss different famous personalities and their attitudes.
3. Describe different personalities with respect to self-motivation and self-management.
4. Imagine you are a supervisor and illustrate different special communications.
5. Assume and interpret different experiences on the first day of your job.

(Note: It's an indicative one. Course instructor may change the activities and the same shall be reflected in course handout)

RESOURCES

TEXTBOOK:

1. Harold R. Wallace and L. Ann Masters, Personal Development for Life and Work, Cengage Learning, Delhi, 10th edition Indian Reprint, 2011. (6th Indian Reprint 2015)
2. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.

REFERENCE BOOKS:

1. K. Alex, Soft Skills, S. Chand & Company Ltd, New Delhi, 2nd Revised Edition, 2011.
2. Stephen P. Robbins and Timothy A. Judge, Organizational Behaviour, Prentice Hall, Delhi, 16th edition, 2014

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=6Y5VWBLi1es>
2. <https://www.youtube.com/watch?v=H9qA3inVMrA>

WEB RESOURCES:

1. <https://www.universalclass.com/.../the-process-of-perso...>
2. <https://www.ncbi.nlm.nih.gov/pubmed/25545842>
3. <https://www.youtube.com/watch?v=Tuw8hxrFBH8>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CE101703	PLANNING FOR SUSTAINABLE DEVELOPMENT	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion on sustainable development, environmental impact, sustainable policies, governance, theories and strategies, media and education for sustainability.

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

- CO1.** Compare sustainable development theories in national and global context to protect the society and environment.
- CO2.** Analyze the unforeseen environmental impacts on sustainable development to protect the society and environment.
- CO3.** Analyze policies and governance for sustainable development considering ethics, economics, society and environment.
- CO4.** Analyze systems and strategies for sustainable development using appropriate tools and techniques considering ethics, economics, society and environment.
- CO5.** Analyze the role of media and education in sustainable development using appropriate tools and techniques considering ethics, society and environment besides communicating effectively.

CO-PO Mapping Table

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	3	-	-	2	-	-	-	-
CO2	3	3	-	-	2	-	-	-	1
CO3	3	3	-	-	2	2	-	-	-
CO4	3	3	-	2	2	2	-	-	-
CO5	3	3	-	2	2	2	-	1	-
Course Correlation Mapping	3	3	-	2	2	2	-	1	1

Correlation Levels: **3: High; 2: Medium; 1: Low**

COURSE CONTENT

Module 1: SUSTAINABLE DEVELOPMENT (09 Periods)

Definition and concepts of sustainable development, Capitalization of sustainability- National and global context; Sustainable development goals, Emergence and evolution of sustainability and sustainable development, Theories of sustainability, Case studies.

Module 2: ENVIRONMENTAL IMPACT (09 Periods)

Climate change – Science, Knowledge and sustainability; Unforeseen environmental impacts on development, Challenges of sustainable development, Centrality of resources in sustainable development, Case studies.

Module 3: SUSTAINABLE POLICIES AND GOVERNANCE (09 Periods)

Governance - Democracy and Eco-welfare; Global civil society and world civil politics, Civic environmentalism, Policy responses to sustainable development, Economics of sustainability, social responsibility in sustainability, National action, ISO 14001: Environmental management system.

Module 4: SUSTAINABLE SYSTEMS AND STRATAGIES (09 Periods)

Need for system innovation, Transition and co-evolution, Theories and methods for sustainable development, Strategies for eco-innovation, Ecological foot print analysis, Socio ecological indicators – Eco labels; Policy programmes for system innovation, Case studies.

Module 5: MEDIA AND EDUCATION FOR SUSTAINABILITY (09 Periods)

Role of emerging media, Remarkable design and communication art, Activism and the public interest, Education for sustainability, Participation in decision making, Critical thinking and reflection, Case studies.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Submit a study report on the importance and implementation of United Nations sustainable goals 17 among all the ratified nations.
2. Submit a study report on any one case study that the challenges being faced during the sustainable development goals implementation.
3. Submit a study report on the social responsibility in implementation of sustainability concept.
4. Prepare and submit a report on any two case studies that how the eco labels put on their products shall make the consumers feel satisfaction over the sustainable development.
5. Submit a report on the communication art and activism through media which makes the public interest that helps to contribute towards sustainable development.

RESOURCES

TEXT BOOKS:

1. John Blewitt, Understanding Sustainable Development, Earth Scan Publications Ltd., 2nd Edition, 2008.
2. Jennifer A. Elliot, An Introduction to Sustainable Development, Earth Scan Publications Ltd., 4th Edition, 2006.

REFERENCE BOOKS:

1. Peter Rogers, Kazi F Jalal and John A Boyd, An Introduction to Sustainable Development, Earth Scan Publications Ltd., 2006.
2. Simon Dresner, The Principles of Sustainability, Earth Scan Publications Ltd., 2nd Edition, 2008.
3. Peter Bartelmus, Environment Growth and Development: The Concepts and Strategies of Sustainability, Routledge, 3rd Edition, 2003.
4. Gabriel Moser, Enric Pol, Yvonne Bernard, Mirilia Bonnes, Jose Antonio Corraliza and Maria Vittoria Giuliani, People Places and Sustainability, Hogrefe & Huber Publishers, 2nd Edition, 2003.

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=a5i9RVyhBtc>
2. https://www.youtube.com/watch?v=fH_iIVPTujE
3. <https://www.youtube.com/watch?v=c2eNrFK5M8I>
4. <https://www.youtube.com/watch?v=qfOgdj4Okdw>
5. https://www.youtube.com/watch?v=_qLqLJq2954

WEB RESOURCES:

1. https://civil.gecgudlavalleru.ac.in/images/admin/pdf/1594706742_III-II-OE-Planning-for-Sustainable-Development.pdf
2. https://www.academia.edu/26950843/Sustainable_Development_in_Practice_Case_Studies_for_Engineers_and_Scientists
3. https://www.academia.edu/24286208/The_Role_of_the_Professional_Engineer_and_Scientist_in_Sustainable_Development
4. https://byjusexamprep.com/liveData/f/2022/8/sustainable_development_goals_upsc_notes_43.pdf
5. https://sdgs.un.org/sites/default/files/2020-10/course%201_Peter_Tarr%20%20-%20Compatibility%20Mode.pdf

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25EC101705	PRINCIPLES OF COMMUNICATION ENGINEERING	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: Fundamentals of Communications; Analog and digital modulation and Demodulation Techniques; Information theory and coding.

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

- CO1.** Analyze different Analog and Digital Modulation Schemes to improve bandwidth and power efficiency.
- CO2.** Analyze Pulse Analog modulation Schemes.
- CO3.** Understand the concepts of Baseband & Passband Digital Transmission.
- CO4.** Analyze various error detection and correction codes for reliable transmission.

CO-PO Mapping Table

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	3	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-
CO4	3	3	2	1	-	-	-	-	-
Course Correlation Mapping	3	3	2	1	-	-	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: ANALOG MODULATION

(13 Periods)

Block diagram of Electrical Communication System, Types of Communications, Need for Modulation, Types of Amplitude Modulation- AM, DSBSC, SSBSC, Power and BW requirements, Generation of AM, DSBSC, SSBSC. Detection of AM - Diode detector, Product demodulation for DSBSC & SSBSC. Frequency & Phase Modulations.

Module 2: PULSE MODULATION

(07 Periods)

Elements & Advantages of Digital communication systems, PAM, Regeneration of Base band Signal, PWM and PPM, Time Division Multiplexing, Frequency Division Multiplexing.

Module 3: BASE BAND DIGITAL TRANSMISSION

(07 Periods)

Pulse Code Modulation- Advantages, Block diagram of PCM, Quantization, effect of Quantization, Quantization error. DM, ADM and Comparison of PCM, DM & ADM.

Module 4: PASS BAND DIGITAL TRANSMISSION

(10 Periods)

Digital Binary Schemes-ASK, FSK, PSK, DPSK, QPSK, Modulation and Demodulation - Coherent and Non-coherent techniques.

Module 5: INFORMATION THEORY AND CODING

(08 Periods)

Concept of Information, Entropy and Rate of Information, Coding efficiency, Shannon-Fano and Huffman Coding.

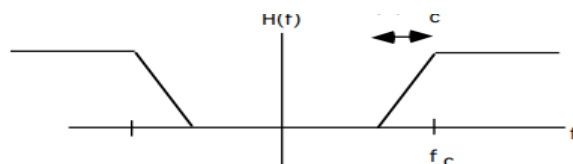
Error Correction and Detection Codes- Linear Block Codes, Cyclic Codes, Convolution Codes.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Suppose that a non-linear device is available for which the output current i_0 and the input voltage v_i are related by: $i_0(t) = a_1 v_i(t) + a_3 v_i^3(t)$ where a_1 and a_3 are constants. Explain how this device may be used to provide (a) a product modulator (b) an amplitude modulator.
2. A voice signal occupying the frequency band 0.3 - 3.4 KHz is to be modulated onto a carrier wave of frequency 11.6 MHz High pass filters such as the one shown below are available. Design a system to generate the USB wave using DSB modulators and these filters.



3. In a binary PCM system, the output signal to-quantizing noise ratio is to be held to a minimum of 40 dB. Determine the number of required levels, and find the corresponding output signal to quantizing-noise ratio.
4. A bipolar binary signal $S_i(t)$ is a +1V or -1V pulse during the interval $(0, T)$. Additive

white noise with power spectral density $\eta/2 = 10^{-5} \text{ W /kHz}$. W/Hz is added to the signal. Determine the maximum bit rate that can be sent with a bit error probability of $P_e \leq 10^{-7}$

5. A compact disc (CD) recording system samples each of two stereo signals with a 16-bit analog-to digital converter (ADC) at 44.1 kb/s.
 - a) Determine the output signal-to-quantizing-noise ratio for a full-scale sinusoid.
 - b) The bit Stream of digitized data is augmented by the addition of error-correcting bits, clock extraction bits, and display and control bit fields. These additional bits represent 100 percent overhead. Determine the output bit rate of the CD recording system.
 - c) The CD can record an hour's worth of music. Determine the number of bits recorded on a CD. For a comparison, a high-grade collegiate dictionary may contain 1500 pages, 2 columns per page, 100 lines per column, 8 words per line, 6 letters per word, and 7 b per letter on average. Determine the number of bits required to describe the dictionary, and estimate the number of comparable books that can be stored on a CD.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. R.P. Singh and S D Sapre, Communication Systems - Analog and Digital, TMH, 2nd edition 2007.
2. Simon Haykin, Communication Systems, John Wiley, 2nd edition 2007.

REFERENCE BOOKS:

1. Herbert Taub & Donald L Schilling, Principles of Communication Systems, Tata McGraw-Hill, 3rd Edition, 2009.
Sham Shanmugam, Digital and Analog Communication Systems, Wiley-India edition, 2006.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/108/104/108104091/>
2. https://onlinecourses.nptel.ac.in/noc19_ee47/preview

WEB RESOURCES:

1. <https://studiousguy.com/basic-principles-of-communication/>
2. https://www.tutorialspoint.com/principles_of_communication/principles_of_communication_modulation.htm

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25EE101702	RELIABILITY AND SAFETY ENGINEERING	3	-	-	-	3

Pre-Requisite -**Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: This course provides a detailed discussion on the fundamentals of reliability and safety engineering. The course emphasizes on various reliability measures used in assessing the performance of the system, evaluating the critical parameters of the network, and the techniques to assess the reliability of the system. The course also deals with safety management and measures in industrial and other hazardous environments.

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

- CO1.** Apply the various probability and statistics fundamentals into engineering systems to evaluate performance.
- CO2.** Develop mathematical models for engineering networks/systems to evaluate the critical parameters for the reliability of a network/system.
- CO3.** analyze the time-dependent/independent characteristics of a repairable system and frequency durations techniques to assess the reliability
- CO4.** Understand various safety management, policy, and planning strategies for personal and industrial safety.
- CO5.** Understand various safety and hazard identification techniques and follow appropriate safety measures in industry and society.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	-	2	1	1	-	-	-
CO2	3	3	-	2	1	-	-	-	-
CO3	3	2	-	1	1	-	-	-	3
CO4	3	2	-	2	1	1	-	-	-
CO5	3	2	-	2	1	1	-	-	-
Course Correlation Mapping	3	2	-	2	1	1	-	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: FUNDAMENTALS OF RELIABILITY ENGINEERING (09 Periods)

Random variables, probability concepts, rules for probabilities of events. Probability density and distribution functions. Binomial distribution - Expected value and standard deviation for binomial distribution. Reliability functions, $f(t)$, $F(t)$, $h(t)$ - Relationship between these functions, Exponential density and distribution functions, expected value and standard deviation of exponential distribution. Measures of reliability - MTTF, MTTR, MTBF. Bathtub curve.

Module 2: NETWORK MODELING AND RELIABILITY EVALUATION (09 Periods)

Basic concepts - Evaluation of network reliability/unreliability, series systems, parallel systems, series - Parallel configuration systems. Redundant systems and its types. Evaluation of network reliability/unreliability using conditional probability method, tie-set and cut-set based approach, complete event tree and reduced event tree methods.

Module 3: MARKOV CHAIN AND MARKOV PROCESSES (09 Periods)

Basic concepts, stochastic transitional Probability matrix, time dependent probability evaluation, Limiting State Probability, Absorbing states. Modelling concepts - State space diagrams, time dependent reliability evaluation of single component repairable model, two component repairable model. Frequency and duration techniques.

Module 4: BASICS OF SAFETY CONCEPTS (08 Periods)

Introduction, goals, need for safety, history of safety movement - the evolution of modern safety concept, general concepts of safety management. Planning for safety- productivity, quality and safety, line and staff functions, budgeting for safety, safety policy.

Module 5: SAFETY TECHNIQUES AND APPLICATIONS (10 Periods)

Introduction to safety techniques, Incident Recall Technique (IRT), disaster control, job safety analysis, safety survey, safety inspection, safety sampling, evaluation of the performance of supervisors on safety. Hazard identification techniques, components of safety audit, types of audit, audit methodology, and process of safety reporting. Applications of industrial Safety, environmental safety, health safety, electrical safety, fire safety.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. The students shall understand various IEEE reliability standards to be followed in the engineering systems for the evaluation of reliability and asses performance.
2. Should collect various engineering components assembled and their network models for evaluations of network reliability indices.
3. The students to visit a nearby power or process industry to know about various types of failures and repair performance of various engineering components and cause of replacements.
4. Should collect information about various safety/alert sign boards and the relative measures for a particular situation.

5. Should understand the standard practices followed during the maintenance/commissioning of the electrical apparatus in any industry following the various safety precautions.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Roy Billinton and Ronald N Allen, Reliability Evaluation of Engineering Systems, 2nd Edition, Springer, New York, 2013.
2. Frank R. Spellman, Nancy E. Whiting, Safety Engineering: Principles and Practices, 3rd Edition, Rowman & Littlefield, 2018.

REFERENCE BOOKS:

1. Charles E. Ebeling, An introduction to reliability and maintainability engineering, 2nd Edition Tata McGraw-Hill Education, 2010.
2. Dan Petersen, Techniques of Safety Management: A Systems Approach, 4th Edition American society of safety engineers, 2003.
3. Ajit Kumar Verma , Srividya Ajit , Durga Rao Karanki, Reliability and Safety Engineering, Springer London, 2016.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/105/108/105108128/>
2. <https://nptel.ac.in/courses/110/105/110105094/>
3. <https://www.youtube.com/watch?v=uutg8jKrL9w>
4. https://www.youtube.com/watch?v=_c-iZ2BAXPw
5. <https://www.youtube.com/watch?v=GeMCF3s5EDk>
6. <https://www.youtube.com/watch?v=xYWyyype7cxE>

WEB RESOURCES:

1. <https://ieeexplore.ieee.org/document/9353567>
2. <https://www.ualberta.ca/engineering/mechanical-engineering/research/reliability-and-safety.html>
3. <https://ieeexplore.ieee.org/document/9353567>
4. <https://www.taylorfrancis.com/books/edit/10.1201/9781003140092/industrial-liability-safety-engineering-dilbagh-panchal-mangey-ram-prasenjrit-chatterjee-anish-kumar-sachdeva>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CE101704	REMOTE SENSING, GIS AND GPS	3	-	-	-	3

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion on photogrammetry, remote sensing, geographic information system, GIS spatial analysis. This course also examines remote sensing and GIS applications, global positioning system and its real-time applications.

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

- CO1.** Analyze photogrammetry and remote sensing to solve complex surveying problems using appropriate tools and techniques following the relevant guidelines and latest developments considering society and environment besides communicating effectively in graphical form.
- CO2.** Analyze GIS to solve complex surveying problems using appropriate tools and techniques following latest developments besides communicating effectively in graphical form.
- CO3.** Analyze GIS spatial analysis to solve complex surveying problems using appropriate tools and techniques following latest developments besides communicating effectively in graphical form.
- CO4.** Analyze remote sensing and GIS applications to solve complex civil engineering problems using appropriate tools and techniques following the relevant guidelines and latest developments considering society, environment, sustainability and management principles besides communicating effectively in graphical form.
- CO5.** Analyze global positioning system to solve complex surveying problems using appropriate tools and techniques considering society and environment besides communicating effectively in graphical form.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	3	-	2	1	1	-	1	1
CO2	2	3	-	2	1	-	-	1	1
CO3	2	3	-	2	1	-	-	1	1
CO4	2	3	-	2	1	1	-	1	1
CO5	2	3	-	2	1	-	-	1	-
Course Correlation Mapping	3	3	-	2	1	1	-	1	1

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: PHOTOGRAMMETRY AND REMOTE SENSING (10 Periods)

Photogrammetry: Principle of photogrammetry, Types of aerial photographs, Planning and execution of photographic flights, Geometry of aerial photographs, Scale of aerial photographs and its determination, Stereoscopy, Ground control, Mosaics, Parallax measurements for height determinations, Latest developments in photogrammetry.

Remote Sensing: Elements of remote sensing, Electromagnetic spectrum, Energy resources, Physics of radiant energy, Energy interactions with earth surface features and atmosphere, Data acquisition platforms Spectral reflectance curves, Resolution; Spectral properties of water bodies, soil and vegetation; Sensors and platforms, Visual interpretation techniques.

Module 2: GEOGRAPHIC INFORMATION SYSTEM (09 Periods)

GIS categories, Components of GIS, Fundamental operations of GIS, Spatial and non-spatial data, Raster data and vector data, File management, Layer based GIS, Feature based GIS, Map projections, Latest developments.

Module 3: GIS SPATIAL ANALYSIS (08 Periods)

Database models, Data storage, Vector data storage, Attribute data storage, Data manipulation and analysis, Integrated analysis of the spatial and attribute data - DTM/DEM, Software's – Arc GIS, QGIS and Global mapper, Latest developments in GIS software.

Module 4: REMOTE SENSING AND GIS APPLICATIONS (09 Periods)

Land use/Land cover classification, Rainfall-runoff studies, Flood and drought impact assessment and monitoring, Drainage morphometry, Watershed management for sustainable development, GIS based precision farming, GIS based natural resources management, Inland water quality survey and management, Regional and urban planning and management, GIS based highway alignment, GIS based traffic congestion analysis, GIS for public health – Case Studies.

Module 5: GLOBAL POSITIONING SYSTEM (09 Periods)

Global Positioning System (GPS) – Fundamental concepts, Components of GPS – Space segment, Control segment, User segment, Reference systems, Satellite orbits; Classification of GPS receivers, GPS observations, GPS measurements and accuracy of GPS, Applications.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Sound composing project: In this assignment, select area and collect the geometry of aerial photographs and analyze the views.
2. Visit any meteorological department and understand about rain gauges and collect, analyse the data
3. Visit Geographical Information Systems Laboratory and understand about GIS and GPS Systems

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Shivam, P. and Shashikanth, T., A Text Book of Basic Concept of Remote Sensing, GPS and GIS, Sankalp Publication, 2020.
2. Anji Reddi, M., A Text Book of Remote Sensing and Geographical Information Systems, B. S. Publications, 2nd Edition, 2012.

REFERENCE BOOKS:

1. Bhatta, B., Remote Sensing and GIS, Oxford University Press, 2nd Edition, 2011.
2. Lillesand, T. M., Kiefer, R. W. and Chipman, J. W., Remote Sensing and Image Interpretation, John Willey and Sons (Asia) Pvt. Ltd., 7th Edition, 2014.
3. Chandra, A. M. and Ghosh, S. K., Remote Sensing and Geographic Information System, Narosa Publishing House, 2nd Edition, 2015.
4. Panigrahi, N., Geographical Information Science, University Press, 2nd Edition, 2013.
5. Peter A. Burragh and Rachael Mc Donnell, Principles of Geographical Information Systems, Oxford University Press, 2nd Edition, 2014.

VIDEO LECTURES:

1. <http://nptel.ac.in/courses/105/107/105107206/>
2. <https://syslab.ceu.edu/videos/geospatial-technologies>

WEB RESOURCES:

1. Digital Audio Signal Processing: <https://www.udemy.com/course/introduction-to-geospatial-technologies-and-arcgis-interface/>
2. Learn Audio Editing - for Beginners: https://www.youtube.com/watch?v=xGgaV9r_kH8
3. <https://storymaps.arcgis.com/stories/47e984aae614442cb80aa40d121b5fe>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CE101705	SMART CITIES	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a discussion on smart city and infrastructure, smart governance, smart mobility, smart economy, smart environment, smart buildings, smart energy, smart water, smart living, smart people and case studies.

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

- C01.** Understand the concept of smart cities and its infrastructure for ensuring safety and sustainability using appropriate techniques and management principles in India besides lifelong learning.
- C02.** Use smart cities to solve problems associated with mobility and governance for the growing population by ensuring safety and sustainability, management using appropriate standards in India besides lifelong learning.
- C03.** Use smart cities to solve problems associated with economy and environment for ensuring safety and sustainability, management using appropriate techniques and standards in India besides lifelong learning.
- C04.** Use buildings, energy and water resource systems in smart cities to solve problems associated with the growing population for ensuring safety and sustainability, management using appropriate standards in India besides lifelong learning.
- C05.** Use the smart cities to solve complex problems associated with people and living systems for ensuring safety and sustainability, management using appropriate techniques in India besides lifelong learning.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
C01	3	-	-	2	1	2	-	1	2
C02	3	3	-	2	3	2	-	1	2
C03	3	3	-	2	3	2	-	1	2
C04	3	3	-	2	3	3	-	-	2
C05	3	3	-	2	3	2	-	-	2
Course Correlation Mapping	3	3	-	2	2	2	-	1	2

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: SMART CITY AND INFRASTRUCTURE (09 Periods)

Smart city - Concept, Objectives, History, Need; Key trends in smart city development, Government of India – Policy for smart city.

Infrastructure: Smart city infrastructure – Components, Challenges; Managing - Principle stake holders, Infrastructure in India and World, Dimensions of smart cities, Global standards and performance benchmarks, Practice codes, Infrastructure development, Integrated infrastructure management systems for smart city, Infrastructure management system applications for existing smart city, Various types of infrastructure systems, Infrastructure assessment.

Module 2: SMART GOVERNANCE AND SMART MOBILITY (09 Periods)

Smart Governance: Definition, smart governance to citizens, Industries and commerce, Smart governance within government, Emerging trends in smart governance, Future of smart governance, Guidelines and standards for smart governance; IOT and ICT Application – Broadband city, Use of sensors, Intelligent city governance.

Smart Mobility: Intelligent transportation systems, Accessibility, Smart vehicles and fuels, GIS, GPS, Navigation system, public transport, Traffic safety management, Logistics flows in cities, Mobility services, E-ticketing.

Module 3: SMART ECONOMY AND SMART ENVIRONMENT (09 Periods)

Smart Economy: City branding, Market places and crowd funding, Innovation, entrepreneurship – E-business, E-commerce, online integrated business platforms and networks; Local and global interconnectedness, Productivity, Flexibility of labour market.

Smart Environment: Network and environmental monitoring, Energy efficiency, Urban planning and urban refurbishment, Smart buildings and building renovation, Resource management, Environmental protection.

Module 4: SMART BUILDINGS, SMART ENERGY AND SMART WATER (09 Periods)

Smart Buildings: Definition, Sustainable city – A green approach, Housing, Sustainable green building - Solar energy for smart city, Waste water management, solid waste management, 3Rs Policy, Green ratings.

Smart Energy: Current energy demand, Alternate energy sources, Renewable energy, Production, Solar energy, Wind energy, Energy from solid waste, Applications, Challenges in smart energy

Smart Water: Storage and conveyance system of water, Sustainable water and sanitation, Sewage systems, Flood management, Conservation system.

Module 5: SMART LIVING, SMART PEOPLE AND CASE STUDIES (09 Periods)

Smart Living: Definition, Cultural facilities, World-class education, Tourist attractions, World-class hospitals, Latest technologies, Quality housing, Community and urban life management, social cohesion.

Smart People: Definition, Human development index, Level of qualification, Graduate enrolment ratio, Lifelong learning, ICT Skills, Quality of smart people – Flexibility, Creativity to contribute to education, Democratic nature; Personality dimensions – Extroversion, Agreeableness, Consciousness, Emotional Stability, Open to experience.

Case Studies: Helsinki – Finland; Zurich - Switzerland; Oslo - Norway; Amsterdam - The Netherlands; New York - United States; Seoul (World's first Smart City) - South Korea.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

1. Prepare a report on smart city infrastructure for south Indian cities.
2. Prepare a review on need for changes in transportation and governing policies in India.
3. Write a report on energy conservation and economy stability in world's first smart city.
4. Write a report on need and technologies to be adopted for green buildings in a smart city.
5. Prepare a case study report on Hyderabad, Telangana.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Li Xian Yi, Smart City on Future Life - Scientific Planning and Construction, Posts and Telecom Press, 2012.
2. Arpan Kumar Kar, Manmohan Prasad Gupta, P. Vigneswara Ilavarasan and Yogesh K. Dwivedi, Advances in Smart Cities, CRC Press, Taylor & Francis Group, Boca Raton, 2017.

REFERENCE BOOKS:

1. Komninos, The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies (Regions and Cities), Routledge Taylor & Francis Group, London, 2015.
2. Ora Riva Sanseverino, Smart Rules for Smart Cities – Managing Efficient Cities in Euro-Mediterranean Countries, Springer for innovation, Springer, Italy, 2014.
3. Smart Cities Mission: A Step Towards Smart India, National Portal of India
4. Anthony M. Townsend, Smart Cities – Big Data, Civic Hackers and The Quest for a New Utopia, W. W. Norton & Company, Inc., New York, 2013.
5. IoT Technician (Smart City) – MHRD, Govt. of India, 2nd Edition, 2022.

VIDEO LECTURES:

1. City of the Future: Singapore – Full Episode | National Geographic - YouTube
2. Integrated Waste Management for a Smart City - Course (nptel.ac.in)

WEB RESOURCES:

1. Smart Cities (nationalgeographic.org)
2. NPTEL: Civil Engineering - NOC: Sustainable Materials and Green Buildings
3. Smart cities (europa.eu)
4. Top 7 Smart Cities in the World in 2023 (earth.org)

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25EC101706	SMART SENSORS FOR ENGINEERING APPLICATIONS	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course provides a detailed discussion on Basics of sensors, characteristics of sensors and their responses; Smart sensors for Engineering, Science and Health Monitoring Applications; Applications of smart sensors and advancements in sensing Techniques.

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

CO1. see the characteristics of transducers and estimate the response of sensors.

CO2. Understanding the working of various sensors in the context of their specialized domains.

CO3. Apply smart sensors for real time applications.

CO4. Apply the advanced techniques to smart sensors to provide solution to real time applications.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
C01	3	3	-	-	-	-	-	-	-
C02	3	-	-	-	-	-	-	-	-
C03	3	-	-	-	-	-	-	-	-
C04	3	-	-	-	-	-	-	-	-
Course Correlation Mapping	3	3	-	-	-	-	-	-	-

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: CONCEPTS OF SENSORS

(08 Periods)

Introduction to sensors and transducers. Need for sensors in the modern world. Different fields of sensors based on the stimuli, various schematics for active and passive sensors. Static and dynamic characteristics of sensors. **Zero, I and II order sensors:** Response to impulse, step, ramp and sinusoidal inputs. Environmental factors and reliability of sensors.

Module 2: SENSORS IN ENGINEERING

(07 Periods)

Physical principles of sensors, Electric Sensors: Resistive, Capacitive, Inductive. Piezoelectric sensor. Photo elastic sensors, Fluid Mechanic sensors.

Module 3: HUMAN AND BIOMIMETIC SENSORS

(10 Periods)

Human sensors: vision, Taste and smell, Hearing, Somatic, Biomimetic Sensors, Electrochemical, Thermoelectric sensors, Optic sensors.

Module 4: APPLICATIONS OF SMART SENSORS

(11 Periods)

WSN Based Physiological Parameters Monitoring System: Measurement of Human Body Temperature. Intelligent Sensing System for Emotion Recognition: Aim of the Emotion Recognition System, Development of Intelligent Sensing System for Emotion Recognition. WSN Based Smart Power Monitoring System.

Module 5: ADVANCEMENTS IN SENSING TECHNOLOGY

(09 Periods)

Ecological Monitoring Using Wireless Sensor Networks: Overview, Challenges, and Opportunities. Development of an Embedded System-Based Gateway for Environmental Monitoring in Wild Fields. Advancements in Structural Health Monitoring.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Build a wireless sensor system for Environmental pollution monitoring.
2. Design a smart temperature measurement system using required accessories.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Patrick F Dunn, Fundamentals of sensors for engineering and science, CRC Press, 2012.
2. Subhas C. Mukhopadhyay, Krishanthi P. Jayasundera, and Anton Fuchs, Smart Sensors, Measurement and Instrumentation, Springer, 2013.

REFERENCE BOOKS:

1. Subhas Chandra Mukhopadhyay, Intelligent Sensing, Instrumentation and Measurements, Springer, Kluwer Academic Publishers, 2013.
2. Henry Bolte, Sensors – A Comprehensive Sensors, John Wiley.

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=oRydUfgMdgA>
2. https://onlinecourses.nptel.ac.in/noc22_ee36/

WEB RESOURCES:

1. <https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1199&context=nasapub#:~:text=The%20smart%20materials%20examined%20include,%2C%20magneto%20Do ptical%20materials%2C%20and>
2. <https://www.youtube.com/watch?v=q8UuRkOQ9A0>
3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8433768/>
4. <https://www.mdpi.com/1424-8220/21/17/5890>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25EE101703	SUSTAINABLE ENERGY SYSTEMS	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course designed emphasizes the operating principle of a range of non-conventional energy resources, energy harvesting and conversion principles and key performance characteristics. The energy conversion technologies will include energy conversion from, Solar, Wind, Ocean, Biomass, Geothermal and Fuel cells. The course also emphasizes on various types of hybrid energy storage systems with their relative advantages and disadvantages.

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

- CO1.** Understand the fundamental concepts of renewable energy sources and their endurance for sustainability.
- CO2.** Understand the various methods of harvesting solar energy, energy conversion principles, and operational aspects and environmental impacts of solar technologies.
- CO3.** Understand the various methods of harvesting wind energy, conversion principles, operational aspects, and environmental impacts of wind energy systems.
- CO4.** Understand the various methods of harvesting ocean energy, Biomass energy and geothermal energy, energy conversion technologies, operational aspects, and their impacts on the environment.
- CO5.** Understand the principle of harvesting energy from fuel cells and the operational aspects of hybrid energy storage systems.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	-	-	-	2	-	-	-	1
CO2	3	-	-	2	2	-	-	-	1
CO3	3	-	-	2	2	-	-	-	1
CO4	3	-	-	2	2	-	-	-	1
CO5	3	-	-	2	2	-	-	-	1
Course Correlation Mapping	3	-	-	2	2	-	-	-	1

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO SUSTAINABLE ENERGY SOURCES (07 Periods)

Impact of conventional sources on Environment—acid rain, ozone layer depletion, Global warming, greenhouse effect and nuclear waste; Limitation of fossil fuels; Renewable energy sources; Renewable sources and their sustainable development.

Module 2: ENERGY FROM SOLAR (10 Periods)

Introduction, solar radiation, Measurement of solar radiation—Pyranometer; Solar energy collectors; Flat plate collectors— Liquid and air (non-porous) types; Focusing type— Parabolic and Point types; Solar photovoltaic system— PV cell and its types, Configuration of solar panel, PV system; Applications: Solar pump, Solar water heater

Module 3: ENERGY FROM WIND (08 Periods)

Introduction, power extraction from the wind, Wind turbines— Horizontal axis wind turbine—Propeller type and Vertical axis wind turbine— Darrieus rotor type; Basic components of wind energy conversion systems, Applications: Energy storage, Water pumping; Environmental impacts.

Module 4: ENERGY FROM OCEAN, BIOMASS AND GEOTHERMAL RESOURCES (12 Periods)

Energy from ocean: Introduction, ocean thermal energy conversion (OTEC): Open and closed cycle power plants; Tidal energy: Schematic diagram of tidal power plant; Advantages and disadvantages.

Energy from Biomass: Introduction, biomass conversion technologies-direct, Thermochemical and Biochemical conversions; Biogas generation—Anaerobic digestion process.

Geothermal energy: Introduction, Geothermal resources, Geothermal power plants— Vapour dominated and liquid dominated; Environmental issues.

Module 5: FUEL CELLS AND HYBRID ENERGY SYSTEMS (08 Periods)

Fuel Cells: Introduction, principle and operation of fuel cell, classification of fuel cells, advantages and disadvantages of fuel cells.

Hybrid energy systems: Need for hybrid systems, configuration and coordination, Block diagram approach of Stand-alone PV-wind system, PV-Diesel and Wind-diesel; energy storage systems — Ultra capacitors, SMES, Battery.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. The students shall visit a solar power plant, understand the operational aspects and should prepare a technical report on the plant visited.
2. The students shall visit a wind farm, understand the operational aspects, and should prepare a technical report on the plant visited.
3. The students shall visit a bio-mass energy conversion plant, understand the operational aspects and should prepare a technical report on the plant visited.
4. The students shall prepare a technical report on the need of a hybrid plant and find new avenues for a new hybrid system.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. Rai, G.D., Non-conventional Energy Sources, Khanna Publishers, New Delhi, 2017.
2. G.N. Tiwari and M.K. Ghosal, Renewable energy resources: Basic principles and applications, Alpha Science International Ltd., 2005.

REFERENCE BOOKS:

1. Jhon Twidell and Tony Wier, Renewable Energy Resources, Taylor & Francis, 2nd edition, London and Newyork, 2006.
2. K.M. Mittal, Non-conventional Energy Systems-Principles, Progress and Prospects, Wheeler Publications, 1997.
3. S. Rao, Dr. B.B. Parulekar, Energy Technology, Third edition, Khanna Publications, 2013.
4. R. K. Rajput, A textbook of power system engineering, Laxmi publications (P) Ltd, 2016

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/103103206>
2. <https://nptel.ac.in/courses/121106014>
3. <https://youtu.be/mh51mAUexK4>
4. <https://youtu.be/UW4HYJ36q0Y>

WEB RESOURCES:

1. www.mnre.gov.in
2. www.ireda.in

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CS101702	WEB DESIGN FUNDAMENTALS	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course is designed to introduce the student to the technologies and facilities of web design: CSS, JavaScript, and jQuery. Students will understand the web design process and use these software technologies together to produce web design projects.

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

- CO1.** Understand the fundamentals of HTML 5 and the principles of web design.
- CO2.** Construct basic websites using HTML and Cascading Style Sheets.
- CO3.** Build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.
- CO4.** Learn how to use HTML5 and other Web technologies to develop interactive and responsive web pages.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	3	3	-	-	-	-	-	-
CO2	3	3	-	-	2	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-
CO4	2	3	3	-	-	2	-	-	-
Course Correlation Mapping	3	3	3	-	2	2	-	-	-
Correlation Levels: 3: High; 2: Medium; 1: Low									

COURSE CONTENT

Module 1: INTRODUCTION

(09 Periods)

Elements – Data types – Working with Text – Arranging Text – Displaying Lists – VAR Element – BDO Element – SPAN Element – DIV Element.

Module 2: LINKS AND URLS

(09 Periods)

Hyperlinks – URLs – Linking to a Mail System – Creating Tables – Inserting Images in a Web Page – Colors – Form Elements – Multiple-Choice Elements – Multimedia

Module 3: DYNAMIC HTML

(09 Periods)

Features of JavaScript – Programming Fundamentals – JavaScript Functions, Events, Image Maps, and Animations – JS Objects – Document Object – Validation, Errors, Debugging, Exception Handling, and Security

Module 4: CASCADING STYLE SHEET

(09 Periods)

CSS Syntax – CSS Selectors – Backgrounds and Color Gradients – Fonts and Text Styles – Creating Boxes and Columns – Displaying, Positioning, and Floating an Element – Table Layouts – : Effects, Frames, and Controls in CSS

Module 5: ADVANCED FEATURES OF HTML5

(09 Periods)

Creating Editable Content – Checking Spelling Mistakes – Custom Data Attributes – Client-Side Storage – Drag and Drop Feature – Web Communication – **jQuery** – Fundamentals of jQuery – Callback Functions – jQuery Selectors – jQuery Methods to Access HTML Attributes.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Design a blog layout that includes header, navigation menu, content area, sidebar. Apply appropriate styling to each section.
2. Develop a java script-based quiz that presents MCQs to the user and provides immediate feedback on their answers. Keep track of the score and display the final results at the end.
3. Build a web page that displays and image gallery. Each image should be a clickable link that opens the image in a larger view when clicked.

(Note: It's an indicative one. The course instructor may change the activities and the same shall be reflected in course handout.)

RESOURCES

TEXT BOOKS:

1. DT Editorial Services, HTML 5 Black Book, Dream tech Press, 2nd Edition, 2016.

REFERENCE BOOKS:

1. Jennifer Niederst Robbins, HTML5 Pocket Reference, O'Reilly, 5th Edition, 2018.
2. Ben Frain, Responsive Web Design with HTML5 and CSS3, Packt, 2nd Edition, 2020.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=h_RftxdJTzs
2. <https://www.youtube.com/watch?v=dlkWNdnO8ek>

WEB RESOURCES:

1. <https://www.w3schools.com/html/>
2. <https://www.w3schools.com/css/>
3. <https://www.geeksforgeeks.org/web-technology/>
4. <https://www.smashingmagazine.com/2021/03/complete-guide-accessible-front-end-components/>
5. <https://css-tricks.com/>
6. <https://davidwalsh.name/css-optional>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25SS101706	WOMEN EMPOWERMENT	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: Concept & Framework, Status of Women, Women's Right to Work, International Women's Decade, and Women Entrepreneurship.

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

- CO1.** Demonstrate the knowledge of the characteristics and achievements of empowered women and women's empowerment techniques by analyzing women's legal and political status.
- CO2.** Apply the knowledge of women's rights by analyzing various societal issues and obstacles in different fields, including science and technology.
- CO3.** Demonstrate the knowledge of the significance of women's participation in policy debates, National conferences, and common forums for equality and development by identifying and analyzing issues.
- CO4.** Analyze the concept of women's entrepreneurship, government schemes, and entrepreneurial challenges and opportunities.

CO-PO Mapping Table

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	1	-	1	-	1	-	-	-
CO2	3	1	-	-	-	-	-	-	-
CO3	3	1	-	-	-	-	-	3	-
CO4	3	1	-	-	-	-	-	-	-
Course Correlation Mapping	3	1	-	1	-	1	-	3	-

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: CONCEPT & FRAMEWORK

(09 Periods)

Introduction– Empowered Women's Characteristics – Achievements of Women's Empowerment **Concept of Empowerment:** Meaning & Concept – Generalizations about Empowerment – Empowerment Propositions – Choices women can make for empowerment – Women's participation in decision making, development process & in Governance. **Framework for Empowerment** – Five levels of equality – Tenets of Empowerment– Elements – Phases and aspects – Techniques – Categories and Models – Approaches.

Module 2: STATUS OF WOMEN

(09 Periods)

Legal Status: Present Scenario – Call for Social Change – Significant Trends – Legal & Schemes – Personal Law – Joint Family – Criminal Law – Shift towards Dowry – Deterrent Punishment – Criminal Law (II Amendment) – Discrimination in Employment.

Political Status: Present Scenario – Political Participation & its Nature Socio-economic Characteristics – Political Mobilization: Mass Media – Campaign Exposure – Group Orientation – Awareness of issues and participation – Progress & Future Thrust.

Module 3: WOMEN'S RIGHT TO WORK

(09 Periods)

Introduction – Present Scenario – Changes in Policy & Programme – National Plan of Action– Women's Cells and Bureau – Increase in the work participation rate – Discrimination in the labour market – Women in unorganized sector – Issues and Obstacles– Women in Education – Women in Science & Technology – Case Study: Linking Education to Women's Access to resources.

Module 4: WOMEN'S PARTICIPATORY DEVELOPMENT

(09 Periods)

Dynamics of social change – conscious participation – Information Explosion – Organized Articulation – National Conference – Common Forums – Participatory Development – New Issues Identified – Role of other Institutions.

Module 5: WOMEN ENTREPRENEURSHIP

(09 Periods)

Introduction – Definition – Concept – Traits of women Entrepreneurs – Role of Women Entrepreneurs in India – Reasons for Women Entrepreneurship – Government schemes & Financial Institutions to develop Women Entrepreneurs – Key policy recommendations – Project Planning – Suggestions and measures to strengthen women entrepreneurship – Growth & Future challenges – Training and Opportunities – Case Study: Training Women as Hand-pump Mechanics– Case Study: Literacy for Empowering Craftswomen

Total Periods: 45

EXPERIENTIAL LEARNING

1. Prepare poster presentation on "impact of women's self-help groups on their empowerment and socio-economic development."
2. Prepare a comparative analysis chart on the status of women in various countries.
3. Prepare a presentation on women and cultural responsibilities in different societies.
4. Prepare a presentation on the women of the past, present and future in terms of responsibilities and duties.
5. Prepare a presentation on the great women entrepreneurs of India.

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Sahay Sushama, Women and Empowerment, Discovery Publishing House, New Delhi, 2013.
2. Nayak Sarojini, Jeevan Nair, Women's Empowerment in India, Pointer Publishers, Jaipur, 2017.

REFERENCE BOOKS:

1. Baluchamy. S, Women's Empowerment of Women, Pointer Publishers, Jaipur, 2010.
2. Khobragade Grishma, Women's Empowerment: Challenges and Strategies Empowering Indian Women, Books clinic Publishing, Chhattisgarh, 2020.

WEB RESOURCES:

1. <https://www.economicdiscussion.net/entrepreneurship/women-entrepreneurs-in-India>
2. <https://www.businessmanagementideas.com/entrepreneurship-2/women-entrepreneurs>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25SS101707	INDIAN KNOWLEDGE SYSTEM IN SCIENCE	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course aims to raise awareness among students about the diverse aspects of the Indian Knowledge System in the context of science.

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

- CO1.** Understand a sense of rootedness and pride in India, along with an appreciation for its rich, diverse, ancient, and modern culture, knowledge systems, and traditions.
- CO2.** Demonstrate the rich scientific and technological heritage of the country.
- CO3.** Use the Indian concept of multidisciplinary learning systems, integrating them with modern science.
- CO4.** Demonstrate the importance of intellectual property rights in safeguarding Indian knowledge.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	1	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-
CO3	2	2	-	-	3	-	-	2	-
CO4	1	1	-	-	-	-	3	3	-
Course Correlation Mapping	2	2	3	-	3	-	3	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: ANCIENT PHILOSOPHY OF KNOWLEDGE

(09 Periods)

Vedas, Vedangas, sutras – Guru Kul Parampara

Module 2: ASTRONOMY IN INDIA

(12 Periods)

Astronomy in India: The Beginnings of Indian Astronomy - The Early Historical Period-The Siddhāntic Era - The Kerala School - Aryabhatta - Varahamihira- Bhaskara I – Brahmagupta- Bhaskara II – Brief notes on Astronomical instruments

Module 3: CHEMISTRY IN INDIA

(12 Periods)

Early Chemical Techniques, Atomism in Vaiśeṣika - Rishi Kanad- Nagarjuna- Al-Bīrūnī, Vāgbhaṭa- Sushruta- Carak Metallurgy in India - Definition, Metallurgy in Harappan Civilization, Metallurgy of Gold- Copper-Zinc- Bronze - Iron and steel.

Module 4: DEVELOPMENTS IN MATHEMATICS

(12 Periods)

Number systems- Geometry- works of Pingala- Baudhayana- Jaina Mahavira-Sridharacharya – Madhava Siddhanthas and Calender systems

Total Periods: 45

EXPERIENTIAL LEARNING

1. List out the aspects of ancient philosophy of the Vedason the charts and explain in detail.
2. Discuss different astronomical instruments.
3. Describe different metals with respect to civilizations.
4. Imagine you are a mathematician and illustrate different number systems.
5. Assume and interpret different siddhanthas and calendar systems.

RESOURCES

TEXTBOOK:

1. "Indian Knowledge Systems": by ParthaPratim Ray (2024 edition).
2. "Introduction to Indian Knowledge System: Concepts and Applications": by B. Mahadevan and others (various editions available, with a 2022 edition noted).

REFERENCE BOOKS:

1. Concise History of Science in India – Bose, Sen & Subbarayappa- INSA Publications (2009 edition)
2. Encyclopedia of Classical Indian Sciences- Roddam Narasimha, Universities Press, 2007.

VIDEO LECTURES:

1. <https://iksindia.org/lectures-and-videos.php>
2. <https://www.youtube.com/watch?v=D3f3jIcEZho>

WEB RESOURCES:

1. [//nep.puchd.ac.in/iks.pdf](https://nep.puchd.ac.in/iks.pdf)
2. [//www.millenniumassessment.org/documents/bridging/papers/balasubramian.a.pdf](https://www.millenniumassessment.org/documents/bridging/papers/balasubramian.a.pdf)

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25SS101708	INTRODUCTION TO INDIAN KNOWLEDGE SYSTEMS	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: The course introduces students to key areas of the Indian Knowledge System (IKS), such as research methods, astronomy, literature and arts, agriculture and food, Ayurveda, and architecture.

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

- CO1.** Demonstrate the various pramanas used in the Indian Knowledge System.
- CO2.** Analyse fields of IKS related to Astronomy, Arts, Ayurveda, and Architecture.
- CO3.** stand the Earth and Atmosphere related specifically to earthquakes, clouds, rainfall, soil, agriculture, and food science
- CO4.** Explore different fields of study in IKS further with the references and the resources provided during the course.
- CO5.** Analyse various materials in āyurveda, rasaśāstra, and vāstuvidyā

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	2	1	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-
CO3	2	2	-	3	-	-	-	2	-
CO4	1	1	-	-	-	-	3	3	-
CO5	1	1	-	-	-	-	3	3	-
Course Correlation Mapping	2	2	3	3	-	-	3	3	-

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: ASTRONOMY AND MATHEMATICS

(10 Periods)

Introduction to various fields in the traditional Indian Knowledge system. Methods and sources - Ancient Indian Observational astronomy. Foundation concepts - nakṣatra, graha, time units, phenomena like meteors, eclipses- Mathematical thinking - numerical and spatial thinking, śulbasūtra, zero, sundials, water clock, time measurement.

Module 2: LANGUAGE, LITERATURE AND ART

(10 Periods)

Formation of words in saṃskṛta and some ideas from Pāṇini and Patañjali. Technical words and examples of their usage- Music Vedic chants, sāma, some concepts in ancient treatises like nāradyāśikṣā, nāṭyaśāstra. Basics of related concepts like dance, meter and rasa in poetry.

Module 3: EARTH AND ATMOSPHERE

(05 Periods)

Anomalous phenomena, Earthquakes, clouds, rainfall, soil, agriculture, and food science

Module 4: ARCHITECTURE AND CIVIL ENGINEERING

(10 Periods)

Sindhu-Sarasvatī cities, description in purāṇa, arthaśāstra. A glance at select texts like nāradaśilpa, Mayamata, and mānasāra.

Module 5: MATERIAL SCIENCE

(10 Periods)

Knowledge and use of various materials in āyurveda, rasaśāstra and vāstuvidyā.

Total Periods: 45

EXPERIENTIAL LEARNING

1. List out the aspects of astronomy and mathematics on the charts and explain in detail.
2. Discuss different technical words and examples of their usage
3. Prepare a poster of anomalous phenomena of Earth and the atmosphere.
4. Demonstrate the role of architecture in the modern world.
5. Illustrate how Materials science can draw upon principles from physics, chemistry, and engineering to understand and manipulate materials.

RESOURCES

TEXTBOOK:

1. Introduction to Indian Knowledge System - A Textbook for UG Students as per NEP 2020 (English, Paperback, Dr. Rohidas Nitonde).
2. "Introduction to Indian Knowledge System: Concepts and Applications": by B. Mahadevan and others (various editions available, with a 2022 edition noted).

REFERENCE BOOKS:

1. Indian Knowledge System Principles and Practices Hardcover –Big Book, 18 December 2024 by Dr. Ajay Kumar Singh.
2. Encyclopedia of Classical Indian Sciences- Roddam Narasimha, Universities Press, 2007.

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=Gexiwsa7Gc0>
2. <https://www.youtube.com/watch?v=D3f3jIcEZho>

WEB RESOURCES:

1. [//nep.puchd.ac.in/iks.pdf](https://nep.puchd.ac.in/iks.pdf)
2. [//www.millenniumassessment.org/documents/bridging/papers/balasubramian.a.pdf](https://www.millenniumassessment.org/documents/bridging/papers/balasubramian.a.pdf)

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25LG101702	QUANTITATIVE APTITUDE AND VERBAL ABILITY	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course explores essential quantitative, verbal, and analytical reasoning skills for competitive exams and placements. It covers arithmetic, algebra, geometry, data interpretation, probability, and logical problem-solving. Verbal modules focus on grammar, vocabulary, reading comprehension, and critical reasoning techniques.

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

- CO1.** Demonstrate knowledge of number systems, percentages, ratios, and averages to solve real-time quantitative problems.
- CO2.** Apply algebraic techniques, progressions, and geometric concepts to compute and analyze mathematical scenarios.
- CO3.** Utilize combinatorics, probability, and data interpretation for decision-making under constraints.
- CO4.** Apply core grammar rules, sentence structures, reading comprehension, and critical reasoning techniques to communicate effectively.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	-	2	-	-	-	-	-
CO2	3	2	-	2	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-
CO4	3	2	2	2	-	-	-	3	-
Course Correlation Mapping	3	2	2	2	-	-	-	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: NUMBER SYSTEMS, PERCENTAGES, RATIOS & AVERAGES (09 Periods)

Number system, power cycle, remainder cycle, factors, multiples, HCF, LCM, Percentages, fraction-to-decimal conversions, increase/decrease calculations, simple and compound interest, Ratio, proportion, variation, problems on ages, profit and loss vocabulary, partnership, cost/selling price, Averages, weighted averages, mixtures and allegations.

Module 2: ALGEBRA, PROGRESSIONS, GEOMETRY (09 Periods)

Logarithms, rules and simplifications, solving quadratic equations, Arithmetic and geometric progressions, nth term, sum formulas, Geometry and mensuration, triangles, circles, area, perimeter, volume, surface area, Time and work, efficiencies, pipes and cisterns, division of wages, Speed, distance, relative motion, trains, boats and streams, races.

Module 3: COMBINATORICS, PROBABILITY, AND DATA INTERPRETATION (09 Periods)

Permutation and combination, counting principles, factorials, arrangements, selections, Probability concepts, events, rules of probability, real-life applications, Data interpretation from tables, pie charts, bar graphs, Data sufficiency techniques, evaluating adequacy of given data, Basic logical reasoning within quantitative problem-solving.

Module 4: CORE VERBAL GRAMMAR AND SENTENCE STRUCTURE (09 Periods)

Sentence correction, subject-verb agreement, modifiers, parallelism, tenses, comparisons, Articles and prepositions, omission rules, compound structures, interrogatives, Active and passive voice, direct and indirect speech rules, Sentence completion, para-jumbles, context clues, logical connectors, Vocabulary building, synonyms, antonyms, word usage, analogies.

Module 5: READING COMPREHENSION AND CRITICAL REASONING (09 Periods)

Reading comprehension types, speed reading, tone/inference-based questions, Critical reasoning – arguments, assumptions, conclusions, strengthen/weaken/inference, Word roots, prefixes, suffixes, sentence structure clues, Logical structuring of arguments, spotting fallacies, Application of reasoning in RCs, data-based questions, verbal puzzles.

Total Periods: 45

EXPERIENTIAL LEARNING

1) **NUMBER SYSTEMS, PERCENTAGES, RATIOS & AVERAGES**

A trader has 3 varieties of rice 13529 kg, 9617 kg, 7987 kg by weights. Find the minimum number of bags of equal size in which he can store the rice without mixing.

- a) 163
- b) 191
- c) 246
- d) 212

2) **NUMBER SYSTEMS, PERCENTAGES, RATIOS & AVERAGES**

The ratio of the ages of A and B is 3:4. After 5 years, the ratio becomes 4:5. What are their present ages?

- a) 15 and 20
- b) 18 and 24
- c) 30 and 40
- d) 20 and 25

3) **ALGEBRA, PROGRESSIONS, GEOMETRY**

Solve for x:

If $2x + 3 = 7$, then what is the value of x?

- a) 1
- b) 2
- c) 3
- d) 4

4) **ALGEBRA, PROGRESSIONS, GEOMETRY**

The perimeter of a rectangle is 36 cm. If the length is 10 cm, what is the width?

- a) 8 cm
- b) 9 cm
- c) 6 cm
- d) 7 cm

5) **COMBINATORICS, PROBABILITY, AND DATA INTERPRETATION**

A card is drawn at random from a standard deck of 52 playing cards. What is the probability that it is a red king?

- a) $1/13$
- b) $1/26$
- c) $1/52$
- d) $2/13$

6) **COMBINATORICS, PROBABILITY, AND DATA INTERPRETATION**

The number of students in five different classes is as follows:

Class A – 40, Class B – 35, Class C – 50, Class D – 45, Class E – 30.

What is the average number of students per class?

- a) 38
- b) 40
- c) 42
- d) 45

7) **CORE VERBAL GRAMMAR AND SENTENCE STRUCTURE**

Identify the grammatically correct sentence:

- a) He go to the gym every morning.
- b) He goes to the gym every morning.
- c) He going to the gym every morning.
- d) He gone to the gym every morning.

8) **CORE VERBAL GRAMMAR AND SENTENCE STRUCTURE**

Despite the heavy rain, the match _____.

- a) has cancel
- b) was cancelled
- c) will be cancelled
- d) continued as scheduled

9) **READING COMPREHENSION AND CRITICAL REASONING**

Passage: The Earth's climate has changed throughout history. However, the current trend of global warming is particularly alarming because it is occurring at an unprecedented rate. Scientists overwhelmingly agree that human activities, especially the burning of fossil fuels, are the primary cause of this rapid change.

According to the passage, what is the main cause of current global warming?

- a) Natural changes in the climate
- b) Increase in solar activity
- c) Volcanic eruptions
- d) Human activities like burning fossil fuels

10) **READING COMPREHENSION AND CRITICAL REASONING**

A new study shows that students who take handwritten notes retain more information than those who type notes. Therefore, schools should ban laptops during lectures to improve student learning.

Which of the following, if true, most seriously weakens the argument?

- a) Many students find typing faster than writing by hand.
- b) Some students need laptops to access course materials.
- c) The study did not account for the difficulty level of the lectures.
- d) The students who typed their notes reviewed them more often than those who wrote by hand.

RESOURCES

TEXTBOOK:

- 1. "R.S. Aggarwal", Quantitative Aptitude for Competitive Examinations, S. Chand Publishing, 2025.
- 2. "Abhijit Guha", Quantitative Aptitude for Competitive Examinations, 7th edition, Tata McGraw Hill Education, 2021.

REFERENCE BOOKS:

- 1. "Arun Sharma", How to Prepare for Quantitative Aptitude for CAT, 11th Edition, McGraw Hill Education, 2024.
- 2. "Nishit Sinha", Quantitative Aptitude for CAT, 5th edition, Pearson Education, 2020.

SOFTWARE/TOOLS:

- 1. Microsoft Excel or Google Sheets (for solving DI sets)
- 2. Any Scientific Calculator (if permitted)
- Online Aptitude Test Platforms like:
 - a. India Bix (<https://www.indiabix.com>)
 - b. Lofoya (<https://www.lofoya.com>)
 - c. Test book (<https://testbook.com>)

VIDEO LECTURES:

- 1. NPTEL: Aptitude Learning (Verbal & Quant)
- 2. Unacademy: Quantitative Aptitude by Arun Sharma
- 3. YouTube: Talent Sprint Aptitude Classes
- 4. YouTube: Study Smart – Full Aptitude Playlist
- 5. Udemy: Quantitative Aptitude for Competitive Exams

WEB RESOURCES:

- 1. <https://www.indiabix.com/aptitude/questions-and-answers/>
- 2. <https://www.geeksforgeeks.org/aptitude/>
- 3. <https://www.lofoya.com>
- 4. <https://www.placementseason.com/aptitude-questions>
- 5. <https://www.campusgate.co.in/p/quantitative-aptitude.html>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25LG101703	LOGICAL REASONING AND RECRUITMENT ESSENTIALS	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course develops essential logical reasoning, analytical skills, and practical communication for competitive exams and placements. It covers data arrangements, coding-decoding, pattern recognition, counting principles, probability, and data interpretation. Learners also acquire skills in logical connectives, syllogisms, time and direction sense, along with group discussions, resume writing, and interview preparation.

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

- CO1.** Apply concepts of data arrangements, blood relations, ranking, and direction sense to solve spatial and logical reasoning problems.
- CO2.** Analyze patterns in coding-decoding, series, analogies, odd-one-out, and visual reasoning to improve abstraction and recognition skills.
- CO3.** Apply principles of combinatorics, probability, data interpretation, logical connectives, syllogistic reasoning, and time-space analysis to construct effective solutions and derive valid conclusions.
- CO4.** Demonstrate effective communication skills in group discussions, resume writing, and personal interviews through structured activities.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	-	2	-	-	-	-	-
CO2	3	2	3	2	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-
CO4	3	2	-	2	-	-	-	3	-
Course Correlation Mapping	3	2	2	2	-	-	-	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: DATA ARRANGEMENTS AND BLOOD RELATIONS (08 Periods)

Linear arrangement, circular arrangement, multi-dimensional arrangement, coded and descriptive blood relations, family trees, ranking, and ordering problems. Focus on directional logic, positional comparisons, and attribute-based placement. Enhances spatial reasoning and logical deduction skills.

Module 2: CODING-DECODING, SERIES, ANALOGY, ODD ONE OUT & VISUAL REASONING (08 Periods)

Letter coding, number coding, substitution patterns, alphanumeric series, analogy-based reasoning, identifying odd one out in sequences, visual reasoning including mirror images, paper folding, figure sequences. Builds pattern recognition and abstraction abilities.

Module 3: COUNTING PRINCIPLES, P&C, PROBABILITY, DATA INTERPRETATION & SUFFICIENCY (09 Periods)

Fundamental counting principle, permutation and combination, probability theory and applications, interpreting pie charts, tables, and bar graphs, data sufficiency problems requiring logical assessment of given facts. Develops analytical thinking and quantitative aptitude.

Module 4: LOGICAL CONNECTIVES, SYLLOGISMS, VENN DIAGRAMS, CLOCKS, CALENDARS & DIRECTION (08 Periods)

IF-THEN logic, syllogistic reasoning with Venn diagrams, calendar-based date/day calculations, clock-angle problems, direction sense and cube-based spatial puzzles. Trains logical sequencing and time-space orientation.

Module 5: RECRUITMENT ESSENTIALS – GD, RESUME & INTERVIEW SKILLS (12 Periods)

Basics of group discussion, resume writing guidelines, and key sections, personal interview structure, HR and technical questions, body language tips, mock GD and interview sessions for real-time practice and evaluation. Equips students with communication and interview readiness.

Total Periods: 45

EXPERIENTIAL LEARNING

LIST OF EXERCISES:

1) **DATA ARRANGEMENTS AND BLOOD RELATIONS**

Six people – A, B, C, D, E, and F – are sitting in a row, facing north.

- B is sitting to the immediate right of D.
- C is at one of the ends.
- A is sitting between E and F.
- D is not at either end.
- E is sitting to the left of A.

Who is sitting in the middle?

Options:

- A) A
- B) B
- C) D
- D) F

2) **DATA ARRANGEMENTS AND BLOOD RELATIONS**

Pointing to a man, Mira says, "He is the son of my mother's only daughter."

How is the man related to Mira?

Options:

- A) Son
- B) Nephew
- C) Cousin
- D) Brother

3) **CODING-DECODING, SERIES, ANALOGY, ODD ONE OUT & VISUAL REASONING**

In a certain code language, **GAMES** is written as **HZNFT**.

How is **PLANE** written in that code?

Options:

- A) QMBOF
- B) QMBOD
- C) QNCOD
- D) OKZMD

4) **CODING-DECODING, SERIES, ANALOGY, ODD ONE OUT & VISUAL REASONING**

Which word does **not** belong to the group?

Options:

- A) Apple
- B) Mango
- C) Banana
- D) Carrot

5) **COUNTING PRINCIPLES, P&C, PROBABILITY, DATA INTERPRETATION & SUFFICIENCY**

If the sales of Company A in 2021 were 80 units and in 2022 were 120 units, what was the percentage increase?

Options:

- A) 33.3%
- B) 50%
- C) 40%
- D) 60%

6) **COUNTING PRINCIPLES, P&C, PROBABILITY, DATA INTERPRETATION & SUFFICIENCY**

The number of students in five different classes is as follows:
Class A – 40, Class B – 35, Class C – 50, Class D – 45, Class E – 30.
What is the value of x?

Statement I: $x^2 = 49$

Statement II: x is a negative number

A) Only I is sufficient

B) Only II is sufficient

C) Both I and II together are sufficient

D) Each alone is sufficient

7) **LOGICAL CONNECTIVES, SYLLOGISMS, VENN DIAGRAMS, CLOCKS, CALENDARS & DIRECTION**

Statements:

1. All engineers are logical.
2. Some logical people are creative.
3. No creative person is careless.

Conclusion:

I. Some engineers are creative.

II. No engineer is careless.

Choose the correct option:

A) Only I follows

B) Only II follows

C) Neither I nor II follows

D) Both I and II follow

8) **LOGICAL CONNECTIVES, SYLLOGISMS, VENN DIAGRAMS, CLOCKS, CALENDARS & DIRECTION**

Ravi starts from his home at 3:00 PM and walks 4 km East, then turns left and walks 3 km. He then turns left again and walks 4 km. What direction is he facing, and what time will it be if each km takes him 15 minutes?

A) Facing North, 3:45 PM

B) Facing West, 4:00 PM

C) Facing South, 4:00 PM

D) Facing West, 3:45 PM

9) **RECRUITMENT ESSENTIALS – GD, RESUME & INTERVIEW SKILLS**

Improves Communication Skills – Students learn to express their thoughts clearly and confidently in a group setting.

Builds Critical Thinking – It enhances analytical skills by encouraging students to think on their feet, structure arguments, and respond to different viewpoints.

Boosts Teamwork & Listening Skills – GD teaches the importance of active listening, respecting others' opinions, and working collaboratively, which are essential in professional environments.

10) **RECRUITMENT ESSENTIALS – GD, RESUME & INTERVIEW SKILLS**

Boosts Confidence – Simulated interviews reduce anxiety and prepare students to face real interviews with ease.

Improves Self-Presentation – Students learn how to present their strengths, goals, and experiences effectively.

Provides Constructive Feedback – Personalized feedback helps identify areas for improvement in communication, attitude, and body language.

RESOURCES

TEXTBOOK:

1. "R.S. Aggarwal", Quantitative Aptitude for Competitive Examinations, S. Chand Publishing, 2025.
2. "Abhijit Guha", Quantitative Aptitude for Competitive Examinations, 7th edition, Tata McGraw Hill Education, 2021.

REFERENCE BOOKS:

1. "Arun Sharma", How to Prepare for Quantitative Aptitude for CAT, 11th Edition, McGraw Hill Education, 2024.
2. "Nishit Sinha", Quantitative Aptitude for CAT, 5th edition, Pearson Education, 2020.

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 - b. Lofoya (<https://www.lofoya.com>)
 - c. Test book (<https://testbook.com>)

VIDEO LECTURES:

1. NPTEL: Aptitude Learning (Verbal & Quant)
2. Un academy: Quantitative Aptitude by Arun Sharma
3. YouTube: Talent Sprint Aptitude Classes
4. YouTube: Study Smart – Full Aptitude Playlist
5. UdeMy: Quantitative Aptitude for Competitive Exams

WEB RESOURCES:

1. <https://www.indiabix.com/aptitude/questions-and-answers/>
2. <https://www.geeksforgeeks.org/aptitude/>
3. <https://www.lofoya.com>
4. <https://www.placementseason.com/aptitude-questions>
5. <https://www.campusgate.co.in/p/quantitative-aptitude.html>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25EC101707	QUANTUM AI	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course introduces the fundamentals of Quantum Artificial Intelligence (Quantum AI), an emerging field that combines quantum computing with artificial intelligence to develop intelligent systems capable of solving complex problems more efficiently than classical methods. Students will explore core concepts of quantum computation, classical and quantum problem-solving, reversible logic, quantum probability, and quantum-inspired cognitive models.

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

- CO1.** Understand the foundational concepts of Quantum AI, including its advantages, working principles, challenges, and its relation to classical and quantum computation.
- CO2.** Analyze classical computation frameworks such as decision problems, P vs NP, and the Church-Turing-Deutsch principle, and apply them to knowledge representation and production systems.
- CO3.** Apply the concepts of reversible computation and probabilistic models like Bayes's theorem and Naïve Bayes to categorize and process information effectively.
- CO4.** Evaluate quantum problem-solving methods using heuristic search, quantum tree search, and production systems for cognitive architectures and structured problems like the n-puzzle.
- CO5.** Explore quantum cognition approaches including quantum probability, decision-making strategies, quantum walk, and quantum neural computation to understand emerging models of intelligent behavior.

CO-PO Mapping Table:

Course Outcome	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	-	-	-	-	-	2	2
CO2	3	3	2	-	-	-	-	2	2
CO3	2	3	2	-	-	-	-	-	2
CO4	3	3	3	2	-	-	-	2	2
CO5	3	2	2	2	-	-	-	3	3
Course Correlation Mapping	3	3	3	2	-	-	-	3	3

Correlation Level: 3-High; 2-Medium; 1-Low

COURSE CONTENT

Module 1: INTRODUCTION

(08 Periods)

Definition of quantum AI, Advantages of QAI (Quantum AI), How Quantum AI Works, why is Quantum AI Important, Current Challenges, Future of Quantum AI, Motivation and Goals, Classical computation, Quantum computation.

Module 2: COMPUTATION, PROBLEM SOLVING AND PRODUCTION SYSTEM.

Cantor's diagonal argument, Decision problems, P and NP, Church-Turing-Deutsch principle, Knowledge Representation, Rules, Logic-based operators, Frames, Categorial representation, Binary vector representation, Deduction systems, Reaction systems, Human problem-solving, Example, Proto logic, Binding problem, Icons, Euclidian geometry of the world.

Module 3: REVERSIBLE ALGORITHMS AND PROBABILITY

(08 Periods)

Reversible Computation, Boolean gates, Reversible Boolean gates, Toffoli gate, Circuit, Conditional probability, Bayes's rule, Joint distribution, Naive Bayes and counting, Counting and categorization.

Module 4: QUANTUM PROBLEM-SOLVING

(10 Periods)

Symbols and Quantum Reality, Uninformed Tree Search, Heuristic functions, Invention of heuristic functions, Quality of heuristic, Principles of quantum tree search, Iterative quantum tree search, no constant branching factor, Quantum Production System, 3-puzzle, Extending for any n-puzzle, Pure production system, Cognitive architecture, Representation.

Module 5: QUANTUM COGNITION AND RELATED APPROACHES

(09 Periods)

Quantum Probability, Decision Making, Unpacking Effects, Quantum Walk: Random Walk, Quantum insect, Quantum Walk on a graph, Quantum Walk on one dimensional lattice, Quantum Walk and search, Quantum Walk for formula evaluation, Adiabatic Computation, Quantum Neural Computation.

Total Periods: 45

EXPERIENTIAL LEARNING:

1. Build a quantum random number generator
2. Simulate a quantum walk

RESOURCES

TEXT BOOK:

1. Andreas Wichert, principles of quantum artificial intelligence, Copyright © 2014 by World Scientific Publishing Co. Pte. Ltd., ISBN 978-981-4566-74-2.

REFERENCE BOOK:

1. No sons. Yanofsky, Mirco A. Mannucci, "Quantum Computing for Computer Scientists"

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=F3nwNK28LzA&pp=0gcJCf0Ao7VqN5tD>
2. https://www.youtube.com/channel/UCgUUiDMmN9AsC2LyQSh_KXw/playlists

WEB RESOURCES:

1. https://www.researchgate.net/publication/262883357_Principles_of_Quantum_Artificial_Intelligence_World_Scientific
2. https://www.worldscientific.com/worldscibooks/10.1142/8980?srsItd=AfmBOop7WiTj56KDDqGnXwRcFMrOlyhVcN5HyIE3S9JO67M_AI45Lwsw
3. <https://www.coursera.org/articles/what-is-quantum-ai>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CA101702	SOFTWARE ENGINEERING FOR AI	3	-	-	-	3
Pre-Requisite	Software engineering					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course introduces the principles and practices of software engineering specifically tailored for AI-based systems. It covers the full lifecycle of AI software development, integrating traditional software engineering methods with modern AI and machine learning workflows. Students will learn how to define requirements, design modular and interpretable systems, engineer data pipelines, develop and test AI models, and deploy them responsibly. Emphasis is placed on maintainability, scalability, fairness, and ethical considerations in building AI-driven applications.

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

- CO1.** Analyze the fundamental differences between conventional software engineering and AI-based systems,
- CO2.** Apply incremental and exploratory system engineering methodologies, to design AI systems.
- CO3.** Analyze exploratory programming practices for managing evolving AI software systems.
- CO4.** Evaluate the design and engineering aspects of machine learning systems and expert systems.
- CO5.** Design AI-driven practical software using engineering toolboxes, support environments.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	-	-	-	-	-	2	2
CO2	3	3	2	2	-	-	-	-	2
CO3	2	3	3	2	-	-	-	2	2
CO4	3	3	2	2	-	-	-	2	2
CO5	3	3	3	2	2	-	-	3	3
Course Correlation Mapping	3	3	3	2	2	-	-	3	3

Correlation Level: 3-High; 2-Medium; 1-Low

COURSE CONTENT

Module 1: INTRODUCTION TO COMPUTER SOFTWARE FOR AI, AI (10 periods) PROBLEMS AND CONVENTIONAL SE PROBLEMS

Computers and software systems, An introduction to Software engineering, Bridges and buildings versus software systems, the software crisis A need for AI systems What is an AI problem, Ill-defined specifications, correct versus 'good enough' solutions, Context-free problems, SAV methodology, the myth of complete specification, what is verifiable, SAT methodology, testing for reliability, the strengths, the weaknesses

Module 2: INCREMENTAL AND EXPLORATORY METHODOLOGY FOR SYSTEM ENGINEERING (09 periods)

Classical methodology and AI problems, The RUDE cycle, Malleable software, AI muscles on a conventional skeleton Conventional paradigms Automatic programming, Transformational implementation, The "new paradigm" of Blazer, Cheatham and Green, Operational requirements of Kowalski, The POLITE methodology

Module 3: EXPLORATORY PROGRAMMING (09 periods)

Reverse engineering, Reusable software Design knowledge, Stepwise abstraction, The problem of decompiling, Controlled modification, Structured growth Self-adaptive software, The threat of increased software problems

Module 4: MACHINE LEARNING AND EXPERT SYSTEMS (09 periods)

Practical machine learning examples, Multisession inductive programming, Expert Systems: Expert systems as AI software, Engineering expert systems, The lessons of expert systems for engineering AI software

Module 5: AI INTO PRACTICAL SOFTWARE (08 periods)

Support environments, Reduction of effective complexity, moderately stupid assistance, An engineering toolbox, Self-reflective software, Over engineering software, Future Holds

Total Periods: 45

RESOURCES

TEXT BOOK:

1. Derek Partridge, "Artificial Intelligence and Software Engineering", Glenlake Publishing Company, 1998.

REFERENCE BOOKS:

1. "The role of Artificial Intelligence in Software Engineering", K. Nitalksheswara Rao, 2020
2. "Farid Meziane & Sunil Vadera, "Artificial Intelligence Applications for Improved Software Engineering Development", Information Science Reference, 2009

VIDEO LECTURES

1. <https://www.youtube.com/watch?v=Ccku34DU7k4>
2. <https://www.youtube.com/watch?v=WNxc85aFFbM>
3. <https://www.youtube.com/watch?v=KIC-sFz5OT8>
4. <https://www.youtube.com/playlist?list=PLDS2JMJnJzdkQPdkhcuwcbJpjB84g9ffX>

WEB RESOURCES

1. <https://www.geeksforgeeks.org/software-engineering/ai-in-software-engineering>
2. <https://www.coursera.org/learn/team-software-engineering-with-ai>
3. <https://ckaestne.github.io/seai/S2020/>
4. <https://www.seerene.com/ai4se>
5. <https://www.coursera.org/specializations/generative-ai-for-software-developers>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CB101703	ADVANCED ARTIFICIAL INTELLIGENCE	3	-	-	-	3
Pre-Requisite	Artificial intelligence					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course offers an in-depth exploration of advanced concepts and methodologies in Artificial Intelligence (AI), preparing students for real-world applications. Beginning with a comprehensive introduction to the foundations and evolution of AI, the course covers cognitive modelling, expert systems, and intelligent robotics. Students delve into advanced reasoning mechanisms including deductive, inductive, abductive, and common-sense reasoning that are essential for building intelligent systems capable of human-like decision-making.

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

- CO1.** Summarize the evolution and history of Artificial Intelligence and its major research domains.
- CO2.** Apply reasoning techniques to real-world and AI problem contexts.
- CO3.** Apply Game Theory models such as zero-sum and evolutionary games to decision-making problems in AI.
- CO4.** Apply Bayesian and Gaussian Process models in real-world transfer learning applications.
- CO5.** Design solution strategies using AI platforms for domain-specific scientific challenges.

CO-PO Mapping Table:

Course Outcome	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	-	-	-	-	-	2	2
CO2	3	3	3	2	-	-	-	2	2
CO3	2	3	3	2	2	-	-	-	2
CO4	3	3	2	3	2	-	-	-	2
CO5	3	2	3	3	2	-	2	3	3
Course Correlation Mapping	3	3	3	3	2	-	2	3	3

Correlation Level: 3-High; 2-Medium; 1-Low

COURSE CONTENT

Module 1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE (10 Periods)

Brief History of AI, Basic Content of Artificial Intelligence Research: Cognitive Modeling, Knowledge Representation, Automatic Reasoning, New Generation Artificial Intelligence, Expert System, Natural Language Processing, Intelligent Robot, Distributed Artificial Intelligence, Internet Intelligence Game, AI for Science.

Module 2: CAUSAL REASONING (09 Periods)

Deductive Reasoning, Inductive Reasoning, Abductive Reasoning, Reasoning by Analogy, Non-Monotonic Reasoning, Common Sense Reasoning.

Module 3: GAME THEORY (09 Periods)

History of Game Theory, Basic Concepts of Game Theory, Applications of Game Theory, Representation of Games: Extensive Form, Normal Form, Characteristic Function Form, Alternative Game Representations, Type of Game Theory, Zero-Sum Game, Evolutionary Game Theory, Game Dynamics: MDA Model, Applications.

Module 4: TRANSFER LEARNING (09 Periods)

History, Important Concepts, Similarity Measure, Classifications, Negative Transfer, Inductive Transfer Learning, Transfer Learning, Model-Based Transfer Learning, Bayesian Models. Gaussian Process (GP), Deep Transfer Learning, Heterogeneous Transfer Learning, Multi-task Transfer Learning, Domain Adaptation Transfer Learning.

Module 5: ARTIFICIAL INTELLIGENCE FOR SCIENCE (08 Periods)

Introduction, Knowledge Discovery, Protein Structure Prediction, Drug Development, Genetic Research, Biological Breeding, New Materials, Superconducting Materials, Graphene, Liquid Metal, Climate Change Climate Model, Long-Term Impacts, Solution Strategy, Platform of Artificial Intelligence for Science.

Total Periods: 45

EXPERIENTIAL LEARNING

Real-World Case Study Analysis on

1. AI in healthcare
2. AI in finance or e-commerce (credit scoring, dynamic pricing)

RESOURCES

TEXT BOOK:

1. Zhongzhi SHI, Advanced Artificial intelligence, World Scientific Publishing Co. Pte. Ltd, 3rd edition, ISBN 9789811293986 (hardcover) , 3rd edition.

REFERENCE BOOKS:

1. Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, 4th (2020) edition, Pearson publications.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press

VIDEO LECTURES

1. <https://www.youtube.com/watch?v=1HpYwa52LeY>
2. <https://www.youtube.com/watch?v=kOkehUZrjBM>
3. https://www.youtube.com/playlist?list=PLxf3-FrL8GzRALeq_9BtdQclN6SF4bTCG

WEB RESOURCES

1. <https://people.engr.tamu.edu/guni/csce625/slides/AI.pdf>
2. <https://dokumen.pub/advanced-artificial-intelligence-3nbsped-9789811293986-9789811293993-9789811294006.html>
3. https://nou.edu.ng/coursewarecontent/CIT%20903%20Advanced%20Artificial%20Intelligence_0.pdf
4. <https://home.schoolnutritionandfitness.com/index.jsp/uploaded-files/M2E709/AdvancedArtificialIntelligenceBook.pdf>

UNIVERSITY ELECTIVE

Course Code	Course Title	L	T	P	S	C
25CE101706	INDIAN KNOWLEDGE SYSTEM IN TOWN PLANNING AND ARCHITECTURE	3	-	-	-	3
Pre-Requisite	-					
Anti-Requisite	-					
Co-Requisite	-					

COURSE DESCRIPTION: This course explores the profound and time-tested wisdom of the Indian Knowledge System (IKS) as it applies to town planning and architecture. Drawing from ancient texts like the Vastu Shastra, Artha shastra, Manasara, and Silpa Shastra, the course delves into how traditional Indian principles harmonized built environments with nature, climate, cosmology, and societal needs. The course provides a historical and philosophical framework to understand the design of cities, temples, dwellings, water management systems, and public spaces in ancient and medieval India.

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

- CO1.** Demonstrate knowledge of traditional Indian architectural and urban planning systems.
- CO2.** Interpret ancient design treatises and relate their principles to real-world examples.
- CO3.** Integration of culture, environment, and functionality in traditional planning.
- CO4.** Apply IKS principles to modern urban and architectural contexts with sustainability in focus.
- CO5.** Interpret the concept of ancient stone carving and their significance in architecture.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	3	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-
CO4	3	1	-	-	-	-	-	-	-
CO5	3	1	-	-	-	-	-	-	-
Course Correlation Mapping	3	2	-	-	-	-	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: ANCIENT TEXT AND TOWN PLANNING (09 Periods)

Introduction to ancient text in the context of Town Planning and Governance; terminologies; Indic languages in which the knowledge is embedded; Chronology of development of ancient text and changing principles.

Module 2: PRINCIPLES OF TOWN PLANNING (09 Periods)

Ancient India progressed towards urbanization with cities of various sizes and shapes. Elaboration of basic understanding of the layouts in terms of geometry, formulae and theory based on population, geography, and various communities shall be understood.

Module 3: ANCIENT TOWNS AND PRESENT PLANNING PRACTICES (09 Periods)

Evolution of the cities following the ancient town planning principles in urban centres. Interconnection between ancient knowledge of town planning and present planning practices to establish the relationship between theory and practice.

Module 4: CLAY ARCHITECTURE (09 Periods)

Terracotta and Terracruda, Brick structures and urns from the Indus Valley and Megalithic sites in south India, Sculptures of terracotta and bronze from Harappa, Terracruda or unbaked clay-made objects and rituals.

Module 5: STONE AND GARDEN (09 Periods)

Stone: Memorials, Architectural Remnants and Objects- Types of stone in India: Mathura Sandstone, Deccani Basalt, Rajasthani Marble, Stone carving for architecture and their social significance. Garden: Islam, the garden of paradise and afterlife, Tombs, palace, garden and waterways from the Mughal and Deccani context.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

EXPERIENTIAL LEARNING

1. Heritage Walks & On-Site Case Studies (Nearby towns)
2. Hands-on mapping of **temple towns**
3. Students make small prototype using traditional techniques.
4. Students document traditional water harvesting system

(Note: It's an indicative one. Course Instructor may change activities and shall be reflected in course Handout)

RESOURCES

TEXT BOOKS:

1. Ali, Daud and Emma Flatt eds, Garden and landscape practices in pre-colonial India: histories from the Deccan, New Delhi: Routledge 2020.
Dehejia, Vidya, Chola: Sacred Bronzes of Southern India, London: Royal Academy of Arts 2006.

REFERENCE BOOKS:

1. Goswamy, B. N., and Eberhard Fischer, Pahari Paintings: The Horst Metzger collection in the Museum Rietberg, New Delhi: Niyogi Books 2017.
2. Hardy, Adam, The Temple Architecture of India. Chichester (GB), J. Wiley and Sons 2007.
3. Pandey, Shailaja, Mayamata: An Indian treatise on housing architecture and iconography, Chaukhamba Surbharati Prakashan 2007.
4. Sharma, Sudarshan Kumar, Samarangana Sutradhara, Parimal Publications 2008.
5. Sharma B.L, Vishvakarma - Vastushastram, Parimal Publications 2010.
6. Jugnu, Shri Krishna, Aparajitprachha, Parimal Publications 2011.
7. Patrick Olivelle, King, governance, and law in ancient India: Kauṭilya's Arthashastra: a new annotated translation, Oxford University Press 2013.
8. Apte, Prabhakar, Samarangana Sutradhara, IGNCA 2023.

VIDEO LECTURES:

1. <https://iksindia.org/lectures-and-videos.php>
2. <https://www.youtube.com/watch?v=4NT9reg4G3s>
3. https://onlinecourses.swayam2.ac.in/imb23_mg53/preview
4. https://www.youtube.com/@IKS_Media_MoE/videos

WEB RESOURCES:

1. <https://nitkkr.ac.in/ndian-knowledge-systems-iks>
2. <https://iksindia.org/research-proposal-form.php>
3. https://en.wikipedia.org/wiki/Indian_Knowledge_Systems