PSG INSTITUTE OF TECHNOLOGY AND APPLIED RESEARCH

COIMBATORE – 641 062

(Autonomous college affiliated to Anna University)

R2025

Courses of Study, Scheme of Assessment and Syllabi for First, Second, Third and Fourth Semesters

for

B.Tech. Artificial Intelligence and Data Science

B.Tech. ARTIFICAL INTELLIGENCE AND DATA SCIENCE

(Minimum No. of credits to be earned: 168)

S. No.	Course Code	Course Title	Hours / Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER I										
THEORY										
1	25MA101	Calculus and its Applications	3	1	0	4	40	60	100	BS
2	25CS101	C Programming	3	0	0	3	40	60	100	ES
3	25EE101	Basics of Electrical and Electronic Systems	3	0	0	3	40	60	100	ES
4	25HS101	English Language Proficiency	3	1	0	4	40	60	100	HS
5	25HS102	தமிழர் மரபு / Heritage of Tamils	1	0	0	1	40	60	100	HS
PRACTICALS										
6	25CS111	C Programming Laboratory	0	0	4	2	60	40	100	ES
7	25EE112	Engineering Skills Laboratory	0	0	4	2	60	40	100	ES
8	25GE111	Design Thinking for Innovation	0	0	2	1	100	0	100	ES
MANDATORY COURSES										
9	25GEM01	Induction Programme**	-	-	-	Grade	-	-	-	MC
Total 25 periods			**13**	**2**	**10**	**20**	**420**	**380**	**800**	

S. No.	Course Code	Course Title	Hours / Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER II										
THEORY										
1	25MA202	Transforms and Applications	3	1	0	4	40	60	100	BS
2	25MA203	Discrete Mathematics	3	1	0	4	40	60	100	BS
3	25CY202	Applied Chemistry	3	0	0	3	40	60	100	BS
4	25AD201	Python Programming	3	0	0	3	40	60	100	ES
5	25AD202	Digital Principles and Computer Organization	3	0	0	3	40	60	100	ES
6	25HS201	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	1	0	0	1	40	60	100	HS
PRACTICALS										
7	25AD211	Python Programming Laboratory	0	0	4	2	60	40	100	ES
8	25CY211	Chemistry Laboratory	0	0	4	2	60	40	100	BS
9	25GE211	Engineering Graphics	0	0	4	2	60	40	100	ES
10	25HS21_	Language Elective	0	0	4	2	60	40	100	HS
11	25EEC01	Workplace Communication Skills	0	0	2	Grade	100	0	100	EEC
MANDATORY COURSES										
12	25GEM02	Activity Point Programme I*	-	-	-	Grade	-	-	-	
Total 36 periods			**16**	**2**	**18**	**26**	**580**	**520**	**1100**	

**** As per AICTE Norms,**

*** As per AICTE Norms Total: 60 hours, Grade: Non - Credit Course,**

CA - Continuous Assessment; ESE – End-Semester Examination; CAT - Category; BS - Basic Science; HS - Humanities and Social Sciences; ES - Engineering Sciences; PC - Professional Core; PE - Professional Elective; OE – Open Elective; EEC - Employability Enhancement Course; MC – Mandatory Course

S. No.	Course Code	Course Title	Hours / Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER III										
THEORY										
1	25MA301	Linear Algebra and its Applications	3	1	0	4	40	60	100	BS
2	25MA303	Probability, Stochastic Processes and Statistics	3	1	0	4	40	60	100	BS
3	25CS301	Data Structures	3	0	0	3	40	60	100	PC
4	25AD301	Fundamentals of Data Science and Analytics	3	0	0	3	40	60	100	PC
5	25AD302	Data Engineering	3	0	0	3	40	60	100	PC
6	25CS303	Object Oriented Programming	2	0	2	3	50	50	100	PC
PRACTICALS										
7	25CS311	Data Structures Laboratory	0	0	4	2	60	40	100	PC
8	25AD311	Data Analytics and Visualization Laboratory	0	0	4	2	60	40	100	PC
9	25EEC02	Foundations for Problem Solving	0	0	2	1	100	0	100	EEC
MANDATORY COURSES										
10	25MC0__	Mandatory Course I	2	0	0	Grade	100	0	100	MC
11	25GEM03	Activity Point Programme II*	-	-	-	Grade	-	-	-	MC
Total 33 periods			**19**	**2**	**12**	**25**	**570**	**430**	**1000**	

S. No.	Course Code	Course Title	Hours / Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER IV										
THEORY										
1	25MA401	Optimization Techniques for Analytics	3	1	0	4	40	60	100	BS
2	25CS401	Database Management Systems	3	0	0	3	40	60	100	PC
3	25CS402	Design and Analysis of Algorithms	3	1	0	4	40	60	100	PC
4	25AD402	Artificial Intelligence Systems	3	1	0	4	40	60	100	PC
5	25AD403	Machine Learning for Data Science	3	0	0	3	40	60	100	PC
PRACTICALS										
6	25CS411	Database Management Systems Laboratory	0	0	4	2	60	40	100	PC
7	25AD412	Artificial Intelligence and Machine Learning Laboratory	0	0	4	2	60	40	100	PC
8	25AD413	Corpus Creation Laboratory	0	0	2	1	60	40	100	ES
9	25ADE01	Mini Project I	0	0	2	1	100	0	100	EEC
10	25EEC03	Problem Solving	0	0	2	1	100	0	100	EEC
MANDATORY COURSES										
11	25MC0__	Mandatory Course II	2	0	0	Grade	100	0	100	MC
12	25GEM04	Activity Point Programme III*	-	-	-	Grade	-	-	-	MC
Total 34 periods			**17**	**3**	**14**	**25**	**680**	**420**	**1100**	

*** As per AICTE Norms Total: 60 hours, Grade: Non - Credit Course, CA - Continuous Assessment;**

ESE – End-Semester Examination; CAT - Category; BS - Basic Science; HS - Humanities and Social Sciences; ES - Engineering Sciences; PC - Professional Core; PE - Professional Elective; OE – Open Elective; EEC - Employability Enhancement Course; MC – Mandatory Course

S. No.	Course Code	Course Title	Hours / Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER V										
THEORY										
1	25HS501	Project and Finance Management	3	0	0	3	40	60	100	HS
2	25AD501	Deep Learning	3	0	0	3	40	60	100	PC
3	25CS501	Operating Systems	3	0	0	3	40	60	100	PC
4	25AD503	Data Communication Networks	3	0	2	4	50	50	100	PC
5	25ADP__[#]	Professional Elective I	3	0	0	3	40	60	100	PE
PRACTICALS										
6	25AD511	Deep Learning Laboratory	0	0	4	2	60	40	100	PC
7	25CS511	Operating Systems Laboratory	0	0	2	1	60	40	100	PC
8	25CSE02/ 25CSE03	Internship I / Community Project	0	0	0	1	100	0	100	EEC
9	25EEC04	Aptitude Skills	0	0	2	1	100	0	100	EEC
MANDATORY COURSES										
10	25GEM05	Activity Point Programme IV*	-	-	-	Grade	-	-	-	MC
Total 25 periods[#]			**15**	**0**	**10**	**21**	**530**	**370**	**900**	

S. No.	Course Code	Course Title	Hours / Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER VI										
THEORY										
1	25MA601	Graph Theory and Mining	3	1	0	4	40	60	100	BS
2	25AD601	Reinforcement Learning	3	0	2	4	50	50	100	PC
3	25AD602	Gen AI and Small Language Models	3	0	0	3	40	60	100	PC
4	25ADP__	Professional Elective II	3	0	0	3	40	60	100	PE
5	25__O__	Open Elective I	3	0	0	3	40	60	100	OE
PRACTICALS										
6	25CS611	Gen AI and Small Language Models Laboratory	0	0	4	2	60	40	100	PC
7	25CSE04	Mini Project II	0	0	2	1	100	0	100	EEC
8	25EEC06	Enhancing Arithmetic Problem Solving	0	0	2	1	100	0	100	EEC
MANDATORY COURSES										
9	25GEM06	Activity Point Programme V*	-	-	-	Grade	-	-	-	MC
Total 26 periods			**15**	**1**	**10**	**21**	**470**	**330**	**800**	

[#] **will vary for laboratory integrated theory courses**

*** As per AICTE Norms Total: 60 hours, Grade: Non - Credit Course**

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S. No.	Course Code	Course Title	Hours / Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER VII										
THEORY										
1	25AD701	Big Data and Advanced Databased Systems	3	0	2	4	50	50	100	PC
2	25AD702	Computer Vision	3	0	2	4	50	50	100	PC
3	25ADP__	Professional Elective III	3	0	0	3	40	60	100	PE
4	25ADP__	Professional Elective IV	3	0	0	3	40	60	100	PE
5	25__O__	Open Elective II	3	0	0	3	40	60	100	OE
PRACTICALS										
6	25CSE05	Project Work I	0	0	4	2	100	0	100	EEC
7	25CSE06	Internship II	0	0	0	1	100	0	100	EEC
Total 23 periods			**15**	**0**	**8**	**20**	**420**	**280**	**700**	

S. No.	Course Code	Course Title	Hours / Week			Credits	Maximum Marks			CAT
			Lecture	Tutorial	Practical		CA	ESE	Total	
SEMESTER VIII										
THEORY										
1	25ADP__	Professional Elective V	3	0	0	3	40	60	100	PE
2	25ADP__	Professional Elective VI	3	0	0	3	40	60	100	PE
PRACTICALS										
3	25CSE07	Project Work II	0	0	8	4	60	40	100	EEC
	Total 14 periods		**6**	**0**	**8**	**10**	**140**	**160**	**300**	

[#] **will vary for laboratory integrated theory courses**

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Summary of Credit Distribution

B.Tech. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE									
S. No.	Course Category	Credits Per Semester							Total Credits
		1	2	3	4	5	6	7	8	
1	HS	5	3	0	0	3	0	0	0	**11**
2	BS	4	13	8	4	0	4	0	0	**33**
3	ES	11	10	0	1	0	0	0	0	**22**
4	PC	0	0	16	18	13	9	8	0	**64**
5	PE	0	0	0	0	3	3	6	6	**18**
6	OE	0	0	0	0	0	3	3	0	**6**
7	EEC	0	0	1	2	2	2	3	4	**14**
8	MC	0	0	0	0	0	0	0	0	**0**
TOTAL		**20**	**26**	**25**	**25**	**21**	**21**	**20**	**10**	**168**

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LIST OF PROFESSIONAL ELECTIVE COURSES: VERTICALS

S. No.	VERTICAL I Full Stack Development	VERTICAL II Data Science for Intelligent System	VERTICAL III Computational Intelligence and Machine Learning	VERTICAL IV Cyber Security
1	25CSP01 Micro service Architecture	25ADP01 Recommender Systems	25ADP09 Natural Language Processing	25ADP17 Secure Coding
2	25CSP02 User Experience Design	25ADP02 Predictive Analytics	25ADP10 MLOps	25CSP14 Cyber Forensics
3	25CSP03 DevOps	25ADP03 Smart Systems	25ADP11 Immersive Technologies	25ADP20 Application Security
4	25CSP04 Software Testing and Automation	25ADP04 Image and Video Analytics	25ADP12 Conversational AI	25ADP15 Responsible AI
5	25CSP05 Secure Full Stack Development	25ADP05 Text and Speech Analysis	25ADP13 Large Language Model	25ADP07 Data Privacy and Security
6	25CSP06 MERN Stack	25ADP06 Knowledge Discovery	25ADP14 Marketing Analytics	25CSP15 AI in Cyber Security
7	25CSP07 Agile Methodologies	25ADP18 Cloud Services Management	25ADP19 Quantum Computing	25CSP21 Blockchain Technologies
8	25CSP08 Vibe Coding	25ADP08 Stream Processing	25ADP16 Cognitive Science	25CSP13 Modern Cryptography

LIST OF PROFESSIONAL ELECTIVE COURSES FOR MINOR DEGREE PROGRAMME

S. No.	Course Code	Course Title
1	25ADM01	Introduction to Artificial Intelligence
2	25ADM02	Machine Learning Algorithms
3	25ADM03	Deep Learning Essentials
4	25ADM04	Multivariate Data Analysis
5	25ADM05	Big Data & AI Integration
6	25ADM06	Gen AI Tools
7	25ADM07	Prompt Engineering
8	25ADM08	Ethics in AI

25MA101 CALCULUS AND ITS APPLICATIONS
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

3 1 0 4

DIFFERENTIAL CALCULUS: Functions of two variables, Limits and continuity, Partial derivatives, Chain rule, Extreme values and saddle points, Lagrange multipliers, Taylor's formula for two variables.

(9+3)

INTEGRAL CALCULUS: Double and iterated integrals over rectangles, Double integrals over general regions, Fubini's theorem, Area and volume by double integration, Reversing the order of integration, Double integrals in polar form.

(9+3)

FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS: Basic concepts, Separable differential equations, Exact differential equations, Integrating factors, Linear differential equations, Modeling - Mixing problems, Newton's law of cooling, Decay and growth problems.

(9+3)

SECOND ORDER LINEAR DIFFERENTIAL EQUATIONS: Homogeneous linear equations of second order, Homogeneous linear ODEs with constant coefficients, Euler– Cauchy equations, Solution by variation of parameters, Free oscillations mass spring systems, Electric circuits. **(9+3)**

VECTOR CALCULUS: Gradient and directional derivative of a scalar field, Divergence and curl of a vector field. Integration in vector field – Line integrals, Path independence of line integrals, Green's theorem in the plane, Divergence theorem of Gauss and Stokes' theorem.

(9+3)

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS:

1. J. Hass, C. Heil, and D. W. Maurice, '*Thomas' Calculus*'. Pearson Education, New Delhi, 2018.
2. Erwin Kreyszig, '*Advanced Engineering Mathematics*'. Wiley India, New Delhi, 2018.

REFERENCES:

1. H. Anton, I. Bivens, and S. Davis, '*Calculus*'. John Wiley and Sons, USA, 2016.
2. C. R. Wylie and L. C. Barrett, '*Advanced Engineering Mathematics*'. Tata McGraw-Hill, New Delhi, 2019.
3. D. G. Michael, '*Foundations of Applied Mathematics*'. Dover Publications, New York, 2013.
4. Gilbert Strang, 'Calculus'. Wellesley Cambridge Press, USA, 2017.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the concepts related to Calculus, Differential Equations and Vector Calculus.	**K2**
CO2	Apply the techniques of Calculus, Differential Equations and Vector Calculus to solve engineering problems.	**K3**
CO3	Analyze the solutions of engineering problems employing Calculus, Differential Equations and Vector Calculus.	**K4**
CO4	Use modern tools to solve engineering problems with the help of Calculus, Differential Equations and Vector Calculus.	

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1														
CO2	3													
CO3		1												
CO4					1									
@	**3**	**1**			**1**									

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25CS101 C PROGRAMMING
(Common to CSE and AI&DS)

3 0 0 3

INTRODUCTION: Evolution of programming languages, Algorithm, Pseudocode and Flowchart, Programming paradigms: Structured programming – Object oriented programming – Functional programming, Static and Dynamic type checking, Strongly and Weakly typed language, Program execution, Embedded C. **(9)**

C PRELIMINARIES AND CONTROL STATEMENTS: Character set – Identifiers and keywords, Data types, Enumeration, Declarations, Expressions, Statements, Preprocessor directives and symbolic constants – Operators and expressions – Input and output Statements, Control constructs: Unconditional statements – Conditional Statements – Branching and Looping Statements. **(9)**

FUNCTIONS AND POINTERS: Library functions and user-defined functions, Call by value, Recursion: Function call – Tail recursion – Tree recursion – Linear recursion, Macros, Storage types, Pointers: Operations on pointers – Pointer arithmetic, Call by reference, Function pointer. **(9)**

ARRAYS: One dimensional and multi-dimensional array, Defining and processing array, Array as function argument, Strings – Pointer to an Array, Array of pointers, Command line arguments, C99-Standards. **(9)**

STRUCTURES, UNION AND DATA FILES: Defining and processing a structure, Nested structures, passing structure to functions – Array of structure, Pointer to structure – Union – Dynamic memory allocation – Files: Streams, Opening and closing a file, Reading and writing a file. **(9)**

Total L: 45 periods

TEXTBOOKS:

1. H. M. Deitel and P. J. Deitel, *'C: How to Program'.* 9th Edition, Pearson, New Delhi, 2022.
2. Herbert Schildt, *'C: The Complete Reference'.* 4th Edition, McGraw Hill, Noida, 2017.

REFERENCES:

1. Pradip Dey and Manas Ghosh, *'Programming in C'*. Oxford University, New Delhi, 2018.
2. Mike McGrath, *'C Programming In Easy Steps Limited'*. 5th Edition, United Kingdom, 2018.
3. Gottfried B, *'Programming with C'*. McGraw Hill, 4th Edition, Noida, 2018.
4. B. W. Kernighan and D. M. Ritchie, *'The C Programming Language'*. 2nd Edition, Pearson, New Delhi, 2015.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the application of C programming in engineering problems.	**K2**
CO2	Apply programming knowledge to solve engineering problems through simple projects.	**K3**
CO3	Analyze data generated through C programs and effectively communicate the results.	**K4**
CO4	Evaluate different problem-solving approaches for effectiveness in given engineering tasks.	**K5**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1												3	3	3
CO2	3											3	3	3
CO3		3										3	3	3
CO4			2									2	2	2
@	**3**	**3**	**2**									**3**	**3**	**3**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25EE101 BASICS OF ELECTRICAL AND ELECTRONIC SYSTEMS
(Common to CSE and AI&DS)

3 0 0 3

DC CIRCUIT: current-voltage –power-energy, electrical circuit elements: resistors-inductor- capacitor, source of electrical energy. Ohm's law-Kirchhoff's laws, series and parallel circuits, Maxwell's loop current method, Network theorems: superposition theorem-Thevenin's theorem-Norton's theorem-maximum power transfer theorem. **(9)**

AC CIRCUITS: Single phase AC circuits: Average and RMS values of sinusoidal wave form- RLC Circuit-Phasor representation-active, reactive apparent power –power factor, analysis of RLC Circuit, three phase circuit: star and delta connection-phase and line quantities-balance and unbalance systems. **(9)**

ELECTROMAGNETISM AND MAGNETIC CIRCUITS: Electromagnetic induction; induced currents, Faraday's law, induction and energy, motional emf and Lenz's law. Magnetic field-magnetic circuit-inductance and mutual inductance-magnetic materials –ideal transformers and real transformers.

(8)

SEMICONDUCTOR DEVICES: Basic diode concepts-diode circuit: half wave rectifier-full wave rectifier-bridge rectifier-special purpose diodes-Zener diode –transistor fundamentals – transistor biasing-bipolar junction transistors-basis amplifier concept-loading effect-power supplies and efficiency.

(10)

OPERATIONAL AMPLIFIERS: Op-Amp Basics, Ideal characteristics of Op-Amp, practical Op-Amp circuits, differential and common mode operation, Inverting and non- inverting amplifiers, Op-Amp as Adder, Subtractor, integrator and differentiator.

(9)

Total L: 45 periods

TEXT BOOKS:

1. Edward Hughes, John Hiley and Keith Brown, '*Electrical and Electronic Technology*'. Pearson Education, 2020.
2. K. Murugesh Kumar, '*Basic Electrical Science and Technology*'. Vikas Publishing House, 2016.
3. B. L. Theraja, '*Basic Electronic Solid State*'. S. Chand and Company Ltd., New Delhi, 2010.

REFERENCES:

1. D. P. Leach, '*Digital Principles and Applications*'. Tata McGraw Hill, 2021.
2. A. R. Hambley, '*Electrical Engineering Principles and Applications*'. Pearson education, 2018.
3. R. L. Boylestad and L. Nashelsky, '*Electronic Devices and Circuit Theory*'. Pearson Education, Noida, 2013.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the basic principles of DC and AC circuits, magnetic circuits, and semiconductor devices.	**K2**
CO2	Apply electrical laws, network theorems, and Electromagnetic principles to analyze electrical circuits, magnetic circuits, and transformers.	**K3**
CO3	Analyze the performance characteristics of electrical and electronic systems using phasors, load analysis, and Op-Amp configurations.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1														
CO2	3		2											
CO3		3	3		2									
@	**3**	**3**	**3**		**2**									

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25HS101 ENGLISH LANGUAGE PROFICIENCY
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

3 1 0 4

VOCABULARY: Etymology-Prefixes and suffixes–Synonyms–Antonyms–Guessing meanings from context–Word formation- Single-word substitutes- Different forms of a word– Phrasal verbs–Collocations. **(9+3)**

LISTENING AND SPEAKING: Understanding listening – Listening techniques - Introducing oneself and others –Seeking and sharing information– Description-Conversation skills– Extempore speaking– Speech practice in varied formal contexts. **(9+3)**

GRAMMAR: Wh-questions – Yes/no questions– Parts of speech – Articles– Prepositions– Gerunds– Conjunctions-Degrees of comparison– Tenses– Modal verbs – Adverbs - Direct and indirect questions. **(9+3)**

READING: Reading strategies: Skimming and scanning, predicting– Reading comprehension: techniques Practice reading. **(9+3)**

WRITING: Discourse markers – Dialogue writing - Completing sentences – Jumbled sentences – Paragraph writing –Writing compare & contrast paragraphs – Letter writing. **(9+3)**

Total L: 45 + T: 15 = 60 periods

TEXTBOOKS:

1. K. N. Shoba and Lourdes Joavani Rayen, '*Communicative English*'. Cambridge University press, Cambridge, 2021.
2. Raymond Murphy, '*Intermediate English Grammar*'. Cambridge University Press, New Delhi, 2020.
3. Dr M. Sambaiah, '*Technical English an integrated text book*'. Wiley India Pvt. Ltd., 2025.

REFERENCES:

1. Raymond Murphy, '*English Grammar in Use*'. Cambridge University Press, New Delhi 2020.
2. N. P. Sudharshana and C. Savitha, '*English for Engineers*'. Cambridge University Press, New York, 2018.
3. Helen Naylor with Raymond Murphy, '*Essential English Grammar*'. Cambridge University Press, New Delhi, 2019.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Demonstrate the ability to recognize and use a wide range of vocabulary and key grammatical structures accurately, while developing inferential reading skills to comprehend, interpret, and analyze written texts across diverse contexts.	**K2**
CO2	Organize their ideas logically in essay writing, develop paragraphs with clear topic sentences and adapt their letter- writing skills to various real-world scenarios.	**K3**
CO3	Develop and demonstrate clear and confident speaking skills in formal and informal contexts.	

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1									3		3			
CO2									3		3			
CO3									1		1			
@									**3**		**3**			

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25HS102 தமிழர் மரபு
(Common to CIVIL, CSE, CS&AM, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

1 0 0 1

மொழி மற்றும் இலக்கியம்: இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயச்சார் பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின்பங்களிப்பு. **(3)**

மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக்கலை: நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரி முனையில் திருவள்ளுவர் சிலை – இசைக்கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வியல் கோவில்களின் பங்கு. **(3)**

நாட்டுப்புறக்கலைகள் மற்றும் வீரவிளையாட்டுகள்: தெருக்கூத்து, கரகாட்டம், வில்லுப் பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள். **(3)**

தமிழர்களின் திணைக்கோட்பாடுகள்: தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்க கால நகரங்களும் துறைமுகங்களும் – சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்தநாடுகளில்சோழர்களின்வெற்றி. **(3)**

இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: இந்தி விடுதலைப் போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப் பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப் படிகள் – தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு. **(3)**

Total L: 15 periods

25HS102 HERITAGE OF TAMILS
(Common to CIVIL, CSE, CS&AM, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

1 0 0 1

LANGUAGE AND LITERATURE: Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

(3)

HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE: Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils. **(3)**

FOLK AND MARTIAL ARTS: Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils. **(3)**

THINAI CONCEPT OF TAMILS: Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

(3)

CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE: Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books. **(3)**

Total L: 15 periods

Text – Cum – Reference Books:

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு - தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்)
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.)
7. Historical Heritage of the Tamils (Dr. S. V. Subrahmanian, Dr. K. D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Describe the Dravidian language family, outline the features of Tamil classical literature, and explain the development of Tamil art, sculpture, and temple-related traditions in a historical context.	**K2**
CO2	Demonstrate the cultural relevance of Tamil folk and martial arts, apply the concepts of Sangam landscape classification to social contexts, and relate Tamil contributions to India's freedom struggle, cultural legacy, and Siddha medicine.	**K3**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1							2				2			
CO2							2				2			
@							**2**				**2**			

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25CS111 C PROGRAMMING LABORATORY

(Common to CSE and AI&DS)

0 0 4 2

1. Formatted I/O statements.
2. Decision Making statements: Simple If, If – else, Switch- case.
3. Looping Statements: For, While, Do – while.
4. Single dimensional arrays and multi-dimensional arrays.
5. Operations on Strings.
6. Pass by value and pass by address, Recursion using functions.
7. Structures and nested structures.
8. String handling operations using pointers.
9. Operations on arrays using pointers.
10. File operations using command line arguments

Total P: 60 periods

REFERENCES:

1. Byron S. Gottfried and Jitendar Kumar Chhabra, '*Programming with C'*. Tata McGraw Hill Publishing Company, New Delhi, 2018.
2. Herbert Schildt, '*C-The Complete Reference*'. Tata McGraw Hill Publishing Company, New Delhi, 2010.
3. Pradip Dey and Manas Ghosh, '*Programming in C'*. Oxford University Press, New Delhi, 2018.
4. Yashavant P. Kanetkar, '*Let Us C'*. BPB Publications, 2017.
5. H. M. Deitel and P. J. Deitel, '*C How to Program'*. Pearson Education, New Delhi, 2013.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain how programs use logical flow and data organization to produce correct and meaningful results.	**K2**
CO2	Apply structured problem-solving approaches to develop programs that handle data efficiently.	**K3**
CO3	Analyze program behavior and outputs to manage data effectively and identify possible improvements.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1												3	3	3
CO2	3											3	3	3
CO3		2										2	2	2
@	**3**	**2**										**3**	**3**	**3**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25EE112 ENGINEERING SKILLS LABORATORY
(Common to CSE and AI&DS)

0 0 4 2

1. Residential house wiring.
2. Stair case wiring.
3. Measurement of electrical quantities Voltage, Current, Power and Power factor.
4. Measurement of energy using single-phase energy meter.
5. Study of iron Box/heater and fan regulator.
6. Verification of Ohms law and Kirchhoff's law.
7. Construction of half-wave and full wave rectifier.
8. Verification of logic gates.
9. Fabrication of electronic circuit using general purpose PCB.
10. Measurement of signal parameters using oscilloscope.
11. Construct amplifier circuit using Op. Amp.

Total P: 60 periods

REFERENCES:

1. D. P. Kothari and I. J. Nagrath, '*Basic Electrical Engineering'.* New Delhi, India: Tata McGraw-Hill, 2010.
2. S. K. Bhattacharya, '*Basic Electrical and Electronics Engineering'*. New Delhi, India: Pearson Education, 2011.
3. R. A. Gayakwad, '*Op-Amps and Linear Integrated Circuits*'. 4th Editon. Delhi, India: Pearson, 2015.
4. R. L. Boylestad and L. Nashelsky, '*Electronic Devices and Circuit Theory*'. 11th Edition, Upper Saddle River, NJ, USA: Pearson, 2013.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the basics of electrical wiring, measurement of electrical and electronic circuits.	**K2**
CO2	Construct and verify basic circuits using electrical and electronics components.	**K3**
CO3	Collaborate in teams to conduct experiments, and present findings through reports.	

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1														
CO2	3													
CO3		3			2									
@	**3**	**3**			**2**									

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25GE111 DESIGN THINKING FOR INNOVATION
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

0 0 2 1

Foundations of Design Thinking History & Origins: Roots in Creative Problem Solving: Traces back to mid-20th century practices in architecture, engineering, and psychology. Herbert Simon's "Sciences of the Artificial" (1969): Introduced design as a way of thinking distinct from scientific inquiry. IDEO and the Rise of Human-Centered Design: Popularized design thinking as a repeatable, user-focused innovation process. Stanford school's Influence: Helped institutionalize design thinking in education and entrepreneurship.

Variations of Design Thinking Phases: IDEO's 3-Phase Model: Inspiration, Ideation, Implementation A flexible, non-linear approach emphasizing creativity and action. Stanford school's 5-Phase Model: Empathize, Define, Ideate, Prototype, Test A structured yet iterative framework centered on user empathy. Double Diamond Model (Design Council UK): Divides the process into Discover, Define, Develop, and Deliver—highlighting divergent and convergent thinking.

Related Concepts & Frameworks: Human-Centered Design (HCD): Focuses on designing solutions that deeply resonate with users' needs and contexts. Systems Thinking: Encourages understanding the broader ecosystem and interdependencies within a problem space. Agile & Lean UX: Integrates design thinking with iterative development and minimal viable experimentation. Service Design: Applies design thinking to orchestrate holistic user experiences across touchpoints. Participatory Design: Involves stakeholders directly in the design process to ensure relevance and inclusivity.

EMPATHIZE: Apply Human-Centric Design Principles: Focus on designing solutions that prioritize user needs, experiences, and values throughout the process. Consult Experts: Engage with subject matter experts to gain foundational knowledge about the problem space. Competitive Analysis: Identify & studying similar products or services to identify gaps and opportunities. Stakeholder Interviews: Engaging with people who influence or are affected by the product or service. Conduct Observations: Observe users in their natural environment to understand behaviors, challenges, and interactions. Engage with Users: Use interviews, conversations, and other methods to connect with users and hear their stories. Immerse Yourself: Step into the users' context to experience their environment and challenges firsthand. Create Empathy Maps: Visualize what users say, think, feel, and do to synthesize insights. Identify User Needs and Pain Points: Extract meaningful patterns and needs from user interactions and observations. Set Aside Assumptions: Approach the research with an open mind, suspending personal biases and preconceptions. Document Insights: Capture quotes, observations, and emotional cues to inform the next stage (Define). **(6)**

DEFINE: Organize Research Findings: Review and structure the data collected during the Empathize stage. Analyze Observations: Identify patterns, themes, and insights from user interactions and behaviors. Craft a Human-Centered Problem Statement: Frame the problem from the user's perspective, focusing on their needs—not business goals. Avoid Business- Centric Framing: Refrain from defining problems based on company objectives alone (e.g., market share). Persona Development: Synthesizing research into user personas to guide design decisions. Use Empathy to Guide Definition: Ensure the problem statement reflects real user challenges and motivations. Develop Point-of-View Statements: Create concise summaries that capture who the user is, what they need, and why. Prepare for Ideation: Formulate "How Might We" questions to spark creative thinking in the next phase. **(6)**

IDEATE: Review the Problem Statement: Revisit the user-centric problem defined in the previous stage to guide ideation. Explore Multiple Perspectives: Encourage diverse viewpoints to broaden the range of potential solutions. Use Ideation Techniques: Apply methods like Brainstorming, Brain writing, SCAMPER, and Worst Possible Idea to spark creativity. Encourage Free Thinking: Create a judgment-free space to generate as many ideas as possible without filtering. Expand the Problem Space Push boundaries and explore unconventional or extreme ideas to uncover hidden opportunities. Refine and Select Ideas: Use evaluation techniques to identify promising concepts that address user needs effectively. Prepare for Prototyping: Choose ideas that are feasible and impactful to develop into tangible prototypes in the next stage. **(6)**

PROTOTYPE: Build Low-Cost Prototypes: Create simple, scaled-down versions of the product or its features to explore ideas. Experiment with Solutions: Implement different solutions from the Ideate stage into prototypes for testing. Test Internally and Externally: Share prototypes with team members, other departments, or a small group of users. Observe User Interactions: Watch how users engage with the prototypes to uncover usability issues and insights. Evaluate and Iterate: Accept, refine, or discard prototypes based on user feedback and performance. Identify Limitations: Discover constraints and challenges in the proposed solutions through hands-on testing. Gain Deeper User Understanding: Learn how users think, feel, and behave when interacting with the product. **(6)**

TEST: Conduct Rigorous Testing: Evaluate the complete product using the most promising prototypes. Observe Real User Interactions: Study how users behave, think, and feel while using the product. Gather Feedback and Insights: Collect qualitative and quantitative data to assess usability and effectiveness. Identify Remaining Issues: Detect limitations, pain points, and areas for improvement. Refine and Iterate: Use test results to improve the product and revisit earlier stages if needed. Redefine Problems if Necessary: Reframe or adjust problem statements based on new insights. Enhance Understanding of Users: Deepen empathy and knowledge of user needs through real-world testing. **(6)**

Design Thinking & Customer Centricity: A human-centered approach that blends empathy and innovation to create solutions that truly resonate with customer needs. Practical Examples of Customer Challenges: Real-world scenarios where customers face friction, unmet needs, or emotional disconnects in their product or service journey. Use of Design Thinking to Enhance Customer Experience: Applying iterative problem-solving and user insights to craft experiences that are intuitive, delightful, and deeply relevant. Parameters of Product Experience: Key dimensions like usability, accessibility, emotional impact, and consistency that shape how customers perceive and interact with a product. Alignment of Customer Expectations with Product Design: Ensuring that every design decision reflects what customers value, expect, and aspire to achieve through the product. **(6)**

Total P: 30 periods

TEXT BOOKS:

1. T. Brown, '*Change by Design*'. Harper Business, 2009.
2. J. Liedtka and T. Ogilvie, '*Designing for Growth*'. Columbia Business School Publishing, 2011.

REFERENCES:

1. T. Kelley and D. Kelley, '*Creative Confidence*'. Crown Business, 2013.
2. Stanford d. School resources: https://dschool.stanford.edu/
3. https://apphaus.sap.com/toolkit/methods#design-thinking

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Apply empathy-driven research to understand user needs.	**K3**
CO2	Develop and test prototypes to refine innovative solutions to the real-world problems.	**K4**
CO3	Frame actionable problem statements and generate creative ideas.	**K5**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3					3	3	3	3		3	1	1	1
CO2		2				2	2	2	2		2	1	1	1
CO3			1			1	1	1	1		1	1	1	1
@	**3**	**2**	**1**			**3**	**3**	**3**	**3**		**3**	**1**	**1**	**1**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25GEM01 INDUCTION PROGRAMME
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

All students shall undergo an induction programme at the beginning of the first semester for a duration of three weeks as per the guidelines of All India Council for Technical Education (AICTE). A student completing the induction programme will be awarded a completed grade in the grade sheet, and only the students who complete the induction programme shall be considered as eligible for award of degree subject to satisfying other conditions. A student who does not complete the induction programme in the first semester shall redo the same in the subsequent semester.

SEMESTER II

25MA202 TRANSFORMS AND APPLICATIONS
(Common to AI&DS and CSE)

3 1 0 4

LAPLACE TRANSFORMS: Laplace transform, inverse transform, linearity, s-shifting, transforms of derivatives and integrals, unit step function, t – shifting, Dirac's delta function, periodic functions, differentiation and integration of transforms. **(9+3)**

APPLICATION OF LAPLACE TRANSFORMS: Convolution, solving differential equations with constant coefficients and variable coefficients, integral equations, systems of ODEs by using Laplace transform technique. **(9+3)**

Z TRANSFORM: Z-transform, the relationship of the Z-transforms to the Laplace transform, some useful properties, inverse Z-transforms, solution of difference equations. **(6+2)**

FOURIER SERIES: Fourier series – even and odd functions, half range expansion, convergence of Fourier series, basic concepts of PDE's, wave equation, solution of one- dimensional heat equation and steady state two-dimensional heat equation. **(12+4)**

FOURIER TRANSFORMS: Fourier integral, Fourier cosine and sine integrals, Fourier transform, Discrete Fourier transform, Fast Fourier transform – DIT algorithm.

(9+3)

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS:

1. Erwin Kreyszig, '*Advanced Engineering Mathematics*'. Wiley India, New Delhi, 2018.
2. G. D. Dean, '*Advanced Engineering Mathematics with MATLAB*'. CRC Press, USA, 2017.

REFERENCES:

1. Peter V. O. Neil, '*Advanced Engineering Mathematics*'. Cengage, New Delhi, 2018.
2. C. R. Wylie and L. C. Barrett, '*Advanced Engineering Mathematics*'. Tata McGraw-Hill, New Delhi, 2019.
3. R. K. Jain and S. R. K. Iyengar, '*Advanced Engineering Mathematics*'. Narosa Publishing House, New Delhi, 2018.
4. Alexander D Poularikas, '*Transforms and Applications Primer for Engineers with Examples and MATLAB*'. CRC press, USA, 2010.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the concepts related to Laplace, Fourier and Z- Transforms and its Applications.	**K2**
CO2	Apply the techniques of Laplace, Fourier and Z- Transforms to solve engineering problems.	**K3**
CO3	Analyze the solutions of engineering problems employing Laplace, Fourier and Z-Transforms.	**K4**
CO4	Use modern tools to solve engineering problems with the help of Laplace, Fourier and Z- Transforms.	

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1														
CO2	3													
CO3		1												
@	**3**	**1**												

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25MA203 DISCRETE MATHEMATICS

3 1 0 4

SETS, RELATIONS AND FUNCTIONS: Introduction to Sets - Set Operations – Computer representation of Sets - Sequences and Summations - Cardinality of Sets - Relations and Their Properties - Closures of Relations - Equivalence Relations - Partial Orderings – Functions: Injective, Surjective, Bijective, and Composition. **(9+3)**

MATHEMATICAL LOGIC AND PROOFS: Propositional Logic - Applications of Propositional Logic - Propositional Equivalences - Predicates and Quantifiers - Nested Quantifiers - Rules of Inference - Introduction to Proofs: Proof by contraposition, Proof by contradiction. **(9+3)**

COUNTING AND COMBINATORICS: The Basics of Counting - The Pigeonhole Principle - Permutations and Combinations - Generalized Permutations and Combinations - Generating Permutations and Combinations. **(9+3)**

RECURRENCE RELATIONS: Recursion – Recurrence relations: Linear First-order recurrence relations – Linear Second order recurrence relations – Divide and conquer recurrence relations. **(9+3)**

ALGEBRAIC STRUCTURES: Algebraic Systems: properties – Groups, Semi groups, Monoids: Homomorphism of Semi groups and monoids – Sub semi groups and sub monoids – Rings: Structure and Properties. **(9+3)**

Total L: 45 +T: 15 = 60 periods

TEXT BOOKS:

1. Kenneth H. Rosen, '*Discrete Mathematics and its Applications*'. 7th Edition, Tata McGraw Hill, 2007.
2. Tremblay J. P. and Manohar R, '*Discrete Mathematical structures with application to Computer Science*'. Tata McGraw Hill, 2011.

REFERENCES:

1. Ralph. P. Grimaldi, '*Discrete and Combinatorial Mathematics: An Applied Introduction*'. 5th Edition, Pearson Education, New Delhi, 2014.
2. Seymour Lipschutz and Mark Lipson, '*Discrete Mathematics*'. 3rd Edition, Schaum's Outlines McGraw Hill Pub. Co. Ltd., New Delhi, 2013.
3. Thomas Koshy, '*Discrete Mathematics with Applications*'. Elsevier Publications, Boston, 2004.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the concepts related to Functions, Mathematical logic, Combinatorics, Recurrence Relations and Algebraic Structures.	**K2**
CO2	Apply the techniques of Functions, Mathematical logic, Combinatorics, Recurrence Relations and Algebraic Structures.	**K3**
CO3	Analyze the solutions of engineering problems employing Functions, Mathematical logic, Combinatorics, Recurrence Relations and Algebraic Structures.	**K4**
CO4	Use modern tools to solve engineering problems with the help of Functions, Mathematical logic, Combinatorics, Recurrence Relations and Algebraic Structures.	

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1														
CO2	3													
CO3		1												
CO4					1									
@	**3**	**1**			**1**									

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25CY202 APPLIED CHEMISTRY
(Common to CSE and AI&DS)

3 0 0 3

ELECTRONIC MATERIALS: Inorganic semiconductors – Elemental – Si and Ge - band theory, doping, compound semiconductors – band gap engineering – applications. Organic semiconductors – conjugated polymers – mechanism of charge transport, doping, states of aggregation, material properties – thermal, mechanical, electrical, chemical, electrochemical. Applications – OLED, OPV – working principle. Liquid crystalline materials – display application.

(9)

PROCESSES IN ELECTRONICS MANUFACTURE: Microchip fabrication – overview, photoresists – chemistry, types. Fabrication facilities – clean rooms - maintenance, ultrapure water– specification, production processes – ion exchange, reverse osmosis, continuous electrode ionisation. PCB fabrication – electroless and electroplating of copper – principle, bath chemistries and process parameters, formation of copper track on plastic board. **(9)**

ELECTRONICS PACKAGING AND PROTECTION: Packaging materials-encapsulants and underfills - adhesives – chemical types, application methods, factors influencing adhesion, soldering alloys – phase diagrams, lead free alloys, phase change materials for cooling. Conducting inks for printed electronics - metal and carbon based – graphene, CNT– synthesis, structure, electrical properties. Corrosion in electronics – types, protection – vapour phase inhibitors.

(9)

ELECTROCHEMICAL POWER SOURCES: Electrochemical cells – emf, electrode potential, dependence of emf on electrolyte concentration – Nernst equation. Batteries– performance characteristics. Materials, construction, reactions, characteristics of Leclanche cell, primary lithium batteries, lead - acid battery and lithium-ion batteries. Supercapacitors – EDLC – fundamentals, electrode materials, electrolytes, pseudo capacitors – materials.

(9)

CHEMICAL SENSORS: Sensors – basic components. Electrochemical sensors- potentiometric transducers – principle, ion-selective electrodes – configurations, response functions and selectivity, applications – potentiometric titrations, water quality monitoring - pH, Hardness, fluoride ion sensors Amperometric transducers – principle, application - glucose biosensors, conductivity sensors – principle – application in conductometric titrations. Colorimetric sensors - Beer-Lambert's law, components, application - determination of ferric ion in water sample. Chemi-resistive sensors - principle, application – environmental monitoring – CO_2 sensor. Microelectrodes for sensors – fabrication.

(9)
Total L: 45 periods

TEXT BOOKS:

1. Shashi Chawla, '*A Textbook of Engineering Chemistry*'. 6th Edition, Dhanpat Rai and Co, New Delhi2022.
2. J. M. G. Cowie and Valeria Arrighi, '*Polymers: Chemistry and Physics of Modern Materials*'. 3rd Edition, CRC Press, London, 2016.

REFERENCES:

1. Bansi D. Malhotra, '*Handbook of Polymers in Electronics*'. 1st Edition, Rapra Technology Ltd., UK, 2002.
2. Peter Van Zant, '*Microchip Fabrication: A Practical Guide to Semiconductor Processing*'.
3. 6th Edition, McGraw Hill, 2014.
4. Derek Pletcher and Frank C. Walsh. '*Industrial Electrochemistry*'. 2nd Edition, Chapman and Hall, London, 1993.
5. Florinel-Gabriel Banica '*Chemical Sensors and Biosensors – Fundamentals and Applications'*.
6. 1st Edition, John Wiley and Sons Ltd, 2012.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Blooms Level**
CO1	Learn the chemistry of engineering materials and analytical devices.	**K2**
CO2	Utilize the suitable materials for electronics engineering applications.	**K3**
CO3	Analyze the properties of electronics materials for the fabrication of electronic devices.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1												2		
CO2	3										3	3		
CO3								1	1					
@	**3**							**1**	**1**		**3**	**3**		

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25AD201 PYTHON PROGRAMMING
(Common to CSE and AI&DS)

3 0 0 3

INTRODUCTION TO PYTHON PROGRAMMING: Introduction to Python, Demo of Interactive and script mode, Tokens in Python – Variables, Keywords, Comments, Literals, Data types, Indentation, Operators and its precedence, Expressions, Input and Print functions. Selective statements – if, if-else, nested if, if –elif ladder statements. Iterative statements - while, for, Nested loops, else in loops, break, continue, and pass statements. **(10)**

FUNCTIONS AND STRINGS: Functions: Types, parameters, arguments: positional arguments, keyword arguments, parameters with default values, functions with arbitrary arguments, Scope of variables: Local and global scope, Recursion and Lambda functions. Strings: Formatting, Comparison, Slicing, Splitting, Stripping, Pattern matching. **(8)**

COLLECTIONS: List: Create, Access, Slicing, Negative Indices, List Methods, and comprehensions Tuples: Create, Indexing and Slicing, Operations on tuples. Dictionary: Create, add, and replace values, and operations on dictionaries. Sets: Create and operations on set. **(9)**

FILES, EXCEPTIONS, AND PACKAGES: Files: text files, file handling modes, reading, writing, and appending to files, handling file exceptions, with statement; command line arguments, errors, exception handling with try, handling multiple exceptions; Modules and Packages, Python's Standard Library. **(9)**

OBJECT-ORIENTED PROGRAMMING USING PYTHON: Classes and Objects in Python, properties and methods, Instantiation, _init() function, self-parameter, pass statement, inheritance in Python, __init() function in inheritance, super() method, types of inheritance, function overriding, Polymorphism. **(9)**

Total L: 45 periods

TEXTBOOKS:

1. Eric Matthes, '*Python Crash Course A Hands-On, Project - Based Introduction to Programming'.* 3rd Edition, No Starch Press, 2024.
2. Mark Summerfield, '*Programming in Python 3: A Complete Introduction to the Python Language'.* 2nd Edition, Pearson Education, 2018.

REFERENCES:

1. Paul Deitel and Harvey Deitel, *'Python for Programmers'*. 1st Edition, Pearson Education, 2021.
2. John V Guttag, *'Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data*.'. 3rd Edition, MIT Press, 2021.
3. Allen B. Downey, '*Think Python: How to Think like a Computer Scientist'*. 2nd Edition. O'Reilly Publishers, 2016.
4. Martin C. Brown, *'Python: The Complete Reference'*. 4th Edition, Mc-Graw Hill, 2018.
5. Karl Beecher, *'Computational Thinking: A Beginner's Guide to Problem Solving and Programming'*. 1st Edition. BCS Learning and Development Limited, 2017.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain basic Python concepts used in programming and object-oriented development.	**K2**
CO2	Apply Python programming using control structures, functions, collections, files, and classes to solve simple and complex problems.	**K3**
CO3	Analyze problems and use cases using Python programs and present the results through team activities.	**K4**
CO4	Use Python libraries and tools to explore problems, practice modern programming techniques and work in teams.	

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1												2	2	2
CO2	3											3	3	3
CO3		3										3	3	3
CO4					2				2			2	2	2
@	**3**	**3**			**2**				**2**			**3**	**3**	**3**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25AD202 DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION

3 0 0 3

DIGITAL CIRCUITS: Binary Arithmetic - Boolean Algebra - Basic Theorems and Properties of Boolean Algebra - Simplification of Boolean Functions - Digital Logic Gates - Karnaugh Map Method - Design of Combinational Circuits - Flip-Flops - Design of Sequential Circuits. **(9)**

COMPUTER ORGANIZATION & PROCESSOR DESIGN: Stored program organization (Von Neumann architecture) - Computer Registers -Stack organization - Instruction Formats - Addressing modes - RISC Vs CISC - Quantitative Principles of computer design. **(9)**

MEMORY AND I/O SYSTEMS: Memory Hierarchy - Associative Memory - Cache Memory - Mapping policies – Cache optimization; I/O Systems: Introduction - Interrupts - Modes of Transfer - DMA. **(8)**

PARALLELISM: Pipelining - Pipelining Hazards - Overcoming Hazards - Instruction Level Parallelism – Dependencies (**8)**

MULTIPROCESSOR SYSTEMS: Symmetric and Distributed shared memory architectures - Challenges – Cache Coherence Snooping protocol - Introduction to GPU Architecture: Streaming Multiprocessors (SMs), CUDA cores - SIMT Model vs. MIMD - GPU Memory Hierarchy: Shared, Global, Constant, and Texture Memory - Parallel Programming Models: Introduction to CUDA / OpenCL Concepts. **(11)**

Total L: 45 periods

TEXT BOOKS:

1. M. Morris Mano and Michael D. Ciletti, '*Digital Design: With an Introduction to the Verilog HDL, VHDL and System Verilog'*. 6th Edition, Pearson Education, 2018.
2. John L. Hennessey and David A. Patterson, '*Computer Architecture: A Quantitative Approach*'. Elsevier India Pvt. Ltd, New Delhi, 2015.

REFERENCES:

1. Morris Mano, '*Computer System Architecture*'. Prentice Hall of India, Prentice Hall of India, 2007.
2. Hennessy, John and Patterson, David, '*Computer Organization and Design MIPS Edition: The Hardware/Software Interface*'. Netherlands, Elsevier Science, 2020
3. David B. Kirk and Wen-Mei W. Hwu, '*Programming Massively Parallel Processors: A Hands-on Approach*'. Morgan Kaufmann, 2016.
4. Carl Hamacher, '*Computer Organization*'. Tata McGraw Hill Publishing, New Delhi, 2002.
5. William Stallings, '*Computer Organization and Architecture*'. Pearson Education / Prentice Hall of India, New Delhi, 2006.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain processor organization, instruction formats, addressing modes, and RISC–CISC differences.	**K2**
CO2	Apply Boolean algebra, K-map, and binary arithmetic to design combinational and sequential circuits.	**K3**
CO3	Analyze memory hierarchy, cache, and I/O systems for performance optimization.	**K4**
CO4	Evaluate pipelining, hazards, and instruction-level parallelism.	**K5**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1												2	2	2
CO2	3											3	2	2
CO3		2										3	2	2
CO4			2									2	2	2
@	**3**	**2**	**2**									**3**	**2**	**2**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25HS201 தமிழரும் தொழில்நுட்பமும்
(Common to CIVIL, CSE, CS&AM, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

1 0 0 1

நெசவு மற்றும் பானைத் தொழில்நுட்பம்: சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள். **(3)**

வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள், சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு – சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை. **(3)**

உற்பத்தித் தொழில் நுட்பம்: கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணங்கள் – நாணயங்கள் அச்சடித்தல்- மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத் துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள். **(3)**

வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம். **(3)**

அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: அறிவியல் தமிழின் வளர்ச்சி – கணித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம். **(3)**

Total L: 15 periods

25HS201 TAMILS AND TECHNOLOGY
(Common to CIVIL, CSE, CS&AM, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

1 0 0 1

WEAVING AND CERAMIC TECHNOLOGY: Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries **(3)**

DESIGN AND CONSTRUCTION TECHNOLOGY: Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period. **(3)**

MANUFACTURING TECHNOLOGY: Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram. **(3)**

AGRICULTURE AND IRRIGATION TECHNOLOGY: Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society. **(3)**

SCIENTIFIC TAMIL & TAMIL COMPUTING: Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project. **(3)**

Total L: 15 periods

TEXT BOOK:

1. V Priyadharshini, '*தமிழரும் தொழில்நுட்பமும் (Tamils and Technology)*'. VK publications, Sivakasi.

REFERENCE BOOKS:

1. கே. கே. பிள்ளை, தமிழக வரலாறு - மக்களும் பண்பாடும் - (வெளியீடு - தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்)
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.)
7. Historical Heritage of the Tamils (Dr. S. V. Subrahmanian, Dr. K. D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Identify the significance of ancient Tamil technologies in weaving, pottery, metallurgy, and architecture, with emphasis on traditional design and construction methods across historical periods.	**K2**
CO2	Use insights from traditional Tamil knowledge systems in agriculture, irrigation, and marine sciences, and connect the development of Tamil language to its applications in digital platforms and computing.	**K3**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1							3				3			
CO2							3				3			
@							**3**				**3**			

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25AD211 PYTHON PROGRAMMING LABORATORY

(Common to CSE and AI&DS)

0 0 4 2

1. Algorithm and Flowchart for Real World Problems
2. Programs using Decision Making statements and Looping Statements
3. Applications using Set, Lists, Tuples, Dictionary
4. Applications using Functions
5. Python Libraries
6. Text processing
7. Searching & sorting algorithms
8. Application Debugging
9. Build a Simple Python Application

Total P: 60 periods

REFERENCES:

1. Romano, Fabrizio, '*Learn Python Programming: A Beginners Guide to Learning the Fundamentals of Python Language to Write Efficient, High-Quality Code'*. 2nd Edition, India, Packt Publishing, 2018.
2. R. Nageswara Rao, *'Core Python Programming'*. 2nd Edition, Dreamtech Press, 2019.
3. Vijay Kumar Sharma, Vimal Kumar, Swati Sharma and Shashwat Pathak, '*Python Programming: A Practical Approach*'. CRC Press, 2021.
4. Meenu Kohli, '*Basic Core Python Programming: A Complete Reference Book to Master Python with Practical Applications'*. 1st Edition, BPB Publications, 2021.
5. J. Cogliati, '*Non-Programmers Tutorial for Python 3'*. Platypus Global Media, 2019.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Implement python programs using control structures, collections, functions and libraries for simple and complex problems.	**K3**
CO2	Analyze, debug, and improve Python programs involving searching and sorting techniques and application development to build simple Python applications.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3											3	3	3
CO2		2										2	2	2
@	**3**	**2**										**3**	**3**	**3**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25CY211 CHEMISTRY LABORATORY

0 0 4 2

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of strength of acids in a mixture of acid using conductivity meter.
3. Determination of strength of strong acid using conductivity meter.
4. Determination of alkalinity of a given water sample.
5. Determination of DO content of water sample by Winkler's method
6. Determination of strength of given hydrochloric acid using pH meter.
7. Estimation of iron content of the given solution using potentiometer.
8. Corrosion experiment-weight loss method.
9. Electroplating of copper and Nickel and determination of coulombic efficiency.
10. Construction of phase diagram for a simple eutectic system.
11. Designing a battery and determination of its characteristics.
12. Photo-colorimetric estimation of Ferric ion in a water sample.
13. Anodizing of aluminum and determination of thickness of anodised film.
14. Determination of kinematic viscosity of lubricating oil using Redwood viscometer.
15. Proximate analysis of coal.

Total: 60 periods

REFERENCE:

1. J Mendham, '*Vogel's Textbook of Quantitative Chemical Analysis'.* 6th Edition, Pearson Education 2009.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Demonstrate the measurement of water quality parameters in the given water sample	**K3**
CO2	Analyze the properties of materials for Engineering applications	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3								3		3			
CO2				3				3						
@	**3**			**3**				**3**	**3**		**3**			

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25GE211 ENGINEERING GRAPHICS
(Common to AI&DS and CSE)

0 0 4 2

INTRODUCTION TO ENGINEERING GRAPHICS **(4)**

1. Introduction to Engineering Graphics.
2. Lettering practice as per BIS.
3. Principles of Dimensioning.

ORTHOGRAPHIC PROJECTIONS **(40)**

1. Introduction to Orthographic Projections.
2. Drawing multiple views from pictorial views of objects.
3. Projection of points.
4. Projection of straight lines (only First angle projections) inclined to both the principal planes.
5. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.
6. Projection of simple solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method.

SECTION OF SOLIDS **(8)**

1. Section of simple solids in simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other and obtaining true shape of section.

ISOMETRIC PROJECTIONS **(8)**

1. Isometric projection of simple solids in simple vertical positions.

Total P: 60 periods

TEXT BOOKS:

1. N. D. Bhatt, '*Engineering Drawing*'. 55th Edition, Charotar Publishing House Pvt. Ltd., 2025.
2. K. C. John, '*Engineering Graphics for Degree*'. Prentice Hall India Publishers, 2009.
3. K. V. Natarajan, '*A Text book of Engineering Graphics*'. 34th Refined Edition, Dhanalakshmi Publications, 2021.

REFERENCES:

1. K. Venugopal and V. Prabhu Raja, '*Engineering Graphics'.* 17th Edition, New Age International Publishers, 2024.
2. Bureau of Indian Standards '*Engineering Drawing Practices for Schools and Colleges SP 46-2003*'. BIS, New Delhi, 2003.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Use the BIS standards and specifications for drawing the engineering components and structures.	**K2**
CO2	Apply orthographic projection principles to draw projection of points, lines, planes, solids, and sectioned solids, isometric and perspective projection of regular solids.	**K3**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1														
CO2	3													
@	**3**													

1-low, 2-medium, 3-high @-Overall Contribution to the Course

LANGUAGE ELECTIVES

25HS211 COMMUNICATION SKILLS FOR ENGINEERS
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

0 0 4 2

COMMUNICATION CONCEPTS: Process of Communication – Inter and Intrapersonal Communication – Essentials for effectiveness. **(9)**

ORAL COMMUNICATION: Oral presentations with visual aids and Group discussions. **(16)**

FOCUS ON SOFT SKILLS: Etiquette – Work Place etiquette – Telephone etiquette- Body Language – Critical Reasoning and Conflict Management based on Case Studies – Group Communication- Meetings - Interview Techniques. **(14)**

TECHNICAL WRITING: Technical Writing Principles - Style and Mechanics - Technical Definitions – Physical, Functional and Process Descriptions – Technical Report Writing – Preparing Instructions – Interpretation of Technical Data. **(14)**

BUSINESS CORRESPONDENCE: Writing Emails, Preparing Resumes. **(7)**

Total P: 60 periods

TEXT BOOKS:

1. Course materials prepared by the Faculty, Department of English, PSG Institute of Technology and Applied Research.

REFERENCES:

1. Jeff Butterfield, '*Soft Skills for Everyone*'. Cengage Learning, New Delhi, 2020.
2. Sabina Pillai and Agna Fernandez, '*Soft skills and Employability Skills*'. Cambridge University Press, New Delhi, 2019.
3. Prashant Sharma, '*Soft Skills Personality Development for Life Success*'. BPB Publications, New Delhi, 2021.
4. K. N. Shoba and D. Praveen Sam, '*Technical English*'. Cambridge University Press, New York, 2020.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Produce clear and concise technical reports, compose professional and effective emails and develop well-structured and impactful resumes	**K2**
CO2	Plan, organize, and deliver engaging and informative presentations using appropriate visual aids and participate positively in group discussions	**K3**
CO3	Resolve disagreements constructively, embody professional conduct and a strong work ethic and apply critical thinking to generate effective solutions	

25HS212 BASIC GERMAN
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

0 0 4 2

Guten Tag! - Learning: To greet, learn numbers till 20, practice telephone numbers & e mail address, learn alphabet, speak about countries & languages; **Vocabulary:** related to the topic; **Grammar:** W – Questions, Verbs & Personal pronouns I. **(12)**

Freunde, Kollegen und ich - Learning: To speak about hobbies, jobs, learn numbers from 20; **Vocabulary:** related to the topic; **Grammar:** Articles, Verbs & Personal pronouns II, sein & haben verbs, ja/nein Frage, singular/plural. **(12)**

In der Stadt – Learning: To know places, buildings, question, know transport systems, understand international words; **Vocabulary**: related to the topic; **Grammar:** Definite & indefinite articles, Negotiation, Imperative with Sie. **(12)**

Guten Appetit! – Learning: To speak about food, shop, converse; **Vocabulary:** related to the topic; **Grammar:** Sentence position, Accusative, Accusative with verbs. **(12)**

Tag für Tag and Zeit mit Freunden – Learning: To learn time related expressions, speak about family, ask excuse, fix appointments on phone, birthdays, understand & write invitations, converse in the restaurant; **Vocabulary:** related to the topic; **Grammar:** Preposition – am, im, um, von…bis, Possessive articles, Modal verbs. **(12)**

Total L: 60 periods

TEXT BOOK:

1. Dengler, Stefanie et al. '*Netzwerk A1.1*'. Klett-Langenscheidt Gmbh, München, 2013.

REFERENCES:

1. Dengler, Stefanie et al. '*Netzwerk A1'.* Klett-Langenscheidt Gmbh München, 2013.
2. Sandra Evans,Angela Pude, Franz Specht, '*Menschen A1*'. –Hueber Verlag , 2012.
3. Hermann Funk, Christina Kuhn, Silke Demme, '*Studio d A1*'. Goyal Publishers & Distributors Pvt. Ltd ,2009.
4. Rosa-Maria Dallapiazza, Eduard von Jan, '*Til Schönherr*'. Tangram Aktuell 1 (Deutsch als Fremdsprache), Max Hueber Verlag, 2004.

25HS213 BASIC JAPANESE
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

0 0 4 2

Orientation Session, Geographic & Socio, economic perspective to Japan, Japanese people and culture and Basic greetings and responses.

Basic script, Method of writing hiragana and katakana, and Combination sounds and simple words.

Topic marker "wa", Desu / dewa arimasen cupolas, Interrogative particle "ka", Grammar particles "mo", "no", "Introducing some one: "Kochira wa ~" and Self introductions: Hajimemashite"

Demonstratives "Kore", "Sore", "Are", Demonstrative "Kono", "Sono", "Ano", Possessive noun particle "no" and Japanese apartments: Greeting your neighbor.

Place markers "Koko", "Soko", "Asoko", Direction markers "Kochira", "Sochira", "Achira" and Japanese department stores: Asking for and buying something.

Asking for and telling the time, Particle "ni (at)" for time, kara (from) ~ made (until), Particle "to (and)", Time periods: Days of the week, months, time of day, Verbs (Present / future and past tense) and Telephone enquiry: Asking for a phone no. And business hours.

Destination particle "e", Particles "de (mode of transportation)" and "to (with) and Japanese train station: Asking for Fare and track no. / types of trains.
Direct object particle "o", Particle "de (place of action)", Verbs ("~masen ka", "~mashou") and "Ohanami" Cherry blossom viewing.

Particle "de (by means of)", Particle "ni (to)", Aaemasu (give) and Moraimasu (receive) and Visiting a Japanese house.

Adjectives ("i" and "na" type), Adjectives (Positive and negative usage), Particle "ga (however, but), "Dore which?)" and Leaving a room, thanking someone for hospitality.

Likes and dislikes, Potential verbs (wakarimasu and dekimasu), "Kara (~ because)", Adverbs and Asking someone out over the phone.

Verbs denoting presence: "Imasu" and "arimasu", Particle "ni (in)", "Dare (who?)", Adverbs ("Chikaku ni ~ "), Particle "dare mo (negative ~ no one)" , Dare ka (anyone), dare ga (who) , Nani ka (anything) , nani ga (what) - ~ya (and) ~ nado (etc.) and Asking for directions.

Counters and Counting suffixes.

Introduction to Adjectives (na and ii type), Different usages of adjectives, Comparison, Likes and dislikes and Going to a trip.

Need and desire (ga hoshii), Wanting to … (Tabeti desu), Going for a certain purpose (mi – ni ikimasu) and Choosing from a menu.

Verb groups, I, II and III and Exercises to group verbs.

Please do (te kudasai), Present continuous tenses (te imasu), Shall I? (~ mashou ka) and Describing a natural phenomenon (It is raining).

To grant permission (~te mo ii desu), Asking for permission (~ te mo ii desu ka) and Should not do (~ te waikemasen) Describing a continuing state and Describing a habitual action.

Roleplays in Japanese.

A demonstration on usage of chopsticks and Japanese tea party.

Total L: 60 periods

TEXT BOOK:

1. *'Minna no nohongo – Romaji ban'.* (first 10 lessons of this book).

REFERENCE:

1. *'Minna no Nihongo I Honsatsu Roma – ji ban (Main Textbook Romanized Version)'.* International publisher A Corporation,Tokyo, Indian distributor – Goyal Publishers & Distributors, New Delhi.

25EEC01 WORKPLACE COMMUNICATION SKILLS
(Common to CIVIL, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

0 0 2 0

BUILDING COMMUNICATION SKILLS:

1. Introduction to Workplace Communication
2. Profile Building for Internships
3. English in the Workplace (Grammar & Vocabulary)
4. Professional Communication (Speaking & Writing)
5. Workplace Communication Tools
6. Career Exploration
7. Resume Update

Total P: 30 periods

REFERENCES:

1. P. C. Wren and H. Martin, '*High school English Grammar and Composition'.* S Chand Publishing, New Delhi, 2017.
2. Norman Lewis, '*Word Power Made Easy*'. Goyal Publisher, New Delhi, 2011.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Understand the importance of soft skills for employability and fine tune their writing skills – Resume writing	**K2**
CO2	Present with clarity and coherence while speaking in formal contexts.	**K3**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1														
CO2									3					
@									**3**					

1-low, 2-medium, 3-high @-Overall Contribution to the Course

SEMESTER III

25MA301 LINEAR ALGEBRA AND ITS APPLICATION

3 1 0 4

LINEAR EQUATIONS: Introduction to systems of linear equations - gauss elimination - linear systems and invertible matrices. **(9+3)**

VECTOR SPACES: General vector spaces- real vector spaces - Euclidean n-space - subspaces - basis and dimension - row space, column space and null space - rank and nullity. **(9+3)**

LINEAR TRANSFORMATIONS: General linear transformation - kernel and range - matrices of linear transformations - change of basis - geometry of linear operators on R^2. **(9+3)**

INNER PRODUCT SPACES: Inner products- angle and orthogonality in inner product spaces, orthonormal bases, Gram Schmidt process, QR decomposition, best approximation- least squares. **(9+3)**

EIGENVALUES AND EIGENVECTORS: Eigen values and eigen vectors, diagonalization- orthogonal diagonalization - spectral decomposition- singular value decomposition- principal component analysis - discrete dynamical systems. **(9+3)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS:

1. Howard Anton and Chris Rorres, '*Elementary Linear Algebra*'. Wiley India, New Delhi, 2018.
2. Gilbert Strang, '*Linear Algebra and its Applications'*. Cengage, New Delhi, 2012.

REFERENCES:

1. Gareth Williams, '*Linear Algebra with Applications'*. Narosa Publishing House, New Delhi, 2012.
2. David C Lay, '*Linear Algebra and its Applications'*. Pearson, New Delhi, 2016.
3. Friedberg, Insel and Spence, '*Linear Algebra'*. Pearson Education, USA, 2015.
4. Kenneth Hoffman and Ray Kunze, '*Linear Algebra'*. Prentice Hall, New Jersey, 2015.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the concepts related to Linear Equations, Vector spaces, Linear transformations, Inner product spaces, Eigenvalues and Eigenvectors.	**K2**
CO2	Apply the techniques of Linear Equations, Vector spaces, Linear transformations, Inner product spaces, Eigenvalues and Eigenvectors to solve engineering problems.	**K3**
CO3	Analyse the solutions of engineering problems employing Linear Equations, Vector spaces, Linear transformations, Inner product spaces, Eigenvalues and Eigenvectors.	**K4**
CO4	Use modern tools to solve engineering problems with the help of Linear Equations, Vector spaces, Linear transformations, Inner product spaces, Eigenvalues and Eigenvectors.	

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1												2	2	2
CO2	2											2	2	2
CO3		1										2	2	2
CO4					1							2	2	2
@	**2**	**1**			**1**							**2**	**2**	**2**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25MA303 PROBABILITY, STOCHASTIC PROCESSES AND STATISTICS

3 1 0 4

PROBABILITY AND DISCRETE RANDOM VARIABLES: Probability, axioms, Conditional Probability, Partitions and the Law of TOTAL Probability, Baye's theorem, Independence, discrete random variables-definitions, probability mass function, families of discrete random variables - binomial, Poisson and geometric random variables, cumulative distribution functions, expectations. **(9+3)**

CONTINUOUS RANDOM VARIABLES: Continuous Sample Space, cumulative distribution functions, probability density function, families of continuous random variables - uniform, exponential, Erlang and Gaussian random variables, expectations. **(9+3)**

MULTIPLE RANDOM VARIABLES: Joint cumulative distribution function – joint probability mass function – marginal probability mass function - joint probability density function - marginal probability density function - independent random variables- expected values– Covariance, Correlation and Independence. **(9+3)**

STOCHASTIC PROCESSES: Definitions and Examples - Random Variables from Random Processes - Independent, Identically Distributed Random Sequences - The Poisson Process-Properties of the Poisson Process - Markov Process - Discrete-Time Markov Chains - Higher Transition Probabilities: Chapman–Kolmogorov Equations - Long-Run Behavior of Markov Chains. **(9+3)**

STATISTICAL INFERENCE: Foundations for inference - Variability in estimates - Confidence intervals - Hypothesis testing - Central Limit Theorem - Inference for numerical data - t-distribution - ANOVA and the F Test - Inference for categorical data - Inference for a single proportion - Difference of two proportions - Testing for goodness of fit using chi-square - Testing for independence in two-way tables. **(9+3)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS:

1. Roy D Yates and David J Goodman, '*Elementary Linear Algebra*'. 3rd Edition ,Wiley India, New Delhi, 2019.
2. David M Diez, Christopher D Barr, Mine Cetinkaya - Rundel. '*Open Intro Statistics'*. Creative Commons license, 2017.

REFERENCES:

1. Saeed Ghahramani, '*Fundamentals of Probability with Stochastic Processes'*. CRC Press, Taylor & Francis Group, USA, 2018.
2. Douglas C Montgomery and George C Runger, '*Applied Statistics and Probability for Engineers'*. Wiley India, New Delhi, 2018.
3. Ronald E. Walpole, Raymond H Myers, Sharon L Myers and Keying Ye, '*Probability and Statistics for Engineers and Scientists*'. Pearson, New Delhi, 2016.
4. David Spiegelhalter, '*The Art of Statistics: How to Learn from Data'*. Pelican Books, 2020.
5. Michael J. Evans, Jeffrey S. Rosenthal, '*Probability and Statistics: The Science of Uncertainty*'. 2nd Edition, WH Freeman, 2010.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the concepts related to Vector spaces, Linear transformations, Inner product spaces, Eigenvalues, Eigenvectors and Matrix decomposition.	**K2**
CO2	Apply the techniques of Vector spaces, Linear transformations, Inner product spaces, Eigenvalues, Eigenvectors and Matrix decomposition to solve engineering problems.	**K3**
CO3	Analyze the solutions of engineering problems employing Vector spaces, Linear transformations, Inner product spaces, Eigenvalues, Eigenvectors and Matrix decomposition.	**K4**
CO4	Use modern tools to solve engineering problems with the help of Vector spaces, Linear transformations, Inner product spaces, Eigenvalues, Eigenvectors and Matrix decomposition.	

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1												2	2	2
CO2	3											2	2	2
CO3		2										2	2	2
CO4					1				1			2	2	2
@	**3**	**2**			**1**				**1**			2	2	2

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25CS301 DATA STRUCTURES

3 0 0 3

INTRODUCTION: Need for data structures – Types of data structures – Abstract Data Type – Algorithm complexity analysis of linear and non-linear data structures – Best case and worst-case complexities – Asymptotic notations. **(9)**

ARRAYS AND LISTS: Array representation and operations – Matrix representation using multi-dimensional arrays – Linked list representation – Operations on singly linked list – Types of linked list – Polynomial addition – Sparse matrices. **(9)**

STACKS AND QUEUES: Stack ADT – Representation and operations – Expressing handling – Role of stack in implementing recursive algorithms – Queue ADT – Representation and operations – Types of queues – Circular queue – Dequeue – Priority queue. **(9)**

TREES: Terminologies – Binary Tree – Traversal – Expression trees – Binary Heap – Priority queue implementation using Binary Heap – Binary Search Tree – AVL Tree – m-way search trees – B Tree – B+ Tree – Application – Tree structure. **(9)**

HASHING AND GRAPHS: Hash table – Hash functions – Resolving collisions – Rehashing. GRAPHS: Graph terminologies – Types of graphs – Representation – Breadth First Search – Depth First Search – Topological sort. **(9)**

Total L: 45 periods

TEXTBOOKS:

1. Mark Allen Weiss, '*Data Structures and Algorithm Analysis in C*'. 2nd Edition, Pearson Education, 2019.
2. Jean Paul Tremblay, Sorenson, '*An Introduction to Data Structures with Applications*'. 2nd Edition, McGraw Hill Publishing Company, New Delhi, 2017.

REFERENCES:

1. Ellis Horowitz, SartaiShani, Sanguthevar Rajasekaran, '*Fundamentals of Computer Algorithms*'. 2nd edition, Universities Press, 2019.
2. Salaria R S, '*Data Structures and Algorithms using C*'. 5th Edition, Khanna Book Publishing, New Delhi, 2017.
3. Amol M. Jagtap, Ajit S. Mali, '*Data Structures Using C – A Practical Approach for Beginners*'. 1st Edition, Chapman and Hall/CRC, 2021.
4. Aaron M Tanenbaum, Moshe J Augenstein and Yedidyah Langsam, '*Data Structures Using C and C++*'. 2nd Edition, Prentice Hall, 2021.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the fundamental concepts, classifications, and principles of data structures and algorithm complexity.	**K2**
CO2	Apply appropriate data structures and their operations to solve computational problems.	**K3**
CO3	Analyze the complexity of data structures and associated algorithms.	**K4**
CO4	Design and develop efficient solutions using appropriate linear and non-linear data structures.	

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1												3	3	3
CO2	3											3	3	3
CO3		3										3	3	3
CO4			2					2				2	2	2
@	**3**	**3**	**2**					**2**				**3**	**3**	**3**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25AD301 FUNDAMENTALS OF DATA SCIENCE AND ANALYTICS

3 0 0 3

INTRODUCTION: Need for data science – Benefits and uses – Facts of data – Data science process – Setting the research goal – Retrieving data – cleansing, integrating, and transforming data – Exploratory data analysis – Build the models – Presenting and building applications. **(9)**

DESCRIPTIVE ANALYTICS: Frequency distributions – Outliers – Interpreting distributions – Graphs – Averages – Describing variability – Interquartile range – variability for qualitative and ranked data - Normal distributions – z scores – Correlation – Scatter plots – Regression – Regression line – Least squares regression line – Standard error of estimate – Interpretation of r^2 – Multiple regression equations – Regression towards the mean. **(9)**

INFERENTIAL STATISTICS: Populations – Samples – Random sampling – Sampling distribution- Standard error of the mean - Hypothesis testing – z-test – z-test procedure – Decision rule – Calculations – Decisions – Interpretations - One-tailed and two-tailed tests – Estimation – Point estimate – Confidence interval–Level of confidence – Effect of sample size. **(9)**

ANALYSIS OF VARIANCE: t-test for one sample – Sampling distribution of t – t-test procedure – t-test for two independent samples – p-value – Statistical significance – t-test for two related samples. F-test – ANOVA – Two-factor experiments – three f-tests – two-factor ANOVA – chi-square tests. **(9)**

PREDICTIVE ANALYTICS: Linear models - goodness of fit - weighted resampling - regression with Stats Models - multiple and non-linear regression - logistic regression - time series basics - moving averages - handling missing data - autocorrelation - survival analysis. **(9)**

Total L:45 Periods

TEXT BOOKS:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, '*Introducing Data Science'*. Manning Publications, 2016.
2. Robert S. Witte and John S. Witte, '*Statistics*'. 11th Edition, Wiley Publications, 2017.
3. Jake VanderPlas, '*Python Data Science Handbook'*. O'Reilly, 2016.

REFERENCE BOOKS:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, '*Deep Learning'*. MIT Press, 2016
2. Allen B. Downey, '*Think Stats: Exploratory Data Analysis in Python'*. Green Tea Press, 2014.
3. Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare, '*Fundamentals of Data Science*'. CRC Press, 2022.
4. Chirag Shah, '*A Hands-On Introduction to Data Science*'. Cambridge University Press, 2020.
5. Vineet Raina, Srinath Krishnamurthy, '*Building an Effective Data Science Practice: A Framework to Bootstrap and Manage a Successful Data Science Practice*'. Apress, 2021.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the principles of data preparation, statistical measures, probability distributions, hypothesis testing, variance analysis, and predictive modelling.	**K2**
CO2	Apply appropriate statistical techniques such as regression, hypothesis testing, and t-tests to complex datasets for data interpretation and decision-making.	**K3**
CO3	Analyze datasets using ANOVA, correlation, multiple regression, and time series methods to identify patterns, trends, and relationships among variables.	**K4**
CO4	Construct analytical models using statistical and predictive techniques and generate structured interpretations of the results.	

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1												2	2	2
CO2	3											3	3	3
CO3		3										3	3	3
CO4			2		2			2				2	2	2
@	**3**	**3**	**2**		**2**			**2**				3	3	3

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25AD302 DATA ENGINEERING

3 0 0 3

INTRODUCTION TO EXPLORATORY DATA ANALYSIS (EDA) - Steps in EDA, Data Types: Numerical Data - Discrete data, continuous data - Categorical data -Measurement Scales: Nominal, Ordinal, Interval, Ratio - Comparing EDA with classical and Bayesian Analysis - Software tools for EDA. **(9)**

TRANSFORMATION TECHNIQUES: Performing data deduplication - Replacing values - Discretization and binning. Introduction to Missing data, Handling missing data: Traditional methods - Maximum Likelihood Estimation. **(9)**

DESCRIPTIVE STATISTICS: Understanding statistics, Measures of central tendency, Measures of dispersion, Grouping Datasets Understanding group by(), Group by mechanics, Data aggregation, Pivot tables and cross-tabulations, Correlation: Introducing correlation, Types of analysis. **(9)**

PLOTTING AND VISUALIZATION: A Brief matplotlib API Primer- Plotting with pandas and seaborn, Time Series Analysis (TSA): Fundamentals of TSA - characteristics of TSA – Time based indexing - visualizing time series – grouping time series data- resampling time series data. **(9)**

PANDAS: Introduction to pandas Data Structures, Essential Functionality, Summarizing and Computing Descriptive Statistics. Data Loading, Storage and File Formats. Reading and Writing Data in Text Format, Web Scraping, Binary Data Formats, Data Cleaning and Preparation. Handling Missing Data, Data Transformation, String Manipulation. Data Wrangling: Hierarchical Indexing, Combining and Merging Data Sets Reshaping and Pivoting. **(9)**

Total L: 45 Periods

TEXT BOOKS:

1. Suresh Kumar Mukhiya and Usman Ahmed, '*Hands-On Exploratory Data Analysis with Python'*. 1st Edition, Packt Publisher, 2020.
2. McKinney. W, '*Python for Data Analysis: Data Wrangling with Pandas, NumPy and IPython'*. 2nd Edition, O'ReillyMedia, 2017.

REFERENCES:

1. Ayodele Oluleye, '*Exploratory Data Analysis with Python*'. 1st Edition, Packt Publisher, 2023.
2. Anamitra Dehmukh,Nimbalkar, '*Data Exploration and Visualization'*. 1st Edition, Technical Publications, 2022.

COURSE OUTCOMES

At the end of the course, students will be able to:		Blooms Level
CO1	Describe the fundamental concepts of Exploratory Data Analysis (EDA), transformation techniques, and descriptive statistics used to summarize datasets.	**K2**
CO2	Apply appropriate techniques for data preprocessing and transformation, visualizing Time Series data, and pandas for data manipulation and statistical computations.	**K3**
CO3	Analyze datasets using grouping, aggregation, correlation methods, and visualization tools, including time series analysis, to identify patterns, trends, and relationships in data.	**K4**
CO4	Evaluate data analysis workflows by integrating EDA techniques, visualization methods, and data wrangling tools to generate meaningful insights from structured and unstructured data.	

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1												2	2	2
CO2	3											3	3	3
CO3		3										3	3	3
CO4			2		2							2	2	2
@	**3**	**3**	**2**		**2**							3	3	3

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25CS303 OBJECT ORIENTED PROGRAMMING

2 0 2 3

CLASSES AND OBJECT-ORIENTED CONCEPTS: Object oriented programming paradigms – Java buzzwords – Data types, variables and arrays – Operators – Control statements – Programming structures in Java – Classes – Constructors – Methods – Access specifiers – Static members –- Overloading methods - Objects as parameters - Returning objects. **(6)**

INHERITANCE, PACKAGES AND INTERFACES: Inheritance Basics – Types of inheritance – Super keyword - Method overriding - Dynamic method dispatch - Abstract classes - Final keyword with inheritance – Packages - Packages and member access - Importing packages – Interfaces. **(6)**

EXCEPTION HANDLING AND MULTITHREADING: Exception Handling basics – Multiple catch clauses – Nested try statements – Java's built-in exceptions – User defined exception. Multithreaded programming: Java thread model – creating a thread and multiple threads – Priorities – Synchronization – Inter thread communication- Suspending – Resuming and Stopping threads. **(6)**

I/O AND STRING HANDLING: I/O Basics – Reading and Writing console I/O – Reading and writing files. Strings: Basic String class, methods and String buffer class – Wrappers – Auto boxing. **(6)**

GENERICS AND COLLECTIONS: Generics: Generic programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Collection Framework in Java: List – Array list – Hash table – Hash set – Tree set – Stack – Priority queue. **(6)**

LIST OF EXPERIMENTS

1. Classes and Methods
2. Inheritance
3. Abstract Classes
4. Interfaces and Packages
5. Exception Handling
6. Multithreading Concepts
7. I/O and Files
8. Generics and Lambda Expressions
9. Collection Classes

Total L: 30 + P: 30 = 60 periods

TEXTBOOKS:

1. Herbert Schildt, *'Java: The Complete Reference'*. 11th Edition, McGraw Hill Education, New Delhi, 2019.
2. Deitel P and Deitel H, '*Java: How to Program*'. 11th Edition, Prentice Hall, 2018.

REFERENCES:

1. Cay S. Horstmann, *'Core Java Fundamentals'.* Volume 1, 11th Edition, Prentice Hall, 2018.
2. James Gosling, Bill Joy, Guy Steele, Gilad Bracha, Alex Buckley and Daniel Smith, '*The Java Language Specification – Java SE*'. 13th Edition, Oracle America Inc., USA, 2019.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the core Object Oriented Programming concepts and their applications.	**K2**
CO2	Apply Java constructs to develop various applications.	**K3**
CO3	Analyze solutions involving code reusability and complexity management	**K4**
CO4	Develop modular and reusable applications by integrating OOP principles and advanced programming concepts.	
CO5	Demonstrate problem-solving skills through the development of well-structured and maintainable applications.	

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1												2	2	2
CO2	3											3	3	3
CO3		1										1	1	1
CO4					3			3				2	2	2
CO5					1			1				1	1	1
@	**3**	**1**			**3**			**3**				**3**	**3**	**3**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25CS311 DATA STRUCTURES LABORATORY

0 0 4 2

1. Solving problems using arrays.
2. Searching and Sorting algorithms.
3. Implementation of linked list.
4. Applications of linked list.
5. Implementation of stack and queue.
6. Applications of stack.
7. Operations on Binary Search Trees.
8. Applications of Binary Search Tree, AVL tree.
9. Graphs – Depth First Search and Breadth First Search.
10. Hashing and Collision Resolution.

Total P: 60 periods

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, '*Fundamentals of Computer Algorithms*'. 2nd Edition, Universities Press, 2019.
2. Jean Paul Tremblay and Sorenson, '*An Introduction to Data Structures with Applications*'. McGraw Hill Publishing Company, New Delhi, 2017.
3. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, '*Introduction to Algorithms*'. MIT Press, England, 2009.
4. Salaria R. S, '*Data Structures and Algorithms Using C*'. 5th Edition, Khanna Book Publishing, New Delhi, 2017.
5. Amol M. Jagtap, Ajit S. Mali, '*Data Structures Using C – A Practical Approach for Beginners*'. Chapman and Hall/CRC, 1st Edition, 2021.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Apply appropriate data structures to find solutions for computational problems.	**K3**
CO2	Analyze optimized solutions to improve algorithmic efficiency and performance.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3											3	3	3
CO2		3										3	3	3
@	**3**	**3**										**3**	**3**	**3**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25AD311 DATA ANALYTICS AND VISUALIZATION LABORATORY

0 0 4 2

1. Working with Numpy, Pandas, Matplotlib and Seaborn.
2. Frequency distributions, Averages, Variability
3. Normal curves, Correlation and scatter plots, Correlation coefficient
4. Regression
5. Z-test
6. T-test
7. ANOVA
8. Building and validating linear models
9. Building and validating logistic models
10. Time series analysis

Total P: 60 Periods

REFERENCES:

1. Robert S. Witte and John S. Witte, '*Statistics'.* 11th Edition, Wiley Publications, 2017.
2. Jake VanderPlas, '*Python Data Science Handbook*'. O'Reilly, 2016.
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, '*Deep Learning*'. MIT Press, 2016
4. Allen B. Downey, '*Think Stats: Exploratory Data Analysis in Python'.* Green Tea Press, 2014.
5. Chirag Shah, '*A Hands-On Introduction to Data Science'*. Cambridge University Press, 2020.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Analyze the fundamental concepts, processes, and significance of data science, including data pre-processing, descriptive statistics, and inferential statistical techniques.	**K4**
CO2	Evaluate statistical techniques for regression, hypothesis testing for z-test, t-test and f-test for data interpretation and decision-making.	**K5**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3											3	3	3
CO2			3		3			3				3	3	3
@	**3**		**3**		**3**			**3**				**3**	**3**	**3**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25EEC02 FOUNDATIONS OF PROBLEM SOLVING

0 0 2 1

1. Speed Mathematics (SAW, Oz, Mirror methods)
2. Speed Mathematics (High5, Minion, Butterfly methods)
3. Speed Mathematics (Inception, Goldeneye methods)
4. Thinking with Numbers
5. Problem Solving with Visual information
6. Words Puzzles
7. Resume Writing Essentials

Total P: 30 periods

REFERENCE:

1. R. S. Agarwal, '*Quantitative Aptitude for Competitive Examination'*. S Chand Publishing, New Delhi, 2017.

SEMESTER IV

25MA401 OPTIMIZATION TECHNIQUES FOR ANALYTICS

3 1 0 4

LINEAR PROGRAMMING: Modelling with linear programming model - Convex sets - Convex functions - Graphical solution for two dimensional problems – Transition from graphical to algebraic solution, Simplex method, M- method, Two phase simplex method; Special cases in the simplex method: Degeneracy, Alternative optima, Unbounded solution, Infeasible solution. **(9+3)**

DUALITY AND POST-OPTIMAL ANALYSIS: Definition of the Dual problem, Primal – Dual relationships, Economic interpretation of Duality, Dual Simplex algorithm, Generalized Simplex algorithm, Post optimal analysis. **(9+3)**

INTEGER PROGRAMMING: Gomory cutting plane methods for all integer and mixed integer programming problems - Branch and Bound method (Land – Dolg and Dakin algorithms). **(9+3)**

DYNAMIC PROGRAMMING AND CONVEX OPTIMIZATION: Principle of Optimality – Backward and forward induction methods-– Shortest path network problems – Cargo loading model, Equipment replacement model. Convex optimization problems- linear and quadratic programs; quasi-convex optimization problems. **(9+3)**

APPLICATIONS IN ANALYTICS AND CASE STUDIES: Optimization in machine learning (regularization, loss minimization), Supply chain and logistics optimization, Marketing analytics: campaign optimization, Finance analytics: risk-adjusted portfolio optimization, Real-time case studies and problem-solving using optimization models. **(9+3)**

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS:

1. Michael H. Veatch, '*Linear and Convex Optimization*'. John Wiley and Sons, Inc, 2021.
2. Richard W. Cottle, Mukund N. Thapa, '*Linear and Nonlinear Optimization*'. Springer Science Business Media, LLC 2017.
3. Stephen J. Wright, Benjamin Recht, '*Optimization for Data Analysis*'. Cambridge University Press, March 2022.

REFERENCES:

1. Hamdy A Taha, '*Operations Research – An Introduction'*. Pearson Education Limited, 2017.
2. Stephen Boyd, Lieven Vandenberghe, *'Convex Optimization*'. Cambridge University Press, 2004.
3. David G. Luenberger, Yinyu Ye, '*Linear and Nonlinear Programming*'. Springer Nature Switzerland, 2021.
4. Edwin K P Chong, Stanislaw H Zak, '*Introduction to Optimization*'. Wiley India, 2017.
5. Charu C. Aggarwal, *'Linear Algebra and Optimization for Machine Learning'*. Springer Nature Switzerland, 2020.

COURSE OUTCOME

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the fundamentals of linear programming, including convex sets and functions, and solve optimization problems using graphical and algebraic methods.	**K2**
CO2	Apply duality theory to linear programming problems, interpret primal-dual relationships, and perform post-optimality analysis including Dual and Generalized Simplex methods.	**K3**
CO3	Analyze and solve integer programming problems using Gomory's cutting plane and Branch and Bound methods for both pure and mixed-integer problems	**K4**
CO4	Formulate and solve dynamic programming models and convex optimization problems, including linear, quadratic, and quasi-convex types, in various decision-making scenarios.	

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3											2	2	2
CO2		2										2	2	2
CO3			2									2	2	2
CO4					1							2	2	2
@	**3**	**2**	**2**		**1**							**2**	**2**	**2**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25CS401 DATABASE MANAGEMENT SYSTEMS

3 0 0 3

DATA MODELS: Databases and database users, Database system concepts and architecture, Data models: Entity relationship model - Enhanced entity relationship model - Relational Model, Relational database constraints, Relational algebra, Conceptual to relational mapping, SQL, DB Vault. **(9)**

DATABASE DESIGN THEORY AND METHODOLOGY: Functional dependencies, Axioms, Normal Forms: First normal form - Second normal form - Third normal form - Boyce Codd normal form, Multi-valued dependency, Join dependency. **(9)**

DATA STORAGE AND INDEXING: Overview, Record storage, Primary file organization, Caching, Index structures for files: Single level Indexing - Multilevel Indexing, B-Trees. **(9)**

SYSTEM IMPLEMENTATION TECHNIQUES: Query processing, Query optimization, Transaction management: Transaction - Concurrency control - Recovery system. **(9)**

NON-RELATIONAL DATABASES: Need for NOSQL Databases, Types, MongoDB - Data types, Creating, Updating and Deleting Documents, Querying the database. **(9)**

Total L: 45 periods

TEXTBOOKS:

1. Ramez Elmasri and Shamkant B Navathe, '*Fundamentals of Database Systems*'. Pearson Education, 7th edition, New Delhi, 2017.
2. Abraham Silberchatz, Henry F Korth and Sudarshan S, '*Database System Concepts*'. Tata McGraw-Hill, 7th edition, New Delhi, 2021.

REFERENCES:

1. Atul Kahate, '*Introduction to Database Management Systems*'. 3rd Edition, Pearson Education, New Delhi, 2011.
2. Raghu Ramakrishnan and Johannes Gehrke, '*Database Management Systems*'. 4th Edition, Tata McGraw Hill, New Delhi, 2013.
3. Kristina Chodorow and Michael Dirolf, '*MONGODB: The Definitive Guide, Powerful and Scalable Storage*'. 3rd Edition, Shroff Publishers, Mumbai, 2019.
4. Thomas M Connolly Z Carolyn E, '*Database Systems: A Practical Approach to Design, Implementation, and Management*'. 6th Edition, Pearson Education, New Delhi, 2019.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the basic concepts of database management systems and data storage techniques.	**K2**
CO2	Apply database management system techniques to solve practical application problems.	**K3**
CO3	Analyse database concepts for the given scenario.	**K4**
CO4	Evaluate appropriate SQL queries and data models to optimize the performance and effectiveness of database applications.	**K5**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1												2	2	2
CO2	3											3	3	3
CO3		2										2	2	2
CO4				2								2	2	2
@	**3**	**2**		**2**								**3**	**3**	**3**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25CS402 DESIGN AND ANALYSIS OF ALGORITHMS

3 1 0 4

DIVIDE AND CONQUER: Introduction to algorithm design techniques, Divide and conquer methodology: Solving recurrence relations – Finding maximum and minimum element – Quick sort – Merge sort – Convex hull.

Activities:

- Time and space complexity analysis and amortized analysis of divide and conquer algorithms
- Implement merge sort and quick sort methods for array of size N. Experiment for different values of N and compare their time complexity. **(9+3)**

GREEDY METHOD: Greedy strategy – Knapsack problem – Minimum spanning trees – Single source shortest path method – Huffman trees.

Activities:

- Implementation of minimum spanning tree algorithms and comparison of their time complexity
- Implementation of dijkstra's algorithm and its complexity analysis. **(9+3)**

DYNAMIC PROGRAMMING: Principle of optimality – Knapsack problem – All pairs shortest path – Optimal binary search tree – Multistage graphs

Activities:

- Implementation of 0/1 knapsack problem using dynamic programming and analysis of time and space complexity.
- Implementation of all pair shortest path algorithm and derive its complexity. **(9+3)**

BACKTRACKING: State space tree – Knapsack problem – The eight queens problem – Sum of subsets – Graph coloring.

Activities:

- NP complete and NP hard problems
- Implement N queen's problem using backtracking. **(9+3)**

BRANCH AND BOUND: Bounding functions – 0/1 Knapsack problem – Traveling salesman problem – Assignment problem.

Activities:

- Implementation of assignment problem
- Implementation of traveling salesman problem
- Comparison of different approaches for solving knapsack problem. **(9+3)**

Total L: 45 + T: 15 = 60 Periods

TEXT BOOKS:

1. Anany Levitin, '*Introduction to the Design and Analysis of Algorithm*'. 3rd Edition, Prentice Hall of India, New Delhi, 2017.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, '*Fundamentals of Computer Algorithms*'. Galgotia Publications, New Delhi, 2010.

REFERENCES:

1.Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, '*Introduction to Algorithms*'. 3rd Edition, MIT Press, England, 2009.
2. Donald E. Knuth, '*The Art of Computer Programming*'. Volumes 1& 3, Pearson Education, 2009.
3. Jeffrey J. McConnell, '*Analysis of Algorithms*'. Jones and Bartlett Publishers, 2008.
4.Parag Himanshu Dave, Himanshu Bhalchandra Dave, '*Design and Analysis of Algorithms*'.Pearson Education, 2008.

COURSE OUTCOMES

At the end of the course, students will be able to:		Bloom's Level
CO1	Explain the fundamental principles of algorithm design and performance analysis.	**K2**
CO2	Develop algorithmic solutions for computational problems using appropriate design strategies.	**K3**
CO3	Analyze the correctness and computational complexity of algorithms using a suitable approach.	**K4**
CO4	Evaluate alternative algorithmic solutions to determine the most efficient approach for a given problem.	**K5**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1												**1**	**1**	**1**
CO2	**3**											**3**	**3**	**3**
CO3		**3**										**3**	**3**	**3**
CO4			**2**									**2**	**2**	**2**
@	**3**	**3**	**2**									**3**	**3**	**3**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25AD402 ARTIFICIAL INTELLIGENCE SYSTEMS

3 1 0 4

INTRODUCTION: Artificial Intelligence - The state of art - Intelligent Agents - Rationality - Nature of Environments – Structure of Agents - Examples.

(9+3)

PROBLEM SOLVING AGENTS: Searching for solutions: Uninformed search - BFS, DFS, Uniform cost search, Iterative deepening search - Informed Search - Greedy Best First search, A* search, AO* search - Adversarial search – Games - Optimal decisions in Games, alpha - beta pruning. **(9+3)**

KNOWLEDGE AND REASONING: Representations and mappings – Approaches to knowledge representation – Property inheritance algorithm - First Order Predicate logic- Instance and ISA relationships – Computable functions and predicates - Unification-Resolution – Question Answering. **(9+3)**

ACTING UNDER UNCERTAINTY: Quantifying uncertainty – Efficient representation of conditional distributions – Probability and Bayes Theorem - Bayesian Networks - Exact and approximate inferences - Making simple decisions – Utility theory - Decision networks – Value of information – Decisions With multiple agent. **(9+3)**

PLANNING: Classical Planning- Algorithms for Planning as state space search - Planning Graphs – Classic planning as Boolean Satisfiability - Analysis of planning approaches – Time, schedules and resources – Hierarchical planning.

(9+3)

Total L: 45 + T: 15 = 60 periods

TEXT BOOKS:

1. Stuart J Russell and Peter Norvig, '*Artificial Intelligence – A Modern Approach*'. 3rd Edition, Prentice Hall of India, Pearson Education, New Delhi, 2021.
2. Elaine Rich, Kevin Knight and Shivashankar B Nair, '*Artificial Intelligence'*. 3rd Edition, Tata McGraw Hill Publishing Company, New Delhi, 2019.

REFERENCES:

1. George F Luger, '*Artificial Intelligence: Structures and Strategies for Complex Problem Solving*'. 6th Edition, Pearson Education, New Delhi, 2021.
2. Deepak Khemani, '*A First Course in Artificial Intelligence*'. McGraw Hill Education, New Delhi, 2017.
3. John Paul Mueller, '*Artificial Intelligence for Dummies*'. Wiley, 2018
4. Lavika Goel, '*Artificial Intelligence: Concepts and Applications*'. Wiley,2021
5. Pradeepta Mishra, '*Practical Explainable AI Using Python: Artificial Intelligence Model Explanations Using Python-based Libraries, Extensions, and Frameworks'.* Apress,2021

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the fundamental concepts of intelligent agents, problem-solving strategies, knowledge representation, and uncertainty handling.	**K2**
CO2	Identify search algorithms, probabilistic models, and planning methods to solve typical AI problems in various environments.	**K3**
CO3	Examine the performance of different AI approaches such as informed/uninformed search, logical inference, and decision-making under uncertainty.	**K4**
CO4	Interpret comprehensive AI solutions across search, reasoning, uncertainty, and planning domains.	

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1												2	2	2
CO2	**3**											3	3	3
CO3		**3**										3	3	3
CO4				**2**				**2**	**2**			2	2	2
@	**3**	**3**		**2**				**2**	**2**			**3**	**3**	**3**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25AD403 MACHINE LEARNING FOR DATA SCIENCE

3 0 0 3

INTRODUCTION & PRE-PROCESSING: Introduction to Machine Learning: Supervised - Unsupervised - Reinforcement Learning. Examples of machine learning applications, Vapnik-Chervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning, Hypothesis spaces, Data Pre-processing: Importing the Dataset – Missing Data - Encoding Categorical data - Splitting the dataset – Feature-Scaling. **(9)**

REGRESSION: Supervised Learning: Classification and Regression - Generalization, overfitting and underfitting Ordinary Least Squares- Cost Functions - Gradient Descent based optimization - Simple Linear Regression - Multiple Linear Regression - Polynomial Regression, Ridge Regression and LASSO regression, Evaluating Regression Model Performance - Regression Model Selection. **(9)**

CLASSIFICATION: Classification - Logistic Regression, K-Nearest neighbors, Support Vector Machine - Kernel SVM, Naive Bayes, Decision Tree Classification, Random Forest Classification, XGBoost, Classification Model Selection, Measuring classifier performance. **(9)**

UNSUPERVISED LEARNING AND DIMENSIONALITY REDUCTION: Clustering: K-Means Clustering, Hierarchical Clustering, Association Rule Learning - Apriori, Gaussian mixture models and Expectation maximization, Principal Component Analysis, Linear Discriminant Analysis. **(9)**

NEURAL NETWORKS: Basics of Neural Networks - MP neurons, Perceptron, Weight, Bias, Activation, Loss function - Optimizer - Gradient based optimization; Artificial Neural Networks - Single Layer Neural Network – Multilayer Perceptron, Feed Forward Neural Networks, Error Backpropagation. **(9)**

Total L: 45 periods

TEXT BOOKS:

1. Ethem Alpaydin, '*Introduction to Machine Learning'*. 4th Edition, MIT Press, 2020.
2. Stephen Marsland, '*Machine Learning: An Algorithmic Perspective'*. 2nd Edition, CRC Press, 2014.

REFERENCE BOOKS:

1. Aurélien Géron, '*Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems'.* O'Reilly Media, 2019.
2. Christopher M. Bishop, '*Pattern Recognition and Machine Learning'.* Springer, 2006.
3. Tom Mitchell, '*Machine Learning'.* 3rd Edition, McGraw Hill, 1997.
4. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, *'Foundations of Machine Learning'*. 2nd Edition, MIT Press, 2012, 2018.
5. Ian Goodfellow, Yoshua Bengio, Aaron Courville, '*Deep Learning'.* MIT Press, 2016.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the principles and foundations of machine learning, including key theoretical concepts and the trade-offs in model generalization.	**K2**
CO2	Apply various supervised and unsupervised machine learning algorithms to analyze datasets and solve classification, regression, and clustering problems.	**K3**
CO3	Analyze the effectiveness of different machine learning models, techniques, and ensemble methods in addressing complex real-world challenges.	**K4**
CO4	Design a machine learning solution as a team, demonstrating the ability to handle end-to-end processes, from problem formulation to model deployment.	

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1												3	3	3
CO2	3											3	3	3
CO3		3										3	3	3
CO4			2		1			2				3	3	3
@	**3**	**3**	**2**		**1**			**2**				**3**	**3**	**3**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25CS411 DATABASE MANAGEMENT SYSTEMS LABORATORY

0 0 4 2

1. Create a database table, add constraints (primary key, unique, check, not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Execute DCL and TCL commands.
3. Create a set of tables, add foreign key constraints and incorporate referential integrity.
4. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
5. Implement sub queries, simple join operations and explore outer joins.
6. Write user defined functions and stored procedures in SQL.
7. Write SQL Triggers for insert, delete, and update operations in a database table.
8. Create view and index for database tables with a large number of records.
9. Create an XML database and validate it using XML schema.
10. Create document, column and graph-based data using NOSQL database tools.

Total P: 60 periods

REFERENCES:

1. Abraham Silberschatz, Henry F Korth and Sudarshan S, '*Database System Concepts*'. 7th Edition, Tata McGraw-Hill, New Delhi, 2021.
2. Ramez Elmasri and Shamkant B Navathe, '*Fundamentals of Database System'*. 7th Edition, Addison Wesley, USA, 2016.
3. Ivan Bayross, '*SQL, PL/SQL the Programming Language of Oracle*'. 4th Edition, BPB Publications, New Delhi, 2020.
4. Benjamin Rosenzweig and Elena Rakhimov, '*Oracle PL/SQL by Example*'. 5th Edition, Pearson Education, India, 2015.
5. Raghu Ramakrishnan and Johannes Gehrke, '*Database Management Systems*'. 4th Edition, Tata McGraw-Hill, New Delhi, 2015.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Apply database concepts to create and manage databases using SQL and connect them with applications by maintaining data accuracy and consistency.	**K3**
CO2	Analyze XML and NoSQL data models through schema validation and multi-model database tools.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3											3	3	3
CO2		2										2	2	2
@	**3**	**2**										**3**	**3**	**3**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25AD412 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY

0 0 4 2

1. Implementation of Intelligent Agents and their types using a simple environment simulation.
2. Implementation of Uninformed Search algorithms: BFS, DFS, and Uniform Cost Search.
3. Implementation of Informed Search algorithms: Greedy Best First Search and A* Search.
4. Implementation of Adversarial Search using Minimax and Alpha-Beta Pruning in a two-player game.
5. Implementation of Decision Networks and Utility-based Decision Making.
6. Linear Regression and Logistic Regression
7. Support Vector Machine
8. Decision Tree and Random Forest
9. K-Means Clustering and Association Rule Mining
10. Gaussian mixture models and Expectation maximization
11. Principal Component Analysis and Linear Discriminant Analysis
12. Artificial neural network

Total P: 60 periods

REFERENCES:

1. George F Luger, '*Artificial Intelligence: Structures and Strategies for Complex Problem Solving'.* 6th Edition, Pearson Education, New Delhi, 2021.
2. Deepak Khemani, '*A First Course in Artificial Intelligence'.* McGraw Hill Education, New Delhi, 2017.
3. Aurélien Géron, '*Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems'.* O'Reilly Media, 2019.
4. Christopher M. Bishop, '*Pattern Recognition and Machine Learning'.* Springer, 2006.
5. Tom Mitchell, '*Machine Learning'.* 3rd Edition, McGraw Hill, 1997.
6. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, '*Foundations of Machine Learning'.* 2nd Edition, MIT Press, 2012, 2018.
7. Ian Goodfellow, Yoshua Bengio, Aaron Courville, '*Deep Learning'.* MIT Press, 2016

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Implement intelligent agents and machine learning algorithms including supervised, and unsupervised approaches, in simulated environments and complex datasets.	**K3**
CO2	Compare and analyze the performance of uninformed, informed, and adversarial search strategies as well as various regression and classification models based on accuracy, efficiency, and applicability to problem contexts.	**K4**

COs-POs & PSOs MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3											3	3	3
CO2					3							3	3	3
@	**3**				**3**							**3**	**3**	**3**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25AD413 CORPUS CREATION LABORATORY

0 0 2 1

1. Introduction to Corpus Linguistics and Corpus Design
2. Text Data Collection from Multiple Sources (Web, PDFs, APIs, Social Media)
3. Text Encoding, Unicode, and Character Normalization
4. Data Cleaning and Noise Removal (HTML tags, emojis, stopwords)
5. Tokenization, Sentence Splitting, and Text Segmentation
6. Part-of-Speech Tagging and Lemmatization
7. Annotation Techniques (Manual and Semi-Automatic Annotation)
8. Metadata Creation and Corpus Documentation
9. Corpus Storage Formats (TXT, CSV, JSON, XML)
10. Corpus Validation, Versioning, and Quality Assessment

Total P: 30 periods

REFERENCES:

1. Tony McEnery and Andrew Hardie, '*Corpus Linguistics: Method, Theory and Practic*e'. Cambridge University Press, 2012.
2. Stefan Th. Gries, '*Quantitative Corpus Linguistics with R*'. Routledge, 2017.
3. Christopher D. Manning and Hinrich Schütze, '*Foundations of Statistical Natural Language Processing'*. MIT Press, 1999.
4. Daniel Jurafsky and James H. Martin, '*Speech and Language Processing*'. Pearson, 3rd Edition, 2023.
5. Nitin Indurkhya and Fred J. Damerau, '*Handbook of Natural Language Processing*'. CRC Press, 2010.
6. Ian Goodfellow, Yoshua Bengio, Aaron Courville, '*Deep Learning'.* MIT Press, 2016.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Design and construct structured text corpora by collecting, cleaning, preprocessing, and organizing textual data from diverse sources using standard corpus creation methodologies.	**K3**
CO2	Apply & Analyze the linguistic annotation, metadata generation, validation techniques, and corpus quality evaluation methods to prepare reusable and domain-specific corpora for NLP and AI applications.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3											2	2	2
CO2		2	2					1				2	2	2
@	**3**	**2**	**2**					**1**				**2**	**2**	**2**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25ADE01 MINI PROJECT I

0 0 2 1

- Identification of a real time problem in thrust areas.
- Developing a mathematical model for solving the above problem.
- Finalization of system requirements and specification.
- Implementation of different solutions for the problem based on literature survey Future trends in providing alternate solutions.
- Consolidated report preparation of the above.

Total P: 30 periods

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Identify real-world problems, formulate appropriate solution approaches, and plan a structured mini-project with clear objectives and methodology.	**K3**
CO2	Develop and demonstrate a functional prototype by applying suitable tools and techniques, and effectively communicate project outcomes through technical presentation and documentation.	**K4**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2											2	2	2
CO2		2	2		2			1	2	1		2	2	2
@	**2**	**2**	**2**		**2**			**1**	**2**	**1**		**2**	**2**	**2**

1-low, 2-medium, 3-high @-Overall Contribution to the Course

Third ACM

25EEC03 PROBLEM SOLVING

0 0 2 1

1. Algorithmic Thinking, Branching & Repetition Problems
2. Logical Reasoning - Data Arrangements & Relations
3. Solving problems based on Coding & decoding, Series, Analogy, Odd man out and Visual reasoning
4. Problems based on Ages, Logical Connectives, Syllogisms, Data Interpretation & Data Sufficiency
5. Solving problems on Clocks Calendars, Direction Sense & Cubes
6. Problems based on Number system, Percentages, Simple & Compound Interest
7. Resume Update **Total P:30 periods**

REFERENCE:

1. R. S. Agarwal, '*Quantitative Aptitude for Competitive Examination'.* S Chand Publishing, New Delhi, 2017.

MANDATORY COURSES

25MC001 ENVIRONMENTAL SCIENCES
(Common to Civil, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

2 0 0 0

INTRODUCTION TO ENVIRONMENT: Environment - Definition, scope and importance. Types and composition of atmosphere – particles, ions and radicals. Ozone layer- significance, formation and depletion. Ecosystems- Structure and functions, components, energy flow, food chains, food web, Biodiversity-levels, values and threats – India as a mega-diversity nation, hotspots of biodiversity, endangered and endemic species of India, conservation of biodiversity. **(6)**

ENERGY RESOURCES: Introduction – National and International status- exploitation - sustainable strategies- Fossil fuels-classification, composition, physico-chemical characteristics and energy content of coal, petroleum and natural gas; solar energy - introduction, harnessing strategies. Wind energy - availability, wind power plants, wind energy conversion systems, site characteristics, and types of wind turbines. Supporting renewable energy resources -tidal, geothermal, hydroelectric. (**6)**

ENVIRONMENTAL POLLUTION: Definition, Sources, causes, impacts and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear hazards, RF hazards, Role of an individual in prevention of pollution. Disaster Management: Floods, earthquake, cyclone and landslides – Case studies, consequences and rescue measures. **(6)**

WASTE MANAGEMENT: Waste water - Characteristics of domestic and industrial wastewater - COD and BOD, Various stages of treatment – primary, secondary, tertiary treatment- Biological and advanced oxidation processes. Solid waste management – Characteristics of municipal solid waste (MSW), biomedical, automobile and e-wastes and their management, landfills, incineration, pyrolysis, gasification and composting**.** **(6)**

SOCIAL ISSUES AND THE ENVIRONMENT: Environmentally Sustainable work practices- Rain water harvesting, Role of non-governmental organizations. Human ethics and rights- impact on environment and human health, role of information technology on environment and human kind. Green IT policies, Process of EIA - ISO 14000. Legislation- Environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act. **(6)**

Total L: 30 periods

TEXT BOOKS:

1. Gilbert M. Masters, '*Introduction to Environmental Engineering and Science*'. Pearson Education, New Delhi, 2004.
2. Deswal S and Deswal A, '*A Basic Course in Environmental Studies*'. Dhanpat Rai and Co, New Delhi, 2004.

REFERENCES:

1. Benny Joseph, '*Environmental Science and Engineering*'. Tata McGraw - Hill, New Delhi, 2006.
2. Koteswara Rao M V R, '*Energy Resources: Conventional & Non – Conventional*'. BSP Publications, New Delhi, 2006.
3. Botkin and Keller, '*Environmental Science*'. Wiley India Private Limited, New Delhi, 2013.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the basic concepts of environment, energy sources and waste management	**K2**
CO2	Use different renewable energy resources and environment protection measures for sustainable development	**K3**
CO3	Conduct a case study and real-time environmental issues and present as a team	

COs-POs & PSOs MAPPING:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	1												
CO3						2	2	2			2		
@	**1**					**2**	**2**	**2**			**2**		

1-low, 2-medium, 3-high @-OVERALL CONTRIBUTION TO THE COURSE

25MC002 INDIAN CONSTITUTION

(Common to Civil, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

2 0 0 0

INTRODUCTION: Evolution of Indian Constitution; significance of constitution; Composition; Preamble and its Philosophy. **(4)**

RIGHTS, DUTIES AND DIRECTIVE PRINCIPLES: Fundamental Rights- Writs and Duties, Directive Principles of State Policy. **(5)**

UNION GOVERNMENT: Union Government, President and Vice President, Houses of the Parliament and their functions; Types of Bills, Stages of passing of Bill into an Act, Veto Power, Constitution Amendment Procedure, Various Amendments made and their significance for India. **(6)**

STATE GOVERNMENT AND FEDERALISM: Composition of State Legislature; Powers, Functions and Position of Governor, Function of Chief Ministers, Council of Ministers; The Indian Federal System, Administrative Relationship between Union and States. **(8)**

JUDICIARY: Supreme Court, High Court; District Court and Lower Courts - Functions and Powers – Judges – Qualifications and Powers - Judicial Review. **(7)**

Total P: 30 periods

TEXT BOOKS:

1. Subash C Kashyap, '*Our Political System*'. National Book Trust, 2011.
2. Praveenkumar Mellalli E, '*Constitution of India, Professional Ethics and Human Rights*'. Sage Publications India Pvt. Ltd., 2015.

REFERENCES:

1. Briji Kishore Sharma, '*Introduction to the Constitution of India*'. Prentice Hall of India, 2010.
2. Basu D D, '*Introduction to the Constitution of India*'. Prentice Hall of India, 2016.
3. Jain. M C, '*The Constitution of India*'. Law House, New Delhi, 2001.
4. Shukla V N, '*Constitution of India*'. Eastern Book Company Ltd., New Delhi, 2011.

COURSE OUTCOMES:

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Explain the evolution, significance, and philosophy of the Indian Constitution, including its Preamble, composition, and core principles.	**K2**
CO2	Analyze the structure, powers, and functions of the Union and State Governments, including the roles of the President, Parliament, Governor, and Council of Ministers, as well as the legislative process, types of bills, and constitutional amendments.	**K3**
CO3	Conduct a case study on the Indian Constitution, demonstrating understanding of its evolution, fundamental rights and duties, structure of Union and State governments, federal system, and the role of the judiciary in governance.	

COs-POs & PSOs MAPPING:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1													
CO2	2												
CO3								2	2		2		
@	**2**							**2**	**2**		**2**		

1-low, 2-medium, 3-high @-Overall Contribution to the Course

25MC003 INDUSTRIAL SAFETY

(Common to Civil, CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

2 0 0 0

SAFETY TERMINOLOGIES: Hazard-Types of Hazard- Risk-Hierarchy of Hazards Control Measures-Lead indicators- lag Indicators-Flammability- Toxicity Time-weighted Average (TWA) - Threshold Limit Value (TLV) -Short Term Exposure Limit (STEL)- Immediately dangerous to life or health (IDLH)- acute and chronic Effects- Routes of Chemical Entry-Personnel Protective Equipment- Health and Safety Policy-Material Safety Data Sheet MSDS. **(6)**

STANDARDS AND REGULATIONS: Indian Factories Act-1948- Health- Safety- Hazardous materials and Welfare- ISO 45001:2018 occupational health and safety (OH&S) - Occupational Safety and Health Audit IS14489:1998- Hazard Identification and Risk Analysis- code of practice IS 15656:2006. **(6)**

SAFETY ACTIVITIES: Toolbox Talk- Role of safety Committee- Responsibilities of Safety Officers and Safety Representatives- Safety Training and Safety Incentives- Mock Drills- On-site Emergency Action Plan- Off-site Emergency Action Plan- Safety poster and Display- Human Error Assessment. **(6)**

WORKPLACE HEALTH AND SAFETY: Noise hazard- Particulate matter- musculoskeletal disorder improper sitting poster and lifting Ergonomics RULE & REBA- Unsafe act & Unsafe Condition- Electrical Hazards- Crane Safety- Toxic gas Release. **(6)**

HAZARD IDENTIFICATION TECHNIQUES: Job Safety Analysis-Preliminary Hazard Analysis-Failure mode and Effects Analysis- Hazard and Operability- Fault Tree Analysis- Event Tree Analysis Qualitative and Quantitative Risk Assessment- Checklist Analysis- Root cause analysis- What-If Analysis- and Hazard Identification and Risk Assessment. **(6)**

Total L: 30 periods

TEXTBOOKS

1. Jain R. K. and Sunil S. Rao, '*Industrial Safety, Health and Environment Management Systems*'. Khanna Publisher, 4th Edition, 2000.
2. Deshmukh L. M., *'Industrial Safety Management: Hazard Identification and Risk Control'.* McGraw-Hill Education, 2007.

REFERENCES

1. John Ridley, John Channing, '*Safety at Work*'. Routledge, 7th Edition, 2008.
2. Dan Petersen, '*Techniques of Safety Management*: *A System Approach*'. Amer Society of Safety Engineers, 4th Edition, 2003.

COURSE OUTCOMES

At the end of the course, students will be able to		**Bloom's Level**
CO1	Describe the safety protocols and standard operating procedures in industrial settings to ensure compliance with safety regulations and minimize hazards in the workplace.	**K2**
CO2	Implement and test emergency response plans tailored to the industrial environments, ensuring effective action during emergencies such as fires, chemical spills or equipment malfunctions.	**K3**
CO3	Review and present on risk assessments and hazards using industry-specific tools to identify potential safety risks and choose appropriate corrective actions to prevent accidents and injuries.	-

CO - PO & PSO MAPPING

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	2	2	-	-	-	-	-	-
CO3	-	-	-	-	-	1	1	1	1	-	1	-	1
@	**2**	**-**	**-**	**-**	**-**	**2**	**2**	**1**	**1**	**-**	**1**	**-**	**1**

1 - low, 2- medium, 3 – high @-Overall Contribution to the Course

25MC004 DISASTER RISK REDUCTION AND MANAGEMENT
(Common to CSE, EEE, ECE, ICE, MECH, AI&DS and EE-VLSI)

2 0 0 0

HAZRADS, VULNERABILITY AND DISASTER RISKS: Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Types of Disasters: Natural, Human induced, Climate change induced – Earthquake, Landslide, Flood, Drought, Fire, etc. – Technological disasters - Structural collapse, Industrial accidents, oil spills - Causes, Impacts including social, Economic, political, environmental, health, psychosocial, etc.- Disaster vulnerability profile of India and Tamil Nadu - Global trends in disasters: urban disasters, pandemics, Complex emergencies, Inter relations between Disasters and Sustainable development Goals. **(6)**

DISASTER RISK REDUCTION (DRR): Sendai Framework for Disaster Risk Reduction, Disaster cycle - Community Based DRR, Structural – Non-structural measures, Roles and responsibilities of - community, Panchayati Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders - Early Warning System – Relevance of indigenous Knowledge, appropriate technology and Local resources. **(6)**

DISASTER MANAGEMENT: Components of Disaster Management – Preparedness of rescue and relief, mitigation, rehabilitation and reconstruction - Disaster Risk Management and post disaster management – Compensation and Insurance- Disaster Management Act (2005) and Policy - Institutional Processes and Framework at State and Central Level - (NDMA – SDMA – DDMA – NRDF - Civic Volunteers). **(6)**

TOOLS AND TECHNOLOGY FOR DISASTER MANAGEMENT: Early warning systems - Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness) – Role of GIS and Information Technology in Disaster Management – Disaster Damage Assessment - Elements of Climate Resilient Development – Standard operation Procedure for disaster response – Financial planning for disaster Management. **(6)**

DISASTER MANAGEMENT: CASE STUDIES: Case studies in the context of disasters - Landslide Hazard Zonation, Earthquake Vulnerability Assessment of Buildings and Infrastructure, Drought Assessment, Coastal Flooding, Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding, Forest Fire, Man Made disasters. **(6)**

Total L: 30 periods

TEXTBOOKS

1. Thomas D. Schneid, and Larry Collins, '*Disaster Management and Preparedness*'. CRC Publications, 2016.
2. R. Singh, '*Disaster Management Guidelines: Earthquakes, Landslides, Avalanches and Tsunami'*. Horizon Press Publications, 2017.
3. J. P. Singhal, '*Disaster Management'*. Laxmi Publications, 2024.
4. T. Bhattacharya, '*Disaster Science and Management'*. McGraw Hill India Education Pvt. Ltd., 2012.

REFERENCES

1. Government of India, '*Disaster Management Act'*. New Delhi, 2005.
2. Government of India, '*National Disaster Management Policy'*. New Delhi, 2009.
3. R. Shaw, '*Community based Disaster risk reduction*'. Natural Hazard Science, Oxford Research Encyclopedias, 2016.

COURSE OUTCOMES

At the end of the course, students will be able to:		**Bloom's Level**
CO1	Summarize the concepts, tools, technologies and strategies for disaster risk reduction and management.	**K2**

COs-POs & PSOs MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1					1	1	1	1	1		1		
@					**1**	**1**	**1**	**1**	**1**		**1**		

1-low, 2-medium, 3-high @-Overall Contribution to the Course