ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

R2024

CURRICULUM & SYLLABI

GRT INSTITUTE OF ENGINEERING AND TECHNOLOGY, Tiruttani

(An Autonomous Institution)

Accredited by NBA (ECE), NAAC with "A++" Grade & An ISO 9001:2015 Certified Institution

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai.

B.TECH. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

CURRICULUM REGULATIONS - 2024

CHOICE BASED CREDIT SYSTEM

CURRICULUM AND SYLLABI (SEMESTER I TO VIII)

(FOR THE STUDENTS ADMITTED DURING 2024)

SEMESTER - I									
S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
1	IP24101	Induction Programme	-	-	-	-	-	0	-
THEORY COURSES									
2	HS24101	Professional English	HS	3	-	-	3	3	60/40
3	MA24101	Algebra and Calculus	BS	3	1	-	4	4	60/40
4	PH24101	Engineering Physics	BS	3	-	-	3	3	60/40
5	CY24101	Engineering Chemistry	BS	3	-	-	3	3	60/40
6	GE24101	Problem Solving and Python Programming	ES	3	-	-	3	3	60/40
7	TA24101	Heritage of Tamils	HS	1	-	-	1	1	60/40
PRACTICAL COURSES									
8	GE24102	Problem Solving and Python Programming Laboratory	ES	-	-	4	4	2	40/60
9	PC24101	Physics and Chemistry Laboratory	BS	-	-	4	4	2	40/60
10	HS24102	English Laboratory	HS	-	-	2	2	1	0/100
TOTAL				**16**	**1**	**10**	**27**	**22**	

SEMESTER - II									
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
THEORY COURSES									
1	MA24201	Statistics and Numerical Techniques	BS	3	1	0	4	4	60/40
2	GE24201	Engineering Graphics	ES	2	0	3	5	4	60/40
3	PH24201	Physics for Information Science	BS	3	0	0	3	3	60/40
4	CS24201	C Language Programming	PC	3	0	0	3	3	60/40
5	TA24201	Tamils and Technology	HS	1	0	0	1	1	60/40
THEORY CUM PRACTICAL COURSES									
6	EE24203	Basic Electrical and Electronics Engineering	ES	3	0	2	5	4	50/50
PRACTICAL COURSES									
7	GE24202	Engineering Practices Laboratory	ES	0	0	4	4	2	40/60
8	CS24202	C Language Programming Laboratory	PC	0	0	4	4	2	40/60
9	HS24201	English Communication Laboratory	HS	0	0	4	4	2	40/60
TOTAL				**15**	**1**	**17**	**33**	**25**	

SEMESTER - III									
S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
THEORY COURSES									
1	MA24305	Probability and Statistics	BS	3	1	0	4	4	60/40
2	AD24301	Artificial Intelligence	PC	3	0	0	3	3	60/40
3	AD24302	Fundamentals of Data Science and Analytics	PC	3	0	0	3	3	60/40
4	AD24303	Java Programming	PC	3	0	0	3	3	60/40
5	EC24303	Computer Organization and Digital Principles	ES	3	0	0	3	3	60/40
THEORY CUM PRACTICAL COURSES									
6	AD24304	Principles of Data Structures and Algorithms	PC	3	0	2	5	4	50/50
PRACTICAL COURSES									
7	AD24305	Artificial Intelligence Laboratory	PC	0	0	4	4	2	40/60
8	AD24306	Data Science and Analytics Laboratory	PC	0	0	4	4	2	40/60
9	AD24307	Java Programming Laboratory	PC	0	0	4	4	2	40/60
10	GE24S01	Professional Development	EEC	0	0	2	2	1	0/100
TOTAL				**18**	**1**	**16**	**35**	**27**	

SEMESTER - IV									
S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
THEORY COURSES									
1	MA24403	Discrete Mathematics	BS	3	1	0	4	4	60/40
2	AD24401	Machine Learning	PC	3	0	0	3	3	60/40
3	AD24402	Relational Database Management Systems	PC	3	0	0	3	3	60/40
4	AD24403	Fundamentals of Operating Systems	ES	3	0	0	3	3	60/40
5	GE24401	Environmental Science and Engineering	ES	2	0	0	2	2	60/40
THEORY CUM PRACTICAL COURSES									
6	AD24404	Data Exploration and Visualization	PC	3	0	2	5	4	50/50
PRACTICAL COURSES									
7	AD24405	Machine Learning Laboratory	PC	0	0	4	4	2	40/60
8	AD24406	Relational Database Management Systems Laboratory	PC	0	0	4	4	2	40/60
9	AD24S01	Technical Skill Practices	EEC	0	0	2	2	1	0/100
TOTAL				**17**	**1**	**12**	**30**	**24**	

SEMESTER - V									
S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
THEORY COURSES									
1	AD24501	Deep Learning	PC	3	0	0	3	3	60/40
2	AD24502	Optimization Techniques	PC	3	0	0	3	3	60/40
3	AD24503	Computer Networks	ES	3	0	0	3	3	60/40
4		Open Elective – I	OE	3	0	0	3	3	60/40
5		Non-Credit Mandatory Course – I	MC	3	0	0	3	-	0/100
6		Professional Elective – I	PE	-	-	-	-	3	-
7		Professional Elective – II	PE	-	-	-	-	3	-
PRACTICAL COURSES									
8	AD24504	Deep Learning Laboratory	PC	0	0	4	4	2	40/60
9	AD24S02	Design Thinking and Project Development Laboratory	EEC	0	0	2	2	1	0/100
TOTAL				-	-	-	-	**21**	

SEMESTER - VI									
S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
THEORY COURSES									
1	AD24601	Generative AI	PC	3	0	0	3	3	60/40
2		Open Elective – II	OE	3	0	0	3	3	60/40
3		Management - Elective	HS	3	0	0	3	3	60/40
4		Non-Credit Mandatory Course – II	MC	3	0	0	3	-	0/100
5		Professional Elective–III	PE	-	-	-	-	3	-
6		Professional Elective–IV	PE	-	-	-	-	3	-
THEORY CUM PRACTICAL COURSES									
7	AD24602	Big Data Analytics	PC	3	0	2	5	4	50/50
PRACTICAL COURSES									
8	AD24603	Generative AI Laboratory	PC	0	0	4	4	2	40/60
TOTAL				-	-	-	-	**21**	

SEMESTER - VII									
S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
THEORY COURSES									
1	AD24701	Text and Speech Analysis	PC	3	0	0	3	3	60/40
2	GE24701	Human Values and Ethics	HS	2	0	0	2	2	60/40
3		Open Elective – III	OE	3	0	0	3	3	60/40
4		Open Elective – IV	OE	3	0	0	3	3	60/40
5		Professional Elective–V	PE	-	-	-	-	3	-
6		Professional Elective–VI	PE	-	-	-	-	3	-
PRACTICAL COURSES									
7	AD24702	Summer Internship	EEC	0	0	0	0	2	0/100
TOTAL				**-**	**-**	**-**	**-**	**19**	

SEMESTER - VIII									
S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
PRACTICAL COURSES									
1	AD24801	Project Work/ Internship	EEC	-	-	20	20	10	40/60
TOTAL				**-**	**-**	**-**	**20**	**10**	

TOTAL CREDITS	169

SUMMARY

Name of the Programme: Artificial Intelligence and Data Science										
S.No	Subject Area	Credits per Semester								Total Credits
		1	2	3	4	5	6	7	8	
1	HS	5	3				3	2		13
2	BS	12	7	4	4					27
3	ES	5	10	3	5	3				26
4	PC		5	19	14	8	9	3		58
5	PE					6	6	6		18
6	OE					3	3	6		12
7	EEC			1	1	1		2	10	15
8	Non-Credit Mandatory					✓	✓			
TOTAL		22	25	27	24	21	21	19	10	169

MANDATORY COURSE

NON-CREDIT MANDATORY COURSE I								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	MX24C71	Introduction to Women and Gender Studies	MC	3	-	-	3	-
2	MX24C72	Elements of Literature	MC	3	-	-	3	-
3	MX24C73	Disaster Risk Reduction and Management	MC	3	-	-	3	-
4	MX24C74	Film Appreciation	MC	3	-	-	3	-

NON-CREDIT MANDATORY COURSE II								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	MX24C75	Well Being with Traditional Practices - Yoga, Ayurveda and Siddha	MC	3	-	-	3	-
2	MX24C76	History of Science and Technology in India	MC	3	-	-	3	-
3	MX24C77	Industrial Safety	MC	3	-	-	3	-
4	MX24C78	Political and Economic Thought for a Human Society	MC	3	-	-	3	-
5	MX24C79	State, Nation Building and Politics in India	MC	3	-	-	3	-

MANAGEMENT ELECTIVE

MANAGEMENT ELECTIVE								
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	GE24M01	Principles of Management	HS	3	-	-	3	3
2	GE24M02	Total Quality Management	HS	3	-	-	3	3
3	GE24M03	Engineering Economics and Financial Accounting	HS	3	-	-	3	3
4	GE24M04	Human Resource Management	HS	3	-	-	3	3
5	GE24M05	Knowledge Management	HS	3	-	-	3	3
6	GE24M06	Industrial Management	HS	3	-	-	3	3

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I Vertical for AIDS I	Vertical II Full Stack Development for IT	Vertical III Cloud Computing and Data Center Technologies	Vertical IV Cyber Security and Data Privacy	Vertical V Creative Media	Vertical VI Emerging Technologies	Vertical VII Vertical for AIDS II
Knowledge Engineering	App Development	Virtualization	Ethical Hacking	Augmented Reality/Virtual Reality	Robotic Process Automation	Bio-Inspired Optimization Techniques
Recommender Systems	Web Technology	Data Warehousing	Social Network Security	Multimedia and Animation	Neural Networks and Deep Learning	Reinforcement Learning
Soft Computing	Cloud Services Management	Cloud Computing	Data and Information Security	Video Creation and Editing	Cyber Security	Health Care Analytics
Computer Vision	UI and UX Design	Storage Technologies	Modern Cryptography	Digital marketing	Quantum Computing	Image and Video Analytics
Business Analytics	Software Testing	Software Defined Networks	Engineering Secure Software Systems	Multimedia Data Compression and Storage	Internet of Things	Game Theory
Natural Language Processing	Web Application Security	Stream Processing	Digital and Mobile Forensics	Game Development	3D Printing and Design	Cognitive Science
Agent Based Intelligent System	DevOps	Security and Privacy in Cloud	Network Security	Visual Effects	Edge Computing	Ethics and AI

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL 1: VERTICALS FOR AIDS I									
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
1	AD24P01	Knowledge Engineering	PE	2	0	2	4	3	50/50
2	AD24P02	Recommender Systems	PE	2	0	2	4	3	50/50
3	AD24P03	Soft Computing	PE	2	0	2	4	3	50/50
4	AD24P04	Computer Vision	PE	2	0	2	4	3	50/50
5	AD24P05	Business Analytics	PE	2	0	2	4	3	50/50
6	AD24P06	Natural Language Processing	PE	2	0	2	4	3	50/50
7	AD24P07	Agent Based Intelligent System	PE	3	0	0	3	3	60/40

VERTICAL 2: FULL STACK DEVELOPMENT FOR IT									
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
1	CS24P38	App Development	PE	2	0	2	4	3	50/50
2	IT24P10	Web Technology	PE	2	0	2	4	3	50/50
3	CS24P18	Cloud Services Management	PE	2	0	2	4	3	50/50
4	CS24P06	UI and UX Design	PE	2	0	2	4	3	50/50
5	CS24P12	Software Testing	PE	2	0	2	4	3	50/50
6	CS24P07	Web Application Security	PE	2	0	2	4	3	50/50
7	CS24P05	DevOps	PE	2	0	2	4	3	50/50

VERTICAL 3: CLOUD COMPUTING AND DATA CENTER TECHNOLOGIES									
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
1	CS24P21	Virtualization	PE	2	0	2	4	3	50/50
2	CS24P19	Data Warehousing	PE	2	0	2	4	3	50/50
3	AD24P08	Cloud Computing	PE	2	0	2	4	3	50/50
4	CS24P20	Storage Technologies	PE	2	0	2	4	3	50/50
5	IT24P04	Software Defined Networks	PE	2	0	2	4	3	50/50
6	CS24P22	Stream Processing	PE	2	0	2	4	3	50/50
7	CS24P27	Security and Privacy in Cloud	PE	2	0	2	4	3	50/50

VERTICAL 4: CYBER SECURITY AND DATA PRIVACY									
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
1	IT24P05	Ethical Hacking	PE	2	0	2	4	3	50/50
2	IT24P06	Social Network Security	PE	2	0	2	4	3	50/50
3	AD24P09	Data and Information Security	PE	3	0	0	3	3	60/40
4	CS24P28	Modern Cryptography	PE	2	0	2	4	3	50/50
5	AD24P10	Engineering Secure Software Systems	PE	2	0	2	4	3	50/50

6	IT24P07	Digital and Mobile Forensics	PE	2	0	2	4	3	50/50
7	CS24P25	Network Security	PE	2	0	2	4	3	50/50

VERTICAL 5: CREATIVE MEDIA									
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
1	AD24P11	Augmented Reality / Virtual Reality	PE	2	0	2	4	3	50/50
2	IT24P11	Multimedia and Animation	PE	2	0	2	4	3	50/50
3	IT24P12	Video Creation and Editing	PE	2	0	2	4	3	50/50
4	AD24P12	Digital Marketing	PE	2	0	2	4	3	50/50
5	IT24P13	Multimedia Data Compression and Storage	PE	2	0	2	4	3	50/50
6	CS24P17	Game Development	PE	2	0	2	4	3	50/50
7	IT24P14	Visual Effects	PE	2	0	2	4	3	50/50

VERTICAL 6: EMERGING TECHNOLOGIES									
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
1	CS24P32	Robotic Process Automation	PE	2	0	2	4	3	50/50
2	AD24P12	Neural Networks and Deep Learning	PE	2	0	2	4	3	50/50
3	IT24P09	Cyber Security	PE	2	0	2	4	3	50/50
4	CS24P33	Quantum Computing	PE	2	0	2	4	3	50/50
5	AD24P13	Internet of Things	PE	2	0	2	4	3	50/50
6	CS24P36	3D Printing and Design	PE	2	0	2	4	3	50/50
7	CS24P37	Edge Computing	PE	2	0	2	4	3	50/50

VERTICAL 7: VERTICALS FOR AIDS II									
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
1	AD24P14	Bio-Inspired Optimization Techniques	PE	3	0	0	3	3	60/40
2	AD24P15	Reinforcement Learning	PE	2	0	2	4	3	50/50
3	AD24P16	Health Care Analytics	PE	3	0	0	3	3	60/40
4	AD24P17	Image and Video Analytics	PE	2	0	2	4	3	50/50
5	AD24P18	Game Theory	PE	2	0	2	4	3	50/50
6	AD24P19	Cognitive Science	PE	2	0	2	4	3	50/50
7	AD24P20	Ethics and AI	PE	2	0	2	4	3	50/50

OPEN ELECTIVES

OPEN ELECTIVE – I									
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
1	AS24901	Space Science	OE	3	0	0	3	3	60/40
2	IE24901	Introduction to Industrial Engineering	OE	3	0	0	3	3	60/40
3	FD24901	Food, Nutrition and Health	OE	3	0	0	3	3	60/40
4	CE24902	Environmental and Social Impact Assessment	OE	3	0	0	3	3	60/40
5	EE24901	Renewable Energy System	OE	3	0	0	3	3	60/40
6	EI24901	Introduction to Industrial Instrumentation and Control	OE	3	0	0	3	3	60/40
7	MA24901	Graph Theory	OE	3	0	0	3	3	60/40

OPEN ELECTIVE – II									
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
1	IE24902	Resource Management Techniques	OE	3	0	0	3	3	60/40
2	MG24901	Fintech Regulation	OE	3	0	0	3	3	60/40
3	BM24901	Holistic Nutrition	OE	3	0	0	3	3	60/40
4	AI24902	IT in Agricultural System	OE	3	0	0	3	3	60/40
5	EC24904	Introduction to Control Engineering	OE	3	0	0	3	3	60/40
6	PY24901	Pharmaceutical Nanotechnology	OE	3	0	0	3	3	60/40
7	AE24902	Aviation Management	OE	3	0	0	3	3	60/40

OPEN ELECTIVE – III									
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
1	HS24901	English for Competitive Examinations	OE	3	0	0	3	3	60/40
2	ME24901	Applied Design Thinking	OE	3	0	0	3	3	60/40
3	MF24901	Reverse Engineering	OE	3	0	0	3	3	60/40
4	IE24903	Industrial Management	OE	3	0	0	3	3	60/40
5	RA24903	Foundation of Robotics	OE	3	0	0	3	3	60/40
6	RA24902	Remote Sensing Concepts	OE	3	0	0	3	3	60/40
7	CH24901	Nano Technology	OE	3	0	0	3	3	60/40
8	AI24901	Urban Agriculture	OE	3	0	0	3	3	60/40
9	EE24903	Introduction to PLC Programming	OE	3	0	0	3	3	60/40
10	EC24901	Fundamentals of Electronic Devices and Circuits	OE	3	0	0	3	3	60/40

OPEN ELECTIVE – IV									
S.NO	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	EXT / INT
				L	T	P			
1	HS24902	Project Report Writing	OE	3	0	0	3	3	60/40
2	AD24903	Multivariate Data Analysis	OE	3	0	0	3	3	60/40
3	RA24905	Concepts in Mobile Robots	OE	3	0	0	3	3	60/40
4	RA24904	Drone Technologies	OE	3	0	0	3	3	60/40
5	GI24901	Geographical Information System	OE	3	0	0	3	3	60/40
6	AI24904	Agriculture Entrepreneurship Development	OE	3	0	0	3	3	60/40
7	FD24902	Food safety and Quality Regulations	OE	3	0	0	3	3	60/40
8	BM24903	Wearable Devices	OE	3	0	0	3	3	60/40
9	EE24904	Sensors and Actuators	OE	3	0	0	3	3	60/40
10	EI24902	Introduction to Industrial Automation Systems	OE	3	0	0	3	3	60/40

SEMESTER-I
Common To All Branches
(B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH)

HS24101	PROFESSIONAL ENGLISH	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Improve the communicative competence of learners.
- Help learners use language effectively in academic /work contexts.
- Build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.
- Develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.
- Use language efficiently in expressing their opinions via various media

UNIT I INTRODUCTION OF EFFECTIVE COMMUNIATION 1

What is effective communication? (Explain using activities) Why is communication critical for excellence during study, research and work? What are the seven C's of effective communication? What are key language skills? What is effective listening? What does it involve? What is effective speaking? What does it mean to be an excellent reader? What should you be able to do? What is effective writing? How does one develop language and communication skills? What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance your English language and communication skills to get the best out of this course?

INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 8

Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Why/ Yes or No/ and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

UNIT II NARRATION AND SUMMATION 9

Reading-Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar–Past tense(simple); Subject Verb Agreement; and Prepositions. Vocabulary-Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs

UNIT III DESCRIPTION OF PROCESS AND PRODUCT 9

Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).

UNIT IV CLASSIFICATION 9

Reading–Newspaper articles; Journal reports–and Non-Verbal Communication (tables, pie charts etc.,). Writing–Note-making/Note-taking (*Study skills to be taught, not tested); Writing recommendations; Transferring information from nonverbal (chart , graph etc., to verbal mode) Grammar–Forms of Verbs, Articles; Pronouns- Possessive & Relative pronouns. Vocabulary-Collocations; Fixed/Semi fixed expressions.

UNIT V EXPRESSION OF VIEWS 9

Reading–Reading editorials; and Opinion Blogs; Writing–Minutes of Meeting, Essay Writing (Descriptive or narrative). Grammar – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences. Vocabulary-Cause & Effect Expressions–Content vs Function words.

Total: 45 Periods

COURSE OUTCOMES:

After completion of this course, the students should be able to

CO1: Use appropriate words in a professional context**.**

CO2: Gain understanding of basic grammatical structures and use them in right context.

CO3: Read and interpret and also infer information presented in tables, charts, denotative and connotative meanings of technical texts and other graphic forms.

CO4: Write definitions, descriptions, narrations and essays on various topics.

TEXTBOOKS:

1. English for Engineers & Technologists Orient Black Swan Private Ltd. Department of English, Anna University, (2020 edition)
2. English for Science & Technology CambridgeUniversityPress,2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. K N. Shoba, and Dr. Lourdes Joevani Department of English, Anna University.

REFERENCEBOOKS:

1. Technical Communication– Principles and Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. A Course Book on Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.
3. English for Technical Communication (With CD) By Aysha Viswa Mohan, McGraw Hill Education, ISBN: 0070264244.
4. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.
5. Learning to Communicate–Dr. V. Chellammal, Allied Publishing House, New Delhi,2003.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2		2		2	2		3	3	2	2	1		
CO2		2		2		2	2		3	3	2	2	1		
CO3		2		2		2	2		3	3	2	3	1		
CO4		1		2		3	2		3	3	2	3	1		
Avg		**1.75**		**2**		**2.25**	**2**		**3**	**3**	**2**	**2.5**	**1**		

1 - Low, 2 - Medium, 3 - High

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

MA24101	ALGEBRA AND CALCULUS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.
- To introduce integral ideas in solving areas, volumes and other practical problems in vector.

UNIT I MATRICES 9+3

Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms – Applications: Stretching of an elastic membrane.

UNIT II DIFFERENTIAL CALCULUS 9+3

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation - Applications: Maxima and Minima of functions of one variable.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 9+3

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Applications: Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

UNIT IV MULTIPLE INTEGRALS 9+3

Double integrals in Cartesian and polar coordinates - Change of order of integration in Cartesian coordinates - Area enclosed by plane curves - Change of variables in double integrals -Triple integrals - Volume of Solids. Applications: Moments and centres of mass, moment of inertia.

UNIT V VECTOR CALCULUS 9+3

Gradient, divergence and curl (excluding vector identities) – Directional derivative –Irrotational and Solenoidal vector fields – Vector integration – Green's theorem in a plane and Gauss divergence theorem and Stoke's theorem (without proof) – Simple applications involving cubes and rectangular parallelopipeds.

Total: 60 Periods

COURSE OUTCOMES:

After completion of this course, the students should be able to

CO1: Demonstrate the matrix techniques in solving the related problems in engineering and technology.

CO2: Apply differential calculus tool to solve engineering applications.

CO3: Use differential calculus ideas on functions several variables.

CO4: Evaluate the area and volume by applying the concept of multiple integration.

CO5: Utilize the concept of vector calculus in evaluating integrals.

TEXTBOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition,
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.

REFERENCEBOOKS:

1. M. K. Venkataraman, "Engineering Mathematics", Volume I, 4th Edition, The National Publication Company, Chennai, 2003.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, 5th Edition, New Delhi, 2017.
3. H. K. Dass and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand Private Limited, 3rd Edition 2014.
4. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 6th Edition, New Delhi, 2008.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2					2		2	3		1	1
CO2	3	3	1	2					2		2	3		1	1
CO3	3	3	2	2					2		2	3		1	1
CO4	3	3	1	1					2		2	3		1	1
CO5	3	3	2	2					2		2	3		1	1
Avg	**3**	**3**	**1.6**	**1.6**					**2**		**2**	**3**		**1**	**1**

1 - Low, 2 - Medium, 3 - High

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

PH24101	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To make the students achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- Equipping the students to successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT I MECHANICS 9

Multi-particle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of the system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M. I – moment of inertia continuous bodies – M.I of a diatomic molecule-rotational energy state of a rigid diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum - gyroscope - torsional pendulum.

UNIT II ELECTROMAGNETIC WAVES 9

The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - Source of electromagnetic waves. EM waves: Energy, momentum, intensity and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium vacuum interface for normal incidence.

UNIT III OSCILLATIONS, OPTICS AND LASERS 9

Simple harmonic motion – resonance –analogy between electrical and mechanical oscillating systems – waves on a string – standing waves – traveling waves – Energy transfer of a wave – sound waves – Doppler effect. Reflection and refraction of light waves – total internal reflection – interference –Michelson interferometer – Theory of air wedge and experiment. Theory of laser – characteristics – Spontaneous and stimulated emission – Einstein's coefficients – population inversion – Nd-YAG laser, CO2 laser, semiconductor laser –Basic applications of lasers in industry.

UNIT IV BASIC QUANTUM MECHANICS 9

Photons and light waves – Electrons and matter waves –Compton effect – Schrodinger equation (Time dependent and time independent forms) – Physical meaning of wave function – particle in a infinite one dimensional (1D) potential well - Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS 9

The harmonic oscillator (qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope – Resonant diode – Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

Total: 45 Periods

COURSE OUTCOMES:

After completion of this course, the students should be able to

CO1: Recognized the importance of mechanics.

CO2: Express their knowledge in electromagnetic waves.

CO3: Demonstrate a strong foundational knowledge in oscillations, optics and lasers.

CO4: Illustrate the importance of quantum physics.

CO5: Comprehend and apply quantum mechanical principles towards the formation of energy bands.

TEXTBOOKS:

1. D. Kleppner and R. Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
2. E.M. Purcell and D.J. Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw-Hill (Indian Edition), 2017.

REFERENCEBOOKS:

1. R. Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2. Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.
3. K. Thyagarajan and A. Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.
4. Halliday, R. Resnick and J. Walker. Principles of Physics, Wiley (Indian Edition), 2015.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	1	-	-	1	-	1	-	-	-	-	-
CO2	3	2	2	1	2	1	2	2	-	1	-	2	-	1	
CO3	3	2	1	1	2	1	1	1	-	1	-	2	-	1	-
CO4	3	3	2	2	2	-	1	2	-	1	-	2	-	1	1
CO5	2	3	2	1	1	1	-	2	-	1	-	2	-	-	-
Avg	**2.8**	**2.6**	**1.75**	**1.25**	**1.6**	**1**	**1.3**	**1.6**	**-**	**1**	**-**	**2**	-	1	1

1 - Low, 2 - Medium, 3 - High

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

CY24101	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UNIT I WATER AND ITS TREATMENT 9

Water: Sources and impurities, Water quality parameters: Definition and significance of-color, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water: Reverse Osmosis. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming & foaming. Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and Calgon conditioning) and External treatment – Ion exchange demineralization and zeolite process.

UNIT II NANOCHEMISTRY 9

Basics: Distinction between molecules, non-materials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of non-material's: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapor deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

UNIT III PHASE RULE AND COMPOSITES 9

Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process. Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

UNIT IV FUELS AND COMBUSTION 9

Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil – cetane number; Power alcohol and biodiesel. - natural gas- compressed natural gas (CNG)- liquefied petroleum gases(LPG).

Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO2 emission and carbon footprint.

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9

Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor- environmental consequences of fossil fuel- Importance of renewable energy sources -Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Batteries: Types of batteries- lead acid battery- Solid Battery – Lithium Battery, Lithium-ion; Battery Electric vehicles-working principles; Fuel cells: H2-O2 fuel cell, microbial fuel cell.

Total: 45 Periods

COURSE OUTCOMES:

After completion of this course, the students should be able to

CO1: Infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.

CO2: Identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nonmaterial for engineering and technology applications.

CO3: Apply the knowledge of phase rule and composites for material selection.

CO4: Analyze the quality of fuel and its various uses.

CO5: Recognize different forms of energy resources and apply them for suitable applications in energy sectors.

TEXTBOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3. S.S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.

REFERENCEBOOKS:

1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2				1	1	2							
CO2	2		1	1	2	2	2	1				3		1	1
CO3	3	1				-	-	2				3			
CO4	3	1	1			1	3	2				2			
CO5	3	2	2	2		3	3	1				3			1
Avg	**2.8**	**1.5**	**1.33**	**1.5**	**2**	**1.75**	**2.25**	**1.6**				**2.75**		**1**	**1**

1 - Low, 2 - Medium, 3 - High

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

GE24101	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9

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

UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS 9

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

UNIT III CONTROL FLOW, FUNCTIONS, STRINGS 9

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

UNIT IV LISTS, TUPLES, DICTIONARIES 9

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

UNIT V FILES, MODULES, PACKAGES 9

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

Total: 45 Periods

COURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Develop algorithmic solutions to simple computational problems.

CO2: Develop and execute simple Python programs.

CO3: Write simple Python programs using conditionals and loops for solving problems.

CO4: Represent compound data using Python lists, tuples, dictionaries etc.

CO5: Read and write data from/to files in Python programs.

TEXT BOOKS:

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.
3. Python Data Science Handbook: Essential Tools for Working with Data, Second Edition (Grayscale Indian Edition) by Jake VanderPlas.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5. https://www.python.org/
6. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.Comparison of Existing and Revised Syllabus

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3		2							1	1		
CO2	3	3	3		2							1	1		
CO3	3	3	3		2							1	1	1	
CO4	3	3	3		2						1	1	1	1	
CO5	3	2	1		1						1	1	1	1	
Avg	**3**	**2.8**	**2.6**		**1.8**						**0.5**	**1**	**1**	**1**	

1 - Low, 2 - Medium, 3 - High

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

TA24101	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

UNIT I LANGUAGE AND LITERATURE 3

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.

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

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.

UNIT III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS 3

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.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

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.

Total: 15 Periods

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு மக்களும் பண்பாடு மற்றும் கல்வியியல் பணிகள் கழகம்.
2. கணினித் தமிழ் முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தோல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தோல்லியல் 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.Subatamanian, 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 C ivilization 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.

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

GE24102	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To understand the problem-solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

LIST OF EXPERIMENTS

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (Reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (Copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (Divide by zero error, voter's age validity, student mark range validation)
11. Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

Total: 60 Periods

COURSE OUTCOMES:

On completion of the course, students will be able to:

CO1 : Develop algorithmic solutions to simple computational problems

CO2 : Develop and execute simple Python programs.

CO3 : Implement programs in Python using conditionals and loops for solving problems.

CO4 : Process compound data using Python data structures.

CO5 : Utilize Python packages in developing software applications.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2						3	2	1		
CO2	3	3	3	3	2						3	2	1		
CO3	3	3	3	3	2						3		1	1	
CO4	1	2			1						1		1	1	
CO5	2	2			2						2		1	1	
Avg	**2.4**	**2.6**	**3**	**3**	**1.8**						**2.4**	**2**	**1**	**1**	

1 - Low, 2 - Medium, 3 - High

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

PC24101	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2

PHYSICS LABORATORY

COURSE OBJECTIVES:

- To learn the proper use of various kinds of physics laboratory equipment
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.
- To make the student as an active participant in each part of all lab exercises.

EXPERIMENT TOPICS: (Any seven experiments to be conducted)

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young's modulus
4. Uniform bending – Determination of Young's modulus
5. Laser- Determination of the wave length of the laser using grating
6. Air wedge - Determination of thickness of a thin sheet/wire
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Post office box -Determination of Band gap of a semiconductor.
11. Photoelectric effect
13. Michelson Interferometer.
14. Melde's string experiment
15. Experiment with lattice dynamics kit.

CHEMISTRY LABORATORY

COURSE OBJECTIVES:

- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electro analytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and alloys.
- To demonstrate the synthesis of nanoparticles.

EXPERIMENT TOPICS: (Any seven experiments to be conducted)

1. Preparation of Na2CO3 as a primary standard and estimation of acidity of a water sample using the primary standard
2. Determination of types and amount of alkalinity in water sample.Split the first experiment into two
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler's method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by Iodometry.
7. Estimation of TDS of a water sample by gravimetry.
8. Determination of strength of given hydrochloric acid using pH meter.
9. Determination of strength of acids in a mixture of acids using conductivity meter.
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
11. Estimation of iron content of the given solution using potentiometer.
12. Estimation of sodium /potassium present in water using flame photometer.
13. Preparation of nanoparticles (TiO2/ZnO/CuO) by Sol-Gel method.
14. Estimation of Nickel in steel
15. Proximate analysis of Coal

COURSE OUTCOMES:

Upon completion of the course, the students should be able to

CO1 : Analysis the Modulus of elasticity of materials.
CO2 : Illustrate the Laser and Optical fiber.
CO3 : Determine the wavelength of Ultrasonic wave in Liquid.
CO4 : Analyze the effect of chloride in water and DO present in sample water.
CO5 : Identify basicity acidity and pH of the materials

TEXT BOOKS:

1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogel's, Textbook of Quantitative Chemical Analysis (2009).

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1			2	2	1				2			
CO2	3	1	2			1	2	2				1		1	1
CO3	3	2	1	1			1	1						1	1
CO4	2	1	2			2	2	2							
CO5	2	1	2		1	2	2	2				1	1		1
Avg	**2.6**	**1.3**	**1.6**	**1**	**1**	**1.4**	**1.8**	**1.6**				**1.3**	**1**	**1**	**1**

1 - Low, 2 - Medium, 3 - High

SEMESTER-I
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

HS24102	ENGLISH LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To improve the communicative competence of learners
- To help learners use language effectively in academic/work contexts
- To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
- To build on students' English languages kills by engaging the listening, speaking and grammar learning activities that is relevant to authentic contexts.
- To use language efficiently in expressing their opinions via various media.

UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 6

Listening for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; - politeness strategies- making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions (filling out a bank application for example).

UNIT II NARRATION AND SUMMATION 6

Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / events-Talking about current and temporary situations & permanent and regular situations* - describing experiences and feelings- engaging in small talk- describing requirements and abilities.

UNIT III DESCRIPTION OF PROCESS/ PRODUCT 6

Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product-explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities (large & small)-talking about precautions.

UNIT IV CLASSIFICATOIN AND RECOMMENDATIONS 6

Listening – Listening to TED Talks; Listening to lectures - and educational videos. Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation-

UNIT V DISCUSSION 6

Listening –Listening to debates/discussions; different viewpoints on an issue; and panel discussions. Speaking –making predictions- talking about a given topic-giving opinions- understanding a website- describing processes

Total: 30 Periods

COURSE OUTCOMES:

At the end of the course, learners will be able

CO1 : To listen and comprehend complex academic texts

CO2 : To speak fluently and accurately in formal and informal communicative contexts

CO3 : To express their opinions effectively in both oral and written medium of communication

Assessment Pattern

- Conduction of Assessment to test speaking and writing skills

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2		3		2	3		3	3	3	1	1		
CO2		2		3		2	3		3	3	3	1	1		
CO3		2		3		1	1		1	3	1	1	1		
Avg		**2**		**3**		**1.6**	**2.3**		**2.3**	**3**	**2.3**	**1**	**1**		

1 - Low, 2 - Medium, 3 - High

SEMESTER-II
Common To All Branches
(B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH)

MA24201	STATISTICS AND NUMERICAL TECHNIQUES	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

The student should be made to:

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS 9+3

Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT II DESIGN OF EXPERIMENTS 9+3

One way and two - way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+3

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATION 9+3

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

Total: 60 Periods

COURSE OUTCOMES

At the end of the course, the students should be able to

CO1 : Apply the concept of testing of hypothesis for small and large samples in real life problems.

CO2 : Apply the basic concepts of classifications of design of experiments in the field of agriculture.

CO3 : Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.

CO4 : Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.

CO5 : Solve the partial and ordinary differential equations with initial and boundary condition by using certain techniques with engineering applications.

TEXT BOOKS:

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

REFERENCES:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.
4. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
5. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4th Edition, 2012.
6. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	1	1						2	2	1		
CO2	3	2	1	2	2						2	3	1		
CO3	2	2	1	1	1						2	2	1		
CO4	2	3	1	1	1						1	3		1	
CO5	2	3	1	1	1						2	2		1	
Avg	**2.2**	**2.6**	**1**	**1.2**	**1.2**						**1.8**	**2.4**	**1**	**1**	

1 - Low, 2 - Medium, 3 - High

SEMESTER-II
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

GE24201	ENGINEERING GRAPHICS	L	T	P	C
		2	0	3	4

COURSE OBJECTIVES:

- To understand the importance of the drawing in engineering applications.
- To develop graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.
- To improve their visualization skills so that they can apply this skill in developing new products.
- To improve their technical communication skill in the form of communicative drawings.

UNIT-I PLANE CURVES AND PROJECTION OF POINTS 5+9

Importance of graphics in engineering applications–Use of drafting instruments– BIS conventions and specifications–size, layout and folding of drawing sheets– lettering and dimensioning. (Not for examination)
Curves used in engineering practices: Conics–construction of ellipse, parabola and hyperbola by eccentricity method, cycloidal curves–construction of cycloid, construction of involutes of square and circle–drawing of tangents and normal to the above curves. Orthographic projection – principles – principal planes – first angle projection – projection of points.

UNIT-II PROJECTION OF LINES AND PLANE SURFACES 5+9

Projection of straight lines (only first angle projection) inclined to both the principal planes – determination of true lengths and true inclinations by rotating line method and traces.
Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT-III PROJECTION OF SOLIDS AND SECTION OF SOLIDS 5+9

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.
Sectioning of solids in simple position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section.

UNIT-IV DEVELOPMENT OF SURFACE AND ISOMETRIC PROJECTIONS 5+9

Development of lateral surfaces of simple and sectioned solids – prisms, pyramids cylinders and cones. Principles of isometric projection – isometric scale –isometric projections of simple solids and truncated solids –prisms, pyramids, cylinders, cones and combination of two solid objects in simple vertical positions.

UNIT-V FREE HAND SKETCHING AND PERSPECTIVE PROJECTIONS 5+9

Visualization concepts–representation of three dimensional objects – layout of views–freehand sketching of multiple views from pictorial views of objects.
Principle of perspective projection – terminology –perspective projection of simple solids-prisms, pyramids, cylinder and cone by visual ray method.

UNIT-VI COMPUTER AIDED DRAFTING (Not for examination) 5

Introduction to drafting packages: Initial Setup Commands, Coordinate system in AutoCAD, UCS, WCS, and MCS. Draw Commands, Modify Commands, View Commands, Annotation commands, 2D Drawings and 3D Models -Simple Exercises.

Total: 75 Periods

COURSE OUTCOMES

On successful completion of this course, the student will be able

CO1 : To construct different plane curves and to comprehend the theory of projection.

CO2 : To project orthographic projections of lines and plane surfaces.

CO3 : To draw the projection of simple solids and sectional solids.

CO4 : To draw the development of lateral surfaces of sectional solids and Isometric projections of solids.

CO5 : To perform freehand sketching of multiple views from pictorial viewand visualize perspective view of simple solids.

TEXT BOOKS:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 51th Edition, 2012.
2. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 31th Edition, 2018.

REFERENCE BOOKS:

1. Varghese P I., "Engineering Graphics", McGraw Hill Education (I) Pvt. Ltd., First Edition, 2013.
2. Venugopal K. and PrabhuRaja V., "Engineering Graphics", New Age International (P) Limited, 12th Edition, 2014.
3. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 23th Edition, 2017.
4. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill Publishing Company Limited, New Delhi, 2nd Edition, 2008.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2					2		3		2	1		
CO2	3	2	2					2		3		2	1		
CO3	3	2	2					2		3		2	1		
CO4	3	2	2					2		3		2	1		
CO5	3	2	2					2		3		2	1		
Avg	**3**	**2**	**2**					**2**		**3**		**2**	**1**		

1 - Low, 2 - Medium, 3 - High

SEMESTER-II
B. Tech-AI&DS, IT, B.E.-CSE

PH24201	PHYSICS FOR INFORMATION SCIENCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts of classical and quantum electron theories and energy band structures
- To enable the students to learn the basics of semiconductor physics and its applications in various devices.
- To establish the properties of magnetic materials and their applications in data storage.
- To understand the functioning of optical materials for optoelectronics
- To instill the basics of quantum structures and their applications in nano electronics.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory -Expressions for electrical conductivity and thermal conductivity - Wiedemann-Franz law – success and failures – electron in metals – degenerate states – Quantum free electron theory – Fermi-Dirac statistics – Fermi-Dirac distribution function- Effect of temperature – Density of energy states – Electron in periodic potential – Energy bands in solids – Tight binding approximation - Electron effective mass – Concept of hole.

UNIT II SEMICONDUCTOR PHYSICS 9

Intrinsic semiconductors – energy band diagram –direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – Extrinsic semiconductors - Carrier concentration in n-type & p-type semiconductors – variation of carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration – carrier transport in semiconductor – drift and diffusion transport – Hall effect and devices – Ohmic contacts – Schottky diode.

UNIT III MAGNETIC MATERIALS 9

Magnetic dipole moment – Origin of magnetic moments – Bhor magneton – magnetic permeability and susceptibility - Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory – Hysteresis – M versus H behavior hysteresis loop – Hard and soft magnetic materials – examples and uses-– Magnetic principle in computer data storage – Magnetic hard disc (GMR sensor).

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) – photo current in a P- N diode – solar cell – photo detectors - LED – Organic LED – Optical storage techniques.

UNIT V NANOMATERIALS & NANO DEVICES 9

Introduction - quantum confinement – quantum structures: quantum wells, wires and dots — band gap of nanomaterials. Tunneling – Single electron phenomena: Coulomb blockade - resonant-tunneling diode – single electron transistor – quantum cellular automata - Quantum system for information processing - quantum states

– classical bits – quantum bits or qubits –CNOT gate - multiple qubits – Bloch sphere – quantum gates – advantage of quantum computing over classical computing.

Total: 45 Periods

COURSE OUTCOMES:

At the end of the course, the students should be able to

CO1 : Explain the classical and quantum electron theories, and energy band structures

CO2 : Apply the basics of semiconductor physics in various electronic applications

CO3 : Explore the properties of magnetic materials and their applications in data storage.

CO4 : Illustrate the functioning of optical materials for optoelectronics

CO5 : Utilize the basics of quantum structures and their applications in Nanoelectronics devices.

TEXT BOOKS

1. Jasprit Singh,"Semiconductor Devices: Basic Principles", Wiley(Indian Edition),2007.
2. S.O. Kasap."Principles of Electronic Materials and Devices", McGraw-Hill Education (Indian Edition), 2020.
3. ParagK.Lala,"Quantum Computing:A Beginner's Introduction",McGraw-HillEducation (Indian Edition), 2020

REFERENCES

1. Charles Kittel, "Introduction to Solid State Physics", Wiley India Edition, 2019.
2. Y.B.BandandY.Avishai,"Quantum Mechanics with Applications to Nanotechnology and Information Science", Academic Press, 2013.
3. V.V.Mitin, V.A.Kochelapand M.A.Stroscio, "Introduction to Nano electronics", Cambridge Univ.Press, 2008.
4. G.W.Hanson, "Fundamentals of Nanoelectronics", Pearson Education (Indian Edition) 2009.
5. B.Rogers, J.Adams and S. Pennathur, "Nanotechnology: Understanding Small Systems", CRC Press, 2014.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3			1			1		1					
CO2	3	2	2	1	2	1	2	2		1		2			
CO3	3	2	1	1	2	1	1	1		1		2			1
CO4	3	3	2	2	2		1	2		1		2	1		1
CO5	2	3	2	1	1	1		2		1		2	2	2	2
Avg	**2.8**	**2.6**	**1.75**	**1.25**	**1.6**	**1**	**1.3**	**1.6**		**1**		**2**	**1.5**	**2.0**	**1.3**

1 - Low, 2 - Medium, 3 - High

SEMESTER-II
B. Tech-AI&DS, IT, B.E.-CSE

CS24201	C LANGUAGE PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand basics of Unix/Linux and the constructs of C Language.
- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop modular applications in C using functions
- To develop applications in C using pointers and structures
- To do input/output and file handling in C and Implementation of simple projects using C

UNIT I BASICS OF C PROGRAMMING 9

Introduction to UNIX/LINUX - basic Commands with shell scripting- Introduction to programming paradigms – Applications of C Language - Structure of C program - C programming: Data Types - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Preprocessor directives -Compilation process

UNIT II ARRAYS AND STRINGS 9

Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.

UNIT III FUNCTIONS AND POINTERS 9

Modular programming - Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion, Binary Search using recursive functions –Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Parameter passing: Pass by value, Pass by reference.

UNIT IV STRUCTURES AND UNION 9

Structure - Nested structures – Pointer and Structures – Array of structures – Self referential structures – Dynamic memory allocation - Singly linked list – typedef – Union - Storage classes and Visibility.

UNIT V FILE PROCESSING and Implementation 9

Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments – Implementation of simple projects using C (Program Design, Program Coding, Program Testing and Debugging).

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

CO1 : Demonstrate basic knowledge on Unix / Linux and C Programming constructs
CO2 : Design and implement applications using arrays and strings
CO3 : Develop and implement modular applications in C using functions.

CO4 : Develop applications in C using structures and pointers.

CO5 : Design applications using sequential and random-access file processing and Implementation of simple projects using C

TOTAL: 45 PERIODS

TEXT BOOKS:

1. ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Programming in ANSI C || 9th Edition || by Balagurusamy || McGraw Hill · 11 July 2024 | Standard Edition Edition · 4
3. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.
4. Linux Essential Commands, Fourth Edition (Grayscale Indian Edition) • Daniel J. Barrett | 11 April 2024 | Fourth Edition -4

REFERENCES:

1. UNIX: The Complete Reference, by Kenneth Rosen. Second Edition.2021.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	1	2	1	1	1	2		3	2	1	2	
CO2	2	3	2	1	2	1	1	1	2		3	2	2	2	
CO3	3	2	2	1	3	1	1	1	2		3	3	2	2	
CO4	2	3	3	1	2	1	2	1	2		3	2	2	3	
CO5	2	2	3	2	1	2			2	1	2	2	2	2	
Avg	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**1**	**2**		**3**	**2**	**2**	**2.2**	

1 - Low, 2 - Medium, 3 - High

SEMESTER-II
Common To All Branches
(B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH)

TA24201	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

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.

UNIT III MANUFACTURING TECHNOLOGY 3

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.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

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.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

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.

Total: 15 Periods

SEMESTER-II
Common To All Branches
(B.Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH)

TA242001	தமிழரும் மற்றும் தொழில்நுட்பம்	L	T	P	C
		1	-	-	1

அலகு I நெசவு மற்றும் பானை தொழில்நுட்பம் 3

சங்க காலத்தில் நெசவுத் தொழில் - பானை தொழில்நுட்பம் - கருப்பு மற்றும் சிவப்பு பாண்டங்கள் பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பம் 3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமானப் பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெரியகோவில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோவில்கள் - மாதிரி கட்டமைப்புகள் பற்றிய அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாடு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ- சாரோசெனிக் கட்டிடக் கலை.

அலகு III உற்பத்தி தொழில்நுட்பம் 3

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற் சாலை- இரும்பு உருகுதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சாடித்தல் - மணிகள் உருவக்கும் தொழிற் சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத் துண்டுங்கள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசன தொழில்நுட்பம் 3

அணை, ஏரி, குளங்கள், மதகு, - சோழர்காலக் குமிழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக் குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

அலகு V அறிவியல் தமிழ் மற்றும் கணிதத்தமிழ் 3

அறிவியல் தமிழின் வளர்ச்சி – கணிதத்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் -சொற்குவைத் திட்டம்.

Total: 15 Periods

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு மக்களும் பண்பாடு மற்றும் கல்வியியல் பணிகள் கழகம்.
2. கணினித் தமிழ் முனைவர் இல.சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தோல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தோல்லியல் 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.Subatamanian, 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 C ivilization 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.

SEMESTER-II
Common To B. Tech – AI&DS, IT, B.E – BME, CSE, & MECH

EE24203	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To illustrate the basics of electric circuits and analysis of DC & AC circuits.
- To understand the knowledge in the basics of working principles and application of electrical machines.
- To evaluate the fundamentals of analog electronics and their characteristics.
- To demonstrate the fundamental concepts of digital electronics.
- To compute the functional elements and working of measuring instruments.

UNIT - I BASIC ELECTRIC CIRCUITS 9

DC Circuits: Basic Circuit elements – Ohm's Law - Kirchhoff's Laws with Independent Sources – Resistors in Series and Parallel- Current division and Voltage division- Nodal Analysis, Mesh analysis with Independent sources only - Thevenin's and Norton's Theorem. Introduction to AC circuit Fundamentals: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor.

UNIT II ELECTRICAL MACHINES 9

Construction and Working principle - DC Machines, EMF equation, Types and Applications. Construction and Working Principle of Transformers & Induction Motors, V/F drives.

UNIT III ANALOG ELECTRONICS 9

PN Junction Diode, Zener Diode – V-I Characteristics & Applications, BJT, SCR, MOSFET, IGBT Types– Basics of Rectifier and Inverter.

UNIT IV DIGITAL ELECTRONICS 9

Number system and its conversion, binary codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps.

UNIT V MEASUREMENTS AND INSTRUMENTATION 9

Functional elements of an instrument, Standards, Operating Principle, types -Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers - CT and PT, DSO – Block diagram – Data Acquisition.

Total: 45 Periods

LIST OF EXPERIMENTS:

1. Simulation and experimental verification of electrical circuit using Mesh analysis.
2. Simulation and experimental verification of electrical circuit using Nodal analysis.
3. Measurement of Three Phase Power using two Wattmeter method.
4. Load test on single-phase transformer.
5. Load test on DC shunt motor.
6. VI characteristic of PN junction diode.

7. VI characteristic of Zener Diode.
8. Study of solar PV.

Total: 30 Periods

Total: 75 Periods

COURSE OUTCOMES

After completing this course, the students will be able to

CO1 : Compute the electric circuit parameters.
CO2 : Illustrate the working principle and applications of electrical machines.
CO3 : Plot the characteristics of analog electronics.
CO4 : Summarize the basic concepts of digital electronics.
CO5 : Interpret the operating principles of measuring instruments.

TEXT BOOKS:

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020.
2. S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.
3. Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., Third Edition, 2015.
4. James A .Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018.
5. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.

REFERENCES:

1. Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017.
2. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 9th edition, 2021.
3. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 7th Edition 2017.
4. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 4th Edition, 2019.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1					1		1		2		1	1
CO2	2	2	1					1		1		2		1	1
CO3	2	2	1					1		1		2		1	1
CO4	2	2	1					1		1		2		1	1
CO5	2	2	1					1		1		2		1	1
Avg	**2**	**2**	**1**					**1**		**1**		**2**		**1**	**1**

1 - Low, 2 - Medium, 3 - High

SEMESTER-II
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

GE24201	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

The main learning objective of this course is to provide hands on training to the students in:

- Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.
- Welding various joints in steel plates using arc welding; machining various simple processes like turning, drilling, and tapping in parts.
- Wiring various electrical joints in common household electrical wire work.
- Soldering and testing simple electronic circuits; assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & MECHANICAL ENGINEERING)

PART I CIVIL ENGINEERING PRACTICES 15

PLUMBING WORK:

a. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.
b. Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
c. Preparation of plumbing line sketches for water supply.
d. Laying pipe connection to the suction and delivery side of a pump
e. Mixed pipe material connection – Pipe connections with different joining components.

WOOD WORK:

a. Study of the joints in roofs, doors, windows and furniture.
b. Making joints like Mortise and Tenon joint, T-Joint and Dovetail joint by sawing, planning and cutting.

PART II MECHANICAL ENGINEERING PRACTICES 15

WELDING WORK:

a. Welding of Butt joints, Lap joints and Tee joints using arc welding.
b. Gas welding practice

BASIC MACHINING WORK:

a. Simple step turning, taper turning
b. Simple drilling.

ASSEMBLY WORK:

a. Study of centrifugal pump
b. Study of air conditioner
c. Study of household mixer.

SHEET METAL WORK:

a. Making models of a square/Rectangular tray and funnels.

FOUNDRY WORK:

a. Demonstrating basic foundry operations.

GROUP B (ELECTRICAL & ELECTRONICS ENGINEERING)

PART III ELECTRICAL ENGINEERING PRACTICES 15

a. Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket.
b. Staircase Wiring.
c. Fluorescent Lamp wiring with introduction to CFL and LED types.
d. Energy meter wiring and related calculations/ calibration.
e. Study of Iron Box wiring and assembly.
f. Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac).
g. Study of emergency lamp wiring/Water heater.

PART IV ELECTRONIC ENGINEERING PRACTICES 15

STUDY OF ELECTRONIC COMPONENTS

a. Measurement of Resistance of a resistor using Color Coding.
b. Measurement of AC signal parameters (Peak-Peak, RMS period, Frequency) using CRO.

SOLDERING WORK:

a. Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:

a. Assembling and testing electronic components on a small PCB.

STUDY OF LOGIC GATES:

a. Verification of logic gates - AND, OR, NOT, NAND, NOR, EXOR, EX-NOR.

ELECTRONIC EQUIPMENT STUDY:

a. Study on elements of smart phone.
b. Assembly and dismantle of LED TV.
c. Assembly and dismantle of computer/ laptop.

Total = 60 Periods

***At end of the semester students should submit the prototypes of their stem projects.**

COURSE OUTCOMES

On successful completion of this course, the student will be able to:

CO1: draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.

CO2: weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, and tapping in parts.

CO3: assemble simple mechanical assembly of common household equipment's; Make a simple model using sheet metal work.

CO4: wiring of various electrical joints in common household electrical wire work.

CO5: solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

CO6: understand the concept and verification of logic gates.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2			1	1	1					2	2	1	1
CO2	3	2			1	1	1					2	2	1	1
CO3	3	2			1	1	1					2	2	1	1
CO4	3	2			1	1	1					2	2	1	1
CO5	3	2			1	1	1					2	2	1	1
CO6	3	2			1	1	1					2	2	1	1
Avg	**3**	**2**			**1**	**1**	**1**					**2**	**2**	**1**	**1**

1 - Low, 2 - Medium, 3 - High

SEMESTER-II
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

CS24202	C LANGUAGE PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To familiarise with basic UNIX/LINUX Commands and C programming constructs.
- To develop programs in C using basic constructs.
- To develop programs in C using arrays.
- To develop applications in C using strings, pointers, functions.
- To develop applications in C using structures.
- To develop applications in C using file processing.

LIST OF EXPERIMENTS:

Note: The lab instructor is expected to design problems based on the topics listed. The Examination shall not be restricted to the sample experiments designed.

1. UNIX/LINUX basic Commands, I/O statements, operators, expressions
2. decision-making constructs: if-else, goto, switch-case, break-continue
3. Loops: for, while, do-while
4. Arrays: 1D and 2D, Multi-dimensional arrays, traversal
5. Strings: operations
6. Functions: call, return, passing parameters by (value, reference), passing arrays to function.
7. Recursion
8. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
9. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
10. Files: reading and writing, File pointers, file operations, random access, processor directives.

Total: 60 Periods

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

CO1 : Demonstrate knowledge on C programming constructs.
CO2 : Develop programs in C using arrays.
CO3 : Develop applications in C using strings, pointers, functions.
CO4 : Develop applications in C using structures.
CO5 : Develop applications in C using file processing.

TEXT BOOKS:

1. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition, 2016.
2. Programming in ANSI C || 9th Edition || by Balagurusamy || McGraw Hill · 11 July 2024 | Standard Edition Edition
3. Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.
4. Linux Essential Commands, Fourth Edition (Grayscale Indian Edition) • Daniel J. Barrett | 11 April 2024 | Fourth Edition -4

REFERENCES:

1. UNIX: The Complete Reference, by Kenneth Rosen. Second Edition.2021.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	3	1	1	1	-	-	2	1	2	2	2	2	
CO2	2	2	2	1	1	2	-	-	2	-	2	2	2	2	
CO3	2	2	2	2	1	2	-	-	3	-	3	3	3	2	
CO4	2	2	3	2	3	2	-	-	3	-	3	3	3	3	
CO5	2	2	3	2	1	2	-	-	2	1	2	2	2	2	
Avg	**2**	**2**	**3**	**2**	**1**	**2**	**-**	**-**	**2**	**1**	**2**	**2**	**2**	**2**	

1 - Low, 2 - Medium, 3 - High

SEMESTER-II
Common To All Branches
B. Tech – AI&DS, IT, B.E – BME, CSE, ECE, EEE & MECH

HS24202	ENGLISH COMMUNICATION LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
- To be able to communicate effectively through writing.

UNIT I SELF INTRODUCTION AND EMAIL DRAFTING 12

Speaking: Role Play Exercises Based on Workplace Contexts, - talking about competition- discussing progress toward goals-talking about experiences-talking about events in life-discussing past events.
Writing: Writing emails (formal & semi-formal).

UNIT II INDIVIDUAL DISCUSSION ON SOCIAL ISSUES 12

Speaking: discussing news stories-talking about frequency-talking about travel problems- discussing travel procedures- talking about travel problems- making arrangements-describing arrangements-discussing plans and decisions- discussing purposes and reasons- understanding common technology terms.
Writing: Writing different types of emails.

UNIT III PRESENTATION ON TECHNICAL AND NON-TECHNICAL TOPICS 12

Speaking: discussing predictions-describing the climate-discussing forecasts and scenarios-talking about purchasing-discussing advantages and disadvantages-making comparisons-discussing likes and dislikes-discussing feelings about experiences-discussing imaginary scenarios.
Writing: Short essays and reports-formal/semi-formal letters.

UNIT IV IMPORTANCE OF DESCRIPTIVE WRITING & INSTRUCTIONS 12

Speaking: discussing the natural environment-describing systems-describing position and movement-explaining rules-(example- discussing rental arrangements)- understanding technical instructions.
Writing: Writing instructions. Writing a short article.

UNIT V GROUP DISCUSSION AND IMPORTANCE OF RESUME WRITING 12

Speaking: describing things relatively-describing clothing-discussing safety issues (making recommendations) talking about electrical devices-describing controlling actions.
Writing: Job application (Cover letter+ Curriculum vitae)- product presentation)

Total: 60 Periods

COURSE OUTCOMES

After completion of this course, the students should be able to

CO1 : Speak effectively in group discussions held in a formal/semi formal contexts.
CO2 : Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions

CO3 : Write emails, letters and effective job applications.
CO4 : Write critical reports to convey data and information with clarity and precision.
CO5 : Give appropriate instructions and recommendations for safe execution of tasks.

Assessment Pattern

- Conduction of Assessment to test speaking and writing skills

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3		3		3	3		3	3	3	3	1		
CO2		3		3		3	3		3	3	3	3	1		
CO3		2		3		3	3		3	3	3	3	1		
CO4		3		3		3	3		3	3	3	3	1		
CO5		3		3		3	3		3	3	3	3	1		
Avg		**2.8**		**3**		**3**	**3**		**3**	**3**	**3**	**3**	**1**		

1 - Low, 2 - Medium, 3 - High

SEMESTER-III
B. Tech - AI&DS

MA24305	PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- Understand the basic concepts of probability with characteristics and also two-dimensional random variables.
- Learn how to formulate and test hypotheses about means, variances and proportions and to draw conclusions based on the results of statistical tests.
- Apply the concepts of probability and statistics in the field of Artificial Intelligence and Data Science.

UNIT I PROBABILITY AND RANDOM VARIABLES 9 + 3

Axioms of probability - Conditional probability - Total probability - Bayes theorem - Random variables - Probability mass function - Probability density functions - Properties.

UNIT II STANDARD DISTRIBUTIONS 9 + 3

Discrete distributions: Binomial - Poisson - Geometric - Continuous distributions: Uniform - Exponential - Normal distributions and their properties.

UNIT III TWO- DIMENSIONAL RANDOM VARIABLES 9 + 3

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT IV NON-PARAMETRIC TESTS 9 + 3

Introduction - The Sign test - The Signed - Rank test - Rank - sum tests – Mann-Whitney U test - The H test - Tests based on Runs - Test of randomness - The Kolmogorov Tests.

UNIT V STATISTICAL QUALITY CONTROL 9 + 3

Control charts for measurements ($\bar{X}$ and R charts) – Control charts for attributes (p, c, u and np charts) – Process capability Studies - Tolerance limits - Acceptance sampling.

TOTAL PERIODS: 60

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

- **CO1:** Demonstrate and apply the basic probability axioms and concepts in their core areas of random phenomena.
- **CO2:** Apply the concepts of probability distributions in an appropriate place of science and Engineering
- **CO3:** Execute the knowledge of solving two-dimensional random variables using correlation techniques
- **CO4:** Understand the basic concepts of classifications of design of experiments in the field of statistical quality control.
- **CO5:** Summarize the measurements and procedure for statistical charts.

TEXT BOOKS:

1. Johnson. R.A., Miller. I.R and Freund. J.E, " Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2016.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata Mc Graw Hill, 4th Edition, 2007. 3. John E. Freund, "Mathematical Statistics", Prentice Hall, 5th Edition, 1992.

REFERENCES:

1. Gupta. S.C. and Kapoor. V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Ross. S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 5thEdition, Elsevier, 2014.
4. Richard A Johnson and John Freund, Miller and Freund's Probability Statistics for Engineers, 8th Edition, Pearson Education, 2015.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	-	-	-	-	-	-	-	-	2	-	-	-
CO2	2	2	1	-	-	-	-	-	-	-	-	1	-	-	-
CO3	1	2	1	-	-	-	-	-	-	-	-	2	-	-	-
CO4	2	1	1	-	-	-	-	-	-	-	-	2	-	-	-
CO5	1	1	2	-	-	-	-	-	-	-	-	1	-	-	-
Avg	**1.4**	**1.6**	**1.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**-**	**-**	**-**

1 - Low, 2 - Medium, 3 - High

SEMESTER-III
B. Tech - AI&DS

AD24301	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are to:

- Learn the basic AI approaches
- Develop problem solving agents
- Perform logical and probabilistic reasoning

UNIT I INTELLIGENT AGENTS 9

Introduction to AI – Agents and Environments – concept of rationality – nature of environments – structure of agents. Problem solving agents – search algorithms – uninformed search strategies.

UNIT II PROBLEM SOLVING 9

Heuristic search strategies – heuristic functions. Local search and optimization problems – local search in continuous space – search with non-deterministic actions – search in partially observable environments.

UNIT III GAME PLAYING AND CSP 9

Game theory – optimal decisions in games – alpha-beta search – monte-carlo tree search – stochastic games – partially observable games. Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP.

UNIT IV LOGICAL REASONING 9

Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic. First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining –backward chaining – resolution.

UNIT V PROBABILISTIC REASONING 9

Acting under uncertainty – Bayesian inference – naïve Bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.

TOTAL PERIODS: 45

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Describe the structure and functionality of intelligent agent frameworks
CO2: Utilize effective problem-solving strategies in AI
CO3: Design and implement solutions using game playing and constraint satisfaction techniques
CO4: Apply logical reasoning methods for knowledge representation and inference
CO5: Apply probabilistic reasoning techniques to make decisions in uncertain environments

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Fourth Edition, Pearson Education, 2021.

REFERENCES:

1. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007.
2. Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2008.
3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006.
4. Deepak Khemani, “Artificial Intelligence”, Tata McGraw Hill Education, 2013.
5. http://nptel.ac.in/

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	3	-	-	-	-	2	3	3	1	2	1	1
CO2	2	2	1	1	1	-	-	-	2	2	3	1	3	2	2
CO3	2	1	2	1	-	-	-	-	2	1	1	3	1	2	1
CO4	2	1	2	2	-	-	-	-	2	1	2	2	1	3	3
CO5	3	2	2	1	1	-	-	-	3	2	1	2	2	2	1
Avg	**2.4**	**1.4**	**2**	**1.6**	**1**	-	-	-	**2.2**	**1.8**	**2**	**1.8**	**1.8**	**2**	**1.6**

1 - Low, 2 - Medium, 3 - High

SEMESTER-III
B. Tech - AI&DS

AD24302	FUNDAMENTALS OF DATA SCIENCE AND ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are to:

- Understand the techniques and processes of data science
- Apply descriptive data analytics
- Visualize data for various applications
- Understand inferential data analytics
- Analysis and build predictive models from data

UNIT I INTRODUCTION TO DATA SCIENCE 8 Need for data science – benefits and uses – facets 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.

UNIT II DESCRIPTIVE ANALYTICS 10

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 toward the mean.

UNIT III INFERENTIAL STATISTICS 9

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.

UNIT IV ANALYSIS OF VARIANCE 9

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 - Introduction to chi-square tests.

UNIT V PREDICTIVE ANALYTICS 9

Linear least squares – implementation – goodness of fit – testing a linear model – weighted resampling. Regression using StatsModels – multiple regression – nonlinear relationships – logistic regression – estimating parameters – Time series analysis – moving averages – missing values - serial correlation – autocorrelation. Introduction to survival analysis.

TOTAL PERIODS: 45

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Explain the data analytics pipeline
CO2: Describe and visualize data
CO3: Perform statistical inferences from data
CO4: Analyze the variance in the data
CO5: Build models for predictive analytics

TEXT BOOKS:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (first two chapters for Unit I).
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.
3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.

REFERENCES:

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

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	-	-	-	-	3	1	3	2	3	3	1
CO2	1	1	2	2	2	-	-	-	2	2	3	2	3	1	1
CO3	1	1	3	1	1	-	-	-	2	3	1	1	2	3	1
CO4	2	3	1	3	1	-	-	-	3	3	3	3	3	2	2
CO5	2	1	1	1	2	-	-	-	3	3	1	3	2	2	1
Avg	**1.4**	**1.4**	**1.8**	**1.6**	**1.5**	**-**	**-**	**-**	**2.6**	**2.4**	**2.2**	**2.2**	**2.6**	**2.2**	**1.2**

1 - Low, 2 - Medium, 3 - High

SEMESTER-III
B. Tech - AI&DS

AD24303	JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are to:

- Understand the fundamental principles of object-oriented programming and Java features such as platform independence, multithreading, and memory management.
- Develop Java programs using core components including variables, operators, control structures, data types, and class definitions.
- Implement the concepts of classes, inheritance, interfaces, and method polymorphism using Java's object-oriented features.
- Apply exception handling and multithreading concepts to build robust and concurrent applications.
- Create dynamic web-based applications using Java Servlets and JSP, and integrate them with databases using JDBC.
- Utilize Java's I/O system and collection framework for efficient file handling and data manipulation.

UNIT I INTRODUCTION TO JAVA 9

An Overview of Java: Object-Oriented concepts - Java buzzwords (Platform independence, Portability, Threads) - JVM architecture – Java Program structure -Java main method – Data types - Variables - type conversion and casting - Java Console input: Buffered input - operators - control statements - Static Data - Static Method - String and String Buffer Classes.

UNIT II CLASSES AND OBJECTS 9

Java user defined Classes and Objects – Arrays – constructors - Inheritance: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super keyword - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword - Packages: Definition - Access Protection - Importing Packages - Interfaces: Definition – Implementation – Extending Interfaces.

UNIT III EXCEPTION HANDLING 9

Try – catch - throw - throws – finally – Built-in exceptions - Creating own Exception classes – garbage collection, finalize - Multithreaded Programming: Thread Class - Runnable interface – Synchronization – Using synchronized methods – Using synchronized statement - Interthread Communication – Deadlock.

UNIT IV JAVA SERVLETS 9

Overview of Web Technologies (Client-Server, HTTP, Web Servers) - Introduction to Java Servlets - Advanced Servlet Concepts and Session Management - Introduction to JSP-Implicit Objects JSP Tags and - MVC Architecture and JSP - Servlet Integration - JDBC architecture - JDBC Advanced Features - Integrating JDBC with Servlets.

UNIT V FILE HANDLING AND FRAMEWORKS 9

Input / Output Basics — Streams — Byte streams and Character streams — Reading and Writing Console — Reading and Writing Files Adapter classes - Inner classes -Java Util Package / Collections framework: Collection & Iterator Interface – Enumeration - List and ArrayList – Vector – Comparator.

TOTAL PERIODS: 45

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Understand OOP and basic Java constructs

CO2: Analyze inheritance and abstract class

CO3: Analyze exception handling

CO4: Develop Java web apps with JDBC

CO5: Perform file I/O, multithreading, containers

TEXT BOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 13th Edition, McGraw Hill Education, New Delhi, 2024.
2. Ken Arnold James Gosling David Holmes, "The Java Programming Language", Fourth Edition, Pearson Education, 2008

REFERENCES:

1. Kathy Sierra Bert Bates "Head First JAVA", 2nd edition, Oreilly, 2015.
2. John P. Flynt "Java Programming", 2nd edition, 2007.
3. DELNET access link open source http://discovery.delnet.in/
4. K-hub in e- Library resource link http://k-hub.in/dashboard

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	-	-	-	1	1	1	2	3	1	-
CO2	3	3	2	2	2	-	-	-	1	1	1	2	3	1	-
CO3	2	3	2	2	3	-	-	1	2	1	1	2	2	1	-
CO4	3	3	3	2	3	1	-	1	2	2	2	2	2	3	-
CO5	3	2	3	2	3	-	-	1	2	1	2	3	3	2	-
Avg	**2.8**	**2.6**	**2.4**	**1.8**	**2.8**	**1**	**-**	**1**	**1.6**	**1.2**	**1.4**	**2.2**	**2.6**	**1.6**	**-**

1 - Low, 2 - Medium, 3 – High

SEMESTER-III
B. Tech - AI&DS

EC24303	COMPUTER ORGANIZATION AND DIGITAL PRINCIPLES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are to:

- Understand the basic structure and operation of a digital computer.
- Study the design of data path unit, control unit for processor and to familiarize with the hazards.
- Understand the concept of various memories and I/O interfacing.
- Analyze and design combinational circuits.
- Analyze and design sequential circuits.

UNIT I COMBINATIONAL LOGIC 9

Combinational Circuits – Karnaugh Map - Design Procedures- Adder – Subtractor - Code convertors - Magnitude Comparator – Decoder – Encoder – Multiplexers – Demultiplexers.

UNIT II SEQUENTIAL CIRCUITS 9

Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Design of synchronous and Asynchronous sequential circuits - Shift Registers –Universal Shift Register - Counters.

UNIT III COMPUTER FUNDAMENTALS 9

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High Level Language.

UNIT IV PROCESSOR 9

Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Micro programmed Control – Pipelining – Data Hazard and Control Hazards.

UNIT V MEMORY AND I/O 9

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB.

TOTAL PERIODS: 45

COURSE OUTCOMES:

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

- **CO1:** State the fundamentals of computer systems and analyze the execution of an instruction.
- **CO2:** Analyze different types of control design and identify hazards.
- **CO3:** Identify the characteristics of various memory systems and I/O communication.
- **CO4:** Design various combinational digital circuits using logic gates.
- **CO5:** Design various synchronous and asynchronous sequential circuits using Flip Flop.

TEXT BOOKS:

1. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020.
2. M. Morris Mano, Michael D. Ciletti, "Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog", Sixth Edition, Pearson Education, 2018.

REFERENCES:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Tenth Edition, Pearson Education, 2016.
3. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	1	1	1	1	2	3	2	3	3
CO2	3	3	3	3	2	1	1	1	1	1	2	3	1	2	2
CO3	3	3	3	3	2	2	1	1	1	1	2	3	2	3	1
CO4	3	3	3	3	1	1	1	1	1	1	1	2	1	3	1
CO5	3	3	3	3	1	2	1	1	1	1	1	2	1	2	1
Avg	**3**	**3**	**3**	**3**	**1.8**	**1.6**	**1**	**1**	**1**	**1**	**1.6**	**2.6**	**1.4**	**2.6**	**1.6**

1 - Low, 2 - Medium, 3 - High

SEMESTER-III
B. Tech - AI&DS

AD24304	PRINCIPLES OF DATA STRUCTURES AND ALGORITHMS (T&P)	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- Understand and implement the linear data structures and its applications.
- Understand the tree data structures, priority queues and string matching.
- Learn various graph algorithms.
- Learn the algorithm design and analysis techniques with orders of growth.
- Learn the advanced algorithm design techniques.

UNIT I LINEAR DATA STRUCTURES 10

Introduction to Data Structures – Types of Data Structures - List: Array Implementation of List – Linked List – Doubly Linked List – Circular Linked List; Stack: Array and Linked List Implementation – Applications; Queues: Array and Linked List Implementation – Applications – Hashing: Hash Function – Collision resolution techniques.

UNIT II TREE AND STRING-MATCHING ALGORITHMS 8

Trees: Binary trees – Binary Search Trees – AVL Trees - Binary Heap Operations – Heap sort and Priority Queues. String Matching: Naïve String-matching algorithm – Rabin-Karp algorithm – Knuth-Morris-Pratt algorithm.

UNIT III GRAPH ALGORITHMS 9

Representation of Graphs – Breadth First Search – Depth First Search - Topological Sort – Shortest Path Algorithms: Dijkstra's Algorithm – Floyd-Warshall's Algorithm – Minimum Spanning Tree: Prim's Algorithm – Kruskal's Algorithm.

UNIT IV FOUNDATION AND ALGORITHM ANALYSIS 9

Fundamentals of algorithmic problem solving – Problem types – Brute force approach: Analysis of Non recursive Algorithms - Divide and Conquer: Analysis of recursive algorithms – Sorting: Selection sort - Bubble sort – Insertion Sort - Merge Sort - Quick sort - Searching: Linear Search – Binary Search.

UNIT V ADVANCED ALGORITHM DESIGN TECHNIQUES 9

Dynamic Programming: Longest Common Subsequence; Optimal Binary Search trees. Greedy Algorithm: Huffman Codes; Backtracking: n-Queens Problem – Subset-sum Problem; Branch and Bound: Assignment Problem – Knapsack Problem - Introduction to P, NP, NP-complete and NP-Hard problems.

TOTAL PERIODS: 45

LIST OF EXPERIMENTS:

1. List - Array and Linked List Implementation.
2. Stack - Array and Linked List Implementation.
3. Queue - Array and Linked List Implementation.
4. Applications of Stack - Infix to Postfix Expression, Evaluation of Postfix Expression.
5. Implementation of Binary Search Tree with Tree traversal Techniques and AVL tree.
6. Graph Algorithms
   a) Graph Traversal's Algorithm - Breadth-first search, Depth-first search.
   b) Shortest Path Algorithm - Dijkstra's algorithm.
   c) Minimum Spanning Tree Algorithm - Prim's algorithm.
7. Sorting - Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Radix Sort.
8. Searching - Linear Search, Binary Search.
9. Backtracking – n-Queens problem
10. Branch and Bound – Knapsack Problem

TOTAL PERIODS: 30
TOTAL PERIODS: 75

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Solve problems using suitable linear data structures.
CO2: Solve problems using suitable nonlinear tree data structures.
CO3: Demonstrate the use of graph algorithms for solving problems.
CO4: Design and analyze time and space complexities of algorithms using different design techniques for various computing problems.
CO5: Design algorithms using advanced algorithm design techniques.

TEXT BOOKS:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2013.
3. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.

REFERENCES:

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
2. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3, Pearson Education, 2009.
3. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	3	-	-	2	2	3	3	3
CO2	3	3	3	3	-	-	-	3	-	-	2	2	3	3	3
CO3	3	3	3	3	-	-	-	3	-	-	2	2	3	3	3
CO4	3	2	1	-	-	-	-	3	-	-	2	2	3	3	3
CO5	3	3	3	3	-	-	-	3	-	-	2	2	3	3	3
Avg	**3**	**2.6**	**2.2**	**3**	**0**	**0**	**0**	**3**	**0**	**0**	**2**	**2**	**3**	**3**	**3**

1 - Low, 2 - Medium, 3 - High

SEMESTER-III
B. Tech - AI&DS

AD24305	ARTIFICIAL INTELLIGENCE LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

The main objectives of this course are to:

- Design and implement search strategies
- Implement game playing techniques
- Implement CSP techniques
- Develop systems with logical reasoning
- Develop systems with probabilistic reasoning

LIST OF EXPERIMENTS:

1. Implement 8 - Puzzle problem
2. Implement 8 - Queens problem
3. Implement A* algorithms.
4. Implement DFS and BFS algorithms.
5. Implement Minimax algorithm for game playing (Alpha-Beta pruning).
6. Solve constraint satisfaction problems.
7. Implement propositional model checking algorithms.
8. Implement forward chaining, backward chaining, and resolution strategies.
9. Build naïve Bayes models.
10. Implement Bayesian networks and perform inferences.

TOTAL PERIODS: 60

COURSE OUTCOMES:

At the end of this course, the students will be able to:

CO1: Apply and develop search algorithms to solve computational problems.
CO2: Develop intelligent agents using game-playing strategies and techniques.
CO3: Apply constraint satisfaction techniques to solve various problems.
CO4: Design and implement systems that utilize formal logic for knowledge representation and inference.
CO5: Develop probabilistic reasoning systems under uncertainty.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	-	3	-	-	3	3	3	-	3	3	1	2
CO2	1	2	3	-	3	-	-	3	3	3	-	3	3	1	2
CO3	1	2	3	-	3	-	-	3	3	3	-	3	3	1	2
CO4	1	2	3	-	3	-	-	3	3	3	-	3	3	1	2
CO5	1	2	3	-	3	-	-	3	3	3	-	3	3	1	2
Avg	**1**	**2**	**3**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**	**3**	**1**	**2**

1 - Low, 2 - Medium, 3 - High

SEMESTER-III
B. Tech - AI&DS

AD24306	DATA SCIENCE AND ANALYTICS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

The main objectives of this course are to:

- Develop data analytic code in python
- Use python libraries for handling data
- Develop analytical applications using python
- Perform data visualization using plots

Tools: Python, Numpy, Scipy, Matplotlib, Pandas, statsmodels, seaborn

LIST OF EXPERIMENTS:

1. Working with Numpy arrays
   a) Write a NumPy program to convert an array to a float type.
   b) Write a NumPy program to create a 3x3 matrix with values ranging from 2 to 10.
   c) Write a NumPy program to convert a list of numeric value into a one-dimensional NumPy array.
   d) Write a NumPy program to convert a list and tuple into arrays.
   e) Write a NumPy program to find the real and imaginary parts of an array of complex numbers.
   f) Write a NumPy program to find the maximum and minimum value from the shape of (3,3) array.
2. Working with Pandas data frames
   a) Creating a dataframe from dictionary of ndarray/lists, perform basic operations on rows/columns like selecting, deleting, adding, and renaming using pandas.
   b) Write a pandas program to sort the dataframe first by 'name' in descending order, then by 'score' in ascending order.
   c) Write a pandas program to select the rows where the number of attempts in the examination is greater than 2.
   d) Write a pandas program to append a new row ‘k’ to dataframe with given values for each column. Now delete the new row and return the original dataframe.
3. Frequency distributions, Averages, Variability
4. Normal curves, Correlation and scatter plots, Correlation coefficient
5. Basic plots using Matplotlib
6. Time series analysis using Matplotlib
7. Z-test, T-test
   a) Write a Python Program to demonstrate the Z-Test and T-Test result for the sample of 20 Students +2 exam final marks.
   b) Write a Python Program to implement T-Test on a sample of ages using NumPy.
   ages = [45, 89, 23, 46, 12, 69, 45, 24, 34, 67]
   c) Evaluate the Data Distribution to formulate hypothesis and calculate Z-Test Statistics with Two-Sample using Pandas and SciPy.

8. ANOVA
    a) Write a Python program to find the null hypothesis or alternate hypothesis using ANOVA.
    b) Write a Python program to implement One-way F-test using ANOVA.
    c) Write a Python program to perform Two-way F-test using ANOVA.
9. Building and validating linear models
10. Building and validating logistic models

TOTAL PERIODS: 60

COURSE OUTCOMES:

Upon successful completion of this course, students will be able to:

CO1: Write python programs to handle data using Numpy and Pandas
CO2: Perform descriptive analytics
CO3: Perform data exploration using Matplotlib
CO4: Perform inferential data analytics
CO5: Build models of predictive analytics

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	3	-	-	-	-	2	2	3	3	3	2	1
CO2	1	2	1	2	2	-	-	-	1	2	3	1	3	2	1
CO3	2	2	2	2	2	-	-	-	3	1	1	2	2	3	1
CO4	2	3	1	3	2	-	-	-	2	3	1	2	2	1	3
CO5	3	1	1	1	2	-	-	-	1	2	2	3	2	2	1
Avg	**2**	**2**	**1.4**	**2.2**	**2**	**-**	**-**	**-**	**1.8**	**2**	**2**	**2.2**	**2.4**	**2**	**1.4**

1 - Low, 2 - Medium, 3 - High

SEMESTER-III
B. Tech - AI&DS

AD24307	JAVA PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

The main objectives of this course are to:

- Demonstrate the creation and usage of Java classes, objects, constructors, and variable initialization.
- Explain decision-making statements and loop constructs in Java.
- Illustrate core object-oriented concepts such as inheritance and polymorphism.
- Explain abstraction through abstract classes, methods, and interfaces.
- Introduce packages and modular programming in Java.
- Demonstrate the development of database-connected web applications using JDBC, Servlets, and JSP.
- Illustrate multithreading using the Thread class and Runnable interface.
- Explain exception handling mechanisms including try-catch, throw, throws, and finally.

LIST OF EXPERIMENTS:

1. Introduce the java fundamentals, data types, operators in java.
2. Demonstrating creation of java classes, objects, constructors, declaration and initialization of variables.
3. Discuss the various Decision-making statements, loop constructs in java
4. Demonstrate the core object-oriented concept of Inheritance, polymorphism
5. Introduce concepts of method overloading, constructor overloading, overriding
6. Introduce the concept of Abstraction, packages.
7. Introduction to abstract classes, abstract methods, and Interface in java.
8. Working on JDBC with Servlets and JSP.
9. Demonstrate creation of threads using Thread class and runnable interface.
10. Introduce File operations in java.
11. Exception handling in java, introduction to throwable class, throw, throws, finally.

TOTAL PERIODS: 60

COURSE OUTCOMES:

Upon successful completion of this course, students will be able to:

CO1: Understand basic concepts of Java constructs.
CO2: Analyze different forms of inheritance and objects in abstract class.
CO3: Analyze different kind of usage of Exception handling.
CO4: Build web applications using Servlets, JSP, and integrate with databases using JDBC.
CO5: Understand the Multithreading in complex Java programs, and usage of Container classes.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	-	-	-	1	1	1	2	3	1	-
CO2	3	3	2	2	2	-	-	-	1	1	1	2	3	1	-
CO3	2	3	2	2	3	-	-	1	2	1	1	2	2	1	-
CO4	3	3	3	2	3	1	-	1	2	2	2	2	2	3	-
CO5	3	2	3	2	3	-	-	1	2	1	2	3	3	2	-
Avg	**2.8**	**2.6**	**2.4**	**1.8**	**2.8**	**1**	**-**	**1**	**1.6**	**1.2**	**1.4**	**2.2**	**2.6**	**1.6**	**-**

1 - Low, 2 - Medium, 3 – High

SEMESTER-III
B. Tech - AI&DS

GE24S01	PROFESSIONAL DEVELOPMENT	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

The main objectives of this course are:

- To be proficient in important Microsoft Office tools: MS WORD, EXCEL, POWERPOINT.
- To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the present ability and overall utility value of content.
- To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize, interlink, and utilizing many more critical features offered.
- To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, present ability, aesthetics, using media elements and enhance the overall quality of presentations.

UNIT I INTRODUCTION TO MS WORD 5

Create and format a document: Working with tables - Working with Bullets and Lists - Working with styles, shapes, smart art, charts - Inserting objects, charts and importing objects from other office tools - Creating and Using document templates.

UNIT II APPLICATIONS OF MS WORD 5

Inserting equations, symbols and special characters - Working with Table of contents and References, citations- Insert and review, comments - Create bookmarks, hyperlinks, endnotes footnote - Viewing document in different modes - Working with document protection and security - Inspect document for accessibility

UNIT III INTRODUCTION TO MS EXCEL 5

Create worksheets - insert and format data-Work with different types of data: text, currency, date, numeric etc. Split, validate, consolidate, Convert data - Sort and filter data - Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,) - Work with Lookup and reference formulae - Create and Work with different types of charts.

UNIT IV APPLICATIONS OF MS EXCEL 5

Use pivot tables to summarize and analyze data-Perform data analysis using own formulae and functions - Combine data from multiple worksheets using own formulae and built-in functions to generate, Results - Export data and sheets to other file formats - Working with macros - Protecting data and Securing the workbook.

UNIT V INTRODUCTION TO MS POWERPOINT AND ITS APPLICATIONS 10

Select slide templates, layout and themes-Formatting slide content and using bullets and numbering-Insert and format images, smart art, tables, charts-Using Slide master, notes and handout master-Working with animation and transitions-Organize and Group slides-Import or create and use media objects: audio, video, animation-Perform slideshow recording and Record narration and create presentable videos.

TOTAL PERIODS: 30

COURSE OUTCOMES:

After completion of this course, the students should be able to

CO1: Create document in MS word for technical requirements.
CO2: Create document in MS word for academic requirements.
CO3: Perform Data operation and analytics using MS Excel.
CO4: Perform record creation and retrieving the data for academic requirements.
CO5: Develop document for academic presentation using media objects in MS PowerPoint.

TEXT BOOKS:

1. "Microsoft Word Step by Step"Joan Lambert (Microsoft Press) the latest MS Word version (e.g., 2019 or Microsoft 365).
2. "Microsoft Office 365 – In practice (2021 Edition) by Randy Nordel, McGraw Hill Education.

REFERENCES:

1. MS Word

Book: Microsoft Word 2019 Step by Step by Joan Lambert (Microsoft Press), Covers document creation, formatting, templates, references, and collaboration. ISBN: 978-1509305845.

2. MS Excel

Book: Excel 2019 Bible by Michael Alexander, Richard Kusleika, and John Walkenbach (Wiley), Comprehensive coverage of Excel functions, data analysis, charts, pivot tables, macros., ISBN: 978-1119517948.

3. MS PowerPoint

Book: PowerPoint 2019 For Dummies by Doug Lowe (For Dummies Series)\, Clear instructions on templates, animations, media, slide masters, and presentations. ISBN: 978-1119514190.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	3	1	-	-	-	-	-	-	-	2	-	-	-
CO3	3	3	3	1	-	-	-	-	-	-	-	2	-	-	-
CO4	3	3	3	1	-	-	-	-	-	-	-	2	-	-	-
CO5	3	3	3	1	-	-	-	-	-	-	-	2	-	-	-
Avg	**3**	**3**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**

1 - Low, 2 - Medium, 3 - High

SEMESTER-IV
B. Tech - AI&DS

MA24403	DISCRETE MATHEMATICS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- Extend student's logical and mathematical maturity and ability to deal with abstraction.
- Understand the concepts of Permutations, Combinations and Induction.
- Acquire the knowledge of graph models
- Familiarize the applications of algebraic structures.
- Understand the concepts, significance of lattices and Boolean algebra which are widely used in computer science and engineering.

UNIT I GRAPHS 9+3

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

UNIT II LOGIC AND PROOFS 9+3

Propositional Logic – Propositional equivalences - Predicates and Quantifiers – Nested Quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy.

UNIT III COMBINATORICS 9+3

Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

UNIT IV ALGEBRAIC STRUCTURES 9+3

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism‟s – Normal subgroup and cosets – Lagrange‟s theorem – Definitions and examples of Rings and Fields.

UNIT V LATTICES AND BOOLEAN ALGEBRA 9+3

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra.

TOTAL PERIODS: 60

COURSE OUTCOMES:

After completion of this course, the students should be able to:

- **CO1:** Relate the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, and to apply them in problem solving.
- **CO2:** Learn the concepts of combinatorics and its applications in real life problems.
- **CO3:** Demonstrate the concepts of graph theory, natural applications of trees and apply the graph colorings concepts in partitioning problems.
- **CO4:** Understand the algebraic structures on many levels.
- **CO5:** Apply the ideas of lattices and Boolean algebra in solving computer programming Problems.

TEXT BOOKS:

1. J.P. Tremblay, R. Manohar. "Discrete Mathematical Structures with Applications to Computer Science", McGraw-Hill Education, 2019.
2. Kenneth H. Rosen. "Discrete Mathematics and Its Applications", 8th Edition, McGraw-Hill, Education, 2021.
3. J. A. Bondy and U. S. R. Murty, "Graph Theory with Applications", Macmillan Press, London, 1976.

REFERENCES:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", 5th Edition, Pearson Education, 2019. 2. Marc Lipson, Seymour Lipschutz. "Discrete Mathematics (Schaum's Outlines)", 4rd Edition, McGraw-Hill Education, 2022.
2. Thomas Koshy, "Discrete Mathematics with Applications", Elsevier India, 2005.
3. L. Zhongwan. "Mathematical Logic for Computer Science", World Scientific, Singapore,1989.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	-	-	-	-	-	-	-	-	2	-	-	-
CO2	2	2	1	-	-	-	-	-	-	-	-	1	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	2	-	-	-
CO4	2	1	1	-	-	-	-	-	-	-	-	1	-	-	-
CO5	1	2	2	-	-	-	-	-	-	-	-	1	-	-	-
Avg	**1.6**	**1.8**	**1.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.4**	**-**	**-**	**-**

1 - Low, 2 - Medium, 3 - High

SEMESTER-IV
B. Tech - AI&DS

AD24401	MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are to:

- Understand the basic concepts of machine learning.
- Understand and build supervised learning models.
- Understand and build unsupervised learning models.
- Understand the basic concepts of neural networks.
- Evaluate the algorithms based on corresponding metrics identified.

UNIT I INTRODUCTION TO MACHINE LEARNING 8

Review of Linear Algebra for machine learning; Introduction and motivation for machine learning; Examples of machine learning applications, Vapnik-Chervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning, Hypothesis spaces, Inductive bias, Generalization, Bias variance trade-off.

UNIT II SUPERVISED LEARNING 11

Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Perceptron algorithm, Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random Forests.

UNIT III ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING 9

Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization.

UNIT IV NEURAL NETWORKS 9

Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks – Unit saturation – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.

UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS 8

Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – t test, McNemar's test, K-fold CV paired t test.

TOTAL PERIODS: 45

COURSE OUTCOMES:

Upon completion of the course, the students will be able to:

CO1: Explain the basic concepts of machine learning.
CO2: Construct supervised learning models.
CO3: Construct unsupervised learning algorithms.
CO4: Develop neural network models.
CO5: Evaluate and compare different models.

TEXT BOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
2. Stephen Marsland, "Machine Learning: An Algorithmic Perspective, "Second Edition", CRC Press, 2014.

REFERENCES:

1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
2. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.
3. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", Second Edition, MIT Press, 2018.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
5. Sebastain Raschka, Vahid Mirjalili , "Python Machine Learning", Packt publishing, 3rd Edition, 2019.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	-	-	-	-	3	3	2	2	2	2	1
CO2	1	3	3	1	2	-	-	-	2	2	2	1	3	1	1
CO3	2	1	3	3	2	-	-	-	1	1	1	1	1	2	1
CO4	2	3	3	2	1	-	-	-	3	2	3	2	1	2	1
CO5	1	1	3	3	1	-	-	-	3	1	1	3	3	3	2
Avg	**1.6**	**1.8**	**2.8**	**2**	**1.5**	**-**	**-**	**-**	**2.4**	**1.8**	**1.8**	**1.8**	**2**	**2**	**1.2**

1 - Low, 2 - Medium, 3 - High

SEMESTER-IV
B. Tech - AI&DS

AD24402	RELATIONAL DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are to:

- Introduce database development life cycle and conceptual modeling.
- Learn SQL for data definition, manipulation and querying a database.
- Learn relational database design using conceptual mapping and normalization.
- Understand the fundamental concepts of transaction, concurrency and recovery processing.
- Learn data model and querying in object-relational and No-SQL databases.

UNIT I CONCEPTUAL DATA MODELING 9

Database environment – Database system development lifecycle – Requirements collection – Database design - Entity-Relationship model – Enhanced-ER model – Conceptual Data Modeling in RDBMS.

UNIT II RELATIONAL MODEL AND SQL 9

Relational model concepts - Integrity constraints - SQL Data manipulation – SQL Data definition – Views - SQL programming.

UNIT III RELATIONAL DATABASE DESIGN AND NORMALIZATION 9

ER and EER-to-Relational mapping – Update anomalies – Functional dependencies – Inference rules – Minimal cover – Properties of relational decomposition – Normalization (upto BCNF).

UNIT IV TRANSACTIONS 9

Transaction Concepts – ACID Properties – Schedules – Serializability – Transaction support in SQL – Need for Concurrency – Concurrency control –Two Phase Locking - Deadlock Handling – Recovery Concepts – Recovery based on deferred and immediate update – Shadow paging – ARIES Algorithm.

UNIT V OBJECT RELATIONAL AND NO-SQL DATABASES 9

Mapping EER to ODB schema – Object identifier – reference types – rowtypes – UDTs – Subtypes and supertypes – user-defined routines – Collection types – Object Query Language; No-SQL: CAP theorem – Document-based: MongoDB data model and CRUD operations; Column-based: Hbase data model and CRUD operations.

TOTAL PERIODS: 45

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

CO1: Understand the database development life cycle and apply conceptual modeling.
CO2: Apply SQL and programming in SQL to create, manipulate and query the database.
CO3: Apply the conceptual-to-relational mapping and normalization to design relational database.
CO4: Construct queries to handle transaction processing and maintain consistency of the database.
CO5: Apply the data model and querying in Object-relational and No-SQL databases.

TEXT BOOKS:

1. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson, 2017.
2. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020.
3. Christian Mancas, "Conceptual Data Modeling and Database Design: A Fully Algorithmic Approach", Volume 1 (2021), Apple Academic Press.

REFERENCES:

1. Thomas M. Connolly, Carolyn E. Begg, Database Systems – A Practical Approach to Design, Implementation, and Management, Sixth Edition, Global Edition, Pearson Education, 2015.
2. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	-	-	-	-	3	1	2	1	2	3	3
CO2	2	3	1	3	-	-	-	-	1	2	2	1	3	3	3
CO3	2	2	2	1	-	-	-	-	2	3	1	2	1	1	2
CO4	2	2	3	1	-	-	-	-	1	2	1	2	2	2	2
CO5	3	1	3	2	-	-	-	-	1	3	1	1	2	1	1
Avg	**2.2**	**2**	**2.4**	**2**	**-**	**-**	**-**	**-**	**1.6**	**2.2**	**1.4**	**1.4**	**2**	**2**	**2.2**

1 - Low, 2 - Medium, 3 - High

SEMESTER-IV
B. Tech - AI&DS

AD24403	FUNDAMENTALS OF OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are to:

- Study the basic concepts and functions of operating systems.
- Learn about Processes, Threads, Scheduling algorithms.
- Understand the process of synchronization and deadlock issues.
- Learn and understand the Memory management systems.
- Learn I/O Management and File Systems.

UNIT I OPERATING SYSTEMS OVERVIEW 9

Introduction – Computer System Organization – Computer System Architecture – Operations – Resource Management – Security and Protection – Virtualization – Computing Environments - Operating Systems Structures: Services – User and OS Interface – System Calls – Linkers and Loaders – Operating system Structure – Building and Booting OS.

UNIT II PROCESS MANAGEMENT 9

Processes: Concepts – Process Scheduling – Operations – Inter process Communication - Shared Memory and Message Passing Systems. - Threads: Overview - multithreading models – issues - CPU Scheduling: FCFS – SJF – Priority – RR – Multilevel Queue Scheduling – Multilevel Feedback Queue.

UNIT III PROCESS SYNCHRONIZATION AND DEADLOCKS 9

Process Synchronization – Critical Section Problem – Peterson's Solution – Hardware Synchronization – Semaphores - Monitors – Classic Problems of Synchronization - Deadlocks: Characterization – Prevention – Avoidance – Detection – Recovery.

UNIT IV MEMORY MANAGEMENT 9

Main Memory: Background – Contiguous Memory Allocation – Paging – Structure of a page table – Segmentation – Virtual Memory – Demand Paging – Page Replacement - FIFO - Thrashing – Mass Storage Management - Disk scheduling.

UNIT V FILE MANAGEMENT 9

File System – Concepts – Access Methods - Directory Structure – Protection – Discretionary Access control and Mandatory Access Control – File System structure – Directory Implementation – Allocation Methods – Free-Space Management - Virtual File System.

TOTAL PERIODS: 45

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

CO1: Interpret the evaluation of the OS functionality, structure and layers.

CO2: Analyze the various Scheduling algorithms and design a model scheduling algorithm.

CO3: Apply and analyze Intercrosses communications, synchronization and Deadlock.

CO4: Compare and contrast various memory management schemes.

CO5: Mount file systems and evaluate various disk scheduling techniques.

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.

REFERENCES:

1. William Stallings, "Operating Systems – Internals and Design Principles", 9thEdition, Pearson, 2018.
2. Andrew S. Tanenbaum and Herbert Bos, "Modern Operating Systems", 4th Edition, Pearson, 2016.
3. Achyut Godbole and Atul Kahate, "Operating System", 3rd Edition, Tata McGraw Hill, 2017.
4. Pavel Y., Alex I., Mark E., David A., "Windows Internal Part I – System Architecture, Processes, Memory Management and More", 7th Edition, Microsoft Press, 2017.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	3	-	1	-	1	2	2	2	3	-	1
CO2	2	2	2	1	2	-	-	-	2	-	2	2	2	3	2
CO3	2	2	2	1	2	-	-	-	1	-	2	2	2	3	2
CO4	2	2	-	-	2	-	-	-	2	-	2	2	3	2	1
CO5	2	-	1	-	2	-	-	1	1	-	2	2	3	-	2
Avg	**2.0**	**2.0**	**1.7**	**1.0**	**2.2**	**-**	**1.0**	**1.0**	**1.4**	**2.0**	**2.0**	**2.0**	**2.6**	**2.7**	**1.6**

1 - Low, 2 - Medium, 3 - High

SEMESTER-IV
B. Tech – AI&DS

GE24401	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

The main objectives of this course are to:

- Introduce ecological concepts and biodiversity, emphasizing conservation and public awareness.
- Understand pollution types, impacts, and waste management practices, with industrial safety focus.
- Expose students to various renewable energy technologies and their practical applications.
- Study how people harm the environment and learn ways to prevent and manage disasters.
- Promote sustainability awareness and application of sustainable practices in industry and society.

UNIT I ENVIRONMENT AND BIODIVERSITY 6

Definition, scope, and importance of environment; need for public awareness. Ecosystem and energy flow with ecological succession. Types and values of biodiversity; India as a mega-diversity nation and biodiversity hotspots. Threats like habitat loss, poaching, man-wildlife conflict, Endangered and endemic species of India and conservation methods (in-situ and ex-situ), Role of information technology in species monitoring.

UNIT II ENVIRONMENTAL POLLUTION 6

Causes, Effects and Preventive measures of water, air, soil, noise, and radioactive pollution. Waste management covers municipal solid waste, hazardous waste, and E-Waste - gold extraction. Carbon Credit and Footprint concepts related to industry. Environmental protection acts. Case studies on OHASMS (Occupational health and safety management systems) focusing on IT-based safety monitoring and digital compliance systems.

UNIT III RENEWABLE SOURCES OF ENERGY 6

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy. Case studies on Hydrogen Fuel Production Modeling.

UNIT IV HUMAN POPULATION AND ENVIRONMENT IMPACT 6

Human population growth and its effect on resources. Importance of value education and human rights. Land degradation and deforestation. Man-made disasters: industrial accidents, nuclear incidents, and oil spills – prediction and management. Carbon sequestration and ozone depletion. Role of individual responsibility in environmental protection.

UNIT V SUSTAINABILITY MANAGEMENT AND PRACTICES 6

Suitability Management - Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability and protocols Sustainable Development Goals-targets. Suitability Practices - Zero waste and R concept, Circular economy, ISO 14000 Series, Environmental Impact Assessment. Sustainable habitat: green buildings, green materials, energy efficiency, sustainable transports. Sustainable energy. Case studies on smart electric vehicle (EV) charging networks.

TOTAL PERIODS: 30

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

- **CO1:** Explore ecosystem functions, biodiversity, and the importance of species protection.
- **CO2:** Identify types of pollution, their effects, and preventive measures including waste management.
- **CO3:** Describe renewable energy sources and their applications in sustainable energy production.
- **CO4:** Analyze human impact on the environment and propose disaster management strategies.
- **CO5:** Apply sustainability concepts and practices in environmental and industrial systems.

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers, 2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERENCES:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38. edition 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice Hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	1	1	-	-	1	3	2	-	1	-	1	-	-	-
CO2	1	2	2	-	1	2	3	2	-	1	-	2	-	-	-
CO3	1	1	2	-	2	3	3	2	-	1	-	2	-	-	-
CO4	1	-	-	-	-	3	3	3	-	1	-	2	-	-	-
CO5	-	1	2	-	1	3	3	3	-	1	-	2	-	-	-
Avg	**1.00**	**1.25**	**1.75**	**-**	**1.33**	**2.40**	**3.00**	**2.40**	**-**	**1.00**	**-**	**1.80**	**-**	**-**	**-**

1 - Low, 2 - Medium, 3 - High

SEMESTER-IV
B. Tech - AI&DS

AD24404	DATA EXPLORATION AND VISUALIZATION (T&P)	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

The main objectives of this course are to:

- Outline an overview of exploratory data analysis.
- Perform univariate data exploration and analysis.
- Apply bivariate data exploration and analysis.
- Use Data exploration and visualization techniques for multivariate and time series data.
- Implement data visualization using Matplotlib.

UNIT I EXPLORATORY DATA ANALYSIS 9

EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data –Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA - Data transformation techniques - merging database, reshaping and pivoting, Transformation techniques - Grouping Datasets - data aggregation – Pivot tables and cross-tabulations.

UNIT II UNIVARIATE ANALYSIS 9

Introduction to Single variable: Distributions and Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality - Smoothing Time Series.

UNIT III BIVARIATE ANALYSIS 9

Relationships between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches – Scatter plots and Resistant Lines – Transformations.

UNIT IV MULTIVARIATE AND TIME SERIES ANALYSIS 9

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.

UNIT V VISUALIZING USING MATPLOTLIB 9

Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three-dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.

TOTAL PERIODS: 45

PRACTICAL EXERCISES:

1. Install the data Analysis and Visualization tool: R / Python / Tableau Public / Power BI.
2. Perform exploratory data analysis (EDA) on with datasets like email data set. Export all your emails as a dataset, import them inside a pandas data frame, visualize them and get different insights from the data.
3. Explore various variable and row filters in R for cleaning data. Apply various plot features in R on sample data sets and visualize.
4. Perform Time Series Analysis and apply the various visualization techniques.
5. Perform Data Analysis and representation on a Map using various Map data sets with Mouse Rollover effect, user interaction, etc..
6. Build cartographic visualization for multiple datasets involving various countries of the world; states and districts in India etc.
7. Perform EDA on Wine Quality Data Set.
8. Use a case study on a data set and apply the various EDA and visualization techniques and present an analysis report.
9. Working with Numpy arrays, Pandas data frames, Basic plots using Matplotlib.

TOTAL PERIODS: 30
TOTAL PERIODS: 75

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

CO1: Understand the fundamentals of exploratory data analysis.
CO2: Perform univariate data exploration and analysis.
CO3: Apply bivariate data exploration and analysis.
CO4: Use Data exploration and visualization techniques for multivariate and time series data.
CO5: Implement the data visualization using Matplotlib.

TEXT BOOKS:

1. Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with Python”, Packt Publishing, 2020. (Unit 1)
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", Oreilly, 1st Edition, 2016. (Unit 2)
3. Catherine Marsh, Jane Elliott, “Exploring Data: An Introduction to Data Analysis for Social Scientists”, Wiley Publications, 2nd Edition, 2008. (Unit 3,4,5)

REFERENCES:

1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
2. Claus O. Wilke, “Fundamentals of Data Visualization”, O’reilly publications, 2019.
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, “Interactive Data Visualization: Foundations, Techniques, and Applications”, 2nd Edition, CRC press, 2015.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	3	-	-	-	-	2	3	3	3	2	2	2
CO2	2	2	2	1	1	-	-	-	3	2	3	1	3	1	3
CO3	2	1	2	1	1	-	-	-	3	2	1	2	2	2	1
CO4	2	2	2	1	-	-	-	-	1	2	1	3	1	3	2
CO5	3	1	1	2	1	-	-	-	3	2	1	2	2	2	3
Avg	**2.4**	**1.4**	**2**	**1.6**	**1**	-	-	-	**2.4**	**2.2**	**1.8**	**2.2**	**2**	**2**	**2.2**

1 - Low, 2 - Medium, 3 - High

SEMESTER-IV
B. Tech - AI&DS

AD24405	MACHINE LEARNING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

The main objectives of this course are to:

- Understand the data sets and apply suitable algorithms for selecting the appropriate features for analysis.
- Learn to implement supervised machine learning algorithms on standard datasets and evaluate the performance.
- Experiment the unsupervised machine learning algorithms on standard datasets and evaluate the performance.
- Understand how to build the neural network models for standard data sets.
- Compare the performance of different ML algorithms and select the suitable one based on the application.

LIST OF EXPERIMENTS:

1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
2. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
3. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
4. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file and compute the accuracy with a few test data sets.
5. Implement naïve Bayesian Classifier model to classify a set of documents and measure the accuracy, precision, and recall.
6. Write a program to construct a Bayesian network to diagnose CORONA infection using standard WHO Data Set.
7. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using the k-Means algorithm. Compare the results of these two algorithms.
8. Write a program to implement *k*-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
9. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select an appropriate data set for your experiment and draw graphs.
10. Build a Support Vector Machine (SVM) model using the given dataset to classify the target variable. Perform preprocessing, choose an appropriate kernel, train the model, and evaluate its performance using suitable metrics.

TOTAL PERIODS: 60

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

CO1: Apply suitable algorithms for selecting the appropriate features for analysis.

CO2: Design supervised machine learning algorithms on standard datasets and evaluate the performance.

CO3: Apply unsupervised machine learning algorithms on standard datasets and evaluate the performance.

CO4: Build the neural network learning models for standard data sets.

CO5: Assess and compare the performance of different ML algorithms and select the suitable one based on the application.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	-	-	-	-	1	2	3	3	3	2	1
CO2	2	1	1	3	2	-	-	-	3	2	3	2	3	1	1
CO3	2	2	1	1	2	-	-	-	1	1	1	1	2	3	3
CO4	2	2	3	3	2	-	-	-	1	2	1	1	1	2	2
CO5	2	2	3	1	2	-	-	-	3	1	1	1	2	1	2
Avg	**2**	**1.8**	**2**	**1.8**	**2**	**-**	**-**	**-**	**1.8**	**1.6**	**1.8**	**1.6**	**2.2**	**1.8**	**1.8**

1 - Low, 2 - Medium, 3 - High

SEMESTER-IV
B. Tech - AI&DS

AD24406	RELATIONAL DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

The main objectives of this course are to:

- Understand the database development life cycle.
- Learn database design using conceptual modeling, Normalization.
- Implement database using Data definition, Querying using SQL manipulation and SQL programming.
- Implement database applications using IDE/RAD tools.
- Learn querying Object-relational databases.

LIST OF EXPERIMENTS:

1. Database Development Life cycle:
   - Problem definition and Requirement analysis
   - Scope and Constraints
2. Database design using Conceptual modeling (ER-EER) – top-down approach:
   - Mapping conceptual to relational database and validate using Normalization
3. Implement the database using SQL Data definition with constraints, Views
4. Query the database using SQL Manipulation
5. Querying/Managing the database using SQL Programming:
   - Stored Procedures/Functions
   - Constraints and security using Triggers
6. Database design using Normalization – bottom-up approach
7. Develop database applications using IDE/RAD tools (Eg., NetBeans, Visual Studio)
8. Database design using EER-to-ODB mapping / UML class diagrams
9. Object features of SQL-UDTs and sub-types, Tables using UDTs, Inheritance, Method definition
10. Querying the Object-relational database using Object Query language

TOTAL PERIODS: 60

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

CO1: Understand the database development life cycle.
CO2: Design relational database using conceptual-to-relational mapping, Normalization.
CO3: Apply SQL for creation, manipulation and retrieval of data.
CO4: Develop a database application for real-time problems.
CO5: Design and query object-relational databases.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	3	2	-	-	-	1	1	1	3	2	2	1
CO2	2	2	1	3	2	-	-	-	3	2	3	1	1	1	2
CO3	2	1	3	1	2	-	-	-	3	3	1	1	2	1	1
CO4	2	2	3	1	2	-	-	-	2	3	2	1	2	1	2
CO5	3	3	1	3	2	-	-	-	1	3	2	3	3	3	2
Avg	**2.4**	**1.8**	**2.2**	**2.2**	**2**	**-**	**-**	**-**	**2**	**2.4**	**1.8**	**1.8**	**2**	**1.6**	**1.6**

1 - Low, 2 - Medium, 3 – High

SEMESTER-IV
B. Tech - AI&DS

AD24S01	TECHNICAL SKILL PRACTICES	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

The main objectives of this course are to:

- Introduce the fundamental concepts of Artificial Intelligence and its applications.
- Develop skills in data cleaning, feature engineering, and exploratory data analysis using Python libraries like Pandas.
- Provide hands-on experience in text preprocessing and sentiment analysis using NLP tools such as NLTK and spaCy.
- Develop problem-solving abilities using current tools and technologies.
- Bridge the gap between theoretical knowledge and real-world application.

LIST OF EXPERIMENTS:

Artificial Intelligence

1. Data Cleaning & Feature Engineering with Pandas
2. Exploratory Data Analysis (EDA) on a Real-world Dataset
3. Text Preprocessing & Sentiment Analysis Using NLTK or spaCy
4. AI for Recommendation Systems: Movie Recommendations or Heart Disease Prediction

Web Technologies

5. HTML, CSS, JavaScript basics
6. Simple form validation and UI development
7. Host a static/dynamic webpage

Emerging Technologies

8. Version control using Git and GitHub
9. Virtualization concepts using oracle virtual box
10. Mobile App Development (Android Studio basics)

TOTAL PERIODS: 30

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

CO1: Perform data cleaning and feature engineering on real-world datasets to prepare data for analysis.
CO2: Perform exploratory data analysis using AI tools and libraries such as Pandas, NLTK, and spaCy
CO3: Understand and implement basic data processing and analysis using AI libraries and tools.
CO4: Design and develop simple web-based applications with form validation.
CO5: Gain exposure to emerging tools and technologies.

TEXT BOOKS:

1. Stuart Russell & Peter Norvig, Artificial Intelligence: A Modern Approach, 4th Edition, Pearson, 2020.
2. Harvey M. Deitel, Paul J. Deitel, Tem R. Nieto, "Internet & World Wide Web: How to Program", 2002.

REFERENCES:

1. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 3rd Edition, O'Reilly, 2022.

ONLINE COURSES / RESOURCES:

1. https://www.kaggle.com/learn
2. https://www.nltk.org/
3. https://nptel.ac.in/Courses/
4. https://www.virtualbox.org/
5. https://developer.android.com/

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	-	-	-	2	1	1	2	3	1	2
CO2	3	3	2	3	3	-	-	-	2	1	1	2	3	3	2
CO3	3	2	3	2	3	-	-	-	2	1	1	2	3	1	3
CO4	2	1	3	1	2	-	-	-	1	1	1	1	1	3	1
CO5	2	2	2	3	3	-	-	-	3	2	1	2	3	3	3
Avg	**2.6**	**2.2**	**2.4**	**2.2**	**2.8**	**-**	**-**	**-**	**2**	**1.2**	**1**	**1.8**	**2.6**	**2.2**	**2.2**

1 - Low, 2 - Medium, 3 - High