DEPARTMENT OF MATHEMATICS
ANNA UNIVERSITY, CHENNAI – 600 025

VISION

We, at the Department of Mathematics, Anna University, Chennai, shall strive constantly to

- Achieve excellence in the field of Computer Science and Information Technology with strong Mathematical foundation by providing high quality teaching, research and training in Computer Science and all related Engineering fields to our students where they can significantly contribute to our society in all aspects
- Contribute to the quality Personnel Development in Computer Science / Information Technology through our effective Masters Programmes

MISSION

- To provide determined computer science background to the students to hone their skills with best-in-class emerging technologies across the globe.
- To imbibe a spirit of innovations in computers, information technologies and mathematical sciences.
- To popularize and to project the proper perspective of Computer Science with essential Mathematical modelling by undertaking sponsored research and provide consultancy services in educational and industrial relevant areas.

PROGRESS THROUGH KNOWLEDGE

ANNA UNIVERSITY, CHENNAI

UNIVERSITY DEPARTMENTS

M.Sc. INFORMATION TECHNOLOGY (5 YEARS INTEGRATED)

REGULATIONS 2023

CHOICE BASED CREDIT SYSTEM

1. **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**
    1. To make the students have sufficient knowledge and understanding in the field of computer science
    2. To ensure the students have sufficient understanding in the fundamental and core concepts of computer science and information technology, which serve as the basics of computer science
    3. To ensure the students are aware of the cutting edge technologies currently being used in industries and provide them a platform to learn the same
    4. To ensure the students work on multiple academic projects pertaining to different domains, to have strong knowledge in the respective domain
    5. To ensure this academic programme provides them learning to take leadership positions in the industry and also initiate businesses offering innovative solutions

2. **PROGRAMME OUTCOMES (POs):**

After going through the five years of study, our information Technology Post-Graduates will exhibit:

i. **PO1:** An ability to independently carry out research/investigation and development work to solve practical problems
ii. **PO2:** An ability to write and present a substantial technical report/document
iii. **PO3:** Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor programme
iv. **PO4:** An ability to work in a multi-disciplinary team
v. **PO5:** An ability to enhance life-long learning and continuous professional development

Attested

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3. **PEO / PO MAPPING:**

PROGRAM EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
1.	✓		✓		
2.	✓	✓	✓		
3.	✓	✓	✓		✓
4.	✓	✓	✓	✓	
5.	✓	✓	✓	✓	✓

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4. **MAPPING OF COURSE OUTCOME AND PROGRAMME OUTCOME**

		Course Name	PO1	PO2	PO3	PO4	PO5
YEAR 1	Semester 1	Communicative English – I	3	1.6	0.4	-	1.4
		Matrices and Calculus	3	2	3	-	-
		Applied Physics	3	1	1	-	0.2
		Chemistry of Materials	3	1	0.6	-	0.2
		Digital Systems	3	0.4	0.4	-	1.6
		Problem Solving and C Programming	3	2.2	3	-	1.2
		Computer Aided Engineering Drawing Laboratory	3	1	-	-	1
	Semester 2	Communicative English – II	3	1.6	0.4	-	1.4
		Basic Electrical and Electronics Engineering	2	1	0.6	-	-
		Ordinary Differential Equations and Transform Techniques	3	2	3	-	-
		Python Programming	3	2.2	3	-	1.2
		Data Structures	3	0.6	2	0.4	0.8
		Computer Architecture	2.8	-	0.8	-	0.6
		Electrical and Electronics Engineering Laboratory	2	1	0.6	-	1
		Data Structures Laboratory	3	2	2	0.4	2
YEAR 2	Semester 3	Partial Differential Equations and Complex Functions	3	2	3	-	-
		Object-Oriented Programming using C++	3	2.2	3	-	1.2
		Database Management Systems	2.8	1	1.2	1	2
		Operating Systems	2.6	-	1.8	-	0.8
		Microprocessor and Applications	2.4	0.4	0.4	-	0.2
		Principles of Analog and Digital Communication Systems	3	0.6	1.6	-	0.4
		Database Management Systems Laboratory	2.8	1	1.2	1	2
	Semester 4	Discrete Structures	3	2	3	-	-
		Linear Algebra	3	2	3	-	-
		Software Engineering	3	1.4	2.2	0.4	1
		Java Programming	3	2.2	3	1	1.2
		Computer Networks	3	2.4	2.2	-	0.4
		Environmental Sciences and Sustainability	2	-	1.2	0.2	1.4
		Java Programming Laboratory	3	2	3	1	2
	Semester 5	Probability and Statistics	3	2	3	-	-
		Object Oriented Analysis and Design	3	1.6	1.6	-	0.6
		Data Warehousing and Mining	3	1.6	2.4	0.2	0.8

		Web Technology	3	2	3	0.4	0.4
		Theory of Computation	3	2	3	-	-
		Professional Elective – I					
		Web Technology Laboratory	3	2	3	1	2
	Semester 6	Operations Research	3	2	3	-	-
		Software Project Management	3	0.4	2	0.6	0.8
		Machine Learning	3	1.2	1.8	-	0.8
		Design and Analysis of Algorithms	3	3	3	-	2
		Cloud Computing	3	1.4	1.6	-	0.8
		Professional Elective – II					
		Mini Project					
YEAR 4	Semester 7	Industrial Project					
	Semester 8	Advanced Statistical Methods for Computing	3	2	3	-	-
		Advanced Networks	3	2.4	2	-	0.8
		Principles of Management and Behavioural Sciences	2.2	-	2	0.4	0.2
		Artificial Intelligence	3	1.8	2	-	0.4
		Cyber Security	3	1.8	1.8	-	0.2
		Professional Elective – III					
		Professional Elective – IV					
		Statistical Programming Laboratory using R and Python	3	1.2	1.8	-	2
YEAR 5	Semester 9	Numerical Methods	3	2	3	-	-
		Internet of Things	3	1.8	2	-	0.4
		Advanced Database Technology and Design	3	2	1.4	-	0.2

		Multimedia Technologies	3	1.2	1.6	-	-
		Professional Elective – V					
		Professional Elective – VI					
		Internet of Things Laboratory	3	1.8	2	1	1
		Creative and Innovative Project					
	Semester 10	Project Work					

ANNA UNIVERSITY, CHENNAI

UNIVERSITY DEPARTMENTS

M.Sc. INFORMATION TECHNOLOGY (FIVE YEARS INTEGRATED)

REGULATION 2023

CHOICE-BASED CREDIT SYSTEM

CURRICULA AND SYLLABI

SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	HS3152	Communicative English – I	FC	3	0	2	5	4
2.	MA3162	Matrices and Calculus	FC	4	0	0	4	4
3.	PH3152	Applied Physics	FC	3	0	0	3	3
4.	CY3152	Chemistry of Materials	FC	3	0	0	3	3
5.	XC3151	Digital Systems	PCC	3	0	2	5	4
6.	XC3152	Problem Solving and C Programming	PCC	2	0	4	6	4
PRACTICAL								
7.	GE3163	Computer Aided Engineering Drawing Laboratory	FC	0	0	4	4	2
			TOTAL	**18**	**0**	**12**	**30**	**24**

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	HS3252	Communicative English – II	FC	3	0	2	5	4
2.	EE3151	Basic Electrical and Electronics Engineering	FC	3	0	2	5	4
3.	MA3253	Ordinary Differential Equations and Transform Techniques	FC	4	0	0	4	4
4.	XT3251	Python Programming	PCC	2	0	4	6	4
5.	XC3251	Data Structures	PCC	3	0	0	3	3
6.	XC3252	Computer Architecture	PCC	3	0	0	3	3
PRACTICAL								
7.	XT3261	Data Structures Laboratory	PCC	0	0	4	4	2
			TOTAL	**18**	**0**	**12**	**30**	**24**

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SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA3351	Partial Differential Equations and Complex Functions	FC	4	0	0	4	4
2.	XT3351	Object-Oriented Programming using C++	PCC	3	0	2	5	4
3.	XT3352	Database Management Systems	PCC	3	0	0	3	3
4.	XC3351	Operating Systems	PCC	3	0	2	5	4
5.	XC3352	Microprocessor and Applications	PCC	3	0	2	5	4
6.	XT3353	Principles of Analog and Digital Communication Systems	PCC	3	0	0	3	3
PRACTICAL								
7.	XT3361	Database Management Systems Laboratory	PCC	0	0	4	4	2
			TOTAL	**19**	**0**	**10**	**29**	**24**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA3451	Discrete Structures	FC	4	0	0	4	4
2.	XT3401	Linear Algebra	PCC	3	0	0	3	3
3.	XC3451	Software Engineering	PCC	3	0	2	5	4
4.	XC3452	Java Programming	PCC	3	0	0	3	3
5.	XT3451	Computer Networks	PCC	3	0	2	5	4
6.	CY3251	Environmental Science and Sustainability	PCC	2	0	0	2	2
PRACTICAL								
7.	XC3461	Java Programming Laboratory	PCC	0	0	4	4	2
			TOTAL	**18**	**0**	**8**	**26**	**22**

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SEMESTER V

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA3551	Probability and Statistics	FC	4	0	0	4	4
2.	XT3501	Object Oriented Analysis and Design	PCC	3	0	2	5	4
3.	XT3551	Data Warehousing and Mining	PCC	3	0	2	5	4
4.	XT3552	Web Technology	PCC	3	0	0	3	3
5.	XC3551	Theory of Computation	PCC	4	0	0	4	4
6.		Professional Elective – I	PEC	3	0	0	3	3
PRACTICAL								
7.	XT3561	Web Technology Laboratory	PCC	0	0	4	4	2
			TOTAL	**20**	**0**	**8**	**28**	**24**

SEMESTER VI

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA3651	Operations Research	FC	4	0	0	4	4
2.	XT3601	Software Project Management	PCC	3	0	0	3	3
3.	XT3651	Machine Learning	PCC	3	0	2	5	4
4.	XC3651	Design and Analysis of Algorithms	PCC	4	0	0	4	4
5.	XC3652	Cloud Computing	PCC	3	0	0	3	3
6.		Professional Elective – II	PEC	3	0	0	3	3
PRACTICAL								
7.	XT3611	Mini Project	EEC	0	0	4	4	2
			TOTAL	**20**	**0**	**6**	**26**	**23**

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SEMESTER VII

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICAL								
1.	XT3711	Industrial Project	EEC	0	0	32	32	16
			TOTAL	**0**	**0**	**32**	**32**	**16**

SEMESTER VIII

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA3851	Advanced Statistical Methods for Computing	FC	4	0	0	4	4
2.	XT3801	Advanced Networks	PCC	3	0	0	3	3
3.	XT3851	Principles of Management and Behavioural Sciences	PCC	3	0	0	3	3
4.	XC3851	Artificial Intelligence	PCC	3	0	0	3	3
5.	XT3852	Cyber Security	PCC	3	0	0	3	3
6.		Professional Elective – III	PEC	3	0	0	3	3
7.		Professional Elective – IV	PEC	3	0	0	3	3
PRACTICAL								
8.	XC3861	Statistical Programming Laboratory using R and Python	PCC	0	0	4	4	2
			TOTAL	**22**	**0**	**4**	**26**	**24**

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SEMESTER IX

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA3951	Numerical Methods	FC	4	0	0	4	4
2.	XT3951	Internet of Things	PCC	3	0	0	3	3
3.	XT3901	Advanced Database Technology and Design	PCC	3	0	2	5	4
4.	XC3951	Multimedia Technologies	PCC	3	0	0	3	3
5.		Professional Elective – V	PEC	3	0	0	3	3
6.		Professional Elective – VI	PEC	3	0	0	3	3
PRACTICAL								
7.	XT3961	Internet of Things Laboratory	PCC	0	0	4	4	2
8.	XT3911	Creative and Innovative Project	EEC	0	0	4	4	2
			TOTAL	**19**	**0**	**10**	**29**	**24**

SEMESTER X

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICAL								
1.	XT3011	Project Work	EEC	0	0	32	32	16
			TOTAL	**0**	**0**	**32**	**32**	**16**

Total No. of credits: 221

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FOUNDATION CORE COURSES (FC)

S.NO	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	HS3152	Communicative English - I	FC	5	3	0	2	4
2.	MA3162	Matrices and Calculus	FC	4	4	0	0	4
3.	PH3152	Applied Physics	FC	3	3	0	0	3
4.	CY3152	Chemistry of Materials	FC	3	3	0	0	3
5.	GE3163	Computer Aided Engineering Drawing Laboratory	FC	4	0	0	4	2
6.	HS3252	Communicative English - II	FC	5	3	0	2	4
7.	EE3151	Basic Electrical and Electronics Engineering	FC	5	3	0	2	4
8.	MA3253	Ordinary Differential Equations and Transform Techniques	FC	4	4	0	0	4
9.	MA3351	Partial Differential Equations and Complex Functions	FC	4	4	0	0	4
10.	MA3451	Discrete Structures	FC	4	4	0	0	4
11.	MA3551	Probability and Statistics	FC	4	4	0	0	4
12.	MA3651	Operations Research	FC	4	4	0	0	4
13.	MA3851	Advanced Statistical Methods for Computing	FC	4	4	0	0	4
14.	MA3951	Numerical Methods	FC	4	4	0	0	4
			TOTAL	**61**	**47**	**0**	**12**	**53**

PROFESSIONAL CORE COURSES (PCC)

S.NO	COURSE CODE	COURSE TITLE	CATEG ORY	CONTACT PERIODS	L	T	P	C
1.	XC3151	Digital Systems	PCC	5	3	0	2	4
2.	XC3152	Problem Solving and C Programming	PCC	6	2	0	4	4
3.	XT3251	Python Programming	PCC	6	2	0	4	4
4.	XC3251	Data Structures	PCC	3	3	0	0	3
5.	XC3252	Computer Architecture	PCC	3	3	0	0	3
6.	XT3261	Data Structures Laboratory	PCC	4	0	0	4	2
7.	XT3351	Object Oriented Programming using C++	PCC	5	3	0	2	4
8.	XT3352	Database Management Systems	PCC	3	3	0	0	3
9.	XC3351	Operating Systems	PCC	5	3	0	2	4
10.	XC3352	Microprocessor and Applications	PCC	5	3	0	2	4
11.	XT3353	Principles of Analog and Digital Communication Systems	PCC	3	3	0	0	3
12.	XT3361	Database Management Systems Laboratory	PCC	4	0	0	4	2

13.	XT3401	Linear Algebra	PCC	3	3	0	0	3
14.	XC3451	Software Engineering	PCC	5	3	0	2	4
15.	XC3452	Java Programming	PCC	3	3	0	0	3
16.	XT3451	Computer Networks	PCC	5	3	0	2	4
17.	CY3251	Environmental Sciences and Sustainability	PCC	2	2	0	0	2
18.	XC3461	Java Programming Laboratory	PCC	4	0	0	4	2
19.	XT3501	Object Oriented Analysis and Design	PCC	5	3	0	2	4
20.	XT3551	Data Warehousing and Mining	PCC	5	3	0	2	4
21.	XT3552	Web Technology	PCC	3	3	0	0	3
22.	XC3551	Theory of Computation	PCC	4	4	0	0	4
23.	XT3561	Web Technology Laboratory	PCC	4	0	0	4	2
24.	XT3601	Software Project Management	PCC	3	3	0	0	3
25.	XT3651	Machine Learning	PCC	5	3	0	2	4
26.	XC3651	Design and Analysis of Algorithms	PCC	4	4	0	0	4
27.	XC3652	Cloud Computing	PCC	3	3	0	0	3
28.	XT3801x	Advanced Networks	PCC	3	3	0	0	3
29.	XT3851	Principles of Management and Behavioural Sciences	PCC	3	3	0	0	3
30.	XC3851	Artificial Intelligence	PCC	3	3	0	0	3
31.	XT3852	Cyber Security	PCC	3	3	0	0	3
32.	XC3861	Statistical Programming Laboratory using R and Python	PCC	4	0	0	4	2
33.	XT3951	Internet of Things	PCC	3	3	0	0	3
34.	XT3901	Advanced Database Technology and Design	PCC	5	3	0	2	4
35.	XC3951	Multimedia Technologies	PCC	3	3	0	0	3
36.	XT3961	Internet of Things Laboratory	PCC	4	0	0	4	2
			Total	**141**	**89**	**0**	**52**	**115**

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EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	XT3611	Mini Project	EEC	4	0	0	4	2
2.	XT3711	Industrial Project	EEC	32	0	0	32	16
3.	XT3911	Creative and Innovative Project	EEC	4	0	0	4	2
4.	XT3011	Project Work	EEC	32	0	0	32	16
			Total	**72**	**0**	**0**	**72**	**36**

PROFESSIONAL ELECTIVE COURSES (PEC)

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	XC3071	Adhoc and Sensor Networks	PEC	3	3	0	0	3
2.	XT3071	Big Data Analytics	PEC	3	3	0	0	3
3.	XC3072	Bio-Inspired Computing	PEC	3	3	0	0	3
4.	XT3072	Block Chain Technologies	PEC	3	3	0	0	3
5.	XC3073	Computational Finance	PEC	3	3	0	0	3
6.	XT3073	Computer Graphics	PEC	3	3	0	0	3
7.	XT3074	Database Administration	PEC	3	3	0	0	3
8.	XT3075	Database Tuning	PEC	3	3	0	0	3
9.	XT3076	Data Science and Analytics	PEC	3	3	0	0	3
10.	XC3074	Deep Learning	PEC	3	3	0	0	3
11.	XC3075	Digital Image Processing	PEC	3	3	0	0	3
12.	XC3076	E - Learning	PEC	3	3	0	0	3
13.	XT3077	Enterprise Application Development	PEC	3	3	0	0	3
14.	XC3077	Game Design and Development	PEC	3	3	0	0	3
15.	XT3078	Geographical Information System	PEC	3	3	0	0	3
16.	XT3079	Information Coding Techniques	PEC	3	3	0	0	3
17.	XT3080	Information Retrieval Techniques	PEC	3	3	0	0	3
18.	XT3081	Information Security	PEC	3	3	0	0	3
19.	XT3082	Marketing Analytics	PEC	3	3	0	0	3
20.	XC3078	Mobile Computing	PEC	3	3	0	0	3
21.	XC3079	Modelling and Simulation	PEC	3	3	0	0	3
22.	XT3083	Multimedia Analytics	PEC	3	3	0	0	3
23.	XC3080	Natural Language Processing	PEC	3	3	0	0	3
24.	XC3081	Network Science	PEC	3	3	0	0	3
25.	XT3084	Open Source Programming	PEC	3	3	0	0	3
26.	XT3085	Pattern Recognition	PEC	3	3	0	0	3
27.	XT3086	Personal Software Processes	PEC	3	3	0	0	3
28.	XC3082	Quantum Computing	PEC	3	3	0	0	3
29.	XT3087	Semantic Web	PEC	3	3	0	0	3

30.	XC3083	Social Psychology	PEC	3	3	0	0	3
31.	XT3088	Software Testing and Quality Assurance	PEC	3	3	0	0	3
32.	XT3089	Total Quality Management	PEC	3	3	0	0	3
33.	XC3084	Unix and Network Programming	PEC	3	3	0	0	3
34.	XT3090	User Interface Design	PEC	3	3	0	0	3
35.	XT3091	Web Analytics	PEC	3	3	0	0	3

SUMMARY

	M.Sc. INFORMATION TECHNOLOGY (FIVE YEARS INTEGRATED)											
	Subject Area	**Credits per Semester**										**Credits Total**
		I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	
1.	FC	16	12	4	4	4	4	-	4	4	-	52
2.	PCC	8	12	20	18	17	14	-	14	12	-	115
3.	PEC	-	-	-	-	3	3	-	6	6	-	18
4.	EEC	-	-	-	-	-	2	16	-	2	16	36
	Total Credit	**24**	**24**	**24**	**22**	**24**	**23**	**16**	**24**	**24**	**16**	**221**

PROGRESS THROUGH KNOWLEDGE

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HS3152	COMMUNICATIVE ENGLISH – I	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To build lexical competency and accuracy that will help learners to use language effectively
- To learn various reading strategies that will enable learners to comprehend the different modes of reading materials of varied levels of complexity
- To comprehend the linguistic aspects of various rhetorical structures and functions of Technical English and use them effectively in writing
- To improve the communicative competence of learners
- To help learners use language effectively in academic /work contexts
- To use language efficiently in expressing their opinions via various media
- To build lexical competency and accuracy that will help learners to use language effectively

UNIT I BASICS OF COMMUNICATION 9+6

Listening – Listening to a Telephone conversation & Writing message, gap filling; **Reading** – Telephone message, bio-note; **Writing** – Message, Self-introduction / Personal profile; **Grammar** – Simple present tense, Present continuous tense, Asking questions (wh-questions); **Vocabulary** – One word substitution, Synonyms, Abbreviations & Acronyms

LAB ACTIVITY: Introducing oneself – Self introduction; Telephone conversation, Relaying telephone message – Role play

UNIT II NARRATION 9+6

Listening – Listening to a Travel podcast / Watching a travel documentary; **Reading** – Reading an excerpt from a travelogue, Newspaper Report; **Writing** – Narrative writing – event, personal experience; **Grammar** – Subject – verb, Simple past, Past continuous Tenses; **Vocabulary** – Antonyms, Word formation (Prefix & Suffix)

LAB ACTIVITY: Narrating one's personal experience in front of a group – formal and informal context – first day in college / vacation / first achievement / failure etc.,

UNIT III DESCRIPTION 9+6

Listening – Listening to a conversation, Listening to an advertisement; **Reading** – Reading a tourist brochure & planning an itinerary, Reading a descriptive article / excerpts from literature; **Writing** – Writing definitions, Paragraph writing (Descriptive); **Grammar** – Future tenses, Perfect tenses, Preposition; **Vocabulary** – Adjectives, Adverbs

LAB ACTIVITY: Making conversation – formal & informal – Turn taking & Turn giving – Small talk

UNIT IV CLASSIFICATION 9+6

Listening – Listening to announcements & filling a table; **Reading** – Reading an article, Reading social media posts and classifying (channel conversion – text to table); **Writing** – Note making, Note taking & Summarising, Writing a classification pragraph; **Grammar** – Discourse markers – Connectives, Transition words; **Vocabulary** – Conjunctions, Contextual vocabulary

LAB ACTIVITY: Making short presentations – Different clubs and their activities in the college / Campus Facilities – About your native place and its major attractions

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UNIT V ARTICULATION / EXPRESSION / DISCUSSION 9+6

Listening – Listening to a debate, Discussion; **Reading** – Reading formal letters, Letters to Editor, Opinion articles / Blogs; **Writing** – Letter writing, Email writing (To Editor, Complaint letter, Enquiry letter); **Grammar** – Question tags, Indirect questions, Yes / No questions; **Vocabulary** – Compound words, Phrasal verbs

LAB ACTIVITY: Taking part in a group discussion on general topics – Debating on topics of interest and relevance

TOTAL: (45+30) = 75 PERIODS

OUTCOMES:

CO 1 : Use grammar and vocabulary suitable for general context.
CO 2 : Comprehend the nuances of spoken and written communication.
CO 3 : Communicate effectively in formal and informal contexts.
CO 4 : Read different types of texts and comprehend their denotative and connotative meanings.
CO 5 : Write different types of texts using appropriate formats.

REFERENCES:

1. "English for Science & Technology I" by Cambridge University Press, 2023.
2. "English for Engineers and Technologists" Volume I by Orient Blackswan, 2022.
3. "Interchange" by Jack C. Richards, Fifth Edition, Cambridge University Press, 2017.
4. "English for Academic Correspondence and Socializing" by Adrian Wallwork, Springer, 2011.
5. "The Study Skills Handbook" by Stella Cortrell, Red Globe Press, 2019.
6. www.uefap.com

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	-	-	-	2
CO 2 :	3	3	-	-	-
CO 3 :	3	2	-	-	-
CO 4 :	3	-	2	-	3
CO 5 :	3	3	-	-	2
AVG:	3	1.6	0.4	-	1.4

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MA3162	MATRICES AND CALCULUS	L	T	P	C
		4	0	0	4

OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications
- To familiarize the student with functions of several variables. This is needed in many branches of engineering
- To solving integrals by using Beta and Gamma functions and their applications
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications
- To acquaint the students with the concepts of vector calculus which naturally arises in many engineering problems

UNIT I MATRICES **12**

Eigen values and Eigen vectors – Properties of Eigen values - Linear dependence and independence of Eigen vectors - Cayley-Hamilton theorem (excluding proof), Reduction to Diagonal form – Similarity transformation, Quadratic form – Reduction of Quadratic form to canonical form, Nature of a Quadratic form

UNIT II DIFFERENTIAL CALCULUS **12**

Functions of several variables, limit, continuity, partial derivatives, differentiability, total differential, Errors and approximations - Taylor's formula for two variables - extreme values and saddle points, constrained maxima and minima: Lagrange multipliers with single constraint

UNIT III INTEGRAL CALCULUS **12**

Improper integrals of the first and second kind and their convergence – Differentiation under integrals - Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions – Properties – Evaluation of integrals using Beta and Gamma functions – Error functions

UNIT IV MULTIPLE INTEGRALS **12**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of variables in double and triple integrals

UNIT V VECTOR CALCULUS **12**

Gradient of a scalar field, directional derivative, divergence of a vector field, curl of a vector field. Line integrals of scalar and vector fields – Surface integrals of scalar and vector fields - Verification of Green's, Stoke's and Gauss divergence theorems (without proof)

TOTAL: 60 PERIODS

OUTCOMES:

CO 1 : The students will be able to Use the matrix algebra methods for solving practical problems.

CO 2 : The students will be able to use differential calculus ideas on several variable functions.

CO 3 : The students will be able to apply different methods of integration in solving practical problems by using Beta and gamma functions.

CO 4 : The students will be able to apply multiple integral ideas in solving areas, volumes and other practical problems.

CO 5 : The students will be able to calculate grad, div and curl and use Gauss, Stokes and Greens theorems to simplify calculations of integrals.

REFERENCES:

1. Joel Hass, Christopher Heil, Maurice D.Weir "'Thomas' Calculus", Pearson Education., New Delhi, 2018.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2017.
3. James Stewart, "Calculus with Early Transcendental Functions", Cengage Learning, 6th Edition, New Delhi,2013.
4. Erwin Kreyszig "Advanced Engineering Mathematics", Wiley India Pvt Ltd., New Delhi, 2015.
5. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education2nd Edition, 5th Reprint, Delhi, 2009.
6. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics",Narosa Publications, 5 th Edition, New Delhi, 2017.
7. Narayanan S. and Manicavachagom Pillai T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
8. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7 th Edition, New Delhi , 2012.
9. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	3	-	-
CO 2 :	3	2	3	-	-
CO 3 :	3	2	3	-	-
CO 4 :	3	2	3	-	-
CO 5 :	3	2	3	-	-
AVG:	**3**	**2**	**3**	**-**	**-**

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PH3152 **APPLIED PHYSICS** **L T P C**

3 0 0 3

OBJECTIVES:

- To introduce and teach the concepts of properties of matter and thermal physics
- To make the students to understand the aspects of acoustics and ultrasonics
- To equip the students on the aspects of quantum principles
- The basic aspects of semiconductor physics and devices are introduced
- The students will be introduced the concepts of photonics and fiber-optics principles

UNIT I PROPERTIES OF MATTER AND THERMAL PHYSICS 9

Elasticity- Hooke's law - relationship between three types of modulus of elasticity (qualitative) – stress -strain diagram – bending of beams - bending moment – depression of a cantilever – Young's modulus by non-uniform bending- I-shaped girders. Thermal Physics - modes of heat transfer- thermal conductivity – Lee's disc method - conduction through compound media - thermal expansion

UNIT II ACOUSTICS AND ULTRASONICS 9

Characteristics of sound - classification of sound- intensity of sound - decibel – Acoustics - Sabine'sformula- derivation using growth and decay method – absorption coefficient and its determination – factors affecting acoustics of buildings and their remedies. Ultrasonics — production by magnetostriction and piezoelectric methods - acoustic grating – applications of ultrasonic waves.

UNIT III QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation) – Compton effect theory and experimental verification – matter waves –Schrondinger wave equation in one dimension: time independent and time dependent equations – particle in a infinitely deep square well potential – finitewell potential – tunnelling through barrier – applications.

UNIT IV SEMICONDUCTOR PHYSICS 9

Energy bands in solids – intrinsic and extrinsic semiconductors - distribution of quantum states in the energy band (qualitative) – Fermi-Dirac statistics – carrier concentration in an intrinsic semiconductor — carrier concentration in n-type semiconductor — variation with temperature and impurity

UNIT V PHOTONICS AND FIBREOPTICS 9

Spontaneous and stimulated emission - population inversion, CO_2 laser, semiconductor lasers - homojunction and heterojunction lasers - industrial applications. Principle and propagation of light in optical fibres – numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – attenuation, dispersion, bending

TOTAL: 45 PERIODS

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OUTCOMES:

CO 1 : Understand the concepts of properties of matter and thermal physics.
CO 2 : Apply the concepts of acoustics and ultrasonic.
CO 3 : Appreciate the importance of quantum physics.
CO 4 : Understand the importance of semiconductor physics.
CO 5 : Make use of photonic and fiber-optic devices.

REFERENCES:

1. G. Keiser, “Optical fiber communications”, McGraw Hill Co., New York, 1995.
2. Gaur R.K. and Gupta S.L., “Engineering Physics”, Dhanpat Rai Publications, Mumbai, 2013.
3. N. Garcia and A. Damask, “Physics for Computer Science Students”, Springer, New York, 2012.
4. Palanisamy, P. K. “Engineering Physics”, SCITECH Publications, Chennai, 2012.
5. Paul Tipler and Gene Mosca, Physics for Scientists and Engineers, W.H. Freeman, New York,2007.
6. Pillai, S. O., “Solid State Physics”, New Age International Publishers, New Delhi, 2009.
7. Raymond Serway, John Jewett, “Physics for Scientists and Engineers”, Bostan, Brooks/Cole, 2014.

CO – PO Mapping:

COURSE OUTCOMES	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	1	1	-	-
CO 2 :	3	1	1	-	-
CO 3 :	3	1	1	-	-
CO 4 :	3	1	1	-	-
CO 5 :	3	1	1	-	1
AVG:	**3**	**1**	**1**	**-**	**0.2**

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CY3152	CHEMISTRY OF MATERIALS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To inculcate sound understanding about batteries and their applications
- To introduce the basic concepts of polymer and its application in the field of electronics
- To impart knowledge on composites and its electrical and electronics applications
- To familiarize the student on dielectric, insulators, semi-conductors, magnetic and nano materials
- To teach about the fabrications of integrated circuits and printed circuit boards

UNIT I BATTERIES 9

Primary and Secondary – Requirements – Commercial batteries – Dry Cell, Lead acid, metal hydride, Li-ion. Fuels cells – Classification - Hydrogen - oxygen fuel cell. UPS - Components and types of UPS. Batteries used in UPS

UNIT II POLYMER IN ELECTRONICS 9

Basic concepts of polymers - degree of polymerization, functionality of monomer, classification of polymer. Piezo and pyro electric polymers – Polyvinyl fluoride – Polyvinylidernefluoride – preparation, properties and applications. Conducting polymers – Classifications – Polyparaphenylene and polypyrrole. Potting – potting compounds – potting problems - encapsulation. Photoresists – Positive and negative

UNIT III COMPOSITES 9

Introduction to composites – Characteristics, Matrix materials – Types – Polymer matrix, metal matrix, ceramic matrix, carbon and graphite matrix material. Reinforcement – fiber, particulates, flakes and whiskers, Classification of composites – Particulates, fibrous and laminated composites – Hybrid composites – Application of composites in electrical and electronic component

UNIT IV SPECIALITY MATERIALS 9

Dielectrics – Characteristics, insulating materials – Characteristics. Ceramics – Mica – types – products (sheet, tapes, papers and glass bonded mica) and applications of mica. Glass – Lead glass, Borosilicate glass, silica glass, glass wool - preparation, properties and uses. Magnetic materials – basis of magnetism – Soft and hard magnetic materials. Semiconductors – Extensive and intensive. Nanomaterials – Size dependant properties – Synthesis of nano materials – Chemical Vapour deposition, Electrospinning and Sol-Gel methods – applications

UNIT V FABRICATION OF INTEGRATED CIRCUITS 9

Introduction – Fabrication – MOS – NMOS, PMOS, CMOS, Ga-As Technologies, Printed circuit boards-Fabrication (Single layer only) – Lamination, printing (photo and screen printing) and mechanical operation

TOTAL: 45 PERIODS

OUTCOMES:

CO 1 : Conversant in the theories involved in batteries and its applications.
CO 2 : Familiar in basic concepts in polymer and its application in the field of electronics.
CO 3 : Exposed to composites and their constituents.
CO 4 : Possess in-depth knowledge about speciality materials.
CO 5 : Conversant in the theories involved in batteries and its applications.

REFERENCES:

1. Dyson R.W. “Specialty Polymer”, Blackie Academic and Professional, Chennai, 2006.
2. Jain P.C and Monika Jain, “Engineering Chemistry”, Dhanpet Rai Publishing Company (P)Ltd., New Delhi,2013.
3. Khanna O.P.,” Material Science” NIH Publications, Maryland, 2007.
4. Sharma S.C. “Composite Materials”, Narosa Publishing House, New Delhi,2000.
5. Wong M.N., “Polymer for electronics and photonic applications”, John Wiley, New York, 2006.

CO – PO Mapping:

COURSE OUTCOMES	PROGRAMME OUTCOMES				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO 1 :	3	1	-	-	-
CO 2 :	3	1	1	-	1
CO 3 :	3	1	1	-	-
CO 4 :	3	1	-	-	-
CO 5 :	3	1	1	-	-
AVG:	**3**	**1**	**0.6**	**-**	**0.2**

XC3151 **DIGITAL SYSTEMS** **L T P C**
3 0 2 4

OBJECTIVES:

- To introduce the basic concept of digital and binary systems
- To give fundamentals of Boolean algebra and logic gates
- To give students the concept of digital logic design
- To give students the basic tools for the design and implementation of digital modules and subsystems
- To reinforce theory and techniques taught in the classroom through project assignments

UNIT I NUMBER SYSTEMS AND BINARY CODES **9**

Introduction to Digital Systems - Binary Numbers — Number Systems and Conversions — Complements – Signed Binary Numbers - Binary Arithmetic – Binary Codes – BCD and other Weighted Codes, Excess-3, Gray Code – Binary Logic

UNIT II BOOLEAN ALGEBRA AND LOGIC GATES **9**

Basic Definitions – Axiomatic Definitions of Boolean Algebra - Basic Theorems and Properties of Boolean Algebra – Boolean Functions – Canonical and Standard Forms – Other Logic Operations –Digital Logic Gates – Integrated Circuits – TTL – MOS – CMOS Circuit

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UNIT III GATE-LEVEL MINIMIZATION 9

Karnaugh Map Method – Two and Three Variable Map - Four Variable Map – Five Variable Map – Product-of-Sums Simplification –Don't Care Conditions – NAND and NOR Implementations - Other Two- Level Implementations – Quine McCluskey Method – Exclusive OR function

UNIT IV COMBINATIONAL LOGIC 9

Combinational Circuits – Analysis and Design of combinational circuits - Binary Adder- Subtractor – Decimal Adder – Binary Multiplier – Magnitude Comparator – Decoders – Encoders – Multiplexers – Demultiplexers

UNIT V SEQUENTIAL LOGIC 9

Sequential Circuits – Storage Elements: Latches and Flip-Flops – Analysis of Clocked Sequential Circuits – State Reduction and Assignment – Design Procedure - Registers – Shift Register – Counters – Ripple Counter – Synchronous Counter

LAB PRACTICES:

1. Study of basic logic gates and realization of logic gates using universal gates.
2. Multiplexer and demultiplexer.
3. Half and full adder / subtractor.
4. Encoder and decoder.
5. Binary decade counter.
6. BCD to seven segment decoder.

TOTAL: (45+30) 75 PERIODS

OUTCOMES:

CO 1 : Apply knowledge of math, science and engineering.
CO 2 : Describe design constraints of digital systems.
CO 3 : Design digital circuitry, analyze and interpret data.
CO 4 : Combinational logic design implementation.
CO 5 : Sequential logic design implementation.

REFERENCES:

1. Charles H. Roth Jr., "Fundamentals of Logic Design", Cengage Learning, 2021.
2. John F. Wakerly, "Digital Design Principles & Practices", Pearson Education, 4th Edition, Noida,India, 2016.
3. Mano, M.M. and Ciletti, M.D., "Digital Design", Pearson Education, 6th Edition, New Jersey, 2018.
4. Neal S Widmer; Gregory L Moss; Ronald J Tocci, "Digital System: Principles and Applications",12th Edition, Pearson, London, 2018.

CO – PO Mapping:

COURSE OUTCOMES	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	-	-	-	-
CO 2 :	3	-	2	-	-
CO 3 :	3	-	-	-	2
CO 4 :	3	1	-	-	3
CO 5 :	3	1	-	-	3
AVG:	**3**	**0.4**	**0.4**	**-**	**1.6**

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XC3152	PROBLEM SOLVING AND C PROGRAMMING	L	T	P	C
		2	0	4	4

OBJECTIVES:

- To analyze and develop C Programs using basic programming constructs.
- To solve searching and sorting problem using arrays and strings.
- To apply code reusability with functions and memory management using pointers.
- To compare and develop applications in C using structures and unions.
- To understand the basics of preprocessor directives and file operations.

UNIT I BASICS OF C PROGRAMMING 6+12

Architecture of Computer – Program design: Algorithm - Pseudocode and flow chart– Introduction to programming paradigms –- Structure of C program - C programming: Data Types - Constants - Keywords - Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements - Decision making statements - Switch statement.

PRACTICALS:

- Designing algorithms for programs
- Designing flowchart for programs
- Programs using integer type, arithmetic operators and basic input/output.
- Programs using other data types and operators.
- Programs using decision making statements and switch

UNIT II LOOP CONTROL STATEMENTS AND ARRAYS 6+12

Iteration statements: For, while, Do-while statements, nested loops - Introduction to Arrays: Declaration, Initialization - One dimensional array -Two dimensional arrays – Searching and sorting in Arrays – Strings – string handling functions - array of strings

PRACTICALS:

- Programs using for, while, do-while loops and nested loops.
- Programs using arrays and operations on arrays.
- Programs implementing searching and sorting using arrays
- Programs implementing string operations on arrays

UNIT III FUNCTIONS AND POINTERS 6+12

Modular programming - Function prototype, function definition, function call, Built-in functions – Recursion – Recursive functions - Pointers - Pointer increment, Pointer arithmetic - Parameter passing: Pass by value, Pass by reference, pointer and arrays, dynamic memory allocation with *malloc/calloc*

PRACTICALS:

- Programs using functions
- Programs using recursion.
- Programs using pointers and arrays, address arithmetic
- Programs using Dynamic Memory Allocation

UNIT IV STRUCTURES AND UNION 6+12

Storage class, Structure and union, Features of structures, Declaration and initialization of structures, array of structures, Pointer to structure, structure and functions, typedef , bit fields , enumerated data types, Union.

PRACTICALS:

- Programs using structures and array of structures

- Programs using pointers to structures, self-referential structures
- Programs using union
- Programs using enumerated data types

UNIT V MACROS AND FILE PROCESSING 6+12

Preprocessor directives – Simple and Conditional, macros with and without parameters - Files - Types of file processing: Sequential and Random access – File operations – read, write & seek.

PRACTICALS:

- Programs using file read operation
- Programs using file write operation
- Programs using file seek operation
- Programs using macros

TOTAL : (30+60) 90 PERIODS

OUTCOMES:

CO 1 : Write simple C programs using basic constructs.
CO 2 : Design searching and sorting algorithms using arrays and strings.
CO 3 : Implement modular applications using Functions and pointers.
CO 4 : Develop and execute applications using structures and Unions.
CO 5 : Solve real world problem using files.

REFERENCES:

1. Anita Goel, “Computer Fundamentals”, Pearson Education, Noida, 2010.
2. E. Balagurusamy, “Programming in ANSI C”, McGraw Hill, 2019.
3. Ashok N. Kamthane, Raj Kamal, “Computer Programming and IT”, Pearson Education,2012.
4. Dromey, R.G, “How to solve it by Computer”, Pearson Education, New York,2008.
5. Kernighan, B. Wand Ritchie, D.M, “C Programming language”, Second Edition, Noida, Pearson Education, 2015
6. Peter Norton, “Introduction to Computers”, Seventh Edition, McGraw Hill, New Delhi, 2017.
7. Byron Gottfired, “Programming with C”, Fourth Edition, McGraw Hill, 2018.
8. Yashavant P. Kanetkar, “Let Us C”, 17th Edition, BPB publications, New Delhi, 2020.

CO – PO Mapping:

COURSE OUTCOMES	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	3	3	-	-
CO 2 :	3	2	3	-	-
CO 3 :	3	2	3	-	2
CO 4 :	3	2	3	-	2
CO 5 :	3	2	3	-	2
AVG:	**3**	**2.2**	**3**	**-**	**1.2**

GE3163	COMPUTER AIDED ENGINEERING DRAWING LABORATORY	L	T	P	C
		0	0	4	2

INTRODUCTION: BIS specifications,Drawing tools, lines, lettering, scalingand dimensioning. Projection –types.

FIRST ANGLE PROJECTION: Introduction- Projection of points, lines, planes, and solids – parallel, perpendicular and inclined to planes.

ISOMETRIC PROJECTION: Introduction to objects of symmetry with either or any one of the axes and objects of revolution.

INTERACTIVE GRAPHICS: Parametric modeling –1D, 2D and 3D geometry – transformations - display – points, lines, planes using software.
CURVES: Parametric curves generation methods -displaying - evaluating control points on curves.

SURFACES: Parametric surface generation methods -displaying - evaluating control points on surfaces – Iso, sub and super parametric surfaces for FEA

SOLIDS: Generation of part models using Computer Aided Geometric Modeling software. (Autodesk Fusion 360, CATIA)

GENERATIVE DESIGN: Important of AI, ML, Solid free form fabrication – Types and applications

LABORATORY COMPONENT: Engineering Graphics using CAD

1. Introductionto CAD Software.
2. Conic curves – Circle, Ellipse, Parabola, Hyperbola – special curves – cycloid, involute
3. First angleprojection ofa. Points b. Lines c. Planes d. Solids
4. Conversion of isometric to orthographic projection and vice versa.
5. Lateral Surface Development
6. Sectioning of regular solids.
7. Perspective projection of simple solids.

Geometric Modeling using a graphical programming language (MATLAB, Auto-LISP)

8. Modeling and displaying a point and line using orthographic projection and performing simple geometric transformation.
9. Modeling and displaying of parametrically represented analytical curves
   a. Circle b. Ellipse c. Parabola d. Hyperbola
10. Modeling and displaying of parametrically represented synthetic curves
    a. Bezier Curve b. B-spline
11. Modeling and displaying of parametrically represented NURBS curve.
12. Modeling and displaying of parametrically represented synthetic surface.
    a. Planar surface b. Ruled surface
13. Modeling and displaying of Bezier surface.
14. Modeling and displaying of B-Spline surface.

Application of CAD through Programming

15. 1D, 2D transformations – scaling, rotation, mirroring, moving, copying
16. Image enhancement – Coloring, shading, shadowing, contrast, filling lights, brightness, hue saturation, tint, temperature variation
17. Noise reduction techniques, edge detection techniques, counting similar geometry in a cluster
18. Applications of Digital Image Processing techniques
19. Generative design approach – Implementation of AI, ML – Applications
20. CAD smart application development

TOTAL : 60 PERIODS

OUTCOMES:

CO 1 : Draw free hand sketching of basic geometrical shapes and multiple views of objects.
CO 2 : Draw orthographic projections of lines and planes
CO 3 : Draw orthographic projections of solids
CO 4 : Draw development of the surfaces of objects
CO 5 : Draw isometric and perspective views of simple solids.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	1	-	-	1
CO 2 :	3	1	-	-	1
CO 3 :	3	1	-	-	1
CO 4 :	3	1	-	-	1
CO 5 :	3	1	-	-	1
AVG:	**3**	**1**	**-**	**-**	**1**

HS3252	COMMUNICATIVE ENGLISH – II	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To actively listen and collect relevant data from various forms of oral content like presentations, lectures and videos
- To use language effectively in a formal presentation and discussions
- To comprehend various reading materials relevant to technical context and understand the main and supporting ideas of the reading materials
- To explore definitions, essay and report writing techniques and practice them in order to develop associated skills
- To write effective job applications along with detailed CV for internship or placements

UNIT I CAUSE AND EFFECT 9+6

Listening – To an interview (survivors tale) & framing a set of instructions/ Dos & Don'ts; **Reading** – Excerpts of Literature (short stories), Journal articles on Global warming/Silent Spring; **Writing** - Instructions; Official letter / email (Request for internship / Industrial visit); **Grammar** – If conditionals, Imperatives; **Vocabulary** – Cause & effect expressions; Idiom

LAB ACTIVITY: Asking questions and answering - Conducting an interview (of an achiever / survivor) – Role play

UNIT II COMPARE AND CONTRAST 9+6

Listening – To product reviews & gap fill exercises, To short talks (TED Talks) for specific information; **Reading** – A graphical content (table / chart / graph) & making inferences; **Writing** – Compare and Contrast Essay; **Grammar** – Degrees of Comparison; Mixed Tenses; **Vocabulary** – Order of Adjectives; Transition words

LAB ACTIVITY: Speaking about specifications of a product (Eg. Home appliances) – Persuasive Talk – Role play activity

UNIT III PROBLEM AND SOLUTION 9+6

Listening – To group discussion (case study); **Reading** – Visual content (Pictures on social issues / natural disasters) for comprehension; Editorial ; **Writing** Picture description; Problem & Solution Essay; **Grammar** – Modal verbs; Relative pronoun; **Vocabulary** – Negative prefixes; Signal words for problem & solution

LAB ACTIVITY: Discussions on Case Study to find solution for problems in professional context

UNIT IV REPORTING 9+6

Listening – To an oral news report; **Reading** – A newspaper report on a survey findings – **Writing** – A survey report; Making recommendations; **Grammar** – Active and passive voice; Direct and Indirect speech; **Vocabulary** – Reporting verbs; Numerical adjectives

LAB ACTIVITY: Describing a visual content (Pictures/Table/Chart) using appropriate descriptive language and making appropriate inferences

UNIT V 9+6

Listening – To a job interview, Telephone interview; **Reading** - Job advertisement and company profile and make inferences; **Writing** – Job application (cover letter and CV) **Grammar** – Prepositional phrases; **Vocabulary** – Fixed expressions, Collocations

LAB ACTIVITY: Making presentation with a visual component (ppt) (job interview / project / Innovative product presentation)

TOTAL: (45+30) = 75 PERIODS

OUTCOMES:

CO 1 : Listen effectively to various oral forms of conversation, lectures, discussion and understand the main gist of the content.

CO 2 : Communicate effectively in formal and informal context.

CO 3 : Read and comprehend technical texts effortlessly.

CO 4 : Write reports and job application for internship or placement.

CO 5 : Participate effectively in formal group discussions and make formal presentations.

REFERENCES:

1. "English for Science & Technology" by Cambridge University Press, 2023.
2. "English for Engineers and Technologists" by Orient Blackswan, 2022
3. "Communicative English for Engineers and Professionals" by Bhatnagar Nitin, Pearson India, 2010
4. Take Off – Technical English for Engineering" by David Morgan, Garnet Education, 2008
5. "Advanced Communication Skills" by Mathew Richardson, Charlie Creative Lab, 2020.
6. www.uefap.com

CO – PO Mapping:

COURSE OUTCOMES	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	-	-	-	2
CO 2 :	3	3	-	-	-
CO 3 :	3	2	-	-	-
CO 4 :	3	-	2	-	3
CO 5 :	3	3	-	-	2
AVG:	**3**	**1.6**	**0.4**	**-**	**1.4**

EE3151 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING L T P C 3 0 2 4

UNIT I ELECTRICAL CIRCUITS 9

DC Circuits: Ohm's Law - Kirchhoff's Laws – Independent and Dependent Sources – Nodal Analysis, Mesh analysis with Independent sources only (Steady state) – AC Fundamentals: Waveforms, Average value, RMS Value, Impedance, Instantaneous Power, Real Power, Reactive Power and Apparent Power, Power Factor – Steady State Analysis of RL and RC Circuits - Introduction to Balanced 3-Phase Circuits and power measurement.

UNIT II ELECTRICAL MACHINES 9

Basic Magnetic Circuit - Construction and Working Principle – DC Separately and Self excited Generators, EMF Equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Transformer - Construction, Working and Applications - Three phase Alternator, Synchronous motor - Single and Three Phase Induction Motor – BLDC motor.

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UNIT III ANALOG AND DIGITAL ELECTRONICS 9

Operation and Characteristics of electronic devices: PN Junction Diodes, Zener Diode, BJT, JFET and MOSFET– Operational Amplifiers (OPAMPs) : Characteristics and basic application circuits-555 timer IC based astable and monostable multivibrator.

Basic switching circuits – Gates and Flip-Flops-Sample and hold circuit- R-2R ladder type DAC-Successive approximation based ADC.

UNIT IV SENSORS AND TRANSDUCERS 9

Solenoids, electro-pneumatic systems, proximity sensors, limit switches, piezoelectric, hall effect, photo sensors, Strain gauge, LVDT, differential pressure transducer, optical and digital transducers, Smart sensors, Thermal Imagers.

UNIT V MEASUREMENTS AND INSTRUMENTATION 9

Functional Elements of an Instrument, Error analysis; Operating Principle - Moving Coil and Moving Iron Instruments, Wattmeter, Energy Meter, Instrument Transformers - CT and PT, Multimeter- DSO - Block Diagram Approach.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS:

ELECTRICAL

1. Verification of ohms and Kirchhoff's Laws.
2. Load test on DC Shunt Motor.
3. Load test on Single Phase Transformer.
4. Load test on 3 Phase Induction Motor.

ELECTRONICS

1. Half wave and full wave Rectifiers.
2. Application of Zener diode as shunt regulator.
3. Inverting and non-inverting amplifier using operational amplifier.
4. Astable multivibrator using IC 555.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

CO 1: Compute and demonstrate the electric circuit parameters for simple problems.

CO 2: Explain the working principles and characteristics of electrical machines, electronic devices and measuring instruments.

CO 3: Identify general applications of electrical machines, electronic devices and measuring instruments.

CO 4: Analyze and demonstrate the basic electrical and electronic circuits and characteristics of electrical machines..

CO 5: Explain the types and operating principles of sensors and transducers.

Mapping of COs with POs and PSOs															
COs/POs & PSOs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	2	2	3	-	-	-	1	2	1	1	-	-	-
CO2	2	3	2	3	3	-	-	-	1	2	1	1	-	-	-
CO3	3	2	1	1	3	-	-	-	1	2	1	1	-	-	-
CO4	1	2	2	2	3	-	-	-	1	2	-	1	-	-	-
CO5	1	1	2	2	2	-	-	-	1	2	-	2	-	-	-
CO/PO & PSO Average	**2**	**2.2**	**1.8**	**2**	**-**	**-**	**-**	**-**	**1**	**2**	**1**	**1.2**	**-**	**-**	**-**
1 – Slight, 2 – Moderate, 3 – Substantial															

TEXT BOOKS:

1. Del Toro 'Electrical Engineering Fundamentals' Pearson Education, New Delhi, 2022.
2. Alan S. Moris, Principles of Measurements and Instruments, Prentice-Hall of India Pvt. Ltd., New Delhi, 1988.
3. Smarjit Ghosh 'Fundamentals of Electrical and Electronics Engineering, 2nd Edition 2010.

REFERENCES:

1. Rajendra Prasad 'Fundamentals of Electrical engineering', Third Edition, Prentice Hall of India, 2014.
2. Sanjeev Sharma 'Basics of Electrical Engineering' Wiley, 2019.
3. John Bird, Electrical Circuits theory and Technology, Taylor & Francis Ltd, Seventh Edition, 2022.
4. Doebelin, E.O., Measurements Systems – Application and Design', McGrawHill Publishing Co, 2019.
5. D.Roy Choudhury, Shail B. Jain, Linear Integrated Circuits, New age international Publishers, 2018.
6. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010.

MA3253 ORDINARY DIFFERENTIAL EQUATIONS AND TRANSFORM TECHNIQUES **L T P C 4 0 0 4**

OBJECTIVES:

- To acquaint the students with Differential Equations which are significantly used in engineering problems
- To make the students appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated
- To develop the analytic solutions for partial differential equations used in engineering by Fourier series
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic
- To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems

UNIT I ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER 12

Homogeneous linear ODEs of second order, linearity principle, general solution- Particular integral: Operator method, Solution by variation of parameters, Method of undetermined coefficients - Homogenous equations of Euler–Cauchy equations and Legendre's equations –Simultaneous system of first order linear differential equations

UNIT II LAPLACE TRANSFORMS 12

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method

UNIT III FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Complex form of Fourier series – Parseval's identity – Harmonic Analysis

UNIT IV FOURIER TRANSFORMS 12

Integral representation, Fourier sine and cosine integrals. Fourier sine and cosine transforms, inverse sine and cosine transform. Fourier transform and inverse Fourier transform, basic properties. The Fourier transform of derivatives. Convolution theorem (without proof)

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS 12

Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and final value theorems – Formation of difference equation – Solution of difference equation using Z – transform

TOTAL: 60 PERIODS

OUTCOMES:

CO 1 : The students will be able to solve higher order ordinary differential equations which arise in engineering applications.
CO 2 : The students will be able to apply Laplace transform methods for solving linear differential equations.
CO 3 : The students will be able to compute Fourier series of functions arise in engineering applications.
CO 4 : The students will be able to compute Fourier transforms of functions arise in engineering applications.
CO 5 : The students will be able to understand Z-transforms.

REFERENCES:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2017.
2. Erwin Kreyszig "Advanced Engineering Mathematics", Wiley India Pvt Ltd., New Delhi, 2015.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education2nd Edition, 5th Reprint, Delhi, 2009.
5. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics",Narosa Publications, 5 th Edition, New Delhi, 2017.
6. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7 th Edition, New Delhi , 2012.
7. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., 11th Reprint, New Delhi, 2010.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	3	-	-
CO 2 :	3	2	3	-	-
CO 3 :	3	2	3	-	-
CO 4 :	3	2	3	-	-
CO 5 :	3	2	3	-	-
AVG:	**3**	**2**	**3**	**-**	**-**

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XT3251	PYTHON PROGRAMMING	L	T	P	C
		2	0	4	4

OBJECTIVES:

- To get introduced to Python and its environment
- To develop Python programs with conditionals and loops
- To define Python functions and use function calls
- To use Python data structures - lists, tuples, dictionaries
- To do input/output with files in Python

UNIT I PROGRAMMING BASICS 6+12

Introduction to Python Specification - Data Representation: Simple statements: Variables and Identifiers – Object Types - Operators - Expressions and its evaluation

Practicals:

- Develop Python programs using simple Input/Output operations
- Develop Python programs using operators and expressions
- Executing simple programs using Python interactive mode

UNIT II CONTROL STATEMENTS AND FUNCTIONS 6+12

Conditional statements: if- if else – if elif – Nested conditional statements. Repetitive statements: while – for – Nested repetitive statements. Branching statement: break – continue – pass. Functions - Defining functions – Argument types – Scope and namespaces - Recursive functions – Lambda functions – Functions as arguments

Practicals:

- Write Python programs using simple and nested selective control statements
- Develop Python programs using simple and nested repetitive control statements
- Write Python programs to generate series and patterns using repetitive control statements
- Develop Python programs using simple functions and recursion
- Write Python programs using lambda functions

UNIT III STRING, LIST, TUPLES 6+12

String literals – String methods – String formatting expressions. Lists – Lists iteration and operations - Lists as stacks and queues – List comprehensions – Nested List comprehensions – Matrix operations using Lists - Tuples and sequences – Tuple iteration and operations

Practicals:

- Write Python programs for operating on Strings
- Design Python programs using Lists, Nested Lists and Lists comprehensions
- Develop Python programs using Tuples, Nested Tuples, Tuple comprehensions, and Sets

UNIT IV SETS & DICTIONARIES, FUNCTIONAL PROGRAMMING 6+12

Sets – Set iteration and operations - Dictionaries – Dictionary iteration and operations - Dictionary comprehensions - Nested Dictionary comprehensions. Functional programming tools (map, filter, reduce) – Modules – import and from statements- Executing modules as scripts – Standard modules & Packages, creation of module/package

Practicals:

- Write Python programs creating sets and performing set operations

- Develop Python programs using Dictionary, Nested Dictionary and comprehensions
- Write Python programs by applying functional programming concepts
- Create, import, and use user-defined modules
- Organize python code using Packages

UNIT V EXCEPTIONS AND FILE HANDLING 6+12

Errors: Syntax and logical errors – Exceptions: Exception types - Handling exceptions - Multiple exceptions and handlers – Raising exceptions. Files: File Path - Type of files - opening modes - Reading and Writing files. Handling Data files.

Practicals:

- Design Python programs to handle errors and exceptions
- Write Python programs with multiple handlers for exceptions
- Write Python programs to read, create, and update text files

TOTAL: (30+60) 90 PERIODS

OUTCOMES:

CO 1 : Understand algorithmic solutions to simple computational problems.
CO 2 : Create Python programs using conditional statements to solve computational problems.
CO 3 : Apply Python data structures for a given problem.
CO 4 : Design modular Python programs using modules and packages.
CO 5 : Create Python programs to manipulate different file types and handle exceptions.

REFERENCES:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, Shroff/O'Reilly Publishers, 2016.
2. Reema Thareja, "Python Programming: Using Problem Solving Approach", Oxford University Press, 2017.
3. Guido van Rossum, Fred L. Drake Jr., "An Introduction to Python – Revised and Updated for Python 3.2", Network Theory Ltd., 2011.
4. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and Expanded Edition, MIT Press , 2013
5. Charles Dierbach, "Introduction to Computer Science using Python", Wiley India Edition, 2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
7. Kenneth A. Lambert, "Fundamentals of Python: First Programs", Cengage Learning, 2012

CO – PO Mapping:

COURSE OUTCOMES	PROGRAMME OUTCOMES				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO 1 :	3	3	3	-	-
CO 2 :	3	2	3	-	-
CO 3 :	3	2	3	-	2
CO 4 :	3	2	3	-	2
CO 5 :	3	2	3	-	2
AVG:	**3**	**2.2**	**3**	**-**	**1.2**

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XC3251	DATA STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts of array and linked list structures
- To know the concepts of stack and queue data structure
- To learn about non-linear tree data structures
- To familiarize the concept of graph and graph-related algorithms
- To know the concepts of sorting and hashing techniques

UNIT I ARRAYS AND LINKED LIST **9**

Introduction to Data Structures and Algorithms – Asymptotic notations – ADT - Arrays – Applications - Linear Search, non-recursive binary search - Linked List – Doubly-Linked Lists – Circular Linked List - Applications- Polynomial Addition

UNIT II STACK AND QUEUE **9**

Stacks – Primitive operations - Implementation of stack using array and linked list- Stack Applications- Parenthesis Checking - Expression Conversion- Evaluation of Expressions – Recursive function. Queues – Primitive operations – Implementation of Linear Queue using array and linked list - Circular Queue - Priority Queue- Double-Ended Queue

UNIT III TREES **9**

Tree – Terminologies – Binary Tree – Binary Tree Variants - Sequential and Linked representation - Tree Traversals – Expression Trees -Threaded Binary Tree – Binary Search Tree – Heap Tree

UNIT IV ADVANCED TREES AND GRAPH **9**

Advanced Tree Structures: AVL Tree – Red-Black Tree – M-Way Search Tree – Tries. Graphs – Terminologies – Representation of Graphs – Adjacency matrix, Adjacency List- Graph Traversals –Minimum spanning Tree

UNIT V HASHING AND SORTING **9**

Hashing – Hash functions – Separate Chaining – Open Addressing – Linear Probing – Quadratic Probing – Double Hashing – Rehashing. Sorting Techniques: Bubble sort- Insertion sort - Selection Sort - Merge Sort - Quick Sort – Heap Sort

TOTAL: 45 PERIODS

OUTCOMES:

CO 1 : Solving real-time applications using a list data structure.
CO 2 : Know about the importance of stack and queue data structure in a wide range of applications.
CO 3 : Implement the tree data structures.
CO 4 : Apply graph data structures for a real-world problem.
CO 5 : Use appropriate sort of algorithms for the task at hand.

REFERENCES:

1. Varsha H. Patil, “Data Structures using C++”, Oxford University Press, Noida, 2012.
2. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, 2nd Edition, Pearson Education, 2014.
3. Narasimha Karumanchi, “Data Structures and Algorithms Made Easy”, Career Monk, 2023.
4. Venkatesan R, and Loveyln Rose. S, “Data Structures”, Second Edition, Wiley, 2019.
5. Jean-Paul Tremblay, Paul Sorenson, “An Introduction to Data Structures With Applications”, Second Edition, McGraw Hill, 2018.
6. Reema Thareja, “Programming in C”, Second Edition, Oxford University Press, 2016.

CO – PO Mapping:

COURSE OUTCOMES	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	1	2	-	-
CO 2 :	3	-	2	-	1
CO 3 :	3	2	2	-	-
CO 4 :	3	-	2	-	2
CO 5 :	3	-	2	2	1
AVG:	**3**	**0.6**	**2**	**0.4**	**0.8**

XC3252 **COMPUTER ARCHITECTURE** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the structure, function and characteristics of computer systems
- To understand the design of the various functional units and components of computers
- To identify the elements of modern instructions sets and their impact on processor design
- To explain the function of each element of a memory hierarchy
- To identify and compare different methods for computer I/O

UNIT I STRUCTURE OF COMPUTERS **9**

Functional Units — Basic Operational Concepts — Performance and Metrics — Bus Structures — Characteristics and Functions – Instruction Cycle – Addressing Modes and Formats – Register Reference Instructions – Input & Output Instructions

UNIT II ARITHMETIC AND LOGIC UNIT **9**

Binary Addition and Subtraction – Binary Multiplication and Division – Booth Algorithm – Fixed PointRepresentations – Floating Point Representation – Floating Point Arithmetic Operations – ArithmeticPipelining

UNIT III CONTROL UNIT **9**

Hardwired and Micro programmed Control – Control Memory – Address Sequencing – Micro instruction Sequencing - Macro instruction Execution - Program Control

UNIT IV MEMORY ORGANIZATION **9**

Memory Operations – Memory Hierarchy – Main Memory – Associative Memory -Auxiliary memory –Virtual Memory – Cache Memory – Memory Array – Secondary Storage – Memory Management Hardware

UNIT V INPUT OUTPUT ORGANIZATION AND ADVANCED ARCHITECTURE 9

Peripheral Devices – I/O Interface – Modes of Data Transfer – Interrupt Driven I/O – DMA – SerialCommunication – Asynchronous Data Transfer – RISC – CISC - Parallel Processing – Vector and Array Processing

TOTAL: 45 PERIODS

OUTCOMES:

CO 1 : Understand the basic structure of computer.
CO 2 : Perform computer arithmetic operations.
CO 3 : Understand the control unit operations.
CO 4 : Understand the concept of cache mapping techniques.
CO 5 : Understand the concept of I/O organization.

REFERENCES:

1. Douglas E. Comer, “Essentials of Computer Architecture”, 1st Edition, Pearson, Education, 2011.
2. Miles Murdocca, Vincent Heuring, “Computer Architecture and Organization: An integrated approach”, Wiley, New Jersey, 2013.
3. Morris Mano, “Computer System Architecture”, 3rd Edition, Pearson Education, London, 2007.
4. William Stallings, “Computer Organization and Architecture: Designing for Performance”, Pearson Education, 2016.

CO – PO Mapping:

COURSE OUTCOMES	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	2	-	-	-	-
CO 2 :	3	-	-	-	-
CO 3 :	3	-	-	-	2
CO 4 :	3	-	2	-	-
CO 5 :	3	-	2	-	1
AVG:	**2.8**	**-**	**0.8**	**-**	**0.6**

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XT3261	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	4	2

LIST OF EXPERIMENTS

1. Operation on Array
2. Matrix Manipulation using dynamic memory allocation
3. Linear Search and Binary Search
4. Linked List, Doubly Linked List
5. Circular Linked List
6. Polynomial Addition using Linked List
7. Implementation of Stack using Arrays and Linked List
8. Checking well-formed parenthesis
9. Infix to postfix and prefix conversion
10. Evaluation of Expression
11. Implementation of Queue using Arrays and Linked List
12. Double Ended Queue and Priority Queue
13. Bubble, Insertion, Selection, and Shell sort
14. Binary Search Tree
15. Graph Traversals

TOTAL : 60 PERIODS

OUTCOMES:

CO 1 : Implementation of arrays and linked lists
CO 2 : Implementation of stack and queue data structure in a wide range of applications.
CO 3 : Implement the tree data structures.
CO 4 : Apply graph data structures for a real-world problem.
CO 5 : Use of appropriate sorting algorithms for the task at hand.

CO – PO Mapping:

COURSE OUTCOMES	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	2	-	2
CO 2 :	3	2	2	-	2
CO 3 :	3	2	2	-	2
CO 4 :	3	2	2	-	2
CO 5 :	3	2	2	2	2
AVG:	**3**	**2**	**2**	**0.4**	**2**

MA3351	PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX FUNCTIONS	L	T	P	C
		4	0	0	4

OBJECTIVES:

- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes
- To familiarize the students in the field of partial differential equations and to solve boundary value problems associated with engineering applications
- To develop an understanding of the standard techniques of complex variable theory in particular analytic function
- To familiarize complex mappings and its mapping property
- To familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Lagrange's Linear equation – Solution of linear equations of higher order with constant coefficients – Linear non-homogeneous partial differential equations

UNIT II APPLICATIONS FOURIER SERIES TO PARTIAL DIFFERENTIAL EQUATION 12

Classification of partial differential equations- Method of separation of variables – Solutions of one-dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation

UNIT III DIFFERENTIATION OF COMPLEX FUNCTIONS 12

Limit, Continuity and Differentiation of Complex functions - Analytic functions – Necessary and sufficient conditions for analyticity: Cauchy-Riemann equations (without proof)- Properties – Harmonic conjugates – Construction of analytic function – elementary analytic functions (exponential, trigonometric, logarithm) and their properties

UNIT IV CONFORMAL MAPPING 12

Introduction to Complex mapping - Conformal mapping – Condition for conformality – Standard mappings: a+z, az, az+b, - Bilinear transformations

UNIT V INTEGRATION OF COMPLEX FUNCTIONS 12

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Cauchy's Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contours (except poles on real lines)

TOTAL : 60 PERIODS

OUTCOMES:

CO 1 : The students will be able to solve partial differential equations which arise in application problems.

CO 2 : The students will be able to obtain the solutions of the partial differential equations using Fourier series.

CO 3 : The students will be able to understand complex functions and differentiation complex functions.

CO 4 : The students will be able to understand their conformal mapping and its application problems.

CO 5 : Evaluate real and complex integrals using the Cauchy's integral formula and residue theorem.

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REFERENCES:

1. Erwin Kreyszig “Advanced Engineering Mathematics” John Wiley & Sons., New Delhi, 2015.
2. Wylie C. R. and Barrett L. C “Advanced Engineering Mathematics” Tata McGraw-Hill., New Delhi, 2019.
3. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, 44th Edition, New Delhi, 2017.
4. Mathews J. H. and Howell R. W “Complex Analysis for Mathematics and Engineering”, Narosa Publishing House., New Delhi, 2012.
5. Peter V.O Neil “Advanced Engineering Mathematics”, Cengage., New Delhi, 2016.
6. Dennis G Zill, “Advanced Engineering Mathematics”, Jones & Bartlett India P Ltd., New Delhi, 2017.
7. Dean G Duffy “Advanced Engineering Mathematics with MATLAB”, CRC., USA.

CO – PO Mapping:

COURSE OUTCOMES	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	3	-	-
CO 2 :	3	2	3	-	-
CO 3 :	3	2	3	-	-
CO 4 :	3	2	3	-	-
CO 5 :	3	2	3	-	-
AVG:	**3**	**2**	**3**	**-**	**-**

XT3351 OBJECT-ORIENTED PROGRAMMING USING C++

L	T	P	C
3	0	2	4

OBJECTIVES:

- To get a clear understanding of object-oriented concepts
- To give an introduction about objects and classes
- To understand the concept of inheritance and polymorphism
- To have knowledge about templates and exception handling
- To have insights into I/O operations and manipulators

UNIT I OOP AND C++ FUNDAMENTALS **9**

Object-oriented paradigm - Elements of object-oriented programming – Characteristics of OOP - C++ operators – data types - Pointers - References - Enumeration – Functions – Function prototype – Default arguments — Inline functions

UNIT II OBJECTS AND CLASSES 9

Specifying a Classes – Defining Member Functions – Static data member and member function - Array of objects – Object as a function argument - Returning Objects – Friend function - pointers to object - This pointer – Constructor and destructor

UNIT III INHERITANCE AND POLYMORPHISM 9

Derived class - Single Inheritance - Multiple Inheritance - Hierarchical Inheritance - Hybrid Inheritance – Virtual base class - Constructors in Derived class – Nesting of classes - Polymorphism – Compile and Run time polymorphism – Function overloading - Operator Overloading – Virtual Functions

UNIT IV TEMPLATES AND EXCEPTION HANDLING 9

Exception handling mechanism – Rethrowing an Exception – Specifying Exceptions – Templates – Class Template – Function Template – Member function template – Non-Type Template arguments –Namespaces

UNIT V INPUT/OUTPUT STREAMS 9

Input / Output operations – I/O stream classes – Unformatted and formatted I/O operations – Manipulators – Overloading the insertion and extraction operators - File input/output – Command line arguments

LIST OF EXPERIMENTS

1. Create a complex number class with all possible operators
2. Static members, Friend functions
3. Operator overloading, overloading of assignment operator
4. Type conversions such as integer to complex, double to complex, and complex to double
5. Constructor, Destructor, Copy constructor
6. Virtual functions
7. Matrix class with operator overloading
8. Single, Multiple, and Hybrid Inheritance
9. Polymorphism
10. Exception Handling
11. Input/Output file handling

TOTAL : (45+30) 75 PERIODS

OUTCOMES:

CO 1 : Describe the procedural and object-oriented paradigm with concepts of streams, classes, functions, data, and objects.

CO 2 : Understand dynamic memory management techniques using pointers, constructors, and destructors.

CO 3 : Describe the concept of function overloading, operator overloading, virtual functions, andpolymorphism.

CO 4 : Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.

CO 5 : Demonstrate the use of I/O stream classes, file handling, and command line arguments.

REFERENCES:

1. Herbert Schildt, “C++ A Beginner’s Guide”, Second Edition, McGraw Hill, 2003.
2. Bjarne Stroustrup, “C++ Programming Language”, Addison-Wesley Educational Publishers Inc, Fourth Edition 2013.
3. Balagurusamy, “Object-Oriented Programming with C++”, Eighth Edition, McGraw Hill, 2020.

4. Dietel & Dietel, “C++ How to Program”, Ninth Edition, Pearson, Education, 2017.

CO – PO Mapping:

COURSE OUTCOMES	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	3	3	-	-
CO 2 :	3	2	3	-	-
CO 3 :	3	2	3	-	2
CO 4 :	3	2	3	-	2
CO 5 :	3	2	3	-	2
AVG:	**3**	**2.2**	**3**	**-**	**1.2**

XT3352 DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To comprehend the fundamental concepts of Database Management Systems
- To model the data and map it using Entity Relationship Model and Enhanced Entity Relationship Model
- To comprehend Fundamental knowledge about Data Storage
- To understand the need for Normalization and Normalize Relations
- To comprehend to work with SQL Queries and need of concurrency control in transactions.

UNIT I INTRODUCTION TO DBMS AND CONCEPTUAL DATA MODELING 9

File Systems – Data Base Management Systems – File Systems vs. DBMS – Architecture of a DBMS – Data Models – Data Modeling using Entity- Relationship Model – Strong Entity – Weak Entity – Unary, Binary and Ternary Relationships – Enhanced Entity Relationship Model – Case Studies

UNIT II RELATIONAL DATA MODELS AND SQL 9

Relational Data Model – Candidate Key – Primary Key – Foreign Key – Relational Algebra Operations – Select – Project – Cartesian Product – Equality Join – Outer Joins – Division – Set Operations – Mapping Entity Relationship Model to Relations – Mapping Enhanced Entity Relationship Model to Relations– Case Studies - Structured Query Language – Data Definition Language – Data Manipulation Language – Transaction Control Language – Join Queries – Nested Queries – Views – Procedure – Function – Triggers – Accessing Relational Database using PHP

UNIT III DATA STORAGE **9**

Storage and File Structure – Overview of Physical Storage Media – Magnetic Disk and Flash Storage – RAID – Tertiary Storage – File Organization – Organization of Records in Files – Data-Dictionary Storage – Database Buffer – Indexing and Hashing – Basic Concepts – Ordered Indices – B + - Tree Index Files - B + - Tree Extensions – Multiple-Key Access – Static Hashing – Dynamic Hashing – Comparison of Ordered Indexing and Hashing – Bitmap Indices – Index Definition in SQL

UNIT IV NORMALIZATION **9**

Functional Dependency – Inference Rules for Functional Dependencies – Need for Database Normalization – First Normal Form – Second Normal Form – Third Normal Form – Boyce- Codd Normal Form – Fourth Normal Form – Fifth Normal Form – Properties of Relational Decomposition – Minimal Cover – Equivalence between Functional Dependencies

UNIT V TRANSACTION MANAGEMENT **9**

Introduction to Transactions– Desirable Properties of Transaction Characterizing Schedules based on Recoverability – Characterizing Schedules based on Serializability – Concurrency Control Techniques -Deadlock – Database Recovery Techniques

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Distinguish unary, binary, and ternary relationships and give a common example of each.

CO 2 : Compare and contrast the object-oriented model with the E-R and EER models.

CO 3 : Understand the various concepts of the data storage.

CO 4 : Use normalization to decompose our relation with anomalies into well-structured relations.

CO 5 : Understand about the concept of transactions with concurrency control and deadlock.

REFERENCES:

1. Abrahm Silberschatz, Henry. F. Korth, S. Sudarsan “Database System Concepts”, McGraw Hill, Seventh Edition, Indian Edition, 2021.
2. C. J. Date, A. Kannan, S. Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
3. Raghu Ramakrishnan, Johannes Gehrke , “Database Management Systems”, McGrawHill, Fourth Edition, 2017.
4. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Pearson / Education, Seventh Edition, Boston, 2017.

CO – PO Mapping:

COURSE OUTCOMES	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	1	1	1	2
CO 2 :	3	1	1	1	2
CO 3 :	3	1	1	1	2
CO 4 :	2	1	2	1	2
CO 5 :	3	1	1	1	2
AVG:	**2.8**	**1**	**1.2**	**1**	**2**

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XC3351	OPERATING SYSTEMS	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To provide a clear understanding of the concepts that underlies operating systems
- Fundamental concepts and algorithms that will be covered are based on those used in existing commercial operating systems
- To present these topics in a general setting that is not tied to one particular operating system
- To understand the concept of file and directory structures
- Throughout the course, practical aspects that pertain to the most popular operating systems such as Unix/Linux and Windows, and some instructional operating systems will be studied as well

UNIT I INTRODUCTION TO OPERATING SYSTEMS AND PROCESSES 9

Introduction to Operating Systems – Operating-system Structure – Process Concept – Process Scheduling – Operations on Processes – Inter process communication – Communication in Client–Server Systems – Threads – Multithreading Models

UNIT II PROCESS MANAGEMENT 9

Process Synchronization – Critical-Section Problem – Synchronization Hardware - Semaphores – Classic Problems of Synchronization — Monitors - CPU Scheduling – Scheduling algorithms – Multiple Processor Scheduling

UNIT III DEADLOCKS AND MEMORY MANAGEMENT 9

Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock – Contiguous Memory Allocation – Paging – Segmentation – Demand Paging – Page replacement Algorithm – Thrashing

UNIT IV STORAGE MANAGEMENT 9

Mass Storage Structure – Disk Structure – Disk Scheduling – Disk Management – File System Interface – Access Methods – Directory and Disk Structure – File System Mounting – File System Implementation – Allocation Methods – Free Space Management

UNIT V CASE–STUDY: LINUX AND WINDOWS OPERATING SYSTEMS 9

Design Principles – Kernel Modules – Process Management – Scheduling – Memory Management – File Systems – Inter Process Communication – Security – Windows XP – Design Principles – System Component – File system

LIST OF EXPERIMENTS

1. Basic LINUX commands
2. Filters – grep, sed, awk
3. Process management - Fork, Exec commands, Wait
4. Inter-Process Communication
5. Semaphores
6. CPU Scheduling algorithms
7. Deadlocks
8. Page replacement Algorithms

TOTAL : (45+30) 75 PERIODS

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OUTCOMES:

CO 1 : Gain extensive knowledge on principles and modules of operating systems.
CO 2 : Compare performance of processor scheduling algorithms and produce algorithmic solutions to process synchronization problems.
CO 3 : Understand process management, concurrent processes, memory management and deadlocks.
CO 4 : Understand the concept of file and directory structures with storage management.
CO 5 : Use modern operating system calls such as Linux process and synchronization libraries.

REFERENCES:

1. Andrew S. Tanenbaum, "Distributed Operating Systems", Pearson Education, 1st Edition, Noida, 2002.
2. Dhamdhere, D.M., "Operating Systems : A concept Based Approach", McGraw Hill Publication, 3rd Edition, 2017.
3. Pramod Chandra P. Bhatt, "An introduction to Operating Systems: Concepts and Practice", Prentice Hall of India, 5th Edition, New Delhi, 2019.
4. Silberschatz, A. Galvin, P.B. and Gagne, G., "Operating System Concepts", John Wiley, 10th Edition, New Jersey, 2021.
5. William Stallings, "Operating Systems", Pearson Edition, 2020.

CO – PO Mapping:

COURSE OUTCOMES	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	-	-	-	1
CO 2 :	3	-	2	-	-
CO 3 :	3	-	3	-	-
CO 4 :	2	-	2	-	2
CO 5 :	2	-	2	-	1
AVG:	**2.6**	**-**	**1.8**	**-**	**0.8**

XC3352 MICROPROCESSOR AND APPLICATIONS

L	T	P	C
3	0	2	4

OBJECTIVES:

- To know about the architecture and related aspects of 8085
- To know about the architecture and related aspects of 16-bit processor 8086
- Learn to write simple programs for both 8086 and 8085 processors
- To develop an in-depth understanding of interfacing techniques
- To understand about different interfacing IC's available

UNIT I INTRODUCTION AND INTEL 8085 **9**

Architecture – Instruction format - addressing modes – Simple Program - Basic timing Diagram - Input/ Output – Interrupt system – based system design

UNIT II 16 – BIT PROCESSORS (INTEL8086) **9**

Intel 8086: Architecture – addressing modes and Instruction format interfacing of memory map; I/O device – odd and even addressed blanks – storing/retrieval of 16 bit data at an odd address – Simple Programs

UNIT III INTRODUCTION TO MICRO CONTROLLERS **9**

Introduction to Intel 8-bit and 16-bit microcontrollers – 8051 – comparisons to microprocessors – on chip D/A and A/D facilities – Watchdog timer – Capabilities of bit-wise manipulation – real time clock – Automatic process control / instrumentation applications case studies – cross assemblers

UNIT IV INTERFACING BASICS **9**

On controlling/monitoring continuous varying (analog) non-electrical signal using microprocessor/microcontrollers need for interfacing ICs – thumb wheel switch as input devices -single LED, seven segment LED as output devices – interfacing these using both memory mapped I/O and peripheral mapped I/O – D/A, A/D ICs and their signals – sample and hold IC and its usage

UNIT V INTERFACING IC'S **9**

(i) 8255-Programmable Peripheral Interface along with8085

(ii) 8254 – Programmable Interval Timer along with Intel8086

(iii) Need for the following ICs:

(a) 8251 – USART; (b) 8257 – Direct Memory Access Controller;

(c) 8259 – Programmable Interrupt Controller; (d) 8279 – Keyboard / Display Interface.

(iv) 8085 and 8051 based industrial automations

LIST OF EXPERIMENTS

Assembly Language Programming of 8085 and 8086

1. Programs for 8 / 16 bit Arithmetic, Sorting, Searching and String operations
2. Programs for Digital clock, Interfacing ADC and DAC
3. Interfacing and programming 8279, 8259, and 8253
4. Serial Communication between two microprocessors kits using 8251
5. Interfacing Stepper Motor, Speed control of DC Motor
6. Parallel communication between two microprocessors kits using Mode 1 and Mode 2 of 8255
7. Macro assembler Programming for 8086

TOTAL : (45+30) 75 PERIODS

OUTCOMES:

CO 1 : Learn the internal organization of some popular microprocessors/microcontrollers.
CO 2 : Learn hardware and software interaction and integration.
CO 3 : Learn the design of microprocessors-based systems.
CO 4 : Learn the design of microcontrollers-based systems.
CO 5 : Design the processor with appropriate interface selection.

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REFERENCES:

1. Charles M. Gilmore, “Microprocessor: Principles and Applications”, McGraw Hill International, 2nd Edition, New York, 1995.
2. Mohammed Ali Mazidi, Jancie Gillispie Mazidi and Rolin K. Mckinlay, “The 805 Microcontroller and Embedded Systems”, Pearson Education Ltd., 2nd Edition, New Delhi, 2007.
3. Mohammed Rafiquzzaman, “Microprocessors – Theory and Applications: Intel and Motorola”, Prentice Hall, Rev Edition, New Delhi, 1992-2007.
4. Mohammed Rafiquzzaman, “Microprocessors and Micro-computer Based System Design”, CRC Press, 2nd Edition, Boca Raton, 1995.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	2	-	-	-	-
CO 2 :	2	1	-	-	-
CO 3 :	3	-	2	-	-
CO 4 :	2	-	-	-	1
CO 5 :	3	1	-	-	-
AVG:	**2.4**	**0.4**	**0.4**	**-**	**0.2**

XT3353 PRINCIPLES OF ANALOG AND DIGITAL COMMUNICATION SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the concepts of signals and systems used communication signal analysis
- To design simple systems for generating and demodulating frequency modulated signals
- To understand basics of information theory and channel coding
- To understand analog to digital conversion techniques and coding techniques
- To understand the digital modulation and transmission techniques

UNIT I INTRODUCTION TO SPECTRUM ANALYSIS **9**

Classification of Signals and Systems – Convolution – Complex Fourier series – Fourier Transform – Magnitude and Phase Spectrum – Power Spectral Density – LTI System Properties – Impulse Response

UNIT II ANALOG MODULATION TECHNIQUES **9**

Amplitude Modulation – Conventional AM, DSB-SC, SSB-SC, VSB – frequency Modulation – Modulation and Demodulation Principles – Spectrum – Bandwidth

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UNIT III INFORMATION THEORY AND CODING TECHNIQUES 9

Information – Entropy – information rate – Entropy Coding Techniques – Source coding – Shannon Fano Coding – Huffman Coding – channel capacity theorem, Introduction to error control coding – Block codes, burst error correction

UNIT IV DIGITAL TRANSMISSION OF ANALOG SIGNALS 9

Sampling – Quantization – Signal to Quantization Noise Ratio – Companding – Pulse code modulation – Differential pulse code modulation – Vocoders Principles – LPC, MPLP, CELP

UNIT V DIGITAL MODULATION AND TRANSMISSION 9

Shift Keying Techniques – Binary ASK, Binary FSK, Binary PSK, QPSK – Modulation and Demodulation Principles – Comparison in terms of Bandwidth and Bit Error Rate

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Understand fundamentals techniques used to analyse the spectrum of modulated signals and properties of LTI systems.
CO 2 : Understand the analog modulation demodulation principles.
CO 3 : Understand the information, source coding and channel coding principles.
CO 4 : Understand the principles of analog to digital conversion and transmission techniques of voice signals.
CO 5 : Understand the digital modulation demodulation principles.

REFERENCES:

1. H.Taub, D.L Schilling, GoutamSaha, “Principles of Communication Systems”, McGraw Hill Education, 4 th Edition, New Delhi, 2017.
2. B.P.Lathi and Zhi Ding, “Modern Digital and Analog Communication Systems”, Oxford University Press, 5th Edition, New York, 2019.
3. John G.Proakis, Masoud Salehi, “Fundamentals of Communication Systems”, Pearson Education, Delhi, 2nd Edition, 2008.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO 1 :	3	-	-	-	-
CO 2 :	3	-	2	-	-
CO 3 :	3	2	2	-	-
CO 4 :	3	-	2	-	1
CO 5 :	3	1	2	-	1
AVG:	**3**	**0.6**	**1.6**	**-**	**0.4**

XT3361 DATABASE MANAGEMENT SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

LIST OF EXPERIMENTS

1. Data Definition Language – Create – Alter – Drop – Enforcing Primary Key and Foreign Key Constraints – Data Manipulation Language – Insert - Delete – Update – Transaction Control Language – Commit – Rollback- Save Points
2. Cartesian Product – Equality Join – Left Outer Join – Right Outer Join – Full Outer Join
3. Set Operations – Creating Views – Creating Sequence – Indexing
4. Aggregate Functions – Analytic Functions – Nested Queries
5. Creating Triggers and Stored Procedures
6. Accessing and Updating a Relational Database using Java
7. Case Studies – Applications – Payroll, Inventory, Grade Processing, Tax Calculation, Electricity Bill

TOTAL : 60 PERIODS

OUTCOMES:

CO 1 : Implementation of DDL commands
CO 2 : Explore various join operations
CO 3 : Implementation of set operations and aggregate functions
CO 4 : Creation of triggers and stored procedures
CO 5 : Create a database for real world applications

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	1	1	1	2
CO 2 :	3	1	1	1	2
CO 3 :	3	1	1	1	2
CO 4 :	2	1	2	1	2
CO 5 :	3	1	1	1	2
AVG:	**2.8**	**1**	**1.2**	**1**	**2**

MA3451 **DISCRETE STRUCTURES** **L T P C**
4 0 0 4

OBJECTIVES:

- To introduce Mathematical Logic, Inference Theory and proof methods
- To provide fundamental principles of combinatorial counting techniques
- To introduce the algebraic structures and their properties
- To introduce graph models, their representation, connectivity and traversability
- To provide exposure to trees and demonstrate their utility

UNIT I LOGIC AND PROOFS **12**

Propositional Logic – Propositional Equivalences – Normal Forms – Predicates and Quantifiers – Nested Quantifiers – Rules of Inference – Introduction to Proofs – Proof Methods and Strategy

UNIT II COMBINATORICS **12**

Mathematical Induction – Strong Induction and Well Ordering – The Basics of Counting – The Pigeonhole Principle – Permutations and Combinations – Recurrence Relations - Solving Linear Recurrence Relations Using Generating Functions - Inclusion–Exclusion Principle and its Applications

UNIT III ALGEBRAIC STRUCTURES **12**

Groups – Subgroups – Homomorphism of groups – Normal Subgroup and Coset – Lagrange's Theorem – Definitions and Examples of Rings and Fields

UNIT IV GRAPHS **12**

Graphs and Graph Models – Graph Terminology and Special Types of Graphs – Matrix Representation of Graphs and Graph Isomorphism – Planar Graphs - Connectivity – Euler and Hamiltonian graphs

UNIT V TREES **12**

Trees – Characterization of trees - Rooted trees – sorting – weighted Trees and Prefix codes - Shortest path problem - Minimum Spanning Tree Problem

TOTAL : 60 PERIODS

OUTCOMES:

CO 1 : Understand the validity of the logical arguments, mathematical proofs and correctness of the algorithm.
CO 2 : Apply combinatorial counting techniques in solving combinatorial related problems.
CO 3 : Understand the significance of algebraic structural ideas used in coding theory and Cryptography.
CO 4 : Use graph models and their connectivity, traversability in solving real world problems.
CO 5 : Apply trees and their utilities.

REFERENCES:

1. Grimaldi R.P., "Discrete and Combinatorial Mathematics", Pearson Education Pvt. Ltd., 5th Edition, Singapore, 2004.
2. Kenneth H. Rosen, " Discrete Mathematics and its Applications", Tata Mc Graw Hill Pub. Co. Ltd., Seventh Edition, Special Indian Edition, New Delhi, 2011.
3. Tremblay J. P. and Manohar R, " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd., Third Edition, New Delhi, 2013.
4. Thomas Koshy," Discrete Mathematics with Applications", Elsevier Publications, Boston, 2004.

5. Seymour Lipschutz and Mark Lipson, ”Discrete Mathematics”, Schaum‘s Outlines, Tata McGraw Hill Pub. Co. Ltd., Third Edition, New Delhi, 2013.
6. Douglas B. West, “Introduction to Graph Theory”, Prentice Hall, 2th Edition, New Jersy, 2001.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	3	-	-
CO 2 :	3	2	3	-	-
CO 3 :	3	2	3	-	-
CO 4 :	3	2	3	-	-
CO 5 :	3	2	3	-	-
AVG:	**3**	**2**	**3**	**-**	**-**

XC3401 **LINEAR ALGEBRA** **L T P C**
3 0 0 3

OBJECTIVES:

- To acquire the thorough knowledge in vector space, sub spaces, basis and dimensions
- To impart the basic idea of linear transformations, their representation by matrices, geometry oflinear operators and change of basis
- To build a base in the analysis of a single linear transformation on a finite dimensional vector space; the analysis of characteristics, values and diagonalizable transformations
- To set a base in the study of finite dimensional inner product spaces in detail, orthogonality, orthogonal projections and the diagonalization
- To follow the required vector space in real time applications such as networks, linear programming, statistics and probability

UNIT I VECTOR SPACES **9**

Vector spaces and subspaces — Linear combinations and Linear system of equations, Span, Linear independence and dependence - Null space, Column space, and Row space – Basis and dimension of a vector space

UNIT II LINEAR TRANSFORMATION **9**

Introduction to linear transformations – General Linear Transformations – Rank and nullity - Kerneland range – Matrices of general linear transformation- Geometry linear operators- Change of basis

UNIT III INNER PRODUCT SAPCES **9**

Inner product, Length, angle and orthogonality – Orthogonal sets – Orthogonal projections – Inner product spaces — Orthonormal basis: Gram-Schmidt process — QR Decomposition – Best Approximation, Least-squares

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UNIT IV EIGEN VALUES AND EIGEN VECTORS 9

Introduction to Eigen values – Diagonalizing a matrix – Orthogonal diagonalization – Applications to differential equations – Positive definite matrices – Similar matrices –Quadratic forms – Quadratic surfaces Singular value decomposition

UNIT V APPLICATIONS 9

Matrices in Engineering – Graphs and Networks – Markov Matrices, Populations and Economics –Linear Programming – Fourier Series: Linear Algebra for functions – Linear Algebra for statistics andprobability

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : The student can set up the base in the basic concepts of vector spaces and dimensions.
CO 2 : Able to study completely about linear transformations and matrices.
CO 3 : Will be familiarized with the techniques of diagonalization by inner product spaces.
CO 4 : Made the objectives clear to get the Eigen values and Eigen vectors required for diagonalization.
CO 5 : Be ready to apply the linear algebra concepts of solving real time problems in various fields.

REFERENCES:

1. David C. Lay, "Linear Algebra and its Applications", Pearson Education, third edition, Delhi, 2011.
2. Gilbert Strang, "Linear Algebra and its Applications", Thomson Learning, fourth edition, Belmont,2006.
3. Howard Anton and Chris Rorres, "Elementary Linear Algebra", Wiley, New York, 2011.
4. Kenneth Hoffman & Ray Kunze, "Linear Algebra", Pearson India education services, second Edition, Noida, 2015.
5. Steven J. Leon, "Linear Algebra with Applications", Pearson Education UK, Linear Algebra withApplications, 2006.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO 1 :	3	2	3	-	-
CO 2 :	3	2	3	-	-
CO 3 :	3	2	3	-	-
CO 4 :	3	2	3	-	-
CO 5 :	3	2	3	-	-
AVG:	**3**	**2**	**3**	**-**	**-**

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XC3451	SOFTWARE ENGINEERING	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To assist the student in understanding the basic theory of software engineering
- To apply these basic theoretical principles to a group software development project
- To understand the importance of analysis and design
- To stress the need for testing before deployment
- To familiarize the functions of a software project manager

UNIT I INTRODUCTION TO SOFTWARE ENGINEERING 9

The Nature of Software – Software Engineering – Software Process Structure - Software Process Models - Agile Development - Software Engineering Principles

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION 9

Requirements Engineering – Requirements Elicitation – Use Case Development – Requirements Negotiation – Requirements Modelling

UNIT III ANALYSIS AND DESIGN 9

Design Concepts – Architectural Design – Component Level Design – User Interface Design – Pattern Based Design – Designing Web Applications – Designing Mobile Apps

UNIT IV SOFTWARE QUALITY AND TESTING 9

Software Quality – Quality Assurance - Software Testing Strategies – Testing Conventional Applications – Testing Object Oriented Applications – Testing Web Applications – Testing Mobile Applications

UNIT V SOFTWARE PROJECT MANAGEMENT 9

Project Management Concepts – Process and Product Metrics – Project Estimation – Project Scheduling – Risk Management – Maintenance and Reengineering

LIST OF EXPERIMENTS

1. Feasibility Study
2. Requirements Engineering
3. Requirements Analysis
4. Software Design using UML
5. Software Implementation
6. Software Testing

A mini project comprising of the above-mentioned phases of software development

TOTAL: (45+30) 75 PERIODS

OUTCOMES:

CO 1 : Understand the importance of software engineering as a discipline.
CO 2 : Able to elicit requirements and model them using appropriate methods.
CO 3 : Identify and apply appropriate software architectures and patterns to carry out high level design of a system.
CO 4 : Carry out testing and ensure quality of the software.
CO 5 : Understand the role of software project management in software engineering.

REFERENCES:

1. Pressman, R.S. “Software Engineering: A Practitioner Approach”, 8th Edition Revised, McGraw Hill, Chennai, 2019.
2. Sommerville, I. “Engineering Software Products”, Global Edition, Pearson Education, 2021.
3. Sommerville, I. “Software Engineering, Global Edition”, 10th Edition, Pearson Higher Education, New Jersey, 2016.
4. Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, “Software Engineering”, Prentice Hall India, New Delhi, 2010.
5. Pankaj Jalote, ”Software Engineering : A Precise Approach”, Wiley India, New Delhi, 2010.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	3	-	-	-
CO 2 :	3	-	3	-	-
CO 3 :	3	2	3	-	-
CO 4 :	3	2	2	-	2
CO 5 :	3	-	3	2	3
AVG:	**3**	**1.4**	**2.2**	**0.4**	**1**

XC3452 **JAVA PROGRAMMING** **L T P C**
3 0 0 3

OBJECTIVES:

- To familiarize the Object-Oriented Programming (OOP) concepts, such as abstraction, encapsulation, instances, initializations, polymorphism, overloading, inheritance and generic programming
- To learn the OOP specific programming languages such as C++ and Java
- To write programs to solve problems using the OOP language constructs rather than structural programming
- To understand and know the importance of OOP in real-world problems
- To familiarize students to create UI applications
- To expose the usage of streams to store and retrieve data

UNIT I INTRODUCTION TO OBJECT ORIENTED PROGRAMMING AND JAVA 9

Introduction to OOP – Thinking Object Oriented - Object Oriented Design. Introduction to Java –JVM - Classes and methods – Varieties of Classes – Messages, Instances and Initialization -Constructors and Destructors – Object and Class in java.lang.class - Namespaces – Scope –Method Overloading – Arrays – Type Casting - Constant Objects and Member Functions –Composition - this Pointer – Static Instances

UNIT II INHERITANCE AND EXCEPTION HANDLING IN JAVA 9

Package Access - Java API Packages – Inheritance - Sub Classes and Subclass Types - – Replacement and Refinement – Implications of Inheritance - Exception Handling- Java Exception Hierarchy - Declaring New Exception Types – Assertions - Garbage Collection and Method finalize– String Class - Converting between Types - Inheritance – an Intuitive Description of Inheritance Subclass, Subtype, and Substitutability – Forms of Inheritance," is-a" and "has-a" rule – Multiple Inheritance

UNIT III POLYMORPHISM IN JAVA 9

Polymorphism - Abstract Classes and Methods - Varieties of Polymorphism – Polymorphic Variables – Overloading and Overriding – Pure Polymorphism - Polymorphic Processing, Operator instance of and Down Casting - final Methods and Classes – Clone Class - Interface – Implementation – Multithreading

UNIT IV FILES AND STREAMS IN JAVA 9

Files and Streams – Formatted Output - Object Concurrency - Serialization - Generic Collections - Generic Classes and Methods - Visibility and Dependency – Reflection and Introspection – Java Utility Packages and Bit Manipulation – Java Collections

UNIT V GUI, MULTIMEDIA AND DATABASE IN JAVA 9

GUI Components – Graphics, 2D and 3D - Introduction to Java Applets – Frameworks - Multimedia: Applets and Applications – Example Frameworks: Swing and AWT – Accessing Databases with JDBC – Case Study: ATM System, Payroll System

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Understand the fundamentals of object-oriented programming in Java.
CO 2 : Understand the appropriate roles of subtyping and inheritance, and use them effectively.
CO 3 : Implement polymorphic code and handle run time errors using exception handling
CO 4 : Implement concurrent applications using threads. Identify the generic classes and methods to implement an application. Use streams to store and retrieve data from database / files.
CO 5 : Create user-interface applications using GUI components and to understand the event handling principles.

REFERENCES:

1. Timothy Budd, "An Introduction to Object-Oriented Programming", Third Edition, Pearson Education, 2008.
2. Paul Deitel and Harvey Deitel, "Java How to Program (Early Objects)", Tenth Edition, Pearson 2017.
3. Marc Lay, Patrick Niemeyer, Daniel Leuck, "Learning Java", Fifth Edition, O'Reilly, 2020.
4. Joshua Bloch, "Effective Java:", Third Edition, Pearson, 2022.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	3	3	1	-
CO 2 :	3	2	3	1	-
CO 3 :	3	2	3	1	2
CO 4 :	3	2	3	1	2
CO 5 :	3	2	3	1	2
AVG:	**3**	**2.2**	**3**	**1**	**1.2**

XT3451 **COMPUTER NETWORKS** **L T P C**
3 0 2 4

OBJECTIVES:

- To understand the division of network functionality into layers
- To understand the TCP/IP protocol suite
- To understand the flow of data between the nodes and building blocks of networks
- To Learn flow control and congestion control algorithms
- To understand the network addressing techniques

UNIT I FUNDAMENTALS **9**

Data communication – Network Topologies – INTERNET – Protocols and Standards – Layered Architecture – Responsibilities of the Layers – Addressing – Transmission Media – Multiplexing – Switching

UNIT II MAC LAYER **9**

Error Detection and Correction – Data link Control – Multiple Access – Wired LAN – Wireless LAN – Connecting Devices

UNIT III NETWORK LAYER **9**

Logical Addressing – IPv4, IPv6, IPv4 to IPv6, CLDR – Protocols – IP ICMP, IGMP, ARP, IGRP – Forwarding – Unicast and Multicast Routing Protocols

UNIT IV TRANSPORT LAYER **9**

Process – To – Process Delivery: UDP, TCP, SCTP – Congestion Control and QOS

UNIT V APPLICATION LAYER **9**

Layer 7 Protocols – DHCP, DNS, TELNET, E-mail, FEP, WWW and Http, SNMP – Network Security

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LIST OF EXPERIMENTS

1. Familiarize with the layered approach of the protocol stack
2. Familiarize with packet capturing tools in Java and Wireshark
3. Familiarize with IP addressing and subnetting concepts
4. Analyze the existing routing protocols and implement any one of them
5. Implement client server programs using sockets which has multiple clients
6. Implement a simple firewall system

TOTAL: (45+30) 75 PERIODS

OUTCOMES:

CO 1 : Identify the components required to build different types of networks.
CO 2 : Trace the flow of information from one node to another node in the network.
CO 3 : Identify the classes of Network address.
CO 4 : Choose functionalities at each layer for different applications.
CO 5 : Evaluate the protocols in network layer from QOS perspective.

REFERENCES:

1. Andrew S. Tanenbaum, Nick Feamster, David Wetherall" Computer Networks", Pearson, 2021.
2. Behrouz. A. Forouzan, "Data communications and Networking ", Fifth Edition, McGraw-Hill Publishers, New York, 2017.
3. Behrouz. A. Forouzan,"TCP/IP Protocol Suite", McGraw-Hill Publishers, 2021.
4. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet ", Pearson, Education, 2021.
5. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A System Approach", Morgan Kaufmann Publishers, 5th Edition, 2012.
6. M. Barry Dumas, Morris Schwartz, "Principles of Computer Networks and communications", Pearson, 1st Edition, New Jersey, 2013.
7. W. Richard Stevens, G.Gabrani, "TCP/IP Illustrated, Volume 1", Pearson, Boston, 2009.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO 1 :	3	-	-	-	-
CO 2 :	3	3	2	-	-
CO 3 :	3	3	3	-	-
CO 4 :	3	3	3	-	2
CO 5 :	3	3	3	-	-
AVG:	**3**	**2.4**	**2.2**	**-**	**0.4**

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CY3251	ENVIRONMENTAL SCIENCE AND SUSTAINABILITY	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

UNIT I ENVIRONMENT AND BIODIVERSITY 6

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

UNIT II ENVIRONMENTAL POLLUTION 6

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts .

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.

UNIT IV SUSTAINABILITY AND MANAGEMENT 6

Development, GDP ,Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols. Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry - A case study.

UNIT V SUSTAINABILITY PRACTICES 6

Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio-economical and technological change.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

CO1: To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.

CO2: To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.

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CO3: To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.

CO4: To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.

CO5: To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.

TEXTBOOKS:

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, Pearson; 1st edition, 2011.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, CL Engineering; International edition, 2015.
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. Daniel J. Sherman, David R. Montgomery, " Environmental Science and Sustainability", W. W. Norton, Incorporated, 2nd edition, 2023.
2. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', B.S Publications, 2010.
3. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publications, Mumbai, 2001.
4. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
5. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 3rd edition, 2015.
6. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO 1 :	2	-	-	-	1
CO 2 :	2	-	2	1	1
CO 3 :	2	-	-	-	2
CO 4 :	2	-	2	-	1
CO 5 :	2	-	2	-	2
AVG:	**2**	**-**	**1.2**	**0.2**	**1.4**

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XC3461	JAVA PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

LIST OF EXPERIMENTS

1. To create runtime polymorphism using abstract class, interface
2. To create callback feature using interface
3. To create a program for interface inheritance
4. To implement a user defined package
5. To implement a user defined checked exception and unchecked exceptions
6. To create inter-thread communication using shared memory, piper stream
7. To implement socket connections (UDP, TCP)

TOTAL: 60 PERIODS

OUTCOMES:

CO 1 : Implement fundamentals of object-oriented programming in Java.
CO 2 : Implement callback feature using interface and interface inheritance.
CO 3 : Implement user defined package, user defined check exceptions.
CO 4 : Create inter-thread communications.
CO 5 : Implement socket connections.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	3	3	1	2
CO 2 :	3	2	3	1	2
CO 3 :	3	2	3	1	2
CO 4 :	3	2	3	1	2
CO 5 :	3	2	3	1	2
AVG:	**3**	**2.2**	**3**	**1**	**2**

MA3551	PROBABILITY AND STATISTICS	L	T	P	C
		4	0	0	4

OBJECTIVES:

- To introduce the idea of one dimensional and two dimensional random variables and the associated properties of their distribution functions
- To impart knowledge of certain special distribution with examples relating to real time situations
- To enable them to estimate the value of the parameters involved in the specific distribution from a possible continuum of alternatives
- To give an idea of testing the statistical hypothesis claimed based on a set of data points using standard sampling distributions
- To establish relationship that make it possible to predict one or more variable in terms of others using correlation and regression analysis

UNIT I PROBABILITY DISTRIBUTIONS 12

Probability Basics - Baye's Theorem - Random Variables - Probability Distributions – Continuous Random Variables - Probability Density Functions - Multivariate Distributions - Marginal Distributions -Conditional Distributions - Expected Value of a Random Variable - Moments - Moment Generating Functions-Conditional Expectation

UNIT II SPECIAL DISTRIBUTIONS 12

Discrete Uniform Distribution - Bernoulli Distribution - Binomial Distribution - Poisson Distribution - Uniform Distribution -Gamma, Exponential and Chi Square Distributions – Normal Distribution

UNIT III ESTIMATION THEORY 12

Unbiased Estimators - Efficiency - Consistency - Sufficiency - Robustness -Method of Moments - Method of Maximum Likelihood - Interval Estimation of Means, Differences Between Means, Variances and Ratio of Two variances

UNIT IV HYPOTHESIS TESTING 12

Sampling Distributions- Central Limit Theorem -Testing a Statistical Hypothesis - Tests Concerning Means, Differences Between Means, Variances, Analysis of r x c Table - Goodness of Fit

UNIT V REGRESSION AND CORRELATION 12

Linear Regression - Method of Least Squares - Normal Regression Analysis - Normal correlation Analysis - Multiple Linear Regression

TOTAL: 60 PERIODS

OUTCOMES:

CO 1 : It enables the students to understand the nature and properties of density functions and hence determine the moments and moment generating functions of any random variable.

CO 2 : It helps the students to choose appropriate distribution for the real time problems and hence interpret the analysis mathematically.

CO 3 : It make the students to obtain the value of the point estimators using the method of moments and method of maximum likelihood.

CO 4 : It imparts the knowledge of various test statistics used in hypothesis testing for mean and variances of large and small samples.

CO 5 : It equips the students to determine the regression line using the method of least square and also to calculate the partial and multiple correlation coefficient for the given set of data points.

REFERENCES:

1. Gupta S. C. and Kapoor V. K. (2002), “Fundamentals of Mathematical Statistics”, Sultan Chand and Sons, 11th Edition, New Delhi, 2002.
2. Jay L. Devore, “Probability and Statistics for Engineers”, CENGAGE Learning India Private Ltd., Boston, 2008.
3. John E. Freund ,” Mathematical Statistics with Applications”, 8th Edition, Pearson Education, New Delhi, 2017.
4. Richard A. Johnson, Irwin Miller and John Freund, “Miller and Freund’s Probability and Statistics for Engineers”, 8th edition, Pearson Education, New Delhi, 2015.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	3	-	-
CO 2 :	3	2	3	-	-
CO 3 :	3	2	3	-	-
CO 4 :	3	2	3	-	-
CO 5 :	3	2	3	-	-
AVG:	**3**	**2**	**3**	**-**	**-**

XT3501 OBJECT ORIENTED ANALYSIS AND DESIGN L T P C 3 0 2 4

OBJECTIVES:

- To learn the concept of Object Oriented Software Development Process
- To get acquainted with UML Diagrams
- To understand Object Oriented Analysis Processes
- To learn the common patterns in OO design and implement them
- To work out on the alternative development processes

UNIT I INTRODUCTION TO OBJECT ORIENTED SYSTEMS 9

Overview of OO Systems Development – Object basics – OO Systems development life cycle – OO methodologies: Rumbaugh et al.’s Object Modeling Technique – The Booch Methodology – The Jacobson et al. Methodology – Patterns – Frameworks – The Unified Approach

UNIT II STATIC AND DYNAMIC MODELLING IN UML 9

UML – Class Diagram – Use Case Diagram – Interaction Diagram: Sequence Diagram – Collaborative Diagram – State Chart Diagram – Activity Diagram – Component Diagram – Deployment Diagram

UNIT III OBJECT ORIENTED ANALYSIS 9

Approaches for Identifying Classes – Noun Phrase Approach – Common Class Patterns Approach – Use-Case Driven Approach – Classes, Responsibilities and Collaborators – Identifying Object Relationships, Attributes and Methods – Case Study: Banking System

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UNIT IV OBJECT ORIENTED DESIGN – I **9**

Object Oriented Design Axioms and Corollaries – Design Patterns - Designing Classes – Refining Attributes – Designing Methods and Protocols – Relational Database management Systems – Object Oriented Database Management Systems – Object Relational Systems: Object Relation Mapping – Table Class Mapping – Table Multiple Classes Mapping – Table Inherited Classes Mapping – Keys for Instance Navigation – Multi-database Systems – Designing Access Layer Classes

UNIT V OBJECT ORIENTED DESIGN – II **9**

View Layer: Designing Interface Objects – Purpose of View Layer Interface – Prototyping the User Interface – Case Studies: Inventory Control System; Library Management System; Hospital Management System; Online Examination System; Online Railway Reservation System

LIST OF EXPERIMENTS

1. Introduction to UML
2. Stock maintenance
3. Passport automation system
4. Book bank
5. Software personnel management system
6. E-ticketing
7. BPO Management System
8. Conference Management System

TOTAL: (45+30) 75 PERIODS

OUTCOMES:

CO1: Master the fundamental principles of Object Oriented programming.
CO2: Master key principles in Object Oriented analysis, design, and development.
CO3: Familiarize with the application of the Unified Modeling Language (UML) towards analysis and design.
CO4: Master common patterns in Object Oriented design and implement them.
CO5: Familiarize with alternative development processes.

REFERENCES:

1. Bahrami, Ali, “Object oriented systems development” Boston, Mass: Irwin/McGraw-Hill, 1999.
2. Booch, Grady, James Rumbaugh, and Ivar Jacobson, “The unified modeling language user guide”, Pearson Education India, 1999.
3. Page-Jones, Meilir, “Fundamentals of object-oriented design in UML”, Addison-Wesley Professional, 2000.
4. Satzinger, John W, Robert B. Jackson, and Stephen D. Burd, “Object-Oriented Analysis and Design with the Unified Process”, Thomson Course Technology, 2005.
5. Booch, Grady, Robert A. Maksimchuk, Michael W. Engel, Bobbi J. Young, Jim Conallen, and Kelli A. Houston, “Object-Oriented Analysis and Design with Applications”, Vol. 3. Addison-Wesley, 2008.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	-	-	-	1
CO 2 :	3	3	-	-	-
CO 3 :	3	3	3	-	-
CO 4 :	3	2	3	-	-
CO 5 :	3	-	2	-	2
AVG:	**3**	**1.6**	**1.6**	**-**	**0.6**

XT3551 DATA WAREHOUSING AND MINING L T P C
3 0 2 4

OBJECTIVES:

- To create a clean, consistent repository of data within a data warehouse for large corporations
- To know the functionalities of data mining and preprocessing techniques
- To perform classification and prediction using various algorithms
- To familiarize the concepts of clustering and frequent itemset mining
- To expose outlier concepts and understand the applications of data mining and its trends

UNIT I DATA WAREHOUSING & ONLINE ANALYTICAL PROCESSING 9

Overview- Data Warehousing Architecture – Data Warehousing Components – Building a Data Warehouse - Data Warehousing schemas – Data Extraction, Cleanup, and Transformation Tools – Metadata - Multidimensional data model - Online Analytical Processing (OLAP) – Need for OLAP - Operations –OLAP Guidelines–Categories of OLAP tools– Patten and Models

UNIT II KDD & DATA PREPROCESSING 9

Data Mining: Data Mining Functionalities–Steps in Knowledge Discovery process–Major issues in data mining. Data Objects and Attribute Types - Basic Statistical Descriptions of Data - Measuring Data Similarity and Dissimilarity. Data Preprocessing – Data Cleaning –Data Integration and Transformation–Data Reduction–Data Discretization and Concept Hierarchy

UNIT III CLASSIFICATION AND PREDICTION 9

Classification: Basic Concepts - Decision Tree Induction - Bayes Classification Methods - Rule-Based Classification - Model Evaluation and Selection - Techniques to Improve Classification Accuracy

UNIT IV CLUSTERING AND FREQUENT ITEMSET MINING 9

Cluster Analysis – Partitioning Methods – Hierarchical Methods – Density-Based Methods – Grid-Based Methods–Evaluation of Clustering. Mining Frequent Patterns, Associations, and Correlations: Basic Concepts – Frequent itemset, Closed Itemset, and association rules –Frequent Itemset Mining Methods–Apriori – FP Growth – Pattern Evaluation Methods: From Association Analysis to Correlation Analysis

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UNIT V OUTLIER DETECTION, APPLICATIONS, AND TRENDS 9

Outlier Detection: Outliers and Outlier Analysis - Statistical Approaches -Proximity-Based Approach: Distance-based Outlier Detection – Clustering–Based Approaches - Classification-Based Approaches. Mining Complex Data Types - Other Methodologies of Data Mining- Data Mining Applications

LIST OF EXPERIMENTS

1. Creation of a data warehouse
2. Exploration of any two data mining tools
3. Exploration of Python packages for data mining task
4. Exercises related to Exploratory Data Analysis
5. Implementation of the Apriori Algorithm
6. Implementation of FP-Growth Algorithm
7. Implementation of Decision Tree
8. Implementation of Naïve Bayes
9. Implementation of K-means
10. Implementation of Hierarchical and DBSCAN clustering

TOTAL: (45+30) 75 PERIODS

OUTCOMES:

CO 1 : Understand the need for a data warehouse and design an OLAP data model for real-time application.
CO 2 : Preprocess the real-time data set.
CO 3 : Perform mining by applying classification algorithms in the real-time dataset.
CO 4 : Perform mining of frequent patterns and make decisions by performing clustering analysis.
CO 5 : Able to detect anomalies in the real-time applications.

REFERENCES:

1. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, McGraw – Hill Education Edition, 2017.
2. G. K. Gupta “Introduction to Data Mining with Case Studies”, Third Edition, Easter Economy Edition, Prentice Hall of India, New Delhi, 2014.
3. Jiawei Han, Jian Pei, Hanghang Tong,” Data Mining: Concepts and Techniques”, Fourth Edition, Elsevier, Reprinted, Morgan Kaufmann, 2022.
4. Pang-Ning Tan, Michael Steinbach, and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2016.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO 1 :	3	-	2	-	-
CO 2 :	3	2	2	-	1
CO 3 :	3	2	3	-	2
CO 4 :	3	2	3	-	1
CO 5 :	3	2	2	1	-
AVG:	**3**	**1.6**	**2.4**	**0.2**	**0.8**

XT3552	WEB TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basics of web and HTML
- To understand the concepts of style sheets and XML
- To learn JavaScript to create interactive web pages
- To learn server-side programming using servlets and JSP
- To learn the PHP scripting

UNIT I WEBSITE BASICS AND HTML 9

Web Essentials: Clients, Servers, and Communication. The Basic Internet Protocols –The World Wide Web – HTTP request message – HTTP response message-Web Clients – Web Servers. Markup Languages: XHTML - An Introduction to HTML - Basic XHTML Syntax and Semantics-Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms- Defining XHTML's Abstract Syntax – Creating HTML documents - HTML5.0

UNIT II STYLE SHEETS AND XML 9

Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout-Beyond the Normal Flow-CSS3.0. Basics of AJAX; Introduction to XML and its Application; Syntax Rules for creating XML document; XML Elements; XML Attributes; XML Tree; XML Namespace; XML schema languages: Document Type Definition (DTD), XML Schema Definition (XSD); XSD Simple Types, XSD Attributes; XSD Complex Types; XML Style Sheets (XSLT)

UNIT III CLIENT-SIDE SCRIPTING WITH JAVASCRIPT 9

Structure of JavaScript Program; Variables and Data Types; Statements: Expression, Keyword, Block; Operators; Flow Controls, Looping, Functions; Popup Boxes: Alert, Confirm, Prompt; Objects and properties; Constructors; Arrays; Built-in Objects: Window, String, Number, Boolean, Date, Math, RegExp, Form, DOM; User Defined Objects; Event Handling and Form Validation, Error Handling, Handling Cookies, jQuery Syntax; jQuery Selectors, Events and Effects; Introduction to JSON

UNIT IV SERVER-SIDE SCRIPTING WITH SERVLETS AND JSP 9

Server-Side Programming : Java Servlets- Life Cycle- Parameter Data- State Management - Sessions-Cookies-URL Rewriting- Event Driven Tracking – Databases and Java Servlets. JSP Technology: Introduction-JSP and Servlets – Basic JSP – Running JSP Applications - JavaBeans Classes and JSP -Tag Libraries and Files-Support for the Model-View-Controller Paradigm - Databases and JSP

UNIT V SERVER-SIDE SCRIPTING USING PHP 9

PHP Syntax, Variables, Data Types, Strings, Constants, Operators, Control structure, Functions, Array, Creating Class and Objects, PHP Forms, Accessing Form Elements, Form Validation, Events, Cookies, and Sessions, Working with PHP and MySQL, Connecting to Database, Creating, Selecting, Deleting, Updating Records in a table, Inserting Multiple Data, Introduction to CodeIgniter, Laravel, WordPress.

TOTAL: 45 PERIODS

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OUTCOMES:

CO 1 : Design simple web pages using markup languages like HTML and XHTML.
CO 2 : Formatting the document using CSS and data using XML.
CO 3 : Create dynamic web pages using DHTML and JavaScript that are easy to navigate.
CO 4 : Program server-side web pages using Servlets and JSP that must process requests from client-side web pages.
CO 5 : Design web pages using PHP with MySQL.

REFERENCES:

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education,2012.
2. Uttam K. Roy, "Web Technologies" – Oxford University Press, 2011.
3. Robin Nixon, "Learning Php, MySQL & JavaScript", Fifth Edition, O'Reilly, 2018.
4. Harvey Deitel, Paul Deitel, and Abbey Deitel, "Internet & World Wide Web How to Program", Fifth Edition, Pearson Education, 2018.
5. N. P. Gopalan, T. A. Adikesavan, "Web Technology: A Developers Perspective", PHI Learning 2014.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	3	-	-
CO 2 :	3	2	3	-	1
CO 3 :	3	2	3	-	-
CO 4 :	3	2	3	1	1
CO 5 :	3	2	3	1	-
AVG:	**3**	**2**	**3**	**0.4**	**0.4**

XC3551 **THEORY OF COMPUTATION** **L T P C**
4 0 0 4

OBJECTIVES:

- To introduce finite state automata as language acceptor of regular sets
- To introduce context free grammars and context free languages and their normal forms
- To explain pushdown automata as the language acceptor of context-free language
- To demonstrate Turing machine as a mathematical model of language acceptor of recursively enumerable language and computer of computing number theoretic functions
- To explain the Chomsky hierarchy among the formal languages

UNIT I REGULAR SETS AND FINITE STATE AUTOMATA 12

Finite state automata - Deterministic and non-deterministic model – Languages accepted by Finite State Automata - Regular Expression - Pumping Lemma for regular set

UNIT II CONTEXT FREE LANGUAGE 12

Grammar - Context Free Grammars - Derivation trees - Simplification of context - Free grammar (only Construction and no proof of equivalence of grammars) - Chomsky normal Form - Greibach Normal Form

UNIT III PUSH DOWN AUTOMATA AND PROPERTIES OF CONTEXT FREE LANGUAGES 12

Pushdown automata - Push down automata and Context free languages - Pumping lemma for context free languages

UNIT IV TURING MACHINE AND UNDECIDEABILITY 12

Turing Machine model - Computational languages and functions - Modifications of Turing machines (only description, no proof for theorems on equivalence of the modification) - Problems - Properties of recursive and recursively enumerable languages - Universal Turing Machine and the un decidable problem

UNIT V THE CHOMSKY HIERARCHY 12

Linear Regression - Method of Least Squares - Normal Regression Analysis - Normal correlation Analysis - Multiple Linear Regression

TOTAL: 60 PERIODS

OUTCOMES:

CO 1 : Design finite state automata to accept regular sets.
CO 2 : Form context free grammar to generate context free language and able to obtain its normal form.
CO 3 : Design pushdown automata to accept a context free language.
CO 4 : Design Turing machine to accept recursive enumerable language, to compute number theoretic functions and able to understand the limitation of Turing computing model.
CO 5 : Understand overall set theoretical relationship of formal languages.

REFERENCES:

1. Hopcroft J.E. and Ullman J.D. “Introduction to Automata Theory, Languages and Computation”, Narosa Publishing House,2002.
2. Hopcroft, J.E., Rajeev Motwani and Ullman, J.D. “Introduction to Automata Theory, Languages, and Computation”, Pearson Education, Second Edition, Harlow, 2014.
3. Mishra K.L.P and Chandrasekaran. N, “Theory of Computer Science: Automata, Languages and Computation”, Prentice Hall of India, Third Edition, New Delhi, 2010.
4. Peter Linz, “An Introduction to Formal Languages and Automata”, Jones and Bartlett Publishers, Fifth Edition, Burlington, 2012.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	3	-	-
CO 2 :	3	2	3	-	-
CO 3 :	3	2	3	-	-
CO 4 :	3	2	3	-	-
CO 5 :	3	2	3	-	-
AVG:	**3**	**2**	**3**	**-**	**-**

XT3561 **WEB TECHNOLOGY LABORATORY** **L T P C**
0 0 4 2

LIST OF EXPERIMENTS

1. Design of static web pages in HTML
2. Creating and embedding a style sheet in an HTML document
3. Write an XML document to store information and display it in the browser
4. Creating dynamic web pages using JavaScript
5. Client-side validation of pages using JavaScript event handling mechanism
6. Dynamic creation of Node using DOM methods
7. Develop servlet with JDBC access
8. Manage session in JSP using cookies
9. Programming in PHP – Arrays, functions, Form handling
10. Cookies, Session Tracking, Database access with PHP and MySQL

TOTAL : 60 PERIODS

OUTCOMES:

CO 1 : Design simple web pages using markup languages like HTML and XHTML.
CO 2 : Formatting the document using CSS and data using XML.
CO 3 : Create dynamic web pages using DHTML and JavaScript that are easy to navigate.
CO 4 : Program server-side web pages using Servlets and JSP that must process requests from client-side web pages.
CO 5 : Design web pages using PHP with MySQL.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	3	1	2
CO 2 :	3	2	3	1	2
CO 3 :	3	2	3	1	2
CO 4 :	3	2	3	1	2
CO 5 :	3	2	3	1	2
AVG:	**3**	**2**	**3**	**1**	**2**

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MA3651 **OPERATIONS RESEARCH** **L T P C**
4 0 0 4

OBJECTIVES:

- To introduce Linear Programming and their methods
- To provide Integer Programming Algorithms
- To give exposure to Non-Linear programming with applications
- To explain the significance of Decision and Game Theory
- To provide Dynamic Programming with applications

UNIT I LINEAR PROGRAMMING **12**

Introduction of OR - Formulation of linear programming models - assumptions of linear programming problems - Graphical solution – Solutions to LPP using simplex algorithm – Two phase method – Big M method - Transportation and Assignment problems

UNIT II INTEGER PROGRAMMING **12**

Introduction – Cutting plane Algorithm – Branch and Bound Algorithm – Zero-one Programming- Goal programming

UNIT III NON-LINEAR PROGRAMMING **12**

Lagrange multipliers – Equality constraints – Inequality constraints – Kuhn-Tucker conditions – Quadratic programming - Replacement models - Inventory Problems

UNIT IV DECISION AND GAME THEORY **12**

Decision making under certainty – Decision making under risk – Decision making under uncertainty – Decision tree analysis - Game Theory – Two person zero sum games, pure and mixed strategies – Theory of dominance - Graphical Solution – Solving by LP

UNIT V DYNAMIC PROGRAMMING **12**

Dynamic programming technique – stage coach problem – reliability problem- capital budgeting problem- manpower planning problem – inventory problem - linear programming – integer programming problem

TOTAL: 60 PERIODS

OUTCOMES:

CO 1 : Develop the skills to consider real-world problems and determine whether or not linear programming is an appropriate modeling framework.
CO 2 : Understand of the role of algorithmic thinking in the solution of operations research problems.
CO 3 : Able to build and solve Transportation Models and Assignment Models.
CO 4 : Understand Operations Research models and apply them to real-life problems.
CO 5 : Interpret the solutions and infer solutions to the real-world problems.

REFERENCES:

1. F.S. Hillier and G.J. Lieberman, “Introduction to Operations Research”, Tata McGraw Hill, 8th Edition, New Delhi, 2005.
2. H.A. Taha, “Operations Research: An Introduction”, Pearson Education, 10th Edition, New Delhi, 2019.
3. J.K. Sharma, “Operations Research: Theory and Applications”, Macmillan India Ltd., 5th Edition, New Delhi, 2012.
4. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, “Linear Programming and Network Flows”, 2nd Edition, Wiley India Pvt ltd, New Delhi, 2008.

5. Philips, Ravindran and Solberg, “Operations Research: Principles and Procatice”, Wiley India Pvt ltd, 2nd Edition, 2007.
6. Pradeep Prabhakar Pai: “Operations Research and Practice”, Oxford University Press, New Delhi, 2012.
7. Richard Bronson and Govindasami Naadimuthu, “Operations Research”, (Schaum’s Outlines – TMH edition), Tata McGraw Hill Publishing Company Ltd., 2nd Edition, New Delhi, 2004.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	3	-	
CO 2 :	3	2	3	-	
CO 3 :	3	2	3	-	
CO 4 :	3	2	3	-	
CO 5 :	3	2	3	-	
AVG:	**3**	**2**	**3**	**-**	

XT3601 SOFTWARE PROJECT MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To develop an awareness of the need for project planning and management
- To explain the procedures needed to monitor and control
- To understand about the process improvements and report on quality
- To learn about the product metrics
- To understand about the quality metrics and management metrics

UNIT I OVERVIEW OF SOFTWARE PROJECT MANAGEMENT AND FRAMEWORK 9

Conventional software management - Evolution of software economics - Improving software economics - Conventional Vs Modern software project management. Lifecycle phases – Artifacts of the process - Model based software architectures -Workflows of the process - Checkpoints of the process

UNIT II SOFTWARE MANAGEMENT DISCIPLINES 9

Iterative process planning - Organization and Responsibilities - Process automation - Process control and process instrumentation - Tailoring the process. Project planning - Scheduling - Tracking and Control - Time and Cost overruns - Project organization - Staffing - Group working - Team dynamics

UNIT III MANAGED AND OPTIMIZED PROCESSES 9

Quality management and ISO 9000 quality assurance method - Configuration management - Quality reviews - Software standards - Tracking of defects - Process improvements - SCI/CMM models - Other process models - Data gathering and analysis Principles of data gathering - Data gathering process - Software measures - Data analysis - Managing software quality - Defect prevention

UNIT IV PRODUCT METRICS 9

Measurement of Internal Product Attributes – Size and Structure – External Product Attributes – Measurement of Quality – COCOMO Cost Estimation model

UNIT V QUALITY METRICS AND MANAGEMENT METRICS 9

Software Quality Metrics – Product Quality – Process Quality – Metrics For Software Maintenance – Case Studies Of Metrics Program – Motorola – HP And IBM. Quality Management Models – Rayleigh Model – Problem Tracking Report (PTR) Model – Reliability Growth Model – Model Evaluation – Orthogonal Classification

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Develop project that matches the organizational needs to the most effective software development model.
CO 2 : Managing people and do effective communications among people and do effective planning to meet changes in software developmental stages.
CO 3 : Select and employ mechanisms for tracking the software projects and maintaining quality.
CO 4 : Develop the skills to apply the metrics for software product.
CO 5 : Develop the software project to apply quality and management metrics.

REFERENCES:

1. Bob Hughes, Mike Cotterell, “Software Project Management”, 5th edition, Tata McGraw Hill, New Delhi, 2009.
2. Humphrey Watts, “Managing the software process”, Reading, Massachusetts Addison Wesley, 1989.
3. Ramesh Gopalaswamy, “Managing Global Software Projects”, Tata McGraw Hill, New Delhi, 2006.
4. Walker Royce “Software Project Management A Unified Framework”, Pearson Education, 2004.
5. Norman E. Fentar, and Share Lawrence Pflieger, "Software Metrics", International Thomson Computer Press, 1997.
6. Stephen H.Kin, "Metric and Models in Software Quality Engineering", Addison Wesley, 1995.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	2	-	-
CO 2 :	3	-	2	3	-
CO 3 :	3	-	2	-	-
CO 4 :	3	-	2	-	2
CO 5 :	3	-	2	-	2
AVG:	**3**	**0.4**	**2**	**0.6**	**0.8**

XT3561 **MACHINE LEARNING** **L T P C**
3 0 2 4

OBJECTIVES:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques.
- To study the various probability based learning techniques
- To understand graphical models of machine learning algorithms
- To work on real life case studies and process data sets to extract knowledge

UNIT I FOUNDATIONS AND LINEAR MODELS 9+6

Introduction to Machine Learning Approach – Applications - Types of Machine Learning – What is statistical learning – Assessing model accuracy. Linear Regression: Simple Linear Regression – Multiple Linear Regression - Comparison of Linear Regression with K-Nearest Neighbors – Classification: Logistic regression – Generative models for classification – Comparison of classification methods – Generalized linear models

Practicals: Introduction to Python – Basic programs – Graphics – Indexing Data – Loading Data – Additional Graphical and Numerical summaries - 1) Linear Regression : Simple linear regression – Multiple linear regression 2) Classification: Logistic regression – Linear Discriminant Analysis – Naive Bayes – K-Nearest Neighbor

UNIT II MODEL SELECTION AND BEYOND LINEARITY 9+6

Re-sampling methods: Cross validation - Bootstrap – Linear model selection and Regularization: Subset selection – Shrinkage methods – Dimension reduction methods – Considerations in higher dimensions – Beyond Linearity: Polynomial regression – Step functions – Basis functions – Regression splines – Smoothing splines – Local regression – Generalized additive models

Practicals: 1) Cross validation and Bootstrap: Validation set approach – Bootstrap. 2) Linear models and regularization methods: Subset selection methods – Ridge regression and the lasso 3) Beyond linearity: Polynomial regression and step functions – GAM

UNIT III TREE BASED METHODS AND SVM 9+6

Basics of Decision Trees - Bagging, Random Forests, Boosting, and Bayesian Additive Regression Trees – Classification Trees - Trees vs Linear Models. SVM: Maximal margin classifier – Support Vector Classifiers – Support Vector Machines – SVMs with multiple classes– Relationship to Logistic regression

Practicals: 1) Decision Trees: Fitting classification trees – Fitting regression trees – Bagging and random forests – Boosting – Bayesian additive regression trees. 2) SVM: Support Vector Classifier – Support Vector Machines – ROC Curves

UNIT IV DEEP LEARNING 9+6

Single layer neural networks – Multi-layer neural networks – Convolutional neural networks: Pooling layers – Architecture – Data Augmentation. Recurrent neural networks: Sequential models – Time series forecasting. Fitting a neural network – Interpolation and double descent.

Practicals: Neural Networks: Single layer neural network – Multi-layer neural network – CNN – Pretrained CNN models – Document classification – RNN.

UNIT V UNSUPERVISED LEARNING AND CASE STUDIES 9+6

Unsupervised learning: Challenge of unsupervised learning – Principal component analysis – Missing values and matrix completion – Clustering methods: Partitional clustering – Hireachical

clustering – Mixture Models. Case Studies: Applications in Computer Vision – Healthcare - Education – Network Security - Finance

Practicals: 1) Unsupervised learning: PCA – Clustering. 2) Suitable Application Problems from Kaggle

TOTAL : (45+30) 75 PERIODS

OUTCOMES:

CO 1 : set up a well-defined learning problem for a given task

CO 2 : select and define a representation for data to be used as input to a machine learning algorithm

CO 3 : compare different algorithms according to the properties of their inputs and outputs

CO 4 : compare different algorithms in terms of similarities and differences in the computational methods used

CO 5 : develop and describe algorithms to solve a learning problem in terms of the inputs, outputs and computational methods used.

REFERENCES:

1. James, G., Witten, D., Hastie, T., Tibshirani, R., & Taylor, J., “An Introduction to Statistica Learning with applications in Python” (1st ed.). Springer. 2023
2. The Elements of Statistical Learning. Trevor Hastie, Robert Tibshirani and Jerome Friedr Second Edition. 2017
3. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer,reprint of the 1 edition, New York, 2006.
4. Tom Mitchell, "Machine Learning", McGraw-Hill, Singapore, 1997.
5. Shai Shalev-Shwartz and Shai Ben-David, “Understanding Machine Learning”, Cambridg University Press. 2017

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO 1 :	3	-	1	-	-
CO 2 :	3	2	2	-	-
CO 3 :	3	2	2	-	-
CO 4 :	3	2	2	-	2
CO 5 :	3	-	2	-	2
AVG:	**3**	**1.2**	**1.8**	**-**	**0.8**

XC3651	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		4	0	0	4

OBJECTIVES:

- To introduce asymptotic notations and growth of functions for understanding of running time of algorithms
- To explain the design of sorting algorithms with correctness and complexity
- To provide details of design, correctness and the complexity of fundamental Graph Algorithms
- To introduce string matching algorithms with correctness and complexity
- To explain classification of problems based on the computational complexity

UNIT I ANALYZING ALGORITHMS 12

Algorithms – Analyzing algorithms – Designing algorithms – Growth of functions Recurrences

UNIT II SORTING 12

Insertion sort – Quick sort – Divide and Conquer – Merge sort – Heap sort – Lower bounds for sorting

UNIT III GRAPH ALGORITHMS 12

Representations of graphs – Breadth-first search – Depth-first search – Minimum spanning tree – The algorithms of Kruskal and Prim – Shortest paths – Dijkstra'salgorithm

UNIT IV STRING MATCHING 12

The naïve string – matching algorithm – String matching with finite automata – The Knuth-Morris –Pratt algorithm

UNIT V NP COMPLETENESS 12

Polynomial time – The complexity class NP – NP-Completeness – Reducibility – NP- Complete problems – CLIQUE and Traveling salesman problem

TOTAL: 60 PERIODS

OUTCOMES:

CO 1 : Describe the complexity of algorithm with appropriate asymptotic notations.
CO 2 : Use efficient sorting algorithms with comparison as the basic operation for solving sorting problems.
CO 3 : Use the fundamental graph algorithms in solving optimization problems.
CO 4 : Use efficient string matching algorithms in string matching problems.
CO 5 : Able to recognize the complexity class of the given computational problems.

REFERENCES:

1. Baase, S. "Computer Algorithms: Introduction to Design and Analysis", 3rd Edition, Addison and Wesley, Boston, 2008.
2. Cormen, T.H., Leiserson, C.E. and Rivest, R.L. "Introduction to Algorithms", 2nd Edition, Prentice Hall of India, New Delhi 2009.
3. Levitin, A., "Introduction to the Design & Analysis of Algorithms", 3rd Edition, Pearson Education (Asia) Pvt. Ltd., Chennai, 2011.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	3	3	-	2
CO 2 :	3	3	3	-	2
CO 3 :	3	3	3	-	2
CO 4 :	3	3	3	-	2
CO 5 :	3	3	3	-	2
AVG:	**3**	**3**	**3**	**-**	**2**

XC3652 **CLOUD COMPUTING** **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the working structure of distributed computing
- To understand the process of virtualization
- To understand virtualization management with respect to storage and networks
- To familiarize the cloud platform architecture
- To have an overview on cloud storage providers

UNIT I BASICS OF DISTRIBUTED COMPUTING **9**

Introduction to Distributed computing – Models of distributed computation - Message Ordering and Group Communication; Termination Detection Reasoning with Knowledge; Distributed Mutual Exclusion - Deadlock Detection- Global Predicate Detection; Distributed Shared Memory

UNIT II VIRTUALIZATION **9**

Basics of Virtual Machines - Process Virtual Machines – System Virtual Machines - Taxonomy of Virtual Machines. Virtualization - Storage Virtualization – Network Virtualization - Desktop Virtualization – Application Virtualization - Server Virtualization

UNIT III VIRTUALIZATION MANAGEMENT **9**

Management Virtualization – Hardware Maximization – Architecture - Virtual Workloads - Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data centre automation

UNIT IV CLOUD PLATFORM ARCHITECTURE **9**

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software- A Generic Cloud Architecture Design – Layered cloud Architectural Development – Virtualization Support and Disaster Recovery – Architectural Design Challenges - Public Cloud Platforms: GAE, AWS – Inter-cloud Resource Management

UNIT V CLOUD STORAGE AND SECURITY 9

Overview of cloud storage - Cloud storage providers - Cloud Software Environments - Eucalyptus, Open Nebula, Open Stack, Nimbus - Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud - Key privacy issues in the cloud –Cloud Security and Trust Management

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Understand the basics of distributed computing.
CO 2 : Gain knowledge on virtualization.
CO 3 : Understand and apply storage and network virtualization.
CO 4 : Develop new cloud platform architectures.
CO 5 : Work with cloud storage providers using real time scenarios.

REFERENCES:

1. Ajay D. Kshemkalyani and Mukesh Singhal, “Distributed Computing: Principles, Algorithms, and Systems”, Cambridge, 2020.
2. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Elsevier, Burlington, 2013.
3. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, “Mastering Cloud Computing”, Elsevier Science, Amsterdam, 2013.
4. Sunita Mahajan and Seema Shah, “Distributed Computing”, 2nd edition, Oxford Univ. Press, New Delhi, 2013

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	-	1	-	
CO 2 :	3	1	1	-	1
CO 3 :	3	2	2		
CO 4 :	3	2	2		1
CO 5 :	3	2	2		2
AVG:	**3**	**1.4**	**1.6**	**-**	**0.8**

MA3851 ADVANCED STATISTICAL METHODS FOR COMPUTING L T P C
4 0 0 4

OBJECTIVES:

- This course provides a sound and rigorous treatment of the basic principles for a proper understanding of the subject matter and for confidence in applying these principles to practical problem solving
- This course provides a solid undergraduate foundation in Time series Analysis and provides an indication of the relevance and importance of the theory in solving real world problems
- To enable the students to use the concepts of multivariate normal distribution and principle components analysis
- To provide information about Estimation theory and regression lines
- To enable the students to use the concepts of design of experiments and factorial design

UNIT I NONPARAMETRIC TESTS 12

The Sign Test – The Signed-Rank Test – Rank-Sum Tests: The U Test - Rank-Sum Tests: The HTest – Tests Based on Runs – The Rank Correlation Coefficient

UNIT II DESIGN OF EXPERIMENTS 12

Analysis of Variance - One-way and two-way Classifications - Completely Randomized Design -Randomized Block Design - Latin Square Design – 2^2 Factorial Design – Taguchi's Robust Design

UNIT III STATISTICAL QUALITY CONTROL 12

Control charts for measurements ($\bar{x}$and R charts) – Control charts for attributes (p, c and np charts)Tolerance limits — Acceptance sampling

UNIT IV TIME SERIES 12

Components of Time Series – Analysis of Time series – Measurement of Trend – Measurement ofSeasonal Fluctuations

UNIT V MULTIVARIATE ANALYSIS 12

Random vectors and Matrices - Mean Vector and Covariance Matrices - Partitioning of Covariance Matrices - Combination of Random Variables for Mean Vector and Covariance Matrix - Multivariate, Normal Density and its Properties - Principal Components: Population principal components - Principal components from standardized variables

TOTAL : 60 PERIODS

OUTCOMES:

CO 1 : The ability to use the appropriate and relevant, fundamental and applied mathematical andstatistics knowledge and methodologies in solving practical problem.

CO 2 : The ability to bring together and flexibly apply knowledge to characterise, analyse and solve awide range of problems.

CO 3 : An understanding of the balance between the complexity/accuracy of the mathematical/ statistical models used and the timeliness of the delivery of the solution.

CO 4 : Critical thinking based on empirical evidence and the scientific approach to knowledge development.

CO 5 : The students can independently participate in the processes of analysis, planning, formulating strategies of development, decision-making, governing and management, and independent making of tactical and strategic decisions related to the statistics.

REFERENCES:

1. Dallas E Johnson et al., “Applied multivariate methods for data analysis”, Thomson andDuxbury press, Singapore, 1998.
2. Gupta S.C. and Kapoor V.K. ”Fundamentals of Mathematical Statistics”, Sultan and Sons, NewDelhi, 2001.
3. Jay L. Devore, “Probability and statistics for Engineering and the Sciences”, Thomson andDuxbury, Singapore, 2002.
4. Johnson, R.A. and Gupta, C.B., “Miller and Freund’s Probability and Statistics for Engineers”,Pearson Education, Asia, 8th Edition, 2011.
5. Richard A. Johnson and Dean W. Wichern, “Applied Multivariate Statistical Analysis”, PearsonEducation, Fifth Edition, New Jersey, 2002.
6. Miller I. and Miller M., “John E. Freund’s Mathematical Statistics with Applications”, Pearson, 8thEdition, New York City, 2019.
7. Krishnaiah, K. and Shahabudeen, P. “Applied Design of Experiments and Taguchi Methods”,Prentice Hall of India, New Delhi, 2012.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	3	-	-
CO 2 :	3	2	3	-	-
CO 3 :	3	2	3	-	-
CO 4 :	3	2	3	-	-
CO 5 :	3	2	3	-	-
AVG:	**3**	**2**	**3**	**-**	**-**

XT3801 **ADVANCED NETWORKS** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn about the principles and practices of advanced computer networking concepts
- To understand the importance of Quality of Service in IP networks
- To explore the need for Ipv6 and manage the MPLS technology in networks
- To learn about SDN architecture and OpenFlow for network virtualization
- To gain an in-depth knowledge of Network Virtualization Functions

UNIT I INTRODUCTION TO NETWORKS **9**

Switched Networks and Shared Media Networks – Circuit Switching, Packet Switching and Virtual Circuits – Flow Control and Congestion Control – TCP/IP Reference Model –Network Externalities – Service Integration – Elastic and Inelastic Traffic – Playback Applications – Additional Requirements for Inelastic Traffic – Core Networks and Access/Edge

Attested

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UNIT II QUALITY OF SERVICE 9

Queuing – Queuing Model – Single Server – Multi-server – Integrated Service Architecture – Internet Traffic – ISA Services QoS Architectural framework – Quality of Service and Metrics – Integrated Services Architecture – Approach, Components, Services – Queuing Discipline: FQ, PS, BRFQ, GPS, WFQ – Traffic Shaping Algorithms – Random Early Detection – Differentiated Services – Class of Service – IP Precedence – Type of Service – Per-Hop Behavior – RSVP: Goals, Characteristics, Operations and Mechanisms

UNIT III IPv6 and MPLS 9

IPv6 Addressing Scheme – IPv6 Header – Address Auto Configuration – IPv6 Enhancements MPLS Architecture – MPLS: Operations, Label Stacking, Protocol Details – Label Distribution – Traffic Engineering with MPLS – Quality of Service with MPLS Technology – Network Recovery and Restoration with MPLS Technology

UNIT IV SOFTWARE DEFINED NETWORKING 9

Evolution of SDN – Characteristics of SDN – Control Plane – Control and data plane separation – SDN Data Plane – SDN Control Plane – OpenFlow Architecture – SDN Controller – VxLAN

UNIT V NETWORK FUNCTION VIRTUALIZATION 9

NFV Concepts and Architecture – Virtualization and Data Plane I/O – Service Locations and Chaining – Functionality – Management – Use Cases of SDNs: Data Centers, Overlays, Big Data

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Explain the advancements in Ethernet Technologies.
CO 2 : Configure and manage different concepts of QoS polices in IP networks.
CO 3 : Configure and manage the Ipv6 addressing based network and Design a MPLS based network and able to provide QoS, TE services.
CO 4 : Implement the SDN concepts and manage SDN controller.
CO 5 : Explain network function virtualization techniques and apply the emerging technologies for various case studies.

REFERENCES:

1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Elsevier/Morgan Kaufmann Publishers, 2011.
2. Bruce S. Davie, Adrian Farrel, “MPLS: Next Steps”, Morgan Kaufmann Publishers, 2011.
3. Paul Goransson, Chuck Black, “Software Defined Networks: A Comprehensive Approach”, Morgan Kaufmann Publisher, June 2014.
4. Thomas D. Nadeau, Ken Gray, “SDN: Software Defined Networks, An Authoritative Review of Network Programmability Technologies”, O’Reilly Media, August 2013.
5. William Stallings, “Foundations of Modern Networking – SDN, NFC, QoE, IoT and Cloud” Third Edition, Pearson Education, 2019.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	2	-	-
CO 2 :	3	2	2	-	-
CO 3 :	3	2	2	-	1
CO 4 :	3	3	2	-	1
CO 5 :	3	3	2	-	2
AVG:	**3**	**2.4**	**2**	**-**	**1.3**

Attested

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XT3851 PRINCIPLES OF MANAGEMENT AND BEHAVIOURAL SCIENCES L T P C
3 0 0 3

OBJECTIVES:

- To know about the basic functions of management and organization environment
- To understand the growth of industries and different forms of business organizations
- To understand the group and organizational behavior
- To study globalization and workforce diversity in management
- To study the introduction of Human Resource Management

UNIT I PRINCIPLES OF MANAGEMENT 9

Meaning, Definition and Significance of Management, Basic Functions of Management – Planning, Organizing, Staffing, Directing and Controlling. Organizational Environment – Social, Economic, Technological and Political. Corporate Social Responsibility

UNIT II INDUSTRIAL AND BUSINESS ORGANIZATION 9

Growth of Industries (Small, Medium, and Large Scale Industries). Forms of Business Organizations. Resource Management – Internal and External Sources

UNIT III GROUP AND ORGANIZATIONAL BEHAVIOUR 9

Group dynamics, Group formation and development, group structure, and group cohesiveness. Informal organization – Sociometry – Interaction analysis, Significance of OB, Impact of culture on an organization. Role of leadership and leadership styles. Personality and Motivational Theories. Attitudes, Values, and Perceptions at Work

UNIT IV GLOBALISATION 9

Issues for global competitiveness, proactive and reactive forces of globalization. Cross-cultural management – Management of workforce diversity

UNIT V HUMAN RESOURCE MANAGEMENT 9

Objectives and Functions, Selection and Placement, Training and Development – Conflict management – Stress management - Human resource management in a global environment - Human resource information system(HRIS) - Case discussion

TOTAL: 45 PERIODS

OUTCOMES:

CO 1 : Have knowledge of basic functions of management.
CO 2 : Have knowledge on small, medium and large scale industries growth.
CO 3 : Have knowledge on group dynamics and leadership role.
CO 4 : Acquire the information about the globalization and cross-cultural management.
CO 5 : Acquire the knowledge on Human Resource Management.

REFERENCES:

1. Harold Koontz, Heinz Weihrich and Ramachandra Aryasri, “Principles of Management”, Tata McGraw Hill, 2014.
2. Mamoria C B, “Personnel Management”, Sultan Chand & Sons, 2005.
3. John W Newstrom and Keith Davis, “Organizational Behavior”, Tata McGraw Hill, 2010.
4. Stephen P Robbins, ”Organisational behavior”, Prentice Hall, 2010.
5. Khanna O P, “Industrial Engineering & Management”, Dhanpat Rai Publications, 2010.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	2	-	2	-	
CO 2 :	2	-	2	-	
CO 3 :	2	-	2	-	
CO 4 :	2	-	2	-	1
CO 5 :	3	-	2	2	
AVG:	**2.2**	**-**	**2**	**0.4**	**0.2**

XC3851 **ARTIFICIAL INTELLIGENCE** **L T P C**
3 0 0 3

OBJECTIVES:

- To know about the basics of Artificial Intelligence
- To learn about the different search strategies in AI
- To learn about knowledge representation techniques
- To learn about intelligent computing algorithms
- To learn to represent knowledge in solving AI problems

UNIT I BASICS OF ARTIFICIAL INTELLIGENCE **9**

Introduction– Definition - Foundations of Artificial Intelligence – AI Applications - Rule-based Expert Systems - Fuzzy Expert Systems - Frame-based Expert Systems – Case Studies

UNIT II SEARCHING STRATEGIES **9**

Classes of search – General State Space Search – Trees, Graphs and Representation – Uninformed Search – Improvements – Algorithm Advantages – Best- First Search – A* Search – Hill Climbing Search – Simulated Annealing – Tabu Search – Constraint Satisfaction Problems

UNIT III KNOWLEDGE REPRESENTATION **9**

Types of Knowledge – Role of Knowledge – Semantic Nets – Frames – Propositional Logic – Predicate Logic – Semantic Web – Computational Knowledge Discovery – Ontology – Communication of Knowledge – Common Sense

UNIT IV INTELLIGENT COMPUTING **9**

Machine Learning Algorithms – Supervised Learning – Unsupervised Learning - Evolutionary Computing – Genetic Algorithms – Genetic Programming – Evolutionary Strategies – Differential Evolution - Fuzzy Logic

UNIT V INTELLIGENT AGENTS **9**

Taxonomy of Robotics – Natural Sensing and Control – Perception with Sensors – Simple Control Architectures – Movement Planning – Robot Programming Languages – Robot Simulators - Anatomy of an agent – Agent Properties and AI – Agent Environments – Agent Taxonomy – Agent Architectures – Agent Languages – Agent Communication

Attested

TOTAL : 45 PERIODS

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OUTCOMES:

CO 1 : Understand the different AI systems.
CO 2 : Use appropriate search algorithms for any AI problem.
CO 3 : Represent a problem using first order and predicate logic.
CO 4 : Provide the appropriate agent strategy to solve a given problem.
CO 5 : Design software agents to solve a problem.

REFERENCES:

1. David L. Poole and Alan K. Mackworth, ”Artificial Intelligence: Foundations of Computational Agents”, Cambridge University Press, Second Edition, 2017.
2. M. Tim Jones, ”Artificial Intelligence: A Systems Approach (Computer Science)” , Jones and Bartlett Publishers, Inc.; First Edition, Burlington, 2008.
3. Michael Negnevitsky, “Artificial Intelligence: A Guide to Intelligent Systems”, Third Edition, Pearson Education, Canada, 2011.
4. S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach”, Pearson Education, Fourth Edition,New Delhi, 2022.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	1	2	-	-
CO 2 :	3	2	2	-	-
CO 3 :	3	2	2	-	-
CO 4 :	3	2	2	-	1
CO 5 :	3	2	2	-	1
AVG:	**3**	**1.8**	**2**	**-**	**1**

XT3852 **CYBER SECURITY** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn about cyber security, types of attacks, and fighting against them
- To learn about ML-based techniques for signature and anomaly detection
- To understand the intrusion detection and prevention system
- To have in-depth knowledge of Reconnaissance attacks and their detection method
- To have the knowledge about detection strategy of botnets and insider attacks

UNIT I INTRODUCTION TO CYBER SECURITY **9**

Basics of Cyber security – History of Cyber Crime – Types of Cyber Crime – Cyber Security components – zero-day attacks – types of network attacks – Application Security – Endpoint Security – Mobile Security – data security – infrastructure security - Fighting Cyberattacks

UNIT II ML FOR SIGNATURE & ANOMALY DETECTION 9

Misuse/Signature Detection -Machine Learning in Misuse/Signature Detection -Machine-Learning Applications in Misuse Detection – Malware Analysis. Anomaly Detection - Introduction – Machine Learning in Anomaly Detection Systems -Machine-Learning Applications in Anomaly Detection- Supervised Anomaly Detection - Spam Detection - Unsupervised Anomaly Detection

UNIT III INTRUSION DETECTION AND PREVENTION 9

Intrusion Detection: Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort – Tools for intrusion Detection. Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products

UNIT IV RECONNAISSANCE 9

Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Fingerprinting Techniques – Tools for scanning

UNIT V BOTNETS AND INSIDER THREATS 9

Botnet topologies, botnet detection using NetFlow analysis - Botnet detection using DNS analysis. Introduction to insider threats, Insider threat profiles -masquerader detection strategies - Using honey tokens for insider threat

TOTAL: 45 PERIODS

OUTCOMES:

CO 1 : Categorize the types of attacks and know the procedure to overcome them.
CO 2 : Apply Machine Learning techniques for signature and anomaly-based detections.
CO 3 : Apply intrusion techniques to detect and prevent the system from attacks.
CO 4 : Solve the issues related to detecting of Reconnaissance attacks.
CO 5 : Have in-depth knowledge about botnets and insider attacks.

REFERENCES:

1. Anand Shinde, “Introduction to Cyber Security Guide to the World of Cyber Security”, Notion Press, 2021.
2. Dua, Sumeet, and Xian Du. “Data Mining and Machine Learning in Cyber Security”, CRC Press, 2016.
3. William Stallings, Lawrie Brown, “Computer Security Principles and Practice”, Third Edition, Pearson Education, 2015.
4. Patrick Engebretson, “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy”, Elsevier, 2011.
5. Stolfo, Salvatore J., Bellovin S M, Hershkop S., Keromytis, A.D., Sinclair S, Smith. S, “Insider Attack and Cyber Security: Beyond the Hacker”, Springer, 2008.
6. Bhattacharyya, Dhruba Kumar, and Jugal Kumar Kalita. “Network Anomaly Detection: A Machine Learning Perspective”, CRC Press, 2013.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	2	-	-
CO 2 :	3	2	2	-	-
CO 3 :	3	2	2	-	-
CO 4 :	3	2	1	-	-
CO 5 :	3	1	2	-	1
AVG:	**3**	**1.8**	**1.8**	**-**	**1**

XC3861 **STATISTICAL PROGRAMMING LABORATORY USING R AND PYTHON** **L T P C 0 0 4 2**

List of Experiments:

1. Implementation of the following problems using Statistical Packages: Classification and tabulation of data and Graphical and diagrammatic presentation of data.
2. Perform calculations that measure the central tendency and dispersion of data and Implementation of measures of Skewness, moments, and kurtosis.
3. Determination of point and interval estimates.
4. Solving linear regression, polynomial regression, and non-linear regression-based problems and solving multiple regression and correlation analysis-based problems.
5. Solving the problems based on Time series analysis and forecasting and implementing statistical quality control charts.

TOTAL : 60 PERIODS

OUTCOMES:

CO 1 : Implementation of statistical packages.
CO 2 : Implementation of skewness, kurtosis and moments.
CO 3 : Implementation of intervals.
CO 4 : Implementation of regression functions.
CO 5 : Implementation of time series analysis.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	-	1	-	2
CO 2 :	3	2	2	-	2
CO 3 :	3	2	2	-	2
CO 4 :	3	2	2	-	2
CO 5 :	3	-	2	-	2
AVG:	**3**	**1.2**	**1.8**	**-**	**2**

MA3951 **NUMERICAL METHODS** **L T P C**
4 0 0 4

OBJECTIVES:

- Toprovidethemathematicalfoundationsofnumericaltechniquesforsolving Eigenvalueproblems and linear system of equations
- To apply the techniques of interpolation for equal and unequal intervals for the given data.
- To understand and apply the techniques of numerical integration and differentiation for solving ODE in applying day-to-day life
- To be familiar with solving initial value problems and ODE for given initial and boundary conditions
- To demonstrate the utility of Numerical techniques for solving Partial Differential Equations in Heat and Fluid problems

UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 12

Iterative method and Newton-Raphson method for Algebraic and Transcendental Equations. Solutions of linear system by Gaussian, Gauss-Jordan, Jacobi and Gauss-Seidel methods. Inverse of a matrix by Gauss-Jordan method. Eigen value of a matrix by Power methods

UNIT II INTERPOLATION 12

Newton's divided difference formula, and Lagrange's formula. Newton's forward and backward difference formulae, Natural Cubic Spline

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Numerical differentiation with interpolating polynomials, Numerical integration by Trapezoidal and Simpson's 1/3rd rule. Double integrals using Trapezoidal and Simpson's rules

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single Step Methods-Taylor Series Euler and Modified Euler, methods for first order differential equations, Runge-Kutta method of order four for first and second order differential equations. Multistep Methods – Milne and Adam's-Bash for the predictor and corrector methods for first-order differential equations

UNIT V BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Finite difference solution for the second order ordinary differential equations, Finite difference solution for one-dimensional heat equation (explicit scheme), one-dimensional wave equation and two-dimensional Laplace and Poisson equations

TOTAL : 60 PERIODS

OUTCOMES:

CO 1 : Demonstrate the understanding of common numerical methods and how they are used to obtain approximate solutions to the algebraic and transcendental equations.

CO 2 : Apply numerical methods to obtain approximate solutions to mathematical problems using interpolation.

CO 3 : Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.

CO 4 : Analyse and evaluate the accuracy of common numerical methods in solving ODE of first and Second-order equations.

CO 5 : Understand various numerical techniques for solving PDE, for given conditions in Heat and fluid flow problems.

REFERENCES:

1. Grewal,B.S, and Grewal J.S., "Numerical Methods in Engineering and Science",39th Edition, Khanna Publishers, New Delhi,2005.
2. John H.Mathews, "Numerical Methods for Mathematics, Science and Engineering",2nd Edition, Prentice-Hall of India, New Delhi,2005.
3. Sankara Rao,K., "Numerical methods for scientists and Engineers", 3rd Edition, Prentice-Hall of India, New Delhi,2008.
4. Sastry,S.S., "Introductory Methods of Numerical Analysis", 3rdEdition, Prentice-Hall of India, New Delhi, 2004.
5. Veerarajan T. and Ramachandran T., "Numerical Methods with Programming in C", Tata McGraw-Hill Publishing Company Limited, New Delhi,2009.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	3	-	-
CO 2 :	3	2	3	-	-
CO 3 :	3	2	3	-	-
CO 4 :	3	2	3	-	-
CO 5 :	3	2	3	-	-
AVG:	**3**	**2**	**3**	**-**	**-**

XT3951 **INTERNET OF THINGS** **L T P C**
3 0 0 3

OBJECTIVES:

- To have an introductory knowledge about IoT architecture
- To understand the communication technologies used in IoT
- To have a broad understanding of architectures, protocols and IoT levels
- To understand the importance of security in IoT
- To analyze applications of IOT in real time scenario

UNIT I IoT ARCHITECTURE **9**

Functional Requirements - IoT Enabling Technologies – IPv6 - Basic Architecture – Components of IoT: Embedded Computation Units, Microcontrollers, System on Chip (SoCs) - Sensors – Actuators – Communication Interfaces

UNIT II RF COMMUNICATION TECHNOLOGIES INIoT **9**

Wireless Sensor Networks (WSN): Overview, Fault Tolerance - RFID – NFC - Low Power Personal Area networks (LowPAN): Overview, 6LowPAN,IEEE 802.15.4, BLE, Zigbee, Zwave, and Thread - Wi-Fi -Low Power Wide Area Networks (LPWAN): Concepts and features, SigFox, LoraWAN, LPWAN-3GPP,Comparing different LPWAN technologies

UNIT III APPLICATION LAYER PROTOCOLS IN IoT **9**

Rest Architecture - HTTP – CoAP: Architecture, Features, Applications-MQTT: Architecture, Feature, Applications -Comparing different IoT Application Layer Protocols

UNIT IV SECURITY IN IoT **9**

IEEE 802.11 Wireless Networks Attacks: Basic Types, WEP Key Recovery Attacks, Keystream Recovery Attacks against WEP – RFID Security – Security Issues in ZigBEE: Eavesdropping Attacks, Encryption Attacks – Bluetooth Security: Threats to Bluetooth Devices and Networks – Blockchain in IoT security

UNIT V PROTOTYPING & APPLICATIONS OF IOT **9**

Prototyping embedded devices- Open Source versus Closed Source-Embedded Computing Basics-Arduino- Raspberry Pi- Implementation - Smart homes – Energy – Health Care – Smart Transportation – Smart Living – Smart Cities- Smart Grid – Smart Agriculture

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Have an introduction to IoT architecture.
CO 2 : Understand the communication technologies used in IoT.
CO 3 : Have a broad understanding of architectures, protocols and IoT levels.
CO 4 : Understand the importance of security in IoT.
CO 5 : Analyze applications of IOT in real time scenario.

REFERENCES:

1. Dieter Uckelmann, Mark Harrison, Florian Michahelles, “Architecting the Internet of Things”, Springer, 2011.
2. Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, John Wiley and Sons, 2014.
3. Olivier Hersent, David Boswarthick and Omar Elloumi, “The Internet of Things: Key Applications and Protocols”, John Wiley & Sons, 2012.
4. Michael Miller, "The Internet of Things", Pearson Education, 2015.
5. Massimo Banzi, "Getting Started with Arduino", Shroff Publishers & Distributors, 2014.
6. Simon Monk, "Programming Arduino: getting started with sketches" McGraw Hill, 2012.
7. Vedat Coskun, Kerem Ok, BusraOzdenizci, "Near Field Communication from theory to practice", John Wiley&Sons, 2011.
8. ARichardWentk, "Teach yourself visually Raspberry Pi", John Wiley& Sons, 2014.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO 1 :	3	1	2	-	-
CO 2 :	3	2	2	-	-
CO 3 :	3	2	2	-	-
CO 4 :	3	2	2	-	-
CO 5 :	3	2	2	-	2
AVG:	**3**	**1.8**	**2**	**-**	**2**

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XT3901 ADVANCED DATABASE TECHNOLOGY AND DESIGN L T P C
3 0 2 4

OBJECTIVES:

- To learn the fundamentals of data modeling and design in advanced databases
- To study the working principles of distributed databases
- To have an introductory knowledge about the query processing in Object-based databases and its usage
- To understand the basics of Spatial and temporal Databases and their applications
- To learn emerging databases such as XML, Data warehouse and NoSQL

UNIT I DISTRIBUTED DATABASES 9

Distributed Systems – Introduction – Distributed Databases Vs Conventional Databases - Architecture; Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing

UNIT II NoSQL DATABASES 9

NoSQL – CAP Theorem – Sharding – Document based-MongoDB Operation: Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding, and Deployment – Using MongoDB with PHP / JAVA

UNIT III ADVANCED DATABASE SYSTEMS 9

Spatial Databases: Spatial Data Types – Spatial Relationships – Spatial Data Structures – Spatial Access Methods – Temporal Databases: Overview – Active Database – Deductive Databases – Recursive Queries in SQL – Active Databases and Deductive Databases, Parallel Databases

UNIT IV XML AND DATA WAREHOUSE 9

XML Database: XML – XML Schema – XML DOM and SAX Parsers – XSL – XSLT – XPath and XQuery – Data Mining: Introduction - Data Warehouse: Introduction –Multidimensional Data Modeling – Star and Snowflake Schema – Architecture – OLAP Operations and Queries

UNIT V INFORMATION RETRIEVAL AND WEB SEARCH 9

IR concepts – Retrieval models – Queries in IR system – Text Preprocessing – Inverted indexing – evaluation measures – web search and analytics – current trends

LAB EXERCISES:

1. Create a distributed database using horizontal and vertical fragmentation in any DBMS.
2. Creation of distributed queries using the fragmented data created.
3. Create a document based database using MongoDB and manipulate the data.
4. Create a data warehouse and perform OLAP operations of Data Cube Pivoting, Rollup display, Drill-down display in an unstructured data environment.
5. Create a database to store multimedia elements and perform data retrieval operations.
6. Create a temporal database and explore the usage of temporal queries in it.
7. Creation of an XML document and validate it using an XML schema.
8. Given an XML document, traverse the document using DOM and SAX parser.
9. Design a web crawler to extract the information from the websites containing product reviews and classify the reviews as either positive or negative.
10. Create an information retrieval system which processes the corpus of documents and create TF/IDF for the keywords extracted from the documents. Create an inverted index to enable an efficient retrieval process.

TOTAL : (45+30)75 PERIODS

OUTCOMES:

CO 1 : Design a distributed database system and execute distributed queries.
CO 2 : Use NoSQL database systems and manipulate the data associated with it.
CO 3 : Have knowledge on advanced database system concepts.
CO 4 : Design a data warehouse system and apply OLAP operations.
CO 5 : Design XML database systems and validating with XML schema and Have knowledge on information retrieval concepts and apply it in web databases.

REFERENCES:

1. Henry F. Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Sixth Edition, McGraw-Hill, 2011.
2. R. Elmasri, S. B. Navathe, "Fundamentals of Database Systems", Seventh Edition,Pearson Education/Addison Wesley, 2017
3. C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
4. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques", Third Edition, Morgan Kaufmann, 2012.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	2	2	-	-
CO 2 :	3	2	2	-	-
CO 3 :	3	2	2	-	-
CO 4 :	3	2	2	-	1
CO 5 :	3	2	-	-	2
AVG:	**3**	**2**	**2**	**-**	**1.5**

XC3951 MULTIMEDIA TECHNOLOGIES L T P C
3 0 0 3

OBJECTIVES:

- To learn about the building blocks of multimedia
- To get exposure in various compression algorithms
- To get familiar with multimedia applications in recent trends
- To study about how to create various content in augmented reality
- To study about interfaces used in virtual reality systems

UNIT I MULTIMEDIA BASICS 9

Creation – Editing – Design – Usage – Tools and Hardware – File Formats for Text, Image /Graphics, Audio, Video, Animation. Color Models, Multimedia Data Structures, KD Trees – R Trees - Hypertext, Hypermedia, Hypermedia Structures and Formats, Web Graphics, Web Design Guidelines, HTML5, Plugins, Multimedia Networking

UNIT II AUTHORING TOOLS & DATA COMPRESSION 9

Authoring – Story Boarding, Metaphors - Card / Page, Icon, Timeline, Tools – Adobe DreamWeaver CC, Flash, Edge Animate CC, Camatasia Studio 8, Claro, E-Learning Authoring Tools –Articulate, Elucidate, Hot Lava - Text Compression – RLE, Huffman, Arithmetic, Dictionary Based, Image Compression – JPEG JPEG2000, JPEG – LS, Audio Compression – PCM, ADPCM, LPC, MPEG Audio, Video Compression – MPEG – 1,2,4

UNIT III MULTIMEDIA APPLICATIONS 9

Multimedia Databases – Content Based Information Retrieval, Multimedia Communications - Multimedia Information Sharing and Retrieval – Applications – Social Media Sharing, Online Social Networking - Virtual Reality - Multimedia for Portable Devices, Collaborative Multimedia Applications

UNIT IV AUGMENTED REALITY CONTENT 9

Augmented Reality – Relationship between augmented reality and other technologies–Augmented reality concepts – major hardware components for augmented reality systems – major software components for augmented reality systems - Contents of augmented reality - creating visual content – creating audio content – Interaction in Augmented Reality – Mobile Augmented Reality – Augmented Reality Applications

UNIT V VIRTUAL REALITY KEY ELEMENTS & SYSTEMS 9

Virtual Reality – Key elements of virtual reality – communication through medium – common issues of Human Communication Media – Interface to the Virtual World - input – user monitoring – world monitoring – output – visual displays

TOTAL: 45 PERIODS

OUTCOMES:

CO 1 : Understand working basic elements of multimedia.
CO 2 : Use and apply authoring tools for web and e-learning.
CO 3 : Implement various multimedia applications.
CO 4 : Develop contents for augmented reality applications.
CO 5 : Apply monitoring techniques in virtual reality systems.

REFERENCES:

1. Alan B. Craig, “Understanding Augmented Reality: Concepts and Applications”. Morgan Kaufhann, Amsterdam, 2013.
2. Burdea, G. C. and P. Coffet. “Virtual Reality Technology”, 3rd Edition. Wiley-IEEE Press, New York, 2023.
3. Fei GAO. “Design and Development of Virtual Reality Application System”, Tsinghua Press, Regina, March 2012
4. Greg Kipper, Joseph Rampolla, “Augmented Reality: An Emerging Technologies Guide to AR“, Syngress, Elsevier, 2013
5. Guangran LIU. “Virtual Reality Technology”, Tsinghua Press, Beijing, Jan. 2011
6. Sherman, William R. and Alan B. Craig. “Understanding Virtual Reality – Interface, Application, and Design”, Morgan Kaufmann, Cambridge, 2018
7. Nigel Chapman and Jenny Chapman, “Digital Multimedia”, John Wiley & Sons, Third Edition, Chichester, 2013.
8. Parag Havaldar and Gerard Medioni, “Multimedia Systems - Algorithms, Standards and Industry Practices”, Course Technology, Course Technology Cengage Learning, Boston, 2010.

9. Ralf Steinmetz and Klara Nahrstedt, “Multimedia Computing, Communications and Applications”, Dorling Kindersley Pvt Lt, New Delhi, 2013.
10. Ze - Nian Li, Mark S Drew and Jiangchuan Liu, “Fundamentals of Multimedia”, Springer-Verlag, Second Edition, New York, 2016.

CO – PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	1	1	-	-
CO 2 :	3	1	1	-	-
CO 3 :	3	2	2	-	-
CO 4 :	3	1	2	-	-
CO 5 :	3	1	2	-	-
AVG:	**3**	**1.2**	**1.6**	**-**	**-**

XT3961 **INTERNET OF THINGS LABORATORY** **L T P C**
0 0 4 2

LIST OF EXPERIMENTS

Working with Arduino – configuring basic sensors – getting data from sensors – processing the data – Working with Raspberry Pi – Activating lights/actuators/motors based on the sensor data

Suggested list of applications:

1. Automatic Street Lighting system.
2. Smart Water Monitoring system.
3. Automatic Smart Parking system.
4. Multi Room Music Player using IoT.
5. Smart Home Monitoring system.

TOTAL: 60 PERIODS

OUTCOMES:

CO 1 : Hands on with Arduino board.
CO 2 : Hands on with Raspberry Pi.
CO 3 : Configuration of basic sensors.
CO 4 : Processing of sensor data.
CO 5 : Develop IoT application for real world scenarios.

CO-PO Mapping:

Course Outcomes	PROGRAMME OUTCOMES				
	PO1	PO2	PO3	PO4	PO5
CO 1 :	3	1	2	1	1
CO 2 :	3	2	2	1	1
CO 3 :	3	2	2	1	1
CO 4 :	3	2	2	1	1
CO 5 :	3	2	2	1	1
AVG:	**3**	**1.8**	**2**	**1**	**1**

XC3071	ADHOC AND SENSOR NETWORK	L T P C 3 0 0 3

OBJECTIVES:

- To gain knowledge of MANET and routing mechanisms
- To gain knowledge of the 802.11Wireless LAN (Wi-Fi) and Bluetooth standards
- To gain knowledge of routing mechanisms and the three classes of approaches: proactive, on-demand and hybrid
- To gain knowledge about wireless sensor nodes
- To gain knowledge about energy management and security mechanism in ad-hoc sensor network

UNIT I INTRODUCTION TO MANETAND ROUTING 9

Introduction to MANET – Applications of MANETS – Challenges – Routing – Unicast – Proactive – reactive – Position-based and QoS routing – Multicasting and Geocasting

UNIT II ADHOC MACLAYERS 9

MAC LAYER – IEEE 802.11 (for wireless LANs) – IEEE 802.15 – Bluetooth technology – Wireless Mesh Networks

UNIT III ADHOC TRANSPORT LAYERS 9

Cognitive Radio and Networks – TCP over ADHOC Networks – Applications of sensor networks –Necessity for mesh networks–Heterogeneous mesh networks – Vehicular mesh networks

UNIT IV SENSOR NETWORKS 9

Introduction – Sensor networks Design Considerations – Sensor networks in controlled Environments and actuators – Data Dissemination – Data gathering – MAC protocols for sensor networks – Location discovery – Quality of sensor networks

UNIT V ENERGY MANAGEMENTAND SECURITY 9

Need for Energy management — Classification of Energy management schemes — Battery management and Transmission power management schemes — Network layer and Data link layer solutions - System power management schemes - Security in Ad hoc and sensor networks — Integrating MANETS WLAN and Cellular networks

TOTAL: 45 PERIODS

OUTCOMES

CO 1 : Understand the principles of mobile Adhoc networks (MANETs) and what distinguishes them from infrastructure-based networks.
CO 2 : Understand the 802.11 Wireless LAN (WiFi) and Bluetooth standards.
CO 3 : Understand how routing protocols function and their implications on data transmission delay and band width consumption.
CO 4 : Have an understanding of the principles and characteristics of wireless sensor networks (WSNs).
CO 5 :Understand the energy management of sensor nodes and ensure security on it.

REFERENCES:

1. Carlos de morais cordeiro and Dharma Prakash Agarwal, “Adhoc and Sensor Networks: Theory and Applications”, World Scientific Publications, Second Edition, Chennai, 2011.
2. Kazem Sohraby, Daniel Minoli, Taieb Znati,” Wireless Sensor Networks: Technology, Protocols and Applications”, Wiley, New Jersey, 2010.
3. Sivaram Murthy C. and Manoj B.S., “Adhoc Wireless Networks — Architecture and Protocols”, Pearson Education, Delhi, 2011.

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4. Rohtash Ghuriya, “Wireless Ad Hoc and Sensor Networks” Gazelle Book Services,2017.
5. Bill, Fenner, M. Andrew,” Unix Network Programming? the Sockets And Networking”, 3rd Edition, Phi Learning Pvt Ltd, 2010.

XT3071 BIG DATA ANALYTICS L T P C
3 0 0 3

OBJECTIVES:

- Introduce big data analytics concepts, its life cycle, challenges, application areas, tools and platforms
- To study classification and clustering techniques for analyzing big data
- To introduce analytical theory and methods and recommendation system
- To study in detail about Hadoop and data management for big data
- To know about graphical analysis for big data using case studies

UNIT I INTRODUCTION TO BIG DATA ANALYTICS 9

Big Data Overview - State of the Practice in Analytics - Key Roles for the New Big Data Ecosystem - Data Analytics Lifecycle Overview – Phases of life cycle – GINA – Big data Challenges – Application area – Application Tools and Platforms

UNIT II ADVANCED ANALYTICAL THEORY AND METHODS 9

Clustering: Overview of Clustering - K-means - Classification: Decision Trees - Naïve Bayes - Diagnostics of Classifiers - Additional Classification Methods – Regression : Linear Regression - Logistic Regression - Reasons to Choose and Cautions - Additional Regression Models

UNIT III ASSOCIATIONAND RECOMMENDATION SYSTEM 9

Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules- Validation and Testing - Diagnostics - Recommendation System: Collaborative Recommendation- Content Based Recommendation -Knowledge Based Recommendation- Hybrid Recommendation Approaches

UNIT IV HADOOP AND NoSQL DATA MANAGEMENT FOR BIG DATA 9

Distributed processing and data storage – Hadoop framework – HDFS and data managements using HDFS – Map reduce framework and programming. NoSQL Databases : Schema-less Models: Increasing Flexibility for Data Manipulation - Key_Value Stores- Document Stores - Tabular Stores - Object Data Stores

UNIT V GRAPH ANALYTICS AND CASE STUDY 9

The Simplicity of the Graph Model – Representation as Triples – Graphs and Network Organization – Choosing Graph Analytics – Graph Analytics Use Cases –Graph Analytics Algorithms and Solution Approaches – Technical Complexity of Analyzing Graphs –Features of a Graph Analytics Platform – Bigdata application and case study – Bigdata in scientific applications – Bigdata in Healthcare

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Work with big data tools and its analysis techniques.
CO 2 : Design efficient algorithms forming the data from large volumes.
CO 3 : Design an efficient recommendation system.
CO 4 : Learn NoSQL databases and management.
CO 5 : Design the tools for visualization.

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REFERENCES:

1. Vignesh Prajapati, “Big Data Analytics with R and Hadoop”, Packt Publishing Limited, Navi Mumbai, 2013.
2. David Dietrich "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC Education Services, Wiley publishers, Indianapolis, 2015.
3. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Burlington, 2013.
4. Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction”, Cambridge University Press, Cambridge, 2012.
5. Nitin Sawant and Himanshu shah, “Big data application Architecture Q & A : A problem solution approach”, Dordrecht : Springer, 2014.
6. Wen – Chen Hu and Naima Kaabouch (eds), “Big data management, technology, and Applications”, IGI Global, Hershey, 2014.

XC3072 **BIO-INSPIRED COMPUTING** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn bio-inspired theorem and algorithms
- To understand random walk and simulated annealing
- To learn genetic algorithm and differential evolution
- To learn swarm optimization and ant colony for feature selection
- To understand bio-inspired application in image processing

UNIT I INTRODUCTION **9**

Introduction to algorithm - Newton ' s method - optimization algorithm - No-Free-Lunch Theorems – Nature - Inspired Mata heuristics - Analysis of Algorithms - Nature Inspires Algorithms - Parameter tuning and parameter control

UNIT II RANDOM WALK AND ANEALING **9**

Random variables - Isotropic random walks - Levy distribution and flights - Markov chains - step sizes and search efficiency - Modality and intermittent search strategy - importance of randomization- Eagle strategy-Annealing and Boltzmann Distribution - parameters -SA algorithm - Stochastic Tunneling

UNIT III GENETIC ALOGORITHMS AND DIFFERENTIAL EVOLUTION **9**

Introduction to genetic algorithms and - role of genetic operators - choice of parameters - GA varients - schema theorem - convergence analysis - introduction to differential evolution - varients - choice of parameters - convergence analysis – implementation

UNIT IV SWARM OPTIMIZATION AND FIREFLY ALGORITHM **9**

Swarm intelligence - PSO algorithm - accelerated PSO - implementation - convergence analysis - binary PSO - The Firefly algorithm - algorithm analysis - implementation - varients- Ant colony optimization toward feature selection

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UNIT V APPLICATION IN IMAGE PROCESSING **9**

Bio-Inspired Computation and its Applications in Image Processing: An Overview - Fine- Tuning Enhanced Probabilistic Neural Networks Using Meta-heuristic-driven Optimization - Fine-Tuning Deep Belief Networks using Cuckoo Search - Improved Weighted Thresholded Histogram Equalization Algorithm for Digital Image Contrast Enhancement Using Bat Algorithm - Ground Glass Opacity Nodules Detection and Segmentation using Snake Model - Mobile Object Tracking Using Cuckoo Search

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Implement and apply bio-inspired algorithms.
CO 2 : Understand the random walk and simulated annealing strategies.
CO 3 : Implement and apply evolutionary algorithms.
CO 4 : Recognize and apply swarm intelligence and ant colony for feature selection.
CO 5 : Apply bio-inspired techniques in image processing.

REFERENCES:

1. Eiben,A.E.,Smith,James E, "Introduction to Evolutionary Computing", Springer 2015.
2. Helio J.C. Barbosa, "Ant Colony Optimization - Techniques and Applications", Intech 2013.
3. Xin-She Yang , Jaao Paulo papa, "Bio-Inspired Computing and Applications in Image Processing",Elsevier 2016.
4. Xin-She Yang, "Nature Ispired Optimization Algorithm,Elsevier First Edition 2014.
5. Yang ,Cui,XIao,Gandomi,Karamanoglu ,"Swarm Intelligence and Bio-Inspired Computing", Elsevier First Edition 2013.

XT3072 BLOCKCHAIN TECHNOLOGIES **L T P C**
3 0 0 3

OBJECTIVES:

- To understand Blockchain's fundamental components, and examine decentralization using blockchain
- To explain how cryptocurrency works, from when a transaction is created to when it is considered part of the Blockchain
- To explain the components of Ethereum and the programming languages for Ethereum
- To study the basics of Hyperledger and Web3
- To know about alternative Blockchains and Blockchain projects in different domains

UNIT I INTRODUCTION TO BLOCKCHAIN **9**

History of Blockchain – Types of Blockchain – Consensus – Decentralization using Blockchain – Blockchain and Full Ecosystem Decentralization – Platforms for Decentralization

UNIT II INTRODUCTION TO CRYPTOCURRENCY **9**

Bitcoin – Digital Keys and Addresses – Transactions – Mining – Bitcoin Networks and Payments – Wallets – Alternative Coins – Theoretical Limitations – Bitcoin Limitations – Name coin – Prime coin – Zcash – Smart Contracts – Ricardian Contracts

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UNIT III ETHEREUM **9**

The Ethereum Network – Components of Ethereum Ecosystem – Ethereum Programming Languages: Runtime Byte Code, Blocks and Blockchain, Fee Schedule – Supporting Protocols – Solidity Language

UNIT IV WEB3 AND HYPERLEDGER **9**

Introduction to Web3 – Contract Deployment – POST Requests – Development Frameworks – Hyperledger as a Protocol – The Reference Architecture – Hyperledger Fabric – Distributed Ledger – Corda

UNIT V ALTERNATIVE BLOCKCHAINS AND NEXT EMERGING TRENDS **9**

Kadena – Ripple – Rootstock – Quorum – Tender mint – Scalability – Privacy – Other Challenges – Blockchain Research – Notable Projects – Miscellaneous Tools

TOTAL: 45 PERIODS

OUTCOMES:

CO 1 : Understand the technology components of Blockchain and how it works behind the scenes.
CO 2 : Identify different approaches to developing decentralized applications.
CO 3 : Understand Bitcoin and its limitations by comparing it with other alternative coins.
CO 4 : Devise a solution using the Ethereum model.
CO 5 : Understand and use Hyperledger and its development framework.

REFERENCES:

1. Imran Bashir, “Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained”, Second Edition, Packt Publishing, 2018.
2. Roger Wattenhofer, “The Science of the Blockchain” CreateSpace Independent Publishing, 2016.
3. Arshdeep Bahga, Vijay Madisetti, “Blockchain Applications: A Hands-On Approach”, VPT, 2017.
4. A.Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press, 2016.
5. Alex Leverington, “Ethereum Programming” Packt Publishing, 2017.
6. Imran Bashir, “Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained”, Second Edition, Packt Publishing, 2018.
7. Andreas Antonopoulos, Satoshi Nakamoto, “Mastering Bitcoin”, O’Reilly Media, 2014.

XC3073 COMPUTATIONAL FINANCE **L T P C**
3 0 0 3

OBJECTIVES:

- To get introduce to the basics of computational finance
- To familiarize with the mathematical preliminaries
- To understand portfolio theory
- To get an overview of basic options theory
- To understand capital asset pricing and risk budgeting

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UNIT I INTRODUCTION TO COMPUTATIONAL FINANCE 9

Law of one price – Risk neutral pricing – Arbitrage and Hedging – Financial Products and capital markets – Futures, Forwards and options – Options pricing problem and three types of solutions

UNIT II MATHEMATICAL PRELIMINARIES 9

Conditional expectation – Sigma Algebra – Filtrations, Time series analysis - Covariance stationary – autocorrelations - MA(1) and AR(1) models, Stochastic Calculus - Random walk – Brownian motion – Martingales – Ito's Lemma

UNIT III PORTFOLIO THEORY 9

Introduction - Portfolio theory with matrix algebra - Review of constrained optimization methods, Markowitz algorithm, Markowitz Algorithm using the solver and matrix algebra – Portfolio choice and linear pricing – Statistical analysis of efficient portfolios

UNIT IV BASIC OPTIONS THEORY 9

Definitions – Pay off diagrams – Single period binomial options theory – Multi period binomial options theory – Real options – American options, Simulation methods for options pricing – Random variable generation – simulation of stochastic processes

UNIT V THE CAPITAL ASSET PRICING (CAP) AND RISK BUDGETING 9

Mean variance portfolio theory – Asset returns – Variance as a risk measure - The one and two fund theorems, The capital market line – CAP as a pricing formula – Systematic and unsystematic risk – Euler's theorem – Asset contributions to volatility – beta as a measure of portfolio risk , Limitations of mathematical models in finance

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Introduce to the basics of computational finance
CO 2 : Familiarize with the mathematical preliminaries
CO 3 : Understand portfolio theory
CO 4 : Get an overview of basic options theory
CO 5 : Understand capital asset pricing and risk budgeting

REFERENCES:

1. David Ruppert, "Statistics and Data Analysis for Financial Engineering", Springer-Verlag, 2011.
2. Edwin J. Elton, Martin J. Gruber, Stephen J. Brown and William N. Goetzmann "Modern Portfolio Theory and Investment Analysis", John Wiley& Sons, 2017.
3. Simon Benninga, Tal Mofkadi, "Financial Modeling", 5th Edition, MIT Press, 2022.
4. Steven E Shreve, "Stochastic Calculus for Finance – I" , Springer, 2009.

XT3073 COMPUTER GRAPHICS L T P C
3 0 0 3

OBJECTIVES:

- To know the mathematical basis of computer graphics
- To train the students to acquire knowledge in Computer Graphics modeling, animation, and rendering
- To create graphical applications
- To acquire knowledge about tools and technologies related to graphics
- To create visually realistic animations

Attested

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UNIT I INTRODUCTION TO COMPUTER GRAPHICS 9

Graphics Display Devices – Graphics Input Primitives and Devices – OpenGL Basic Graphic Primitives – Line Drawing Algorithms DDA and Bresenham – Windows and Viewports – Clipping Algorithms for Lines, Regular Polygons, Circles and Arcs – Parametric Form for a Curve – Visibility Algorithms – Review of Vectors – Representations of Key Geometric Objects – Lines And Planes

UNIT II MODELING AND TRANSFORMATION OF OBJECTS 9

Introduction to Transformations – Two Dimensional Transformations – 3D Affine Transformations – Homogeneous Coordinates – Matrix Representation – Drawing 3D Scenes Interactively – Introduction to Solid Modeling with Polygonal Meshes – Mesh Approximations to Smooth Objects – Particle Systems and Physically Based Systems

UNIT III VIEWING AND VISUAL REALISM 9

Three-Dimensional Viewing – Hidden Surface Removal – Illumination Models-Depth Cueing – Perspective Projections of 3D Objects – Introduction to Shading Models – Flat Shading and Smooth Shading – Adding Texture to Faces – Morphing – To Add Shadows of Objects – OPENGL Shading Language – Manipulating Pixmaps – Manipulating Symbolically Defined Regions – Aliasing and Anti Aliasing Techniques – Creating More Shades and Colours

UNIT IV SURFACE DESIGN 9

Describing Curves using Polynomials – Bezier Curves – Blending Functions – The B-Spline Basis Functions – Modeling Curved Surfaces – Rational Splines and NURBS – Interpolation – Modeling Curved Surfaces – Color Theory – Overview of the Ray Tracing Process – Intersecting Rays with other Primitives – Adding Shadows for Greater Realism – Reflections and Transparency – Boolean Operations on Objects – Ray Casting

UNIT V ANIMATIONS 9

Design of Animation Sequence – Animation Function – Raster Animation – Key Frame Systems – Motion Specification – Morphing – Tweening – Types of Animation – Fractals – Tools for Animation Creations

TOTAL: 45 PERIODS

OUTCOMES:

CO 1 : Articulate the concepts and techniques used in three-dimensional graphics.
CO 2 : Understand and Implement algorithms related to graphics creation.
CO 3 : Design and model graphical structures.
CO 4 : Understand and comprehend the graphical algorithms.
CO 5 : Design and develop simple and realistic animations.

REFERENCES:

1. F. S. Hill, Jr., Stephen M. Kelley, Jr., “Computer graphics using OpenGL”, Pearson Prentice Hall, Third Edition, 2007.
2. Donald D. Hearn, M. Pauline Baker, W. Carithers., “Computer Graphics with Open GL”, Fourth Edition, Pearson Eduction, 2010.
3. Tay Vaughan., “Multimedia: Making it Work”, Ninth Edition, McGraw-Hill Education, 2014.
4. Alan Watt, “3D Computer Graphics”, Third Edition, Pearson Addison Wesley, 2000.
5. Ralf Steinmetz, Klara, 2004.

XT3074 **DATABASE ADMINISTRATION** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the basics and applications of database systems in real- world
- To Learn the various roles in database administration and basic issues of transaction processing
- To understand data and storage management
- To learn the database recovery and performance tuning of database
- To study the user management and database security

UNIT I CREATING THE DATABASE ENVIRONMENT 9

DBMS Architectures-DBMS Clustering-DBMS Proliferation-Hardware Issues - Cloud Database Systems-Installing the DBMS-DBMS Installation Basics-Hardware Requirements-Storage Requirements-Memory Requirements -Configuring the DBMS-Installing and upgrading various database packages (MS SQL Server, Oracle, MySQL)-Connecting the DBMS to Supporting Infrastructure Software-Installation Verification-Database standards and Procedures

UNIT II DATABASE PROCESS 9

Introduction: Data, Database and System Administration - Types of DBA: System DBA-Database Architect - Database Analyst - Data Modeler - Application DBA - task Oriented DBA - Performance Analyst-Database Design: From Logical Model to Physical Database- Database Performance Design – De-normalization - Views. Application Design: Database Application Development and SQL- Defining Transactions - Locking – Batch Processing

UNIT III DATA AND STORAGE MANAGEMENT 9

Storage Management Basics: Files and Data Sets - Space Management - Fragmentation and Storage-Storage Options. Data Movement and Distribution: Loading and Unloading Data - EXPORT and IMPORT - Bulk Data Movement - Distributed Databases

UNIT IV BACKUP AND MAINTENANCE 9

Database Recovery: Types of Database Failures - Oracle Recovery Process - Performance Recovery with RMAN - Cloning a Database - Techniques for Granular Recovery - Flashback Techniques and Recovery - Using Restore Points-Repairing Data Corruption and Trail Recovery-Troubleshooting Recovery Errors-Flashback Data Archive. Performance Tuning: Approach to Oracle Performance Tuning-Optimizing Oracle Query Processing-SQL Performance Tuning Tools- End-to-End Tracing-SQL Tuning Advisor-Using the Result Cache-Simple Approach to Tuning SQL Statements

UNIT V USER MANAGEMENT AND DATABASE SECURITY 9

Managing Users - Database Resource Manager - Controlling Database Access - Auditing Database Usage - Authenticating Users - Enterprise User Security - Database Security Do's and Don'ts

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Impart the knowledge to use of different definition language to write query for a database.
CO 2 : Understand the role of various database users including data base administrator.
CO 3 : Examine the fragmentation, loading and unloading of data.
CO 4 : Understand the techniques for data backup and maintenance.
CO 5 : Learn the user management, controlling and auditing user access of database.

Attested

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REFERENCES:

1. Craig S. Mullins, “Database Administration: The Complete Guide to Practices and Procedures”, Addison-Wesley, 2nd Edition, 2012.
2. Sam R. Alapati, Expert Oracle Database 11g Administration, Apress, 1st Edition, 2009.
3. Adam Jorgensen, Jorge Segarra, Patrick Leblanc, Jose Chinchilla and Aaron Nelson, Microsoft SQL server bible 2012, Wiley India Pvt.Ltd, 1st Edition, 2012.
4. RoopeshRamklass, OCA Oracle Database12c, oracle press, McGraw Hill Education, 2014.
5. Tom Best, Maria Billings, Oracle Database 10g: Administration Workshop I, Oracle Press, Edition 3.1, 2008.

XT3075 DATABASE TUNING L T P C
3 0 0 3

OBJECTIVES:

- To get the feel of basics of database tuning
- To learn concepts behind database design optimization
- To write procedures involving query planning
- To understand how troubleshooting is done
- To formulate new indexing methods

UNIT I FUNDAMENTALS OF TUNING 9

Review of Relational Databases – Relational Algebra - Locking and Concurrency Control – Correctness Consideration – LOCK Tuning – Transaction Chopping – Logging and the Recovery Subsystem – Principles of Recovery – Tuning the Recovery Subsystem – Recovery Tuning– Operating Systems Considerations – Hardware Tuning

UNIT II INDEX TUNING 9

Indexes – Clustering Indexes – Non Clustering Indexes – Composite Indexes – Comparison of Indexing and Hashing techniques – Hot Table – Storage Structure Optimization through Index Tuning

UNIT III DESIGN AND QUERY OPTIMIZATION 9

Tuning Relational Systems – Normalization – Tuning De-normalization – Clustering Two Tables – Aggregate Maintenance – Record Layout –Triggers – Client Server Mechanisms – Types of Queries –Query Tuning

UNIT IV INTERFACE AND CONNECTIVITY TUNING 9

Objects, Application Tools and Performance –Tuning the Application Interface – Bulk Loading Data – Accessing Multiple Databases – ODBC – JDBC Tuning — Case Studies: Tuning E-Commerce Application– Data Warehouse Tuning

UNIT V TROUBLESHOOTING 9

Query Plan Explainers – Performance Monitors – Event Monitors – Finding —Suspicious Queries – Understanding Access Plans – Analyzing a Query‘s Access Plan – Profiling a Query Execution – Analyzing DBMS Subsystems and Hardware Resources – SQL performance Analyzer – Time Series Databases – Configuration Parameters: Oracle; SQL Server; DB2UDB

TOTAL : 45 PERIODS

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OUTCOMES:

CO 1 : Design databases involving normalization.
CO 2 : Write optimized code for accessing multiple databases.
CO 3 : Use tuning tools for different database operations.
CO 4 : Troubleshoot database issues.
CO 5 : Use benchmark databases for demonstrating concepts behind database tuning.

REFERENCES:

1. Dennis Shasha and Philippe Bonnet —Database Tuning, Principles, Experiments, and Troubleshooting Techniques, Morgan Kaufmann: An Imprint of Elsevier, San Francisco, 2003.
2. Peter Gulutzan and Trudy Pelzer, —SQL Performance Tuning, Addison-Wesley, First Edition, Boston, 2002.
3. Richard Niemiec, —Oracle Database 11g Release 2 Performance Tuning Tips and Techniques, McGraw Hill Osborne, New York, 2012.
4. Thomas Connolly and Carolyn Begg, —Database Systems: A Practical Approach to Design, Implementation and Management, Fifth Edition, Pearson Education, Boston, 2009.

XT3076 DATA SCIENCE AND ANALYTICS L T P C
3 0 0 3

OBJECTIVES:

- To know the fundamental concepts of data science and analytics
- To learn fundamental data analysis using R
- To understand various data modeling techniques
- To learn the basic and advanced features of open source big data tools and frameworks
- To study various analytics on stream data

UNIT I INTRODUCTION TO DATASCIENCE AND BIG DATA 9

Introduction to Data Science – Data Science Process – Exploratory Data analysis –Collection of Data – Graphical Presentation of Data – Classification of Data – Storage and Retrieval of Data, Big data: Definition, Risks of Big Data, Structure of Big Data – Web Data: The Original Big Data –Evolution Of Analytic Scalability – Analytic Processes and Tools – Analysis versus Reporting – Core Analytics versus Advanced Analytics– Modern Data Analytic Tools – Statistical Concepts: Sampling Distributions – Re-Sampling – Statistical Inference – Introduction to Data Visualization

UNIT II DATA ANALYSIS USING R 9

Univariate Analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis – Bivariate Analysis: Correlation – Regression Modeling: Linear and Logistic Regression – Multivariate Analysis – Graphical representation of Univariate, Bivariate and Multivariate Analysis in R: Bar Plot, Histogram, Box Plot, Line Plot, Scatter Plot, Lattice Plot, Regression Line, Two-Way cross Tabulation

UNIT III DATA MODELING 9

Bayesian Modeling – Support Vector and Kernel Methods – Neuro – Fuzzy Modeling – Principal Component Analysis – Introduction to NoSQL: CAP Theorem, MongoDB: RDBMS Vs MongoDB, Mongo DB Database Model, Data Types and Sharding – Data Modeling in HBase : Defining Schema– CRUD Operations.

UNIT IV DATA ANALYTICAL FRAMEWORKS **9**

Introduction to Hadoop: Hadoop Overview – RDBMS versus Hadoop – HDFS (Hadoop Distributed File System): Components and Block Replication – Introduction to MapReduce – Running Algorithms Using MapReduce – Introduction to HBase: HBase Architecture, HLog and HFile, Data Replication – Introduction to Hive, Spark and Apache Sqoop

UNIT V STREAM ANALYTICS **9**

Introduction to Streams Concepts – Stream Data Model and Architecture – Stream Computing – Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window.

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Convert real world problems to hypothesis and perform statistical testing.
CO 2 : Work with big data platform and its analysis techniques.
CO 3 : Select and employ mechanisms for tracking the software projects and maintaining quality.
CO 4 : Write efficient MapReduce programs for small problem-solving methods.
CO 5 : Implement suitable data analysis for stream data.

REFERENCES:

1. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
2. Umesh R Hodeghatta, Umesha Nayak, “Business Analytics Using R – A Practical Approach”, Apress, 2017.
3. Anand Rajaraman, Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
4. Nishant Garg, “HBase Essentials”, Packt, 2014.
5. Rachel Schutt, Cathy O'Neil, “Doing Data Science”, O'Reilly, 2013.
6. Foster Provost, Tom Fawcet, “Data Science for Business”, O'Reilly, 2013.
7. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications”, Wiley, 2014.

XC3074 DEEP LEARNING **L T P C**
3 0 0 3

OBJECTIVES:

- To provide the mathematical and computational demands of building neural networks
- To study the concepts of convolution neural network (CNN) and its architecture
- To introduce the sequence modelling using recurrent neural network (RNN)
- To understand the various challenges involved in designing deep learning algorithms for varied applications
- To apply deep learning techniques for real time applications

UNIT I FOUNDATIONS OF DEEP NETWORKS **9**

Neural networks: Biological neuron - Perceptron - Multi-layered Feedforward Networks - Backpropagation learning, Activation functions: Linear - sigmoid - rectified linear and SoftMax, Loss functions, regularization, Deep networks: Unsupervised Pretrained Networks - Deep Belief Networks - Generative Adversarial Networks

UNIT II CONVOLUTIONAL NEURAL NETWORKS (CNNs) 9

Convolutional Operation, Motivation, Pooling layers, Fully connected layers, A complete CNN architecture: AlexNet - VGG - Inception - ResNet, Training a Convnet: weights initialization - batch normalization - hyperparameter optimization

UNIT III SEQUENCE MODELING USING RECURRENT NETS 9

Recurrent Neural Networks (RNN), Bidirectional RNNs, Encoder-Decoder sequence-to-sequence architectures, Deep RNNs, Recursive NN, Challenge of long-term dependencies, Long Short-term Memory (LSTM) and other Gated RNNs

UNIT IV DEEP LEARNING RESEARCH 9

Linear Factor Models, variants of Autoencoders, Representational Learning, Structured probabilistic models for deep learning, Monte Carlo Methods, Generative adversarial networks - Deep generative models

UNIT V APPLICATIONS OF DEEP LEARNING 9

Case studies (one in each) in Computer Vision, Speech Processing, Natural Language Processing

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Understanding the basics concepts of deep learning.
CO 2 : Understanding of CNN and RNN to model for real world applications.
CO 3 : Emphasizing knowledge on various deep learning algorithms.
CO 4 : Analyse the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
CO 5 : Solve real-world problems by implementing deep learning algorithms.

REFERENCES:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016
2. Yoshua Bengio, “Learning Deep Architectures for AI, Foundations & Trends in Machine Learning”, Now Publishers, 2009
3. Josh Patterson, Adam Gibson, Deep Learning: A Practitioner’s Approach, O’Reilly Media, 2017.
4. Li Deng, Dong Yu, “Deep Learning: Methods and Applications”, Now Publishers 2014.
5. Nikhil Buduma, “Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms”, O’Reilly publications.2017.
6. Jon Krohn, “Deep Learning for Natural Language Processing: Applications of Deep Neural Networks to Machine Learning Tasks”, Addison-Wesley, 2017.

XC3075 DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To learn the fundamental concepts and applications of Digital Image Processing
- To study about various Filters and its types
- To understand segmentation and feature analysis processes
- To understand various compression techniques
- To learn about image processing applications in recent trends

UNIT I FUNDAMENTALS OF IMAGE PROCESSING 9

Introduction– Representation – Fundamental Steps in Image Processing – Components of Image Processing Systems – Image Sensing & Acquisition–Sampling and Quantization–Digital Image processing operations

UNIT II IMAGE ENHANCEMENT 9

Image Transforms: Discrete Fourier Transform – Fast Fourier Transform – Discrete Cosine Transform – Image Enhancement in Spatial and Frequency Domain – Grey Level Transformations – Histogram Processing –Spatial Filtering – Smoothing and Sharpening – Frequency Domain: Filtering in Frequency Domain – Homomorphic filtering

UNIT III IMAGE RESTORATION AND MULTIRESOLUTION ANALYSIS 9

Image Restoration – Image Degradation Model – Noise Modeling – Blur – Order Statistic Filters – Image Restoration Algorithms -Multi Resolution Analysis: Image Pyramids – Multi Resolution Expansion – Wavelet Transforms

UNIT IV IMAGE SEGMENTATION AND FEATURE ANALYSIS 9

Multi-Resolution Analysis: Image Pyramids – Multiresolution Expansions – Wavelet Transforms. Image Segmentation – classification - Detection of Discontinuities – Edge detection– Image morphology – Morphological operators – Grayscale morphology – Image Feature Representation: Boundary Representation – Boundary Description – Regional Descriptors – Feature Selection Techniques

UNIT V APPLICATIONS OF IMAGE PROCESSING 9

Image Fusion – Image Security - Digital Image Forensics – Medical Image Processing – Video Processing and Video Compression – Computer vision – Data Mining and Content-based Image Retrieval Systems

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Understand the fundamentals of image and implement basic image processing operations.
CO 2 : Apply filtering techniques in the areas of image enhancement.
CO 3 : Apply image restoration algorithms and analyze the image.
CO 4 : Understand the image segmentation algorithms and extract features from images.
CO 5 : Apply image processing techniques in various fields.

REFERENCES:

1. Sridhar. S, “Digital Image Processing”, Oxford University Press, 2nd Edition, New Delhi, 2016.
2. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, Pearson Education, 4th Edition, New York, 2018.
3. Anil K. Jain, “Fundamentals of Digital Image Processing”, Pearson Education, New Delhi, 2009.
4. Milan Sonka, Vaclav Hlavac, and Roger Boyle, “Image Processing, Analysis, and Machine Vision”, Cengage Learning, 4th Edition, Stanford, 2015.

XC3076	E-LEARNING	L T P C 3 0 0 3

OBJECTIVES:

- To get an overview about e-learning
- To understand the importance of psychological background in e-learning
- To completely understand the models of e-learning
- To get updated about the recent trends in e-learning
- To familiarize with the current technologies in e-learning

UNIT I Concept of E-Learning **9**

Meaning, Evolution of E-Learning –Generations of distance education, Components of ELearning – Virtual classroom: Tele conferencing, Audio and Video conferencing tools. Advantages & disadvantages, E-learning in education versus corporate sector

UNIT II Psychological Background in E-Learning **9**

Process of E-Learning: Knowledge Acquisition and Creation, Sharing of Knowledge, Utilization of Knowledge – E-Learning Instructional Grounds: Behaviourism, Cognitivism and Constructivism

UNIT III Models of E-Learning **9**

Role of Web-Based Instruction in Learning – Definition, Models of Instructional Design ISD Model & Hyper Media Design Model (HMD) –Tools for web based instruction

UNIT IV Trends in E-Learning **9**

Challenges of Distance Education – Electronic Media in Distance Education – Open Educational Resources – Internet in Distance Education – Virtual University System, E- Patashala, E Content Development by Indian Institutions

UNIT V Current Technologies in E-Learning **9**

Augmented Reality, Artificial Intelligence, Internet of Things, Learning Management System, School Management, systems, cloud computing, remote virtual laboratories

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Get an overview about e-learning.
CO 2 : Understand the importance of psychological background in e-learning.
CO 3 : Completely understand the models of e-learning.
CO 4 : Get updated about the recent trends in e-learning.
CO 5 : Familiarize with the current technologies in e-learning.

REFERENCES:

1. Mahmut Sinecen, “Trends in E Learning”, Intech Open London, UK, 2018.
2. Badrul H.Khan and Mohammad Ally, “International and book of Learning, Volume I Theoretical Perspectives and Research” ,Routledge, UK, 2015.
3. Boykaand Gradinarova, “E-Learning Instructional Design, Organizational Strategy and Management”, Intech Open, UK, 2015.
4. Mohamed Hamada, “E-Learning –New Technology, Applications and Future Trends”, Nova Science Publishers, 2013.
5. Diane Elkins and Desiree , “E Learning Fundamentals: A Practical Guide”, Pinder, 2015.
6. Book Depository, UK. Michael Allenn “Guide to E Learning”, II Edition, John Wiley & Sons, New Jersey, 2016.

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XT3077 ENTERPRISE APPLICATION DEVELOPMENT L T P C
3 0 0 3

OBJECTIVES:

- To introduce the basics and benefits of enterprise resource planning
- To learn the ERP implementation and its methodology
- To know the ERP technologies used for online businesses
- To learn the business modules in the ERP
- To know the future trends in the ERP

UNIT I ENTERPRISE RESOURCE PLANNING 9

ERP – Introduction – Scope – Technology – Benefits of ERP. Business Engineering – Overview – Significance – Principles of Business Engineering. Business Modelling for ERP – Overview – Building the Business Model

UNIT II ERP IMPLEMENTATION 9

Implementation Of ERP – Overview – Post-Implementation Options, ERP Implementation Methodology – Guidelines for ERP Implementation. ERP Domain – Industrial and financial systems- Bann IV – SAP - SAP R/3 Applications

UNIT III ERP AND TECHNOLOGY 9

ERP and Technology –Introduction - Business intelligence – E-commerce and E- Business – Business process re-engineering (BPR) – online analytical processing (OLAP)-Supply Chain Management (SCM) – Customer Relational ship Management (CRM)

UNIT IV MODULES IN ERP 9

Business Modules in ERP- Finance – Manufacturing (production) – Human resources – plant maintenance – Material management – Marketing – sales, distribution and services

UNIT V CURRENT TRENDS IN ERP 9

Introduction – New markets – New channels – customization tools – SOA factor. ERP Case Studies

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : To know the strategic importance of Enterprise Resource Planning.
CO 2 : To know the implementation of ERP.
CO 3 : To understand the ERP technology and how its supports for online business.
CO 4 : To understand and implement ERP in various sectors.
CO 5 : To understand the current and future trends in ERP.

REFERENCES:

1. Vinod Kumar Grag and N.K. Venkitakrishnan, ERP- Concepts and Practice, Prentice Hall of India, 2nd edition, 2006.
2. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, New Delhi, 2014.
3. Alexis Leon, Enterprise Resource Planning, Fourth edition, Tata McGraw-Hill, 2019.
4. Jagan Nathan Vaman, ERP in Practice, Tata McGraw-Hill, 2008.
5. Joseph A Brady, Ellen F Monk, Bret Wagner, “Concepts in Enterprise Resource Planning”, Thompson Course Technology, USA, 2001.
6. Mahadeo Jaiswal and Ganesh Vanapalli, “ERP”, Macmillan Publishers India Limited, 2009.

XC3077	GAME DESIGN AND DEVELOPMENT	L T P C 3 0 0 3

OBJECTIVES:

- To know the basics of 2D and 3D graphics for game development
- To know the stages of game development
- To understand the basics of game engine
- To survey the gaming development environment and toolkits
- To learn and develop simple games using Pygame environment

UNIT I 3D GRAPHICS FOR GAME PROGRAMMING 9

Game – Definition – Genres of Games, Basics of 2D and 3D Graphics, Game Objects Design – 2D and 3D Transformations – Projections – Colour Models – Illumination and Shader Models – Animation – Controller based Animation

UNIT II GAME DESIGN PRINCIPLES 9

Character Development, Storyboard Development for Gaming – Script Design – Script Narration – Game Balancing –Core Mechanics – Principles of Level Design – Proposals – Writing for Pre-production, Production and Post-Production

UNIT III GAME ENGINE DESIGN 9

Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine – Collision Detection – Game Logic – Game AI – Path Finding

UNIT IV GAMING PLATFORMS AND FRAMEWORKS 9

Pygame Game development – Unity – Unity Scripts –Mobile Gaming, Game Studio, Unity – Single player and Multi-Player games

UNIT V GAME DEVELOPMENT USING PYGAME 9

Developing 2D and3D Interactive Games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating Music and Sound – Asset Creations – Game Physics Algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based Games – Overview of Puzzle Games

TOTAL: 45 PERIODS

OUTCOMES:

CO 1 : Have knowledge on the concepts of 2D and 3D graphics.
CO 2 : Prepare game design documents.
CO 3 : Understand the implementation of gaming engines.
CO 4 : Survey gaming environments and frameworks.
CO 5 : Implement a simple game in Pygame.

REFERENCES:

1. Sanjay Madhav, “Game Programming Algorithms and Techniques: A Platform Agnostic Approach”, Addison-Wesley Professional, 2013.
2. Will McGugan, “Beginning Game Development with Python and Pygame: From Novice to Professional”,Apress Publishers, 2007.
3. Paul Craven, “Python Arcade games”,Apress Publishers, 2016.
4. David H. Eberly, “3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics”, Second Edition, CRC Press, 2006.
5. Jung Hyun Han, “3D Graphics for Game Programming”, Chapman and Hall/CRC, 2011.

XT3078 GEOGRAPHICAL INFORMATION SYSTEM L T P C
3 0 0 3

OBJECTIVES:

- To Develop an understanding of the world's quickly-growing spatial data infrastructure
- To study how to put GIS to work for producing location-based information
- To Identify the relevant spatial characteristics of diverse application areas enabling professionals to integrate spatial thinking
- To study GIS analysis into their careers
- To have an ability to use geospatial technologies to gain a significant advantage in the information technology field

UNIT I GIS OVERVIEW 9

GIS – Definition -History of GIS -Basic Components of GIS – Hardware, Software, Data, Methods, People – List of GIS Software: Popular software, Open Source software

UNIT II GIS DATA 9

Data: Spatial and Non-Spatial Data – Spatial Data: Points, Lines, Polygons/Area and Surface - Non-Spatial Data - Levels of Measurement: Nominal, Ordinal, interval, ratio – Data Base – Functions -Data Base Structures – Hierarchical, Network, Relational-Relational Data Base Management System – Normalization, E-R Diagram

UNIT III GIS MODEL AND COMPRESSION 9

Raster Data Model – Grid Cell/Pixel -Tessellations – Regular, Irregular – Geometry of Regular Tessellations: Shape, Adjacency, Connectivity, Orientation - Size of Grid Cell – Data Encoding: Rule of dominance, Rule of importance, Centre of Cell -Data Compression: Runlength, Chain, Block and Quadtree coding -Vector Data Model – Topology - Euler Equation, Rules for Topological Consistency – Arc-Node Data Structure – Raster vs. Vector Comparison

UNIT IV GIS FILE FORMATS 9

Vector Data Input – Digitizer: Principles, Co-ordinate transformation – Errors in digitizing – Scanner: Principles, On Screen Digitization, Geo-referencing – Raster File Formats, Vector File formats – Import/Export Functionality – Linking Non-spatial data with Spatial data – Linking digital databases: ODBC – GPS data integration

UNIT V TECHNIQUES USED IN GIS 9

Discrete and Continuous Surfaces – Interpolation Techniques - Digtial Elevation Models – Sources of DEM: Ground Survey, Photogrammetry, Stereo Satellite data, Airborne Laser Terrain Mapping- DEM representation – Gridded DEM, TIN structure – Extraction of Topographic Parameters: Slope, Aspect, Delineation of Watershed and Drainage Network – DEM Applications

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : How to describe what GIS is; name the major GIS software available; know where to find more information.

CO 2 : How to explain the components and functionality of a GIS and the differences between GIS and other information systems.

CO 3 : The nature of geographic information and explain how it is stored in computer (including map projection) and the two types of GIS data structure.

CO 4 : How to conduct simple spatial analysis using GIS software.

CO 5 : How to design and complete a GIS project from start to finish (data capture, data storage and management, analysis, and presentation).

REFERENCES:

1. Lo, C.P. and Yeung, Albert K.W.," Concepts and Techniques of Geographic Information Systems", Pearson, Second Edition, 2016.
2. Peter A. Burrough, Rachael A. McDonnell, "Principles of GIS", Oxford University Press, Third Edition,2015.
3. Robert Laurini and Derek Thompson, "Fundamentals of Spatial Information Systems", Academic Press, 1992.
4. Paul Longley, Geographic Information Systems and Science, John Wiley & Sons Inc, ,Third Edition, 2010.

XT3079 INFORMATION CODING TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To have a complete understanding of error –control coding
- To understand the encoding and decoding of digital data streams
- To introduce methods for the generation of these codes and their decoding techniques
- To have a detailed knowledge of compression and decompression techniques
- To introduce the concepts of multimedia communication

UNIT I INFORMATION ENTROPY FUNDAMENTALS 9

Uncertainty–Information and entropy–Source coding theorem–Kraft's Inequality-Huffman coding – Shannon Fano coding–Lempel-Ziv Algorithm–Run Length Encoding

UNIT II CHANNEL CAPACITY AND CODING 9

Channel Models - Discrete memory less channels – Channel capacity – Channel coding theorem –Information capacity theorem

UNIT III ERROR CONTROL CODING 9

Linear block codes – Matrix Description- Equivalent codes – Parity Check Matrix – Decoding of Linear Block Code – Syndrome decoding – Cyclic codes – Generator polynomial –Encoder for cyclic codes – Cyclic Redundancy Check (CRC) codes – Convolutional codes–Tree codes–Trellis codes–Viterbi Decoding of Convolutional codes

UNIT IV TEXT AND IMAGE COMPRESSION 9

Compression Principles – Text compression – Static Huffman coding – Dynamic Huffman coding – Arithmetic coding – Image compression – Graphics interchange format –Tagged image file format –Digitized documents-JPEG

UNIT V AUDIO AND VIDEO CODING 9

Audio compression – Differential pulse code modulation – adaptive differential PCM – adaptive predictive coding – Linear predictive coding – video compression principles - H.261- H.263– MPEG–MPEG-1—MPEG-2—MPEG-4

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Understand the fundamentals of information.
CO 2 : Know the basic notions of information and channel capacity.
CO 3 : Convolutional and block codes, decoding techniques.

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CO 4 : Understand how error control coding techniques are applied in communication systems.
CO 5 : Compression techniques for text, image, audio and video.

REFERENCES:

1. Amitabha Bhattacharya," Digital Communication", Tata McGraw-Hill, New Delhi,2015.
2. Fred Halsall, "Multimedia Communications: Applications, Networks, Protocols and Standards", Pearson Education Asia, Delhi, 2001.
3. K. Sayood, "Introduction to Data Compression", Third Edition, Elsevier, San Francisco, 2010.
4. R. Bose, "Information Theory, Coding and Cryptography", Tata McGraw-Hill, New Delhi, 2008.
5. S. Gravano, "Introduction to Error Control Codes", Oxford University Press, Oxford, 2007.

XT3080 INFORMATION RETRIEVAL TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To learn the concepts behind IR
- To understand the operation of web search
- To learn the algorithms related to text classification, indexing and searching
- To understand various IR models
- To understand how IR is applied in real world problems

UNIT I MODELLING 9

Taxonomy of information retrieval models – Formal characterization of IR models – Classic Information Retrieval – Alternative Set Theoretic Models – Alternative Algebraic Models – Alternative Probabilistic Models – Structured Text Retrieval Models – Models for Browsing

UNIT II QUERY LANGUAGES & OPERATIONS 9

Keyword based querying – Pattern matching – Structural queries – Query protocols – User relevance feedback – Automatic local analysis – Automatic global analysis

UNIT III INDEXING & SEARCHING 9

Inverted files – Other indices for text – Boolean queries – Sequential searching – Pattern matching – Structural queries

UNIT IV USER INTERFACES 9

Human-computer interaction – Information access process – Starting points – Query specification – Context – Using relevance judgements – Interface support for the search process

UNIT V MULTIMEDIA IR 9

Data modelling – Query languages – Generic Multimedia Indexing approach – One-dimensional time series – Two-dimensional color images – Automatic feature extraction

TOTAL: 45 PERIODS

OUTCOMES:

CO 1 : Use an open source search engine framework and explore its capabilities.
CO 2 : Represent documents in different ways and discuss its effect on similarity calculations and on search.
CO 3 : Design and implement an innovative feature in a search engine.
CO 4 : Build an IR model.
CO 5 : Enhance an existing IR model.

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REFERENCES:

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, “Modern Information Retrieval”, Pearson , Second Edition, England, 2011.
2. Bruce Croft, Donald Metzler and Trevor Strohman, “Search Engines: Information Retrieval in Practice”, Pearson, Boston, 2010.
3. C. Manning, P. Raghavan and H. Schütze, “Introduction to Information Retrieval”, Cambridge University Press, Cambridge, 2008.
4. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, “Information Retrieval: Implementing and Evaluating Search Engines”, The MIT Press, Cambridge, 2016.

XT3081 INFORMATION SECURITY L T P C
3 0 0 3

OBJECTIVES:

- To Understand basic information security principles and approaches
- To Recognize the major information security threats and countermeasures
- To understand the importance of information security
- To understand the various security protocols
- To design a secure system model

UNIT I INTRODUCTION TO INFORMSTION SECURITY 9

History - What is Information Security - Critical Characteristics of Information - NSTISSC Security Model - Components of an Information System - Securing the Components - Balancing Security and Access - The SDLC - The Security SDLC

UNIT II SECURITY INVESTIGATION 9

Need for Security - Business Needs – Threats - Attacks – Legal - Ethical and Professional Issues

UNIT III SECURITY ANALYSIS 9

Risk Management: Identifying and Assessing Risk - Assessing and Controlling Risk

UNIT IV LOGICAL DESIGN 9

Blueprint for Security - Information Security Policy - Standards and Practices - ISO 17799/BS 7799 - NIST Models - VISA International Security Model - Design of Security Architecture - Planning for Continuity

UNIT V PHYSICAL DESIGN 9

Security Technology – IDS - Scanning and Analysis Tools – Cryptography - Access Control Devices - Physical Security - Security and Personnel

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Identify both external and internal vulnerabilities to enterprise computer infrastructures and sensitive digital assets and devise a mitigation plan against them.

CO 2 : Have comprehensive information about security policies, establishing necessary organizational processes/functions for information security and will be able to arrange necessary resources.

CO 3 : Differentiating among the models, architectures, challenges and global legal constraints of secure electronic commerce technologies used to ensure transmission, processing and storage of sensitive information.
CO 4 : About cyber law and ethics.
CO 5 : About recent information security threats and preventive measures.

REFERENCES:

1. Matt Bishop, Elisabeth Sullivan; Michelle Ruppel “Computer Security Art and Science”, Addison-Wesley, 2nd Edition, Boston, 2019.
2. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Mass. : Cengage Learning, 6th Edition, Boston, 2018.
3. Micki Krause, Harold F. Tipton, “Information Security Management Handbook 3”, CRC Press, 6th Edition, Boca Raton,.2009.
4. Stuart Mc Clure, Joel Scrambray, George Kurtz, “Hacking Exposed”, Tata McGraw-Hill, 7th Edition, New York, 2012.

XT3082 MARKETING ANALYTICS L T P C
3 0 0 3

OBJECTIVES:

- To give an overview of models and metrics
- To explain competitive analysis and business strategy
- To understand product, service and price analytics
- To familiarize with distribution and promotion analytics
- To introduce to sales analytics

UNIT I MODELS AND METRICS 9

Marketing Analytics, Models and metrics- Market Insight – Market data sources, sizing, PESTLE trend analysis, and porter five forces analysis – Market segment identification and positioning

UNIT II COMPETITIVE ANALYSIS AND BUSINESS STRATEGY 9

Competitor identification, Intelligence gathering, analysis and strategy- Analytics based strategy selection, with strategic models and metrics, Forecasting, balanced scorecard, and critical success factors

UNIT III PRODUCT, SERVICE AND PRICE ANALYTICS 9

Conjoint analysis model, decision tree model, portfolio resource allocation, Pricing techniques, pricing assessment, pricing for business markets, price discrimination

UNIT IV DISTRIBUTION AND PROMOTION ANALYTICS 9

Retail location selection, distribution channel evaluation, and multi-channel distribution, Promotion budget estimation and allocation, promotion metrics for traditional media and social media

UNIT V SALES ANALYTICS 9

E-Commerce sales mode, sales metrics, profitability metrics and support metrics

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Get an overview of models and metrics.
CO 2 : Understand competitive analysis and business strategy.
CO 3 : Understand product, service and price analytics.
CO 4 : Familiarize with distribution and promotion analytics.
CO 5 : Understanding about sales analytics.

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REFERENCES:

1. Stephan Sorger, “Marketing Analytics – Strategic Models and Metrics”, Admiral Press, 2013.
2. Simon Kingsnorth, “Digital Marketing Strategy: An Integrated Approach to Online Marketing”, Kogan Page, 2019.
3. Wayne L. Winston, “Marketing Analytics: Data-Driven Techniques with Microsoft Excel”, Wiley, 2014.
4. Simon Kingsnorth, “Digital Marketing Strategy: An Integrated Approach to Online Marketing”, Kogan Page, 2019.

XC3078 **MOBILE COMPUTING** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn about the basics of wireless communication
- To learn basic concepts and systems issues in telecommunication and satellite systems
- To illustrate architecture and protocols in pervasive computing and to identify the trends and latest development of the technologies in the area to design successful mobile and pervasive computing applications and services research project
- To design successful mobile and pervasive computing applications and services research project
- To evaluate critical design trade-offs associated with different mobile technologies, architectures, interfaces and business models and how they impact the usability, security, privacy and commercial viability of mobile and pervasive computing services and applications

UNIT I OVERVIEW OF WIRELESS COMMUNICATION **9**

History of wireless communication – applications of wireless networks and mobile communications – wireless transmission- frequencies for radio transmission- signals – antennas – signal propagation- multiplexing – modulation – spread spectrum – cellular systems – medium access control

UNIT II TELECOMMUNICATION AND SATELLITE SYSTEMS **9**

GSM – Functional architecture of a GSM system – Handover in GSM – security – DECT – TETRA – UMTS and IMT -2000 – Bluetooth - WiFi, WiMAX, 3G, 4G ,WATM.- Mobile IP protocols -WAP push architecture-WML scripts and applications - Data networks – SMS – GPRS – EDGE – Hybrid Wireless Networks – ATM – Wireless ATM

UNIT III PERVASIVE COMPUTING **9**

Introduction - Principles, Characteristics- interaction transparency, context aware, automated experience capture. Architecture for pervasive computing - Pervasive devices-embedded controls - smart sensors and actuators -Context communication and access services

UNIT IV PROTOCOLS **9**

Open protocols- Service discovery technologies- SDP, Jini, SLP, UpnP protocols–data synchronization- SyncML framework - Context aware mobile services - Context aware sensor networks, addressing and communications- Context aware security

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UNIT V TECHNOLOGIES, PLATFORMS AND RECENT TRENDS 9

Past, Present and Future-Device Technology-Device Connectivity-Web application Concepts-WAP and Beyond-Voice Technologies-Personal Digital Assistants -Network simulators: NS2 – GLOMOSIM– SENSIM – OPNET – Programming Platforms – J2ME – SYMBIAN OS – Recent advances in Wireless Networks.

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : To deploy better strategies for radio and signal transmission.
CO 2 : To develop suitable scripts and applications for recent networks.
CO 3 : To use context aware sensor and mesh networks to develop mobile computing environment.
CO 4 : To develop better protocols and effective communication mechanism for mobile and context aware computing.
CO 5 : To develop more system model by using different simulators and design an appropriate mechanism to evaluate the system performance.

REFERENCES:

1. Jochen Burkhardt, Stefan Heper, Klaus Rindtorf, Thomas Schaeck, ”Pervasive Computing-Technology and Architecture of Mobile Internet Application”, Pearson Education, Indian Edition, 2012.
2. Jochen Schiller, “Mobile Communications”, Pearson, Second Edition, 2012.
3. Seng Loke, Context-Aware Computing Pervasive Systems, Auerbach Pub., New York, 2007.
4. Uwe Hansman etl ,Pervasive Computing, 2nd Edition,Springer, New York,2003.

XC3079 MODELLING AND SIMULATION L T P C
3 0 0 3

OBJECTIVES:

- To introduce system, models and simulation
- To understand random numbers and the techniques to generate random numbers
- To know the different queueing models
- To analyze the various simulation data with different techniques
- To understand the simulation of computer network system

UNIT I INTRODUCTION TO SYSTEMS 9

Simulation – Advantages and Disadvantages – Applications of Simulation – Systems and System Environment – Components of a system – Discrete and Continuous systems – Model of a system– Types of models – Discrete-Event system simulation – Steps in a simulation study

UNIT II RANDOM NUMBERS AND RANDOM-VARIATE GENERATION 9

Properties of random numbers – Generation of Pseudo-random numbers – Techniques for generating random numbers – Linear congruential method – Combined linear congruential generators – Random-number streams – Tests for Random numbers – Frequency tests – Tests for autocorrelation - Inverse-Transform Technique – Acceptance-Rejection technique – Special properties

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UNIT III QUEUEING MODELS **9**

Characteristics of queueing systems – Long-run measures of performance of queueing systems – Little's Formula – Steady-state behavior of Finite and Infinite population Markovian queueing models Networks of Queues

UNIT IV ANALYSIS OF SIMULATION DATA **9**

Data collection – Identifying the distribution with data – Parameter estimation – Goodness of fit tests – Fitting a non-stationary Poisson process – Selecting input models without data – Multi-variate and Time series input models

UNIT V SIMULATION OF NETWORKED COMPUTER SYSTEMS **9**

Simulation tools – Model Input – Mobility models in wireless systems – The OSI stack model – Physical layer in wireless systems – Media Access control – Data link layer – TCP – Model construction

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Understand the system concept and simulation models.
CO 2 : Know about random numbers and techniques to generate random numbers.
CO 3 : Understand the queuing models.
CO 4 : Understand the different analyzing techniques of simulation data.
CO 5 : Understand the simulation of computer network system.

REFERENCES:

1. Jerry Banks John S. Carson II, Barry L. Nelson, and David M.Nicol, "Discrete -Event System Simulation", 5 th Edition, Pearson, India, 2013
2. Geoffrey Gordon, "System Simulation", 2nd Edition, PHI Learning, 2013.
3. Narsingh Deo, "System Simulation with Digital Computer, "Prentice Hall, India, 2004.
4. Shannon, R.E. "Systems simulation, The art and science", Prentice Hall, 1998.
5. Thomas J. Schriber, "Simulation using GPSS", Krieger Publishing Company, 1990.

XT3083 MULTIMEDIA ANALYTICS **L T P C 3 0 0 3**

OBJECTIVES:

- To introduce the basics of multimedia databases and its architecture
- To deal with multimedia databases include text, image and video analysis
- To learn the techniques of text mining in multimedia
- To learn architectural support of multimedia data mining and video retrieval in video mining
- To design content-based image and video retrieval system

UNIT I MULTIMEDIA DATABASES **9**

Introduction to multimedia databases – Multimedia data – An introduction to SQL and multimedia - Querying Multimedia data – Modelling multimedia databases – Using multimedia metadata – Multimedia database architecture and performance – Multimedia and the internet

UNIT II DEALING WITH MULTIMEDIA DATABASES 9

Text Databases - Querying Character Data Using SQL, Statistical Methods for Text Analysis, Querying Multimedia Text, Content-dependent Metadata, Indexing Technologies for Text. Image Databases - Technologies for Image Processing, Role of Feature Extraction, Retrieval Methods, Developing Image Media Databases. Video Databases - Video Analysis and Segmentation, Storage of Video Objects, Dealing with Moving Images, Metadata for Speech and Video, Manipulating Video Data, Video Query Process

UNIT III MULTIMEDIA TEXT MINING 9

Overview, From Textural Information to Numerical Vectors - Collection Documents, Document Standardization, Tokenization, Lemmatization, Vector Generation for Prediction, Sentence Boundary Determination, Part-Of-Speech Tagging, Word Sense Disambiguation, Phrase Recognition, Named Entity Recognition, Parsing, Feature Generation. Using Text for Prediction - Recognizing that Documents Fit a Pattern, Document Classification, Learning to Predict from Text, Evaluation of Performance, Applications

UNIT IV MULTIMEDIA DATA AND AUDIO MINING 9

Technologies, Architectural Support, Process of Multimedia Data Mining, Outcomes, Approaches and Techniques. Audio Mining - Overview, Audio Retrieval, Audio Mining, Taxonomy for Audio Mining

UNIT V IMAGE AND VIDEO RETRIEVAL SYSTEM 9

Feature Extraction and Representation, Similarity Measurements, Dimension Reduction and High-dimensional Indexing, Clustering, The Semantic Gap, Learning, Relevance Feedback, Benchmarking Solutions. Video Parsing, Video Abstraction and Summarization, Video Content Representation, Indexing and Retrieval, Video Browsing Schemes, Samples of Video Retrieval Systems

TOTAL :45 PERIODS

OUTCOMES:

CO 1 : To understand the basics of the multimedia database and its architecture.
CO 2 : To extract and deal with the text, image and the video data from multimedia database.
CO 3 : To predict from text, classification and pattern recognition from text.
CO 4 : To understand the approaches and techniques used in data and audio mining.
CO 5 : To deal with the content-based image and video retrieval system.

REFERENCES:

1. Dunckley Lynne, Multimedia Databases: An Object Relational Approach, Pearson Education, 2003.
2. Sholom M. Weiss, NitinIndurkhya, Tong Zhang and Fred Damerau, “Text Mining: Predictive Methods for Analyzing Unstructured”, Springer, 2010.
3. Oge Marques and BorkoFurht, “Content-Based Image and Video Retrieval”, 2012.
4. Robertson, L. Methods and innovations for multimedia database content management/current trends and future practices for digital literacy and competence, Information Science Reference, 2013.
5. Djeraba, C. Multimedia mining: a highway to intelligent multimedia documents (Vol. 22). Springer Science, Business Media, 2012.

XC3080	NATURAL LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the fundamentals of natural language processing
- To appreciate the use of CFG and PCFG in NLP
- To understand the role of semantics and pragmatics
- To understand how to model a language
- To understand how NLP is applied in real world problems

UNIT I OVERVIEW OF WORDS, EXPRESSIONS and AUTOMATA 9

Words - Regular Expressions and Automata - Words and Transducers - N-grams - Part-of-Speech – Tagging - Hidden Markov and Maximum Entropy Models

UNIT II SPEECH 9

Speech – Phonetics - Speech Synthesis - Automatic Speech Recognition - Speech Recognition: - Advanced Topics - Computational Phonology

UNIT III SYNTAX 9

Formal Grammars of English - Syntactic Parsing - Statistical Parsing - Features and Unification - Language and Complexity

UNIT IV SEMANTICS AND PRAGMATICS 9

The Representation of Meaning - Computational Semantics - Lexical Semantics - Computational Lexical Semantics - Computational Discourse

UNIT V APPLICATIONS 9

Information Extraction - Question Answering and Summarization - Dialogue and Conversational Agents - Machine Translation

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Tag a given text with basic Language features.
CO 2 : Design an innovative application using NLP components.
CO 3 : Implement a rule based system to tackle morphology/syntax of a language.
CO 4 : Design a tag set to be used for statistical processing for real-time applications.
CO 5 : Compare and contrast use of different statistical approaches for different types of NLP applications.

REFERENCES:

1. Daniel Jurafsky, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech”, Dorling Kindersley Pvt, Ltd., 2nd Edition, India, 2016.
2. Breck Baldwin, Krishna Dayanidhi, “Language Processing with Java and LingPipe Cookbook”, Packt Publishing Limited, London, 2014.
3. Nitin Indurkhya and Fred J. Damerau, “Handbook of Natural Language Processing”, Chapman & Hall/CRC, Second Edition, Boca Raton, 2010.
4. Richard M Reese, “Natural Language Processing with Java”, Packt Publishing, 2nd Edition, Birmingham, 2018.
5. Steven Bird, Ewan Klein and Edward Loper, “Natural Language Processing with Python”, O‘Reilly Media, First Edition, Beijing , 2009.

XC3081	NETWORK SCIENCE	L T P C 3 0 0 3

OBJECTIVES:

- To learn the concepts of random networks
- To understand the model of Barabási-Albert
- To examine the scale-free network
- To learn the networks with degree correlation
- To understand the robustness of scale-free network

UNIT I RANDOM NETWORKS 9

Basics of networks and graphs, random network model - degree distribution, evolution, small world property, six degrees of separation, Watts- Strogatz model, local clustering coefficient, random networks and network science

UNIT II BARABÁSI-ALBERT MODEL 9

Growth and preferential attachment, Barabási - Albert model, degree dynamics, degree distribution, diameter and the clustering coefficient, preferential attachment - absence of growth, measure, non-linearity, the origins

UNIT III SCALE-FREE PROPERTY 9

Power laws and scale-free networks, Hubs, Universality, Ultra-small property, role of the degree exponent, Generating networks with a pre-defined degree distribution

UNIT IV EVOLVING NETWORKS AND DEGREE CORRELATION 9

Bianconi-Barabási model, measuring fitness, Bose-Einstein condensation, evolving networks. Assortativity and disassortativity, Measuring degree correlations, Structural cutoffs, Degree correlations in real networks

UNIT V NETWORK ROBUSTNESS 9

Percolation theory, robustness of scale-free networks, attack tolerance, cascading failures, modeling cascading failures, building robustness

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Understand the concept of random networks
CO 2 : Examine the model of Barabási-Albert.
CO 3 : Investigate the scale-free network with its properties.
CO 4 : Understand the degree correlation in real networks.
CO 5 : Examine the network robustness with cascading failures.

REFERENCES:

1. Albert-László Barabási, “Network Science”, Cambridge University Press, 2020
2. Filippo Menczer, Santo Fortunato, Clayton A. Davis, “A First Course in Network Science”, Cambridge University Press, 2020.
3. Estrada, E., Fox, M., Higham, D.J. and Oppo, G.L., “Network Science - Complexity in Nature and Technology”, Springer, 2010.
4. Ted G. Lewis, “Network Science: Theory and Practice”, John Wiley& Sons, 2013.
5. Guido Caldarelli, Alessandro Chessa, “Data Science and Complex Networks: Real Case Studies with Python”, Oxford University Press, 2016.

XT3084	OPEN-SOURCE PROGRAMMING	L T P C 3 0 0 3

OBJECTIVES:

- To expose the context and operation of open-source software
- To understand open-source operating system and database
- To learn programming language like: PHP – Python
- To learn configuration of web servers
- To learn some important OSS tools

UNIT I PRINCIPLES OF OPEN-SOURCE SOFTWARE 9

Introduction to Open Source - The Philosophy of OSS - The Cathedral and Bazaar Model -Commercial Software and OSS - Free Software and Freeware - Open-Source Licenses - Copyrights and Copyleft – Patents - Economics of FOSS: Zero Marginal Cost - Income - Generation Opportunities - Problems with Traditional Commercial Software – Internationalization

UNIT II OPEN-SOURCE OPERATING SYSTEMS AND DATABASE 9

Kernel Types - Architectures - Supported File Systems -Security Issues - Case Study: Flavors of Linux - SQL Standard Compliance - Supported Platforms - Programming Interfaces. Case Study: Mysql - Internals and Portability - Data Types - Security - Scalability - Connectivity - Localization - Postgresql - Couchdb – Hbase

UNIT III OPEN-SOURCE PROGRAMMING LANGUAGES 9

Introduction to Open-Source Programming and Scripting Languages- Execution Environment - Programming in Web Environment - File Handling and Data Storage - Working with Forms - Case Study: PHP – Python

UNIT IV OPEN-SOURCE WEB SERVER 9

Web Server - Feature – Architectures - Case Study: Apache Web Server - Configuring and Using Web Server - Comparison of Apache Web Server with Commercial Web Servers

UNIT V TOOLS AND TECHNOLOGIES 9

Integrated Development Environment for Development and Testing - Text Processing Tools - E-Learning Tools - Version Control and Content Management Tools - Parallel and System Programming Tools - Virtualization and Cloud Computing - Social Network Engine

TOTAL :45 PERIODS

OUTCOMES:

CO 1 : Understand how to install and run open-source operating systems.
CO 2 : Apply the security concept in open-source database.
CO 3 : Contribute software to and interact with Free and Open-Source software development projects.
CO 4 : Build and modify one or more Free and Open-Source web server's configuration.
CO 5 : Use a version control system.

REFERENCES:

1. Brian D Foy, "Mastering Perl", O'Reilly Media, Second Edition, California, 2014.
2. Christopher Negus and Christine Bresnahan, "Linux Bible", Wiley, 8th Edition, Washington, 2015.
3. Julie Meloni, "Teach Yourself PHP, MySQL and Apache All in One", Sams Publishers, Fifth Edition, Indiana, 2012.
4. Kailash Vadera and Bhavyesh Gandhi, "Open Source Technology", University Science Press, First Edition, New Delhi, 2009.
5. Sandeep Koranne, "Handbook of Open Source Tools", Springer Science, Business Media, Heidelberg, 2015.

XT3085 **PATTERN RECOGNITION** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn about Supervised and unsupervised Learning
- To study about feature extraction and structural pattern recognition
- To explore different classification models
- To learn Artificial Intelligence techniques
- To understand Fuzzy Pattern Classifiers and Perception

UNIT I OVERVIEW OF PATTERN RECOGNITION 9

Discriminant functions - Supervised learning - Parametric estimation - Maximum Likelihood estimation - Bayesian parameter estimation - Problems with Bayes Approach - Pattern classification by distance functions - minimum distance Pattern classifier

UNIT II UNSUPERVISED CLASSIFICATION 9

Clustering for unsupervised learning and classification, clustering concepts C – means algorithm – hierarchical clustering – Graph theoretic approach to pattern clustering - Validity of clustering solutions

UNIT III FEATURE EXTRACTION AND STRUCTURAL PATTERN RECOGNITION 9

KL Transforms – feature selection through functional approximation – Binary selection – Elements of formal grammars, syntactic description, stochastic grammars, Structural representation

UNIT IV AI TECHNIQUES 9

Search and control strategies – Uniformed search – Informed search – searching AND/OR graphs - Matching techniques – Knowledge for recognition and Classification process – Visual image understanding - Expert system architectures

UNIT V RECENT ADVANCES AND IMAGE APPLICATIONS 9

Learning of neural pattern recognition - Fuzzy logic – Fuzzy pattern classifiers – image segmentation – Credit scoring – Applications in Computer vision, Automated Target recognition, Finger print Identification, Industrial Inspection

TOTAL: 45 PERIODS

OUTCOMES:

CO 1 : Classify data and identifying patterns.
CO 2 : Extract feature set and select the features from given data set.
CO 3 : Apply graph theory approaches to pattern clustering.
CO 4 : Apply AI techniques.
CO 5 : Apply Fuzzy logic and neural pattern rules.

REFERENCES:

1. Andrew Webb, Keith D Copsey, “Statistical Pattern Recognition”, John Wiley & Sons, Third Edition, Hoboken, 2011.
2. Dan Patterson, “Introduction to artificial Intelligence and Expert Systems”, Pearson Education, 1 st Edition, New Delhi, 2015.
3. Richard O Duda, Peter E Hart, David G Stork, “Pattern Classification and Scene Analysis”, John Wiley, 2nd Edition, New York, 2012.
4. Earl Gose, Richard Johnson baugh, Stene Jost, “Pattern Recognition and Image analysis”, Pearson India Education, Indian Edition, Noida, 2015.
5. Elaine Rich, Kevin Knight, “Artificial Intelligence”, Tata Mcgraw Hill Education, 3rd Edition, NewDelhi, 2011.

XT3086	PERSONAL SOFTWARE PROCESSES	L T P C 3 0 0 3

OBJECTIVES:

- To study how to manage and track the time for software processes and personal life
- To study how to plan a product and how to measure size of a product
- To learn how to schedule a process and how to be committed in work
- To learn about software Development process and how to produce defect free product
- To learn how to estimate the product and process quality

UNIT I OVERVIEW AND PLANNING PROCESS 9

Overview of Software Development Life cycle – Overview of PSP – Different levels of PSP – Importance of Statistical data - Why do planning? – Size and Time – Process and sequencing – Tracking – Making the plan – Common planning tools – Software size

UNIT II SOFTWARE SIZE, PROBE SIZE ESTIMATION AND SCHEDULE ESTIMATION 9

Estimation Process - Common estimation techniques – Function points – PROBE overview - Time estimation – size estimation – Time in phase - Planning development time – Estimating task time – Schedule estimating -– Software size estimation

UNIT III DESIGN AND CODE METHODOLOGIES AND REVIEWS 9

Advantages – Effectiveness data – justifying time investment – setting up a review process – Heuristics for design review – - Design and Coding methodologies - Review metrics – Derived metrics – checklists – Different Review Mechanism – Importance of review – Different types of testing

UNIT IV SOFTWARE QUALITY MANAGEMENT AND PROCESS DESCRIPTION 9

Quality Management, Hurdles to Quality – Different Statistical tools - Quality economics – Metrics for cost of quality – Effects of yield variance on schedule – Defect removal process – using casual analysis – Benefits of process definition – process components – Defining phases

UNIT V DATA SUMMARY AND CAUSAL ANALYSIS AND DEVELOPING PSP PROCESS SCRIPTS 9

Defect removal – Basic resource – Causal Analysis Techniques –- Tracking – Overall defect rates – Reduce compile and test defects –Refining time estimation – Developing PSP Process scripts Tailoring PSP Process Scripts to the needs

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Able to implement software development life cycle.
CO 2 : Analyze, prioritize, and manage requirements and do scheduling the jobs based on estimation plan.
CO 3 : Design checklist which is used in reducing defect injection in coding and planning.
CO 4 : Identify and prioritize risks in producing quality product.
CO 5 : Do analyze the root cause for defect and will be committed towards quality.

REFERENCES:

1. Humphrey, W.S., “Introduction to Personal Software Process”, Pearson Education (Singapore) Pvt., Ltd., Delhi, 2003.
2. Raghav S. Nandyal, “Making Sense of Software Quality Assurance”, 1st Edition, Tata McGrawHill, New Delhi, 2007.
3. Steve McConnell,” Code Complete” A Practical Handbook of Software Construction”, 2nd Edition, Microsoft Press, Washington, 2011.

XC3082	QUANTUM COMPUTING	L T P C 3 0 0 3

OBJECTIVES:

- To understand the building blocks of a quantum computer
- To Implement the simple quantum algorithms and information channels in the quantum circuit model
- To understand the principles of quantum information
- To understand the applications and limitations of quantum operations formalizing
- To simulate a simple quantum error-correcting code

UNIT I FUNDAMENTAL CONCEPTS 9

Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms

UNIT II QUANTUM COMPUTING 9

Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications, Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database

UNIT III QUANTUM COMPUTERS 9

Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance

UNIT IV QUANTUM INFORMATION 9

Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum noise and Quantum Operations – Applications of Quantum operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum information

UNIT V QUANTUM ERROR CORRECTION 9

Introduction, Shor code, Theory of Quantum Error Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub Additivity, Data Compression, Quantum cryptography

TOTAL :45 PERIODS

OUTCOMES:

CO 1 : Understand the basics of quantum computing.
CO 2 : Understand the background of quantum mechanics.
CO 3 : Analyse the computation models.
CO 4 : Model the circuits using quantum computation environments and frameworks.
CO 5 : Understand the quantum operations such as noise and error-correction.

REFERENCES:

1. Michael A. Nielsen, Issac L. Chuang, Quantum Computation and Quantum Information, Tenth Edition, Cambridge University Press, 2013.
2. Parag K Lala, Mc Graw Hill Education, Quantum Computing, A Beginners Introduction, First edition (1 November 2020).
3. Chris Bernhardt, The MIT Press; Reprint edition (8 September 2020), Quantum Computing for Everyone.
4. Quantum Computing, A Gentle Introduction, Eleanor G. Rieffel and Wolfgang H. Polak MIT press (2014)

XT3087	SEMANTIC WEB	L T P C 3 0 0 3

OBJECTIVES:

- To learn the fundamentals of semantic web and to conceptualize and depict Ontology for semantic web
- To make a study of languages for semantic web
- To learn about the ontology learning algorithms and to utilize in the development of an application
- To know the fundamental concepts of management of ontology
- To understand the working of ontology models

UNIT I THE QUEST FOR SEMANTICS 9

Building Models - Calculating with Knowledge - Exchanging Information - Semantic Web Technologies – Layers – Architecture - Components –Types – Ontological Commitments – Ontological Categories – Philosophical Background - Sample Knowledge Representation Ontologies –Top Level Ontologies – Linguistic Ontologies – Domain Ontologies – Semantic Web – Need – Foundation

UNIT II LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES 9

Web Documents in XML – RDF - Schema – Web Resource Description using RDF - RDF Properties – Topic Maps and RDF – Overview – Syntax Structure – Semantics – Pragmatics - Traditional Ontology Languages – LOOM - OKBC – OCML – F-Logic Ontology Markup Languages – SHOE – OIL - DAML + OIL - OWL

UNIT III ONTOLOGY LEARNING FOR SEMANTIC WEB 9

Taxonomy for Ontology Learning – Layered Approach – Phases of Ontology Learning –Importing and Processing Ontologies and Documents – Ontology Learning Algorithms -Evaluation

UNIT IV ONTOLOGY MANAGEMENT AND TOOLS 9

Overview – Need for management – development process – target ontology – ontology mapping – Skills management system – Ontological class – Constraints – Issues. Evolution –Development of Tools and Tool Suites – Ontology Merge Tools – Ontology based Annotation Tools

UNIT V APPLICATIONS 9

Web Services – Semantic Web Services - Case Study for specific domain – Security issues – Web Data Exchange and Syndication - Semantic Wikis - Semantic Portals - Semantic Metadata in Data Formats - Semantic Web in Life Sciences - Ontologies for Standardizations - RIF Applications

TOTAL: 45 PERIODS

OUTCOMES:

CO 1 : Create Ontology for a given domain.
CO 2 : Develop an application using ontology languages and tools.
CO 3 : Perform ontology management effectively.
CO 4 : Evaluate different ontology models.
CO 5 : Design and develop web service applications using semantic portals.

REFERENCES:

1. Alexander Maedche, — Ontology Learning for the Semantic Web,Springer; New York 1 edition, 2012.
2. Dean Allemang(Author),James Hendler(Author) —Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL (Paperback), Morgan Kaufmann, Burlington, Massachusetts 2008.
3. Grigoris Antoniou, Frank van Harmelen, —A Semantic Web Primer (Cooperative Information Systems), The MIT Press, Cambridge ,Massachusetts, 2004.

4. John Davies, Dieter Fensel, Frank Van Harmelen, —Towards the Semantic Web: Ontology – Driven Knowledge Management, John Wiley & Sons Ltd. West Sussex, 2003.
5. Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, —The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management, Wiley, Indianapolis, 2003.

XC3083	SOCIAL PSYCHOLOGY	L T P C 3 0 0 3

OBJECTIVES:

- To study how people view themselves
- To study how people view others
- To study how people influence group
- To study how people interact with group
- To study how people act when they are a part of a group

UNIT I OVERVIEW OF SOCIAL PSYCHOLOGY 9

Social Psychology – Origin and development – Social behavior and social thought –social relationships- social cognition-Applications in society and business

UNIT II PERCEIVING AND UNDERSTANDING OTHERS 9

Social perception – Nonverbal communication – Attribution – Impression formation and impression management

UNIT III COGNITION IN THE SOCIAL WORLD 9

Self, Self Esteem and Social Comparison , self-efficacy, narcissism ,Social cognition – Schemas – Heuristics – Errors – Attitudes and Behavior – Persuasion – Cognitive dissonance

UNIT IV INTERPERSONAL RELATIONS 9

Social identity – Prejudice – Discrimination – Aggression – Interpersonal attraction and Relationships

UNIT V APPLIED SOCIAL PSYCHOLOGY 9

Social Influence – Conformity – Compliance – Social Influence – Pro social behavior – Groups – Social issues, Stress, personal beliefs and health

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : The fundamentals of social psychology.
CO 2 : Social perception and impression management.
CO 3 : Social cognition and comparison.
CO 4 : Social Identity and interpersonal attraction and relations.
CO 5 : Social influence and the application of social psychology.

REFERENCES:

1. Baron, Byrne and Brascombe, “Social Psychology”, 14th Edition, Pearson, 2017.
2. David G. Myers, “Social Psychology”, 11th Edition, McGraw Hill, 2021.
3. Baron and Byrne, “Social Psychology”, 8th Edition, PHI, 2006.

XT3088 SOFTWARE TESTING AND QUALITY ASSURANCE L T P C
3 0 0 3

OBJECTIVES:

- To present the concepts software processes methodologies and quality Standards
- To understand the models and metrics of software quality and reliability
- To know the behavior of the testing techniques
- To design test cases to detect the errors in the software
- To enable students to gain a working knowledge of techniques for management of testing projects

UNIT I INTRODUCTION TO SOFTWARE QUALITY 9

Ethical Basis for Software Quality – Total Quality Management Principles – Software Processes and Methodologies – Quality Standards, Practices & Conventions – Improving Quality with Methodologies – Structured/Information Engineering – Measuring Customer Satisfaction–Software Quality Engineering – Defining Quality Requirements – Management Issues for Software Quality – Data Quality Control – Benchmarking and Certification.

UNIT II SOFTWARE QUALITY METRICS AND RELIABILITY 9

Writing Software Requirements and Design Specifications – Analyzing Software Documents using Inspections and Walkthroughs – Software Metrics – Lines of code, Cyclomatic Complexity, Function Points, Feature Points – Software Cost Estimation– Reliability Models – Reliability Growth Models – OO Metrics.

UNIT III TEST CASE DESIGN 9

Testing as an Engineering Activity – Testing Fundamentals – Defects – Strategies and Methods for Black Box Test Case Design – Strategies and Methods for White-Box Test Case design –Test Adequacy Criteria – Evaluating Test Adequacy Criteria – Levels of Testing and different types of testing – OO Testing.

UNIT IV TEST MANAGEMENT 9

Testing and Debugging Goals and Policies – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – Reporting Test Results – The role of three groups in Test Planning and Policy Development – Process and the Engineering Disciplines – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group.

UNIT V CONTROLLING AND MONITORING 9

Measurement and Milestones for Controlling and Monitoring – Status Meetings – Reports and Control Issues – Criteria for Test Completion – SCM – Types of reviews – Developing a review program – Components of Review Plans – Reporting review results.

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : To appreciate the importance of software quality assurance.
CO 2 : To apply quality and reliability metrics to ensure the performance of the software.
CO 3 : To test the software by applying various testing techniques.
CO 4 : To prepare test planning based on the document.
CO 5 : To know the inputs and deliverables of the testing process.

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REFERENCES:

1. Edward Kit, Susannah Finzi, “Software Testing in the Real World – Improving the Process”, Addison-Wesley, Reprinted, Harlow , 1999.
2. Elfriede Dustin, “Effective Software Testing”, Addison-Wesley, 5th printing, Boston, 2006.
3. Ilene Burnstein, “Practical Software Testing - a process-oriented approach”, Springer-Verlag, New York, 2010.
4. M G Limaye, “Software Testing – Principles, Techniques and Tools”, Tata McGraw-Hill Education, New Delhi, 2009.
5. Milind Limaye, “Software Quality Assurance”, Tata McGraw Hill Education, New Delhi, 2011.
6. Rajani and Pradeep Oak, “Software Testing – Effective Methods, Tools and Techniques”, Tata McGraw Hill, New Delhi, 2007.
7. Stephen Kan, “Metrics and Models in Software Quality”, Addison-Wesley, 2nd Edition, Boston,2008.
8. Yogesh Singh, “Software Testing” Cambridge University Press, Cambridge, 2013.

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XT3089 **TOTAL QUALITY MANAGEMENT** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn the basic concepts of TQM
- To understand the various principles, practices of TQM to achieve quality
- To learn the various statistical approaches for quality control
- To understand the TQM tools for continuous process improvement
- To learn the importance of ISO and quality systems

UNIT I INTRODUCTION TO QUALITY **9**

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality - Basic concepts of TQM – TQM Framework - Contributions of Quality Gurus – Barriers to TQM — Cost of Quality

UNIT II TQM PRINCIPLES **9**

Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen service quality frameworks and gaps – Control charts for variables and attributes

UNIT III TQM TOOLS & TECHNIQUES I **9**

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types

UNIT IV TQM TOOLS & TECHNIQUES II **9**

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures – BPR

UNIT V QUALITY SYSTEMS **9**

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing - QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Quality Council – Leadership, Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Develop and understand the quality management philosophies and frameworks.
CO 2 : Develop in-depth knowledge on various tools and techniques of quality management.
CO 3 : Learn the applications of quality tools and techniques used in both manufacturing and service industry.
CO 4 : Develop analytical skills for investigating and evaluating the quality management issues in the industry.
CO 5 : Measure exactly where an organization stands on quality management with respect to the ISO 9000 quality management standard and the Baldrige Award criteria.

REFERENCES:

1. Janakiraman, Band Gopal, R.K, “Total Quality Management — Text and Cases”, Prentice Hall (India) Pvt. Ltd., New Delhi, 2006.
2. Dale H. Besterfiled, et.al., “Total Quality Management”, Pearson Education Asia, 5th Edition, 2018.
3. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, 8th Edition, Cengage Learning India Private Limited, 2012.
4. Shridhava Bhat,”Total Quality Management” Himalaya Publishing house,1s Edition, 2010.
5. Suganthi, L and Anand Samuel, “Total Quality Management”, Pearson Publishing, 2018.

XC3084	UNIX AND NETWORK PROGRAMMING	L T P C 3 0 0 3

OBJECTIVES:

- To learn the basics of UNIX OS and IPC
- To learn the basics of socket programming using TCP and UDP
- To learn about the EchoServer, DayTimeServer, and I/O multiplexing
- To learn about the various socket options
- To learn to create and implement raw sockets

UNIT I BASICS OF UNIX OS and IPC 9

Introduction — Overview of UNIX OS - Environment of a UNIX process - Process control - ProcessrelationshipsSignals–InterprocessCommunication-OverviewofTCP/IPprotocol

UNIT II ELEMENTARYTCP SOCKETS 9

Introduction to Socket Programming –Introduction to Sockets – Socket address Structures – Byteordering functions – address conversion functions – Elementary TCP Sockets – socket, connect, bind,listen,accept,read,write,closefunctions–IterativeServer–ConcurrentServer

UNIT III APPLICATION DEVELOPMENT 9

TCP Echo Server — TCP Echo Client — Posix Signal handling — Server with multiple clients —boundary conditions: Server process Crashes, Server host Crashes, Server Crashes and reboots,Server Shutdown – I/O multiplexing – I/O Models – Select function – Shutdown function – TCP echoServer(withmultiplexing)–Pollfunction–TCPechoClient(withMultiplexing)

UNIT IV SOCKETOPTIONS,ELEMENTARY UDPSOCKETS 9

Socket options – getSocket and setSocket functions – generic socket options – IP socket options –ICMP socket options – TCP socket options – Elementary UDP sockets – UDP echo Server – UDP echoClient – Multiplexing TCP and UDP sockets – Domain name system gethostbyname function Ipv6support in DNS – gethostbyaddr function – getservbyname and getservbyport functions

UNIT V ADVANCED SOCKETS 9

Ipv4 and Ipv6 interoperability – Threaded servers – Thread creation and termination – TCP echoserver using threads – Mutexes – condition variables – Raw sockets – Raw socket creation – Rawsocket output–Rawsocket input–Ping program–Traceroute program

TOTAL: 45 PERIODS

OUTCOMES:

CO 1 : The idea about the UNIX Operating System and Inter-Process Communication.
CO 2 : Ability to do socket programming using TCP and UDP.
CO 3 : Knowledge about EchoServer, DayTimeServer, and I/O multiplexing.
CO 4 : Knowledge of various socket options and able implement socket programming.
CO 5 : Ability to create and implement raw sockets.

REFERENCES:

1. Richard Stevens.W, Bill Fenner, Andrew M Rudoff, “Unix Network Programming –The Sockets and Networking API Volume1”, Addison-Wesley, 3rdEdition, Boston, 2012.
2. W. Richard Stevens, “Unix Network Programming – Volume2 Inter-process communication”, Prentice Hall International, Upper Saddle River,2009.
3. W. Richard Stevens, Stephen A. Rago, “Advanced Programming in The UNIX Environment ”, Addison Wesley, Third Edition, Upper Saddle River,2014.

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XT3090	USER INTERFACE DESIGN	L T P C 3 0 0 3

OBJECTIVES:

- To understand the concepts of user interface
- To learn the process of user interface design
- To learn the system menus and its navigation schemes
- To study the characteristics and components of windows and the various controls for the windows
- To examine the various screen based controls

UNIT I INTRODUCTION TO THE USER INTERFACE 9

The User Interface-Introduction, Overview, The importance of user interface – Defining the user interface, The importance of Good design, Characteristics of graphical and web user interfaces, Principles of user interface design

UNIT II THE USER INTERFACE DESIGN PROCESS 9

Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, Business functions-Business definition and requirement analysis, Basic business functions, Design standards

UNIT III SYSTEM MENUS AND NAVIGATION SCHEMES 9

Structures of menus, Functions of menus, Contents of menus, Formatting of menus, Phrasing the menu, Selecting menu choices, Navigating menus, Kinds of graphical menus

UNIT IV WINDOWS 9

Windows - Characteristics, Components of window, Window presentation styles, Types of window, Window management, Organizing window functions, Window operations, Web systems, Characteristics of device based controls

UNIT V SCREEN BASED CONTROLS 9

Screen based controls- Operable control, Text control, Selection control, Custom control, Presentation control, Windows Tests-prototypes, kinds of tests

TOTAL : 45 PERIODS

OUTCOMES:

CO 1 : Understand the basic concepts of user interface.
CO 2 : Understand the process of user interface design.
CO 3 : Implement an application for system menus with its navigation methods.
CO 4 : Examine windows with operations and device based controls.
CO 5 : Implement an application with different screen based controls.

REFERENCES:

1. Wilbert O. Galitz, “The Essential Guide to User Interface Design”, John Wiley & Sons, Second Edition 2002.
2. Ben Sheiderman, “Design the User Interface”, Pearson Education, 1998.
3. Alan Cooper, ”The Essential of User Interface Design”, Wiley- Dream Tech Ltd.,2002

XT3091	WEB ANALYTICS	L T P C 3 0 0 3

OBJECTIVES:

- To get an overview of the foundation of web analytics
- To understand the importance of data collection
- To get introduced to web analytics strategy
- To familiarise with web analytics tools
- To get introduced to Google Analytics

UNIT I FOUNDATION OF WEB ANALYTICS 9

Understanding web analytics – The foundations of Web analytics: Techniques and Technologies – Present and Future of Web analytics

UNIT II DATA COLLECTION 9

Importance and Options –Web server log files: Click stream data – User submitted information – Web server performance data – Page tags –First and third party tracking

UNIT III WEB ANALYTICS STRATEGY 9

Key performance indicators – Web analytics process – Heuristics evaluations – Site visits – Surveys – Measuring reach – Measuring acquisition – Measuring conversion – Measuring retention – Security and privacy implications of Web analytics

UNIT IV WEB ANALYTICS TOOLS 9

Content organization tools –Process measurement tools – Visitor segmentation tools – Campaign analysis tools – Commerce measurement tools – Google analytics – Omniture – Web trends – Yahoo! Web analytics

UNIT V WEB METRICS 9

Common metrics: Hits, Page views, Visits, Unique visitors, Unique page views, Bounce, Bounce rate, Page/visit, Average time on site, New visits; Optimization(e-commerce, non e-commerce sites): Improving bounce rates, Optimizing adwords campaigns; Real time report, Audience report, Traffic source report, Custom campaigns, Content report, Google analytics, Introduction to KPI, characteristics, Need for KPI, Perspective of KPI, Uses of KPI

TOTAL: 45 PERIODS

OUTCOMES:

CO 1 : Get an overview of the foundation of web analytics.
CO 2 : Understand the importance of data collection.
CO 3 : Get introduced to web analytics strategy.
CO 4 : Familiarise with web analytics tools.
CO 5 : Get introduced to web metrics.

REFERENCES:

1. Bernard J. Jansen, “Understanding User-Web Interactions via Web analytics”, Morgan and Claypool, 2009.
2. Avinash Kaushik, “Web Analytics2.0”, John Wiley & Sons, 2010.
3. Brian Clifton, “Advanced web metrics with Google analytics”, John Wiley & Sons, 2012.
4. Jerri L. Ledford, Joe Teixeira and Mary E. Tyler, “Google Analytics”, John Wiley & Sons, 2013.
5. Sterne J., “Web Metrics : Proven methods for measuring web site success”, 1st Edition, John Wiley and Sons 2002.

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