

P. A. COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University, Chennai)
An ISO 9001:2015 Certified Institution - Accredited by NBA and NAAC with 'A' Grade
Pollachi – 642 002



B.E COMPUTER SCIENCE AND ENGINEERING **CURRICULA & SYLLABI**

(I to VIII Semester)

REGULATIONS 2022



Vision and Mission of the Institute and Department

Vision of the Institute

To progress to become a center of excellence in Engineering and Technology through creative and innovative practices in teaching-learning process and promoting research and development to produce globally competitive and employable professionals who are psychologically strong and emotionally balanced with social perception and professional ethics.

Mission of the Institute

To offer academic programmes, in the emerging areas of Engineering and Technology, provide training and research facilities and opportunities to promote student and faculty research in collaboration with Industry and Government for sustainable growth.

Vision of the Department

To become a Center of Excellence in the field of Computer Science and Engineering through value based teaching-learning process, facilitating innovative research and development, encouraging and molding young minds with ethical values, to be future-ready to take challenges as opportunities.

Mission of the Department

To produce competent and quality professionals by imparting excellent computer education, problem solving techniques, ability to design and work with modern tools, inventive technologies and to develop innovative research capabilities, leadership and entrepreneurial abilities with ethical values.

Program Educational Objectives (PEO)

The objectives of the programme are to provide the following to the students:

- PEO 1:** To make students as well-equipped computer professionals by providing comprehensive knowledge in Mathematics, Science and Engineering to find the solutions to the real-time computing problems.
- PEO 2:** To enhance students to be capable of transforming their gained knowledge into skills in order to work with modern tools and technologies to impart innovative research capabilities.
- PEO 3:** To provide all-round development thereby students are motivated to choose their career as entrepreneurs and technocrats with ethical values and to adapt themselves to rapidly changing work environment for benefit of the society.

Program Specific Outcomes (PSO):

The following outcomes of the programme are provided to the students:

- PSO 1:** To analyze and develop essential proficiency skills in the areas related to engineering science, communicating the earned knowledge, algorithms and analysis, system software, networking and data science and to apply the knowledge based skill to solve real time problems.

PSO 2: To ensure programming skills for the software development using modern computer languages, tools and platforms.

PSO 3: To use the knowledge in research and product development accompanying ethical values as to benefit the society.

Program Outcomes (POs):

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/Development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a

member and leader in a team, to manage projects and in multidisciplinary environments.

- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

SEMESTER I

Sl.No.	COURSE CODE	COURSE TITLE	L	T	P	C
		Induction Programme	0	0	0	0
THEORY						
1	22CAHS101	Professional English - I	3	0	0	3
2	22CABS102	Matrices and Calculus	3	1	0	4
3	22CABS103	Engineering Physics	3	0	0	3
4	22CABS104	Engineering Chemistry	3	0	0	3
5	22CAES105	C Programming	3	0	0	3
6	22CAHS109	Heritage of Tamils	1	0	0	1
PRACTICAL						
7	22CAES106	Programming in C Laboratory	0	0	3	1.5
8	22CABS107	Physics and Chemistry Laboratory	0	0	3	1.5
9	22CAHS108	Communication Skills Laboratory	0	0	2	1
Total			16	1	8	21

SEMESTER II

Sl.No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	22CAHS201	Professional English - II	3	0	0	3
2	22CABS202	Advanced Calculus and its Applications	3	1	0	4
3	22CAES203	Python Programming	3	0	0	3
4	22CABS204	Physics for Information Science	3	0	0	3
5	22CAES205	Basics of Electrical and Electronics Engineering	3	0	0	3
6	22CAES104	Engineering Graphics	1	0	4	3
7	22CAHS202	Tamils and Technology	1	0	0	1
PRACTICAL						
8	22CAES107	Engineering Practices Laboratory	0	0	3	1.5
9	22CAES206	Python Programming Laboratory	0	0	3	1.5
Total			17	1	10	23

SEMESTER III

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	22CABS301	Transform Techniques and its Applications	3	1	0	4
2	22CSES302	Digital Principles and System Design	3	0	0	3
3	22CSPC303	Data Structures	3	0	0	3
4	22CAPC304	Object Oriented Programming	3	0	0	3
5	22CSPC305	Computer Organization and Architecture	3	0	0	3
6	22CAMC306	Constitution of India	3	0	0	0
PRACTICAL						
7	22CSPC307	Data Structures Laboratory	0	0	3	1.5
8	22CAPC308	Object Oriented Programming Laboratory	0	0	3	1.5
Total			18	1	6	19

SEMESTER IV

	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	22CABS401	Discrete Mathematics	3	1	0	4
2	22CAPC402	Operating Systems	3	0	2	4
3	22CAPC403	Database Management Systems	3	0	0	3
4	22CAPC404	Object Oriented Software Engineering	3	0	0	3
5	22CSPC405	Design and Analysis of Algorithms	3	0	0	3
6	22CSPC406	Data Science	3	0	0	3
PRACTICAL						
7	22CSPC407	Data Science Laboratory	0	0	3	1.5
8	22CAPC408	Database Management Systems Laboratory	0	0	3	1.5
Total			18	1	8	23

SEMESTER V

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	22CSBS501	Probability and Statistics	3	1	0	4
2	22CSPC502	Web Programming	3	0	0	3
3	22CAPC503	Computer Networks	3	0	0	3
4	22CAPC504	Theory of Computation	3	0	0	3
5	22CSPE5XX	Professional Elective - I	3	0	0	3
6	22CSOE5XX	Open Elective	3	0	0	3
PRACTICAL						
7	22CSPC505	Web Programming Laboratory	0	0	3	1.5
8	22CAPC506	Computer Networks Laboratory	0	0	3	1.5
Total			18	1	6	22

SEMESTER VI

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	22CSPC601	Artificial Intelligence and Machine Learning	3	0	0	3
2	22CSPC602	Compiler Design	3	0	0	3
3	22CSPC603	Internet of Things	3	0	0	3
4	22CSPE6XX	Professional Elective - II	3	0	0	3
5	22CSPE6XX	Professional Elective - III	3	0	0	3
6	22CSOEXXX	Open Elective	3	0	0	3
7	22CAMC604	Quantitative and Reasoning Skills	3	0	0	0
PRACTICAL						
7	22CSPC605	Machine Learning Laboratory	0	0	3	1.5
8	22CSPC606	Mobile Application Development Laboratory	0	0	3	1.5
Total			21	0	6	21

SEMESTER VII

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	22CAPC701	Cryptography and Network Security	3	0	0	3
2	22CSPC702	UI and UX Design	3	0	0	3
3	22CAHS703	Principles of Management	3	0	0	3
4	22CSPE7XX	Professional Elective - IV	3	0	0	3
5	22CSPE7XX	Professional Elective - V	3	0	0	3
6		Open Elective	3	0	0	3
PRACTICAL						
7	22CAPC704	Security Laboratory	0	0	3	1.5
8	22CSEE705	Mini Project	0	0	3	1.5
Total			18	0	6	21

SEMESTER VIII

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	22CSPE8XX	Professional Elective - VI	3	0	0	3
2		Open Elective IV	3	0	0	3
PRACTICAL						
3	22CSEE801	Project Work	0	0	16	8
Total			6	0	16	14

Total Credits: 21+23+19+23+22+21+21+14=164

HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT (HS)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22CAHS101	Professional English - I	3	0	0	3
2	22CAHS109	Heritage of Tamils	1	0	0	1
3	22CAHS108	Communication Skills Laboratory	0	0	2	1
4	22CAHS201	Professional English - II	3	0	0	3
5	22CAHS202	Tamils and Technology	1	0	0	1
6	22CAHS703	Principles of Management	3	0	0	3

BASIC SCIENCES (BS)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22CABS102	Matrices and Calculus	3	1	0	4
2	22CABS103	Engineering Physics	3	0	0	3
3	22CABS104	Engineering Chemistry	3	0	0	3
4	22CABS107	Physics and Chemistry Laboratory	0	0	3	1.5
5	22CABS202	Advanced Calculus and its Applications	3	1	0	4
6	22CABS204	Physics for Information Science	3	0	0	3
7	22CABS301	Transform Techniques and its Applications	3	1	0	4
8	22CABS401	Discrete Mathematics	3	1	0	4
9	22CABS501	Probability and Statistics	3	1	0	4

ENGINEERING SCIENCES (ES)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22CAES105	C Programming	3	0	0	3
2	22CAES106	Programming in C Laboratory	0	0	3	1.5
3	22CAES203	Python Programming	3	0	0	3
4	22CAES205	Basics of Electrical and Electronics Engineering	3	0	0	3
5	22CAES104	Engineering Graphics	1	0	4	3
6	22CAES107	Engineering Practices Laboratory	0	0	3	1.5
7	22CAES206	Python Programming Laboratory	0	0	3	1.5
8	22CSES302	Digital Principles and System Design	3	0	0	3

PROFESSIONAL CORES (PC)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22CSPC303	Data Structures	3	0	0	3
2	22CSPC305	Computer Organization and Architecture	3	0	0	3
3	22CAPC304	Object Oriented Programming	3	0	0	3
4	22CSPC307	Data Structures Laboratory	0	0	3	1.5
5	22CAPC308	Object Oriented Programming Laboratory	0	0	3	1.5
6	22CAPC402	Operating Systems	3	0	2	4
7	22CSPC406	Data Science	3	0	0	3
8	22CSPC405	Design and Analysis of Algorithms	3	0	0	3
9	22CAPC404	Object Oriented Software Engineering	3	0	0	3
10	22CAPC403	Database Management Systems	3	0	0	3
11	22CSPC408	Database Management Systems Laboratory	0	0	3	1.5
12	22CSPC407	Data Science Laboratory	0	0	3	1.5
13	22CSPC502	Web Programming	3	0	0	3
14	22CAPC503	Computer Networks	3	0	0	3
15	22CAPC504	Theory of Computation	3	0	0	3
16	22CSPC505	Web Programming Laboratory	0	0	3	1.5
17	22CAPC506	Computer Networks Laboratory	0	0	3	1.5
18	22CSPC601	Artificial Intelligence and Machine Learning	3	0	0	3
19	22CSPC602	Compiler Design	3	0	0	3
20	22CSPC603	Internet of Things	3	0	0	3
21	22CSPC605	Machine Learning Laboratory	0	0	3	1.5
22	22CSPC606	Mobile Application Development Laboratory	0	0	3	1.5
23	22CAPC701	Cryptography and Network Security	3	0	0	3
24	22CSPC702	UI and UX Design	3	0	0	3
25	22CAPC704	Security Laboratory	0	0	3	1.5

PROFESSIONAL ELECTIVE (PE) – I (SEMESTER V)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22CSPE501	Data Warehousing and Data Mining	3	0	0	3
2	22CSPE502	Software Testing and Automation	3	0	0	3
3	22CSPE503	Advanced Algorithms	3	0	0	3
4	22CSPE504	Big Data Analytics	3	0	0	3
5	22CSPE505	Distributed Systems	3	0	0	3
6	22CSPE506	Digital Marketing	3	0	0	3

PROFESSIONAL ELECTIVE (PE) – II (SEMESTER VI)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22CSPE601	Digital Signal Processing	3	0	0	3
2	22CSPE602	Cloud Computing	3	0	0	3
3	22CSPE603	App Development	3	0	0	3
4	22CSPE604	Soft Computing	3	0	0	3
5	22CSPE605	Cryptocurrency and Block chain Technologies	3	0	0	3
6	22CSPE606	Exploratory Data Analytics	3	0	0	3

PROFESSIONAL ELECTIVE (PE) – III (SEMESTER VI)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22CSPE607	Devops	3	0	0	3
2	22CSPE608	Multimedia and Animation	3	0	0	3
3	22CSPE609	Deep Learning	3	0	0	3
4	22CSPE610	Multi-Core Architecture	3	0	0	3
5	22CSPE611	Ethical Hacking	3	0	0	3
6	22CSPE612	Optimization Techniques	3	0	0	3

PROFESSIONAL ELECTIVE (PE) – IV (SEMESTER VII)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22CSPE701	Virtualization Techniques	3	0	0	3
2	22CSPE702	Bioinformatics	3	0	0	3
3	22CSPE703	Digital Image Processing	3	0	0	3
4	22CSPE704	Human Computer Interaction	3	0	0	3
5	22CSPE705	Augmented and Virtual Reality	3	0	0	3
6	22CSPE706	Embedded Systems	3	0	0	3

PROFESSIONAL ELECTIVE (PE) – V (SEMESTER VII)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22CSPE707	Quantum Computing	3	0	0	3
2	22CSPE708	Agile Methodologies	3	0	0	3
3	22CSPE709	Generative AI	3	0	0	3
4	22CSPE710	Software Project Management	3	0	0	3
5	22CSPE711	Service Oriented Architecture	3	0	0	3
6	22CSPE712	Full Stack Development	3	0	0	3

PROFESSIONAL ELECTIVE (PE) – VI (SEMESTER VIII)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22CSPE801	Professional Ethics in Engineering	3	0	0	3
2	22CSPE802	Intellectual Property Rights	3	0	0	3
3	22CSPE803	Robotics and its Applications	3	0	0	3
4	22CSPE804	Information Retrieval Techniques	3	0	0	3
5	22CSPE805	Natural Language Processing	3	0	0	3
6	22CSPE806	Information Security	3	0	0	3

OPEN ELECTIVE (OE)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	22ADOE01	Computer Vision	3	0	0	3
2.	22ADOE02	Ethics and AI	3	0	0	3
3.	22ADOE03	Network Security and Firewalls	3	0	0	3
4.	22ADOE04	R Programming	3	0	0	3
5.	22ADOE05	Programming with ASP.Net	3	0	0	3
6.	22CSOE01	Computer Graphics and Simulation	3	0	0	3
7.	22CSOE02	Data Integration & Big data	3	0	0	3
8.	22CSOE03	Game Programming	3	0	0	3
9.	22CSOE04	Storage Technologies	3	0	0	3
10.	22CSOE05	Recommender Systems	3	0	0	3
11.	22ECOEO1	Computational Intelligence	3	0	0	3
12.	22ECOEO2	Wearable Devices	3	0	0	3
13.	22ECOEO3	VLSI Testing and Design For Testability	3	0	0	3
14.	22ECOEO4	IoT Based Systems Design	3	0	0	3
15.	22ECOEO5	Design Thinking	3	0	0	3
16.	22EEOEO1	Power Plant Engineering	3	0	0	3
17.	22EEOEO2	Sensors and Transducers	3	0	0	3
18.	22EEOEO3	Hybrid Energy Technology	3	0	0	3
19.	22EEOEO4	Biomedical Instrumentation	3	0	0	3
20.	22EEOEO5	Electric and Hybrid Vehicles	3	0	0	3
21.	22ITOE01	Mobile Adhoc Networks	3	0	0	3
22.	22ITOE02	Blockchain Technologies	3	0	0	3
23.	22ITOE03	Open Source Technologies	3	0	0	3
24.	22ITOE04	Android Application Development	3	0	0	3
25.	22ITOE05	Digital and Mobile Forensics	3	0	0	3
26.	22MEOEO1	Testing of Materials	3	0	0	3
27.	22MEOEO2	Welding Technology	3	0	0	3
28.	22MEOEO3	Industrial Safety Engineering	3	0	0	3
29.	22MEOEO4	Marketing Management	3	0	0	3
30.	22MEOEO5	Maintenance Engineering	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EE)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22CSEE705	Mini Project	0	0	3	1.5
2	22CSEE801	Project Work	0	0	16	8

MANDATORY COURSES (MC) (NO - CREDIT)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22CAMC306	Constitution of India	3	0	0	0
2	22CAMC607	Quantitative and Reasoning Skills	3	0	0	0

VALUE ADDED COURSES (VA)

Sl.No.	SUBJECT CODE	COURSE TITLE	CREDITS			
			L	T	P	C
1	22CSVAX01	Android Application Development	1	0	0	1
2	22CSVAX02	Multimedia Systems	1	0	0	1
3	22CSVAX03	Software Testing Tools	1	0	0	1
4	22CSVAX04	CISCO Networking	1	0	0	1
5	22CSVAX05	.NET Programming	1	0	0	1
6	22CSVAX06	Node JS & Angular JS	1	0	0	1
7	22CSVAX07	Virtual Machine Fundamentals	1	0	0	1
8	22CSVAX08	Software Product Development and Management	1	0	0	1
9	22CSVAX09	IOT for Telecommunication Systems	1	0	0	1
10	22CSVAX10	Social and Psychological Well Being	1	0	0	1
11	22CSVAX11	NPTEL Courses Relevant to CSE	1	0	0	1

SUMMARY OF CREDIT DISTRIBUTION

S.No.	Course Work Subject Area	CREDITS PER SEMESTER								Total Credits	% of Credits	Credit Range		Anna University
		I	II	III	IV	V	VI	VII	VIII			PA	AICTE	
1	HS	5	4					3		12	7.32	12	12	12
2	BS	11.5	7	4	4	4				30.5	18.59	30.5	25	25
3	ES	4.5	12	3						19.5	11.89	19.5	24	18
4	PC			12	19	12	12	7.5		62.5	38.12	62.5	48	61
5	PE					3	6	6	3	18	10.97	18	18	18
6	OE					3	3	3	3	12	7.32	12	18	12
7	EE							1.5	8	9.5	5.79	9.5	15	16
8	MC			0			0			0		0	-	
	Total	21	23	19	23	22	21	21	14	164	100%	164	160	162

BS – Basic Sciences; HS – Humanities and Social Sciences including Management ;
 ES – Engineering Sciences; PC – Professional Cores; PE – Professional Electives ;
 OE – Open Electives; EE – Employability Enhancement Courses ;
 MC – Mandatory Courses; VA – Value Added Courses

COURSE OBJECTIVES:

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

UNIT-I: INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 9

- Listening - For general information - Listening and filling a form
 Speaking - Self Introduction
 Reading - brochures and social media messages relevant to technical contexts.
 Writing - Writing emails / letters (permission, accepting, declining)
 Grammar - Present Tense, Parts of Speech.
 Vocabulary - One word substitution; Abbreviations & Acronyms

UNIT-II: NARRATION AND SUMMATION 9

- Listening -Listening Comprehension –Monologues - Dialogues.
 Speaking -Narrating personal experiences /oral presentation
 Reading -Reading biographies, newspaper reports, Reading Comprehension
 Writing - Paragraph writing, Short Report on an event (field trip etc.) - discourse markers (connectives & sequence words)
 Grammar - Past tense; Subject-Verb Agreement.
 Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms

UNIT-III: DESCRIPTION OF A PROCESS / PRODUCT 9

- Listening -Listen to a product and process descriptions and advertisements about a products.
 Speaking -Picture description; giving instruction to use the product; advertising a product.
 Reading -Reading advertisements, gadget reviews; user manuals.
 Writing -Writing definitions; instructions; and Product /Process description.
 Grammar -Degrees of comparison; Future Tense
 Vocabulary -Homonyms; and Homophones.

UNIT-IV: CLASSIFICATION AND RECOMMENDATIONS 9

- Listening - Listening and transfer of information- Note-taking.
 Speaking - Small Talk; Mini presentations and making recommendations.
 Reading - Reading for specific information- interpreting visual materials (pictures, labels, signs, postcards).
 Writing - Note-making / recommendations; Transferring information from non verbal

(tables, chart, graph etc,) to verbal mode.
Grammar - wh-yes or no- tags.
Vocabulary - Collocations; Fixed / Semi fixed expressions.

UNIT-V: EXPRESSION

9

Listening - Listening to speeches (experts)..
Speaking - Group discussion, Debate, & Role play activities
Reading - Cloze test, speed reading.
Writing - Essay Writing (Descriptive or narrative)- Cause & Effect Expressions
Grammar - Simple, Compound & Complex Sentences
Vocabulary - Idioms - Phrasal verbs.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Meenakshi Raman & Sangeeta Sharma, “Technical Communication” – Principles And Practices, Oxford Univ. Press, New Delhi 2022.
2. Dr.S. Mahalakshmi, “Professional English”, VK Publications (India) Pvt. Ltd. (2022)
3. Meenakshi Raman & Sangeeta Sharma, “Professional English”, Oxford Higher Education, 2018
4. Aysha Viswamohan, “English For Technical Communication” (With CD), Mcgraw Hill Education, ISBN: 0070264244.
5. Department of English, Anna University, “English for Engineers & Technologists” Orient Blackswan Private Ltd. (2020) edit.
6. Dr. S. Gunasekaran, “A Work Book of Technical English”, Vishnu Prints Media, Chennai- (2020) edit.

COURSE OUTCOMES:

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

- CO1:** Listen and comprehend complex academic texts.
CO2: Read and infer the denotative and connotative meanings of technical texts.
CO3: Write definitions, descriptions, narrations and essays on various topics.
CO4: Speak fluently and accurately in formal and informal communicative contexts.
CO5: Express their opinions effectively in both oral and written medium of communication.

COURSE OBJECTIVES:

- To obtain the knowledge of Eigen values and diagonalization of a matrix.
- To be familiarize with differentiation of single variable and its applications.
- To acquire knowledge of differentiation for more than one variable and its applications.
- To obtain the knowledge of various techniques of integration.
- To acquire the knowledge of multiple integration and related applications.

UNIT-I: MATRICES**9+3**

Eigen values and Eigenvectors of a real matrix - Characteristic equation - Properties of Eigen values and Eigenvectors - Cayley-Hamilton theorem - Diagonalization of a matrix by orthogonal transformation - Reduction of a quadratic form to canonical form by orthogonal transformation - Nature of quadratic forms.

UNIT-II: DIFFERENTIAL CALCULUS**9+3**

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

UNIT-III: FUNCTIONS OF SEVERAL VARIABLES**9+3**

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

UNIT-IV: INTEGRAL CALCULUS**9+3**

Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT-V: MULTIPLE INTEGRALS**9+3**

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.

Contact Periods:**Lecture: 45 Periods****Tutorial: 15 Periods****Practical: 0 Periods****Total: 60 Periods**

REFERENCES:

1. Kreyszig E., “Advanced Engineering Mathematics”, John Wiley & Sons, 10th Edition, 2018.
2. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, 44th Edition, New Delhi, 2018.
3. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 5th Edition, 2016.
4. James Stewart, “Calculus: Early Transcendentals”, Cengage Learning, 8th Edition, New Delhi, 2015.
5. Thomas G.B., Hass J. and Weir M.D., “Thomas Calculus”, Pearson Education, 14th Edition New Delhi, 2018.
6. Anton H., Bivens I. and Davis S., “Calculus”, Wiley, 10th Edition, 2016.

COURSE OUTCOMES:

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

- CO1:** Understand the matrix algebra techniques for solving practical problems.
- CO2:** Understand the limit definition and rules of differentiation to differentiate functions.
- CO3:** Apply differentiation to solve maxima and minima problems.
- CO4:** Apply different methods of integration in solving practical problems.
- CO5:** Apply multiple integrals ideas in solving areas and volumes.

COURSE OBJECTIVES:

- To make the students effectively to achieve understanding of mechanics of solids.
- To enable the students to gain knowledge of thermal conductivity of solids.
- To motivate the students towards the applications of acoustics and ultrasonics.
- To equip the students to understand the importance of quantum physics.
- To make the students to understand the basics of crystallography and its importance in studying materials properties.

UNIT-I: MECHANICS OF SOLIDS**9**

Elasticity- Hooke's law - Types of strain - Classification of Modulus of Elasticity- Poisson's Ratio - Stress-Strain diagram - Factors affecting elasticity - Moment, Couple and Torque - Derivation of Twisting Couple on a wire - Bending moment - Depression of a cantilever - Young's modulus by Uniform Bending – Non-Uniform bending - I shaped girders.

UNIT-II: THERMAL PROPERTIES**9**

Thermal Conductivity - Thermal Diffusivity - Specific Heat Capacity - Rectilinear Flow of Heat along a Uniform Bar - heat conduction in solids - flow of heat through compound media (parallel and perpendicular) - Determination of Thermal Conductivity of a Good Conductor by Forbe's Method: theory and experiment - Determination of Thermal Conductivity of a poor Conductor by Lee's Disc Method: theory and experiment.

UNIT-III: ACOUSTICS AND ULTRASONICS**9**

Classification of Sound – decibel - Weber-Fechner law – Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedies. Piezoelectric crystals - Production of ultrasonics – magnetostriction and piezoelectric methods – Non Destructive testing – pulse echo system through transmission and reflection modes – Medical application – Sonogram.

UNIT-IV: QUANTUM MECHANICS**9**

Limitations of classical Physics - Introduction to Quantum theory - Dual nature of matter and radiation - Properties of matter waves - de Broglie wavelength in terms of voltage, energy, and temperature - Heisenberg's Uncertainty principle - verification - physical significance of wave function - Schrodinger's Time independent and Time dependent wave equations - Particle in a one-dimensional potential well.

UNIT-V: CRYSTALLOGRAPHY**9**

Crystal structures: Crystal lattice – basis - unit cell and lattice parameters – crystal systems and Bravais lattices – Structure and packing fractions of SC, BCC, FCC, diamond and NaCl structures – crystal planes, directions and Miller indices – distance between successive planes –crystalline and non-crystalline materials – imperfections in crystals.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. D.Halliday, R.Resnick and J.Walker, Principles of Physics, Wiley (Indian Edition), 2015.
2. N.Garcia, A.Damask and S.Schwarz, Physics for Computer Science Students. Springer Verlag, 2012.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGrawHill (Indian Edition), 2017.
4. R.Wolfson, Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
5. Paul A. Tipler, Physics – Volume 1 & 2, CBS, (Indian Edition), 2004.
6. K.Thyagarajan and A.Ghatak, Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.

COURSE OUTCOMES:

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

CO1: Understand the importance of mechanics and their various properties.

CO2: Express their knowledge in thermal physics.

CO3: Apply acoustical and ultrasonic principles for industrial and medical applications.

CO4: Understand the importance of quantum physics.

CO5: Demonstrate a strong foundational knowledge about crystals.

COURSE OBJECTIVES:

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on engineering applications of polymers.
- To understand the principles of electrochemistry, electrochemical cells, emf and applications of emf measurements.
- To acquire knowledge about principles of corrosion and corrosion control techniques.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UNIT-I: WATER AND ITS TREATMENT

9

Water quality parameters: Significance - Alkalinity, TDS, COD and BOD (definition and significance only). Hardness- types, estimation of hardness by EDTA method - Boiler feed water troubles - Scale and sludge - Priming and foaming - Caustic embrittlement - Boiler corrosion. Softening of boiler feed water - Internal softening (colloidal, phosphate, sodium aluminate and calgon conditioning) - External softening – demineralization process - Desalination of brackish water – Electrodialysis and Reverse Osmosis. Municipal water treatment - primary treatment and disinfection (UV, Ozonation, break-point chlorination).

UNIT-II: POLYMER CHEMISTRY

9

Introduction: Classification of polymers – Functionality – Degree of polymerization. Types of polymerization: Addition, condensation and copolymerization. Thermal Properties of polymers: Thermoplastic and Thermosetting - Glass Transition temperature (T_g) – significance - factors affecting T_g, Molecular weight – weight average, number average and polydispersity index. Preparation, properties and uses of PVC, Bakelite and Epoxy resin. Conducting polymers-mechanism – application of OLED.

UNIT-III: ELECTROCHEMISTRY

9

Electrode potential - Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf. Emf series and its applications. Nernst equation (problems). Reference electrodes – Standard Hydrogen electrode – Calomel electrode, Ion selective electrode – glass electrode and measurement of pH. Potentiometric redox titration (Estimation of ferrous ion) – conductometric titration (Strong acid Vs Strong base).

UNIT-IV: CORROSION AND ITS CONTROL

9

Corrosion - chemical corrosion - mechanism, nature of oxides – Pilling - Bedworth rule. Electrochemical corrosion – mechanism. Galvanic series and importance. Factors influencing corrosion. Prevention methods - design of materials, cathodic protection techniques - sacrificial anode and impressed current method. Protective coatings – electroplating - Cr, Ni and galvanizing. Anodising of aluminium.

UNIT-V: ENERGY SOURCES AND STORAGE DEVICES

9

Nuclear energy: light water nuclear power plant - breeder reactor. Solar energy conversion - working principles of photovoltaic cell, organic and dye sensitized solar cell. Batteries - Types of batteries. Primary battery – Leclanche cell. Secondary battery - lead acid battery – nickel metal hydride and Li-ion battery. Fuel cells: proton exchange membrane and solid oxide fuel cell. Supercapacitors: working principles.

Contact Periods:**Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods****REFERENCES:**

1. P. C. Jain and Monica Jain, "Engineering Chemistry, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 17th Edition, 2018.
2. V. R. Gowariker, N. V. Viswanathan and Jayadev Sreedhar, Polymer Science, New Age International Publishers, 6th Edition, 2019.
3. Sivasankar B. "Engineering Chemistry, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2012.
4. S.S. Dara, "A Text book of Engineering Chemistry. S. Chand Publishing, 12th Edition, 2018.
5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

COURSE OUTCOMES:

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

- CO1:** Understand the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
- CO2:** Acquire the basic knowledge of polymers and apply in engineering.
- CO3:** Understand the basic principles of electrochemistry and its applications.
- CO4:** Know the principles, various types of corrosion and corrosion control techniques.
- CO5:** Identify different forms of energy resources and apply them for suitable applications in energy sectors.

COURSE OBJECTIVES:

- To develop C Programs using basic programming constructs.
- To develop C programs using arrays and strings.
- To develop applications in C using functions and pointers.
- To develop program in C using structures and union.
- To perform file handling operations in C and learn dynamically allocated memory techniques.

UNIT-I: BASICS OF C PROGRAMMING 11

Generation and Organization of Computers - Number System - Binary - Decimal - Conversion - Problems. Need for logical analysis and thinking - Algorithm - Pseudo code - Flow Chart. Introduction to programming paradigms: Structure of C program - Data Types - Constants - Keywords - Operators and Expressions - Input / Output statements.

UNIT-II: ARRAYS AND STRINGS 9

Decision making statements - Switch statement - Looping statements - Arrays - Initialization - Declaration - One dimensional and Two dimensional arrays - String: String operations - String Arrays - Simple programs: Sorting - Searching - Matrix operations.

UNIT-III: FUNCTIONS AND POINTERS 9

Introduction to functions: Function prototype, function declaration, function definition, function call, Built-in functions (string functions, math functions) - Recursion - Pointers - Pointer operators - Pointer arithmetic - Arrays and pointers - Array of pointers - Parameter passing: Pass by value, Pass by reference.

UNIT-IV: STRUCTURES AND UNION 9

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

UNIT-V: FILE PROCESSING 7

Files: File opening modes - Types of file processing: Sequential access, Random access - Preprocessor directives - Command line arguments.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Kernighan, B.W and Ritchie, D.M, “The C Programming language”, 2nd Edition, Pearson Education, 2015.
2. ReemaTheraja “Fundamentals of Computing and Programming in C”, 2nd Edition, Oxford

- University Press, 2016.
3. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2013.
 4. Paul Deitel and Harvey Deitel, “C How to Program with an Introduction to C++”, Eighth edition, Pearson Education, 2018.
 5. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 16th revised edition, 2020.

COURSE OUTCOMES:

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

- CO1:** Develop simple applications in C using basic constructs.
- CO2:** Design and implement applications using arrays and strings.
- CO3:** Develop and implement applications in C using functions and pointers.
- CO4:** Develop applications in C using structures and union.
- CO5:** Design applications using sequential and random-access file processing.

UNIT-I: LANGUAGE AND LITERATURE 3

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

UNIT-II: HERITAGE - ROCK ART PAINTINGS TO MODERN ART 3
- SCULPTU

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT-III: FOLK AND MARTIAL ARTS 3

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

UNIT-IV: THINAI CONCEPT OF TAMILS 3

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

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

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL : 15 PERIODS**REFERENCES:**

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - சே.கே. விவேகா (மொழியும் கருத்தும்) - மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and

- RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
 7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
 8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
 9. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
 10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
 11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
 12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

COURSE OBJECTIVES:

- To develop programs in C using basic constructs.
- To develop applications in C using strings, pointers, functions, structures.
- To develop applications in C using file processing.

LIST OF EXPERIMENTS:

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

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods

COURSE OUTCOMES:

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

CO1: Develop C programs for simple applications making use of basic constructs, arrays and Strings.

CO2: Develop C programs involving functions, recursion, pointers, and structures.

CO3: Design applications using sequential and random access file processing.

LIST OF EQUIPMENT'S AND COMPONENTS

- Software Required – Turbo C Compiler / GNU C Compiler / Equivalent
- Operating System – Windows 7 / 8.1 / 10 / Linux
- Computers Required – 30 Nos.

PHYSICS LABORATORY:**COURSE OBJECTIVES:**

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

LIST OF EXPERIMENTS:

1. Cantilever bending – Determination of Young’s modulus.
2. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia.
3. Non-uniform bending - Determination of Young’s modulus.
4. Laser- a) Determination of the wave length of the laser using grating.
b) Determination of Numerical Aperture and acceptance angle using optical fiber.
5. Air wedge - Determination of thickness of a thin sheet/wire.
6. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids.

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 24 Periods Total: 24 Periods

COURSE OUTCOMES:

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

CO1: Understand the functioning of various physics laboratory equipment.

CO2: Use experimental models to analyze laboratory data.

CO3: Use mathematical models as a medium for quantitative reasoning and describing physical reality.

CO4: Access, process and analyze scientific information.

CO5: Solve problems individually and collaboratively.

CHEMISTRY LABORATORY:

COURSE OBJECTIVES:

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric analysis.
- To inculcate experimental skills to understanding of water quality parameters, such as hardness, alkalinity and dissolved oxygen.
- To induce the students to familiarize with electroanalytical techniques such as conductometry and potentiometry.
- To demonstrate the analysis of strong acid and strong base by conductometry.
- To equip the students for determination of hydrochloric acid by pH measurement.

LIST OF EXPERIMENTS:

1. Estimation of hardness by EDTA method.
2. Determination of types and amount of alkalinity in water sample.
3. Estimation of Dissolved Oxygen by Iodometry.
4. Determination of HCl by pH titration.
5. Conductometric titration of strong acid and strong base.
6. Estimation of iron content of the given solution using potentiometer.

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 21 Periods Total: 21 Periods

REFERENCE:

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

COURSE OUTCOMES:

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

CO1 Outfit with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

CO2: Quantify the type and amount of alkalinity in water sample.

CO3: Equip with the methods and techniques involved in pH metry.

CO4: Apply the conductometric measurements in quantitative analysis of chemical substances.

CO5: Estimate the amount of ferrous ion present in solution by potentiometric titration.

COURSE OBJECTIVES:

- To enhance the Employability and Career Skills of students.
- To orient the students towards grooming as a professional.
- To make them Employability Graduates.
- To develop their confidence and help them in attending interviews successfully.
- To demonstrate an understanding of job applications and interviews for internship and placements.

LIST OF ACTIVITIES & EXERCISES

S.No.	Activity/Exercise
1.	Soft skills
2.	Giving & asking personal information
3.	Listening & Answering to a Lecture
4.	Small talk on everyday topics
5.	Strategies for presentation ; group/ pair presentation
6.	Job Application Letter with Resume
7.	Group Discussion
8.	Activities to improve GD skills
9.	Interview etiquette
10.	Career plan

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 30 Periods Total: 30 Periods

Recommended Software**1. Globearena****REFERENCES:**

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015.
2. Interact English Lab Manual for Undergraduate Students,. Orient BalckSwan: Hyderabad, 2016.
3. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan:

Hyderabad, 2015.

4. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014.
5. S. Hariharan et al. Soft Skills. MJP Publishers: Chennai, 2010.

COURSE OUTCOMES:

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

CO1: Make effective presentations.

CO2: Participate confidently in Group Discussions.

CO3: Attend job interviews and be successful in them.

CO4: Develop adequate Soft Skills required for the workplace.

CO5: Present their opinions in a planned and logical manner, and draft effective resume in context of job search.

COURSE OBJECTIVES:

- To engage learners in meaningful language activities to improve their LSRW skills.
- To enhance learners' awareness of general rules of writing for specific audiences.
- To help learners understand the purpose, audience, contexts of different types of writing.
- To develop analytical thinking skills for problem solving in communicative contexts.
- To demonstrate an understanding of job applications and interviews for internship and placements.

UNIT-I: MAKING COMPARISONS**9**

- Listening - Listening to oral presentation- Listening and Gap filling
 Speaking - Marketing a product, Mock interviews
 Reading - Reading advertisements, Reading to identify stylistic features(syntax, lexis and sentence structures)
 Writing - Compare and Contrast Essay, Review writing
 Grammar - If conditions, Direct and indirect speech
 Vocabulary - Verbal analogies

UNIT-II: EXPRESSING CASUAL RELATIONS IN SPEAKING AND WRITING**9**

- Listening - Listening to longer technical, Listening technical information from podcasts
 Speaking - Describing and discussing the reasons of accidents or disasters based on news reports
 Reading - Reading and understanding technical articles
 Writing - Writing responses to complaints
 Grammar - Active Passive Voice transformations, Infinitive and Gerund
 Vocabulary - Technical Jargons

UNIT-III: PROBLEM SOLVING**9**

- Listening - Listening to video clips and answering the questions, listening to different view points on an issue
 Speaking - Picture description
 Reading - Case studies, excerpts from literary texts, news reports etc
 Writing - Letter to the Editor, Checklists
 Grammar - Error correction, Numerical adjectives
 Vocabulary - Compound Words, Sentence Completion

UNIT-IV: REPORTING OF EVENTS AND RESEARCH**9**

- Listening - Listening comprehension based on news reports and documentaries
 Speaking - Interviewing, Presenting an oral report, Mini presentations on select topics
 Reading - Newspaper articles
 Writing - Delivering welcome address, Proposing Vote of thanks, Accident Report, Survey Report
 Grammar - Phrases and its types

UNIT-V: THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY

- Listening - Listening to TED Talks, Job interviews(analysis of the interview performance)
Speaking - Participating in a Role play, virtual interviews, Making presentations with visual aids
Reading - Company profiles, Statement of Purpose(SOP), an excerpt of interview with professionals
Writing - Internship application, Cover letter & Resume, Precise writing, Summarizing
Grammar - Subject- Verb agreement, Relative clauses
Vocabulary - Numerical Adjectives

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Department of English, Anna University, “English for Engineers & Technologists”, Orient Blackswan, 2020.
2. Krishna Mohan, Meera Bannerji, “Developing Communication Skills”, Macmillan India Ltd, Delhi, 2020.
3. V. N. Arora and Laxmi Chandra, “Improve Your Writing”, Oxford University Press, New Delhi, 2020.
4. J. Anbazhagan Vijay, “Communicative English”, Global Publishers, Chennai, 2019.
5. Raman, Meenakshi, Sharma. Sangeeta, “Professional English”, Oxford University Press, New Delhi, 2019.
6. Prof. R.C. Sharma & Krishna Mohan, “Business Correspondence and Report Writing”, Tata McGraw Hall & Co. Ltd, New Delhi, 2019.

COURSE OUTCOMES:

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

- CO1:** Compare and contrast products and ideas in technical texts.
CO2: Identify cause and effects in events, industrial processes through technical texts
CO3: Analyze problems in order to arrive at feasible solutions and communicate them orally and in the written format.
CO4: Report events and the processes of technical and industrial nature.
CO5: Present their opinions in a planned and logical manner and draft effective resume in context of job search.

COURSE OBJECTIVES:

- To gain the knowledge of vector differentiation, integration and related applications.
- To be known about analytic functions with properties, construction of analytic function and the knowledge of conformal transformation.
- To obtain the knowledge of Cauchy's integral theorem, calculus of residues and complex integration around unit circle and semicircle.
- To gain methods to solve differential equations with constant and variable coefficients.
- To introduce the basic concepts of PDE for solving standard partial differential equations

UNIT-I: VECTOR CALCULUS**9+3**

Gradient and directional derivative - Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields - Line integral over a plane curve - Surface integral - Volume integral - Green's, Gauss divergence and Stoke's theorems (Excluding Proofs).

UNIT-II: ANALYTIC FUNCTIONS**9+3**

Analytic functions - Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties - Harmonic conjugates - Construction of analytic function - Conformal mapping - Mapping by functions $w = z + c, cz, 1/z, z^2$ - Bilinear transformation.

UNIT-III: COMPLEX INTEGRATION**9+3**

Line integral - Cauchy's integral theorem - Cauchy's integral formula - Taylor's and Laurent's series - Singularities - Residues - Residue theorem - Application of residue theorem for evaluation of real integrals - Use of circular contour and semicircular contour.

UNIT-IV: ORDINARY DIFFERENTIAL EQUATIONS**9+3**

Higher order linear differential equations with constant coefficients - Method of variation of parameters - Homogenous equation of Euler's and Legendre's type - System of simultaneous linear differential equations with constant coefficients.

UNIT-V: PARTIAL DIFFERENTIAL EQUATIONS**9+3**

Formation of partial differential equations - Singular integrals - Solutions of standard types of first order partial differential equations $[F(p,q) = 0 \text{ and } z = px + qy + f(p,q)]$ - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of homogeneous types.

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: 0 Periods Total: 60 Periods

REFERENCES:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, New Delhi, 2018.
2. Kreyszig E., "Advanced Engineering Mathematics", John Wiley & Sons, 10th Edition,

- 2018.
3. Bali N.P. and Manish Goyal, "A Text book of Engineering Mathematics", Laxmi Publications Pvt. Ltd, New Delhi, 10th Edition, 2021.
 4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.
 5. Ramana B.V., "Higher Engineering Mathematics", Mc Graw Hill Education Pvt. Ltd, New Delhi, 11th Edition, 2018.
 6. James G., "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 4th Edition, 2016.

COURSE OUTCOMES:

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

- CO1:** Acquire knowledge in Gradient, divergence and curl of a vector point function and related identities.
- CO2:** Understand the properties and formation of analytic function, mappings of standard functions and Bilinear transformation.
- CO3:** Understand calculus of residues to evaluate contour integration.
- CO4:** Apply various techniques in solving differential equations.
- CO5:** Understand how to solve the given standard partial differential equations.

COURSE OBJECTIVES:

- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures – lists, tuples, dictionaries.
- To do input/output with files in Python.
- To understand different Python packages and libraries.

UNIT-I: DATA, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode; values and Numeric Data types, variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Object Oriented Features; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT-II: CONTROL FLOW, FUNCTIONS 9

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

UNIT-III: LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, quick sort

UNIT-IV: FILES, MODULES, PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

UNIT-V: DATA HANDLING AND DATA VISUALIZATION 9

Data Handling using Pandas – Introduction to Python Libraries: Pandas, Matplotlib, Numpy – Pandas: Series and Data Frames – Descriptive Statistics – Data Frame Operations – Handling missing Values – Data Visualization – Creating Charts: Bar and Pie Charts – Customizing Plots

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, “Computational Thinking: A Primer for Programmers and Data Scientists”, 1st Edition, Notion Press, 2021.
3. John V Guttag, “Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data”, Third Edition, MIT Press, 2021.
4. Wes McKinney, “Python for Data Analysis”, 2nd Edition, O’Reilly Publishers, 2017.
5. Karl Beecher, “Computational Thinking: A Beginner’s Guide to Problem Solving and Programming”, 1st Edition, BCS Learning & Development Limited, 2017.

COURSE OUTCOMES:

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

CO1: Write simple Python programs using conditionals and loops for solving problems.

CO2: Decompose a Python program into functions.

CO3: Represent compound data using Python lists, tuples, dictionaries etc.

CO4: Read and write data from/to files in Python programs.

CO5: Explore their knowledge in Python packages and libraries.

COURSE OBJECTIVES:

- To make the students to understand the importance in studying electrical properties of materials.
- To enable the students to gain knowledge in semiconductor physics
- To instil knowledge on magnetic properties of materials.
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications.
- To inculcate an idea of significance of nano structures, quantum confinement and ensuing nano materials applications.

UNIT-I: ELECTRICAL PROPERTIES OF MATERIALS 9

Classical Free electron theory of metals – Postulates - Electrical and Thermal conductivity of metals - Derivation of Wiedemann-Franz law - Lorentz number - Drawbacks of Classical theory – Occupation probability - Effect of temperature- Density of energy states in metals (derivation) – Carrier concentration in metals - Calculation of Fermi energy at 0K - Types of electronic materials: metals, semiconductors and insulators.

UNIT-II: SEMICONDUCTOR PHYSICS 9

Properties of semiconductors - elemental and compound semiconductor - Direct and indirect band gaps - Intrinsic and extrinsic semiconductors - Fermi level - Carrier concentration in intrinsic semiconductor - Dependence of Fermi level on temperature - Electrical conductivity - band gap determination - extrinsic semiconductors - Carrier concentration in P type and N type – Semiconductors - Dependence of Fermi level on impurity concentration and temperature for P type and N type semiconductors.

UNIT-III: MAGNETIC PROPERTIES OF MATERIALS 9

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

UNIT-IV: OPTICAL PROPERTIES OF MATERIALS 9

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

UNIT-V: ADVANCED QUANTUM MECHANICS 9

Introduction - quantum confinement – quantum structures: quantum wells, wires and dots — band gap of nanomaterials. Tunneling – Single electron phenomena: Coulomb blockade - single electron transistor – Nanomaterials - Properties- Methods of synthesize - Top- down & Bottom up Approach -Ball Milling - Chemical vapour deposition - Application of Nanomaterials.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. D.Halliday, R.Resnick and J.Walker, Principles of Physics, Wiley (Indian Edition), 2015.
2. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw-Hill Education (Indian Edition), 2020.
3. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
4. Y.B.Band and Y.Avishai, Quantum Mechanics with Applications to Nanotechnology and Information Science, Academic Press, 2013.
5. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson Education (Indian Edition) 2009.
6. Jasprit Singh, “Semiconductor Devices: Basic Principles”, Wiley (Indian Edition), 2007.

COURSE OUTCOMES:

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

CO1: Gain knowledge on classical and quantum electron theories and energy band structures.

CO2: Acquire knowledge on basics of semiconductor physics.

CO3: Get knowledge on magnetic properties of materials and their applications in data storage.

CO4: Have the necessary understanding on the functioning of optical materials for optoelectronics.

CO5: Understand the basics of quantum structures and their applications.

REFERENCES:

1. Kothari DP and I.J Nagrath, “Basic Electrical and Electronics Engineering”, Second Edition, McGraw Hill Education, 2020.
2. S.K.Bhattacharya “Basic Electrical and Electronics Engineering”, Pearson Education, Second Edition, 2017.
3. Sedha R.S., “A textbook book of Applied Electronics”, S. Chand & Co., 2008.
4. James A .Svoboda, Richard C. Dorf, “Dorf’s Introduction to Electric Circuits”, Wiley, 2018.
5. A.K. Sawhney, Puneet Sawhney ‘A Course in Electrical & Electronic Measurements & Instrumentation’, Dhanpat Rai and Co, 2015.
6. Thomas L. Floyd, ‘Digital Fundamentals’, 11th Edition, Pearson Education, 2017.

COURSE OUTCOMES:

After completing this course, the students will be able to

CO1: Analyze the DC and AC circuits.

CO2: Explore the significance of electrical machines.

CO3: Analyze the characteristics of analog electronic devices.

CO4: Acquire the basic concepts of digital electronics.

CO5: Explain the operating principles of measuring instruments.

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COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Drawing various types of conical and special engineering curves.
- Drawing orthographic projection of points, lines and 3D objects.
- Drawing projection of plane surfaces and projection of solids.
- Drawing section of solids and development of solids.
- Drawing isometric projections of simple solids and sketching of 3D objects.

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT-I: PLANE CURVES**3+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – Construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT-II: ORTHOGRAPHIC PROJECTION OF POINTS, LINES AND 3D OBJECTS**3+12**

Principal planes – First angle projection – Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method and traces. Visualization concepts – Visualization principles – Representation of Three Dimensional objects – Layout of views – Sketching of multiple views from pictorial views of objects.

UNIT-III: PROJECTION OF PLANE SURFACES AND SOLIDS**3+12**

Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method – Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method.

UNIT-IV: PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES**3+12**

Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids: Prisms, pyramids cylinders and cones.

UNIT – V: ISOMETRIC PROJECTIONS**3+12**

Principles of Isometric projection – Isometric scale – Isometric projections of simple solids and truncated solids: Prisms, pyramids, cylinders, cones – Conversion of orthographic views to pictorial views (Simple objects)

Contact Periods:

Lecture: 15 Periods Tutorial: 0 Periods Practical: 60 Periods Total: 75 Periods

REFERENCES:

1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, McGraw Hill, 2nd Edition, 2019.
2. Bhatt, N.D., “Engineering Drawing”, Charotar Publishing House Pvt. Ltd., 53rd Edition, 2019.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I & II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
4. Parthasarathy N. S. and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
5. Kulkarni, D.M., Rastogi, A.P. and Sarkar, A.K., “Engineering Graphics with AutoCAD”, PHI Learning, 2nd Edition, 2010.

COURSE OUTCOMES:

Upon on completion of this course, the student will be able to

CO1: Construct the conic curves, involutes and cycloid.

CO2: Solve practical problems involving orthographic projection of points, lines and 3D objects.

CO3: Draw the projections of plane surfaces and simple solids.

CO4: Draw the section of solids and the development of simple solids.

CO5: Draw the isometric projections of simple solids and sketching of 3D objects

Special points applicable to End Semester Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

UNIT-I: WEAVING AND CERAMIC TECHNOLOGY

3

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

UNIT -II: DESIGN AND CONSTRUCTION TECHNOLOGY

3

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

UNIT-III: MANUFACTURING TECHNOLOGY

3

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

UNIT-IV: AGRICULTURE AND IRRIGATION TECHNOLOGY

3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT-V: SCIENTIFIC TAMIL & TAMIL COMPUTING

3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL : 15 PERIODS**REFERENCES:**

1. தமிழ் வரலாறு - தொழில் தொழில்நுட்பம் -
தமிழ் மரபியல் அறிவுரைகள் -
தமிழ் மரபியல் - தொழில்நுட்பம், கட்டிடம், கலைகள் முதலானவை.
தமிழ் - மரபியல் அறிவுரைகள் தொழில்நுட்பம் மற்றும் கட்டிடம் (தமிழ் மரபியல் அறிவுரைகள் தொழில்நுட்பம் மற்றும் கட்டிடம்)
தமிழ் - தொழில்நுட்பம் மற்றும் கட்டிடம் (தமிழ் மரபியல் அறிவுரைகள் தொழில்நுட்பம் மற்றும் கட்டிடம்)
- 2.
- 3.
- 4.
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

COURSE OBJECTIVES:

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

- Connecting various pipe fittings used in common household plumbing work, sawing, planning and making joints in wood materials used in common household wood work.
- Welding various joints in steel plates using arc welding work.
- Machining various simple processes like turning, drilling, and tapping in parts and making a tray out of metal sheet using sheet metal work.
- Wiring various electrical joints in common household electrical wire work
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & MECHANICAL)
PART I CIVIL ENGINEERING PRACTICES

PLUMBING WORK:

- a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
- b) Preparing plumbing line sketches.
- c) Laying pipe connection to the pump
- d) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:

- a) Sawing,
- b) Planning and
- c) Making joints like T-Joint, Cross lap Joint and Dovetail joint.

Wood Work Study:

- a) Studying joints in door panels and wooden furniture.
- b) Studying common industrial trusses using models.

PART II MECHANICAL ENGINEERING PRACTICES

WELDING WORK:

- a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
- b) Practicing gas welding.

BASIC MACHINING WORK:

- a) Simple Turning.
- b) Simple Drilling.
- c) Simple Tapping.

SHEET METAL WORK:

- a) Making of a square tray

FOUNDRY WORK:

- a) Demonstrating basic foundry operations.

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 24 Periods Total: 24 Periods

**GROUP – B (ELECTRICAL & ELECTRONICS)
PART III ELECTRICAL ENGINEERING PRACTICES**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Measurement of voltage and current using solar panel
3. Stair case wiring
4. Assembling and Testing of Ceiling Fan
5. Study of lightning arrester

PART IV ELECTRONIC ENGINEERING PRACTICES

1. Study of Electronic components and equipments – Resistor, colour coding
2. Measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
3. Verification of logic gates AND, OR, EX-OR and NOT.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Assembling of 15 watts LED circuit

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 21 Periods Total: 21 Periods

COURSE OUTCOMES:

Upon completion of this course, the student will be able to

- CO1:** Apply the knowledge of pipeline and connecting various pipe fittings used in common household plumbing work and Use tools and equipments used in Carpentry.
- CO2:** Perform the various welding joints in steel plates using arc welding work.
- CO3:** Perform operation in a lathe machine and also fabricate parts like tray in sheet metal.
- CO4:** Wire various electrical joints in common household electrical wire work.
- CO5:** Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

COURSE OBJECTIVES:

- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To develop applications using python packages and libraries.

LIST OF EXPERIMENTS:

1. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
2. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
3. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Retail Store –operations of list & tuples)
4. Implementing real-time/technical applications using Sets, Dictionaries. (Student Enrolment and Mark sheet - operations of Sets & Dictionaries)
5. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
6. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
7. Implementing programs using Python Standard Libraries (pandas, numpy, Matplotlib)
8. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
9. Create a data frame based on E Commerce data and generate descriptive statistics (Mean, Median, Mode and Variance).
10. Consider Data of your interest from an Open Source (Eg. Data.gov.in) aggregate and summarize. Then plot it using different plotting functions of Matplotlib Library.
11. Mini Project.

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods

COURSE OUTCOMES:

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

CO1: Implement programs in Python using conditionals and loops for solving problems.

CO2: Deploy functions to decompose a Python program.

CO3: Utilize Python packages and libraries in developing software applications.

LIST OF EQUIPMENT'S AND COMPONENTS

- Software Required – Python 3 Interpreter
- Operating System – Windows 7 / 8.1 / 10 / Linux
- Computers Required – 30 Nos.

COURSE OBJECTIVES:

- To introduce Fourier series analysis which is central to many applications in Engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To be familiar with techniques of Laplace and Inverse Laplace transformations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT-I: FOURIER SERIES**9+3**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic analysis.

UNIT-II: APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**9+3**

Classification of PDE – Fourier Series solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

UNIT-III: LAPLACE TRANSFORMS**9+3**

Existence conditions – Transforms of elementary functions – Basic properties – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

UNIT-IV: FOURIER TRANSFORMS**9+3**

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT-V: Z -TRANSFORMS AND DIFFERENCE EQUATIONS**9+3**

Z-transforms – Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems – Convolution theorem – Formation of difference equations – Solution of difference equations using Z-transform.

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: 0 Periods Total: 60 Periods

REFERENCES:

1. Grewal B. S., "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, New Delhi, 2018.
2. Kreyszig E., "Advanced Engineering Mathematics", John Wiley & Sons, 10th Edition, 2018.
3. Ramana B.V., "Higher Engineering Mathematics", Mc Graw Hill Education Pvt. Ltd, New Delhi, 11th Edition, 2018.
4. Andrews L. C and Shivamoggi B, "Integral Transforms for Engineers" SPIE Press, 1999.
5. Bali N.P. and Manish Goyal, "A Text book of Engineering Mathematics", Laxmi Publications Pvt. Ltd, New Delhi, 10th Edition, 2021.
6. James G., "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, New Delhi, 2016.

COURSE OUTCOMES:

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

- CO1:** Solve differential equations using Fourier series analysis which plays a vital role in Engineering applications.
- CO2:** Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
- CO3:** Understand Laplace transform and inverse transform of simple functions, various related theorems and application to differential equations with constant coefficients.
- CO4:** Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of Engineering.
- CO5:** Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

COURSE OBJECTIVES:

- To introduce different methods to simplify Boolean function and realize the logic circuits.
- To acquire knowledge for the design of the combinational circuit and simulation using HDL.
- To learn the working of the synchronous sequential circuits and their simulation using HDL.
- To get exposure of asynchronous sequential circuits.
- To understand the principles of memory and programmable logic circuits.

UNIT-I: NUMBER SYSTEM AND BASIC LOGIC 9

Number Systems and Codes - Boolean algebra and theorems - Simplifications of Boolean functions using Karnaugh map - Implementation of Boolean functions using basic gates.

UNIT-II: COMBINATIONAL CIRCUITS 9

Combinational circuits - Analysis and Design procedure - Circuits for arithmetic operations: Adder, Subtractor - Code Converters - Magnitude Comparator - Decoders and Encoders - Multiplexers and Demultiplexers - HDL for combinational circuits.

UNIT-III: SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Sequential circuits - Flip-Flops - Counters - Registers – Analysis and design procedures - State reduction and state assignment – Design of Counters - HDL for Sequential Circuits.

UNIT-IV: ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

Analysis and design of fundamental mode asynchronous sequential circuits - Reduction of state and flow tables - Race-free state assignment - Hazards.

UNIT-V: MEMORY AND PROGRAMMABLE LOGIC 9

Classification of memories - ROM- RAM - Programmable Logic Devices: PLA, PAL - Implementation of combinational logic circuits using PLA, PAL.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Morris. M, Mano. R and Michael D. Ciletti, “Digital Design: With an Introduction to the Verilog HDL, VHDL and System Verilog”, 6th Edition, Pearson Education, 2017.
2. S. Salivahanan and S. Arivazhagan, “Digital Circuits and Design”, 5th Edition, Oxford University Press, 2018
3. John F. Wakerly, “Digital Design Principles and Practices”, 5th Edition, Pearson Education, 2017.
4. Charles H. Roth Jr and Larry L. Kinney, “Fundamentals of Logic Design”, 6th Edition, Cengage Learning, 2013
5. Donald D. Givone, “Digital Principles and Design”, Tata Mc Graw Hill, 2003.

COURSE OUTCOMES:

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

- CO1:** Simplify Boolean function and realize the logic circuits.
CO2: Design the combinational circuit and simulate using HDL.
CO3: Design synchronous sequential circuit and simulate using HDL.
CO4: Design asynchronous sequential circuits.
CO5: Design the memory and programmable logic circuits.

COURSE OBJECTIVES:

- To Implement List, Stack and Queue Abstract Data Types.
- To implement Tree and graph.
- To Implement Shortest Path Algorithm and Minimum Spanning Tree Algorithms.
- To Understand Various internal and external sorting
- To understand the hashing Techniques.

UNIT-I: INTRODUCTION AND LINEAR DATA STRUCTURE 9

Algorithm analysis: Calculation of running time, Introduction to Abstract Data Types (ADT) – List ADT – Array-based implementation – Linked list implementation – Cursor-based linked lists – Doubly-linked lists – Applications of lists.

UNIT-II: STACK AND QUEUE 9

Stack ADT: Stack model, Implementation of stacks, Applications: Balancing symbols, Postfix expression evaluation, Infix to postfix conversion, Function Calls – Queue ADT: Queue Model, Implementation of Queues, Priority Queues, and Applications.

UNIT-III: TREES 9

Tree ADT – Tree traversals – Left child right sibling data structures for general trees – Binary Tree ADT – Expression trees – Applications of trees – Binary search tree ADT – Threaded Binary Trees. AVL trees – Splay trees – B-Tree - Heaps – Binary heaps – Applications of binary heaps.

UNIT-IV: GRAPH ALGORITHMS 9

Definitions – Representation of Graphs – Traversal – Topological sort – Shortest path algorithms: Dijkstra’s algorithm – Network flow problem – Minimum spanning tree: Prim’s and Kruskal’s algorithm.

UNIT-V: SORTING AND HASHING 9

Insertion sort – Shell sort – Heap sort – Merge sort – Quick sort – Bucket sort – External sorting: Simple algorithm, Multi way merge, Poly phase merge. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C” 2nd Edition, Pearson Education Limited, 2002.
2. Thomas H. Cormen, Charles E. Leiserson and Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, Fourth Edition, Mcgraw hill/ MIT Press., 2022.
3. Sartaj Sahni, “Data Structures, Algorithms and applications in C++”, 2nd Edition, Universities Press, 2005.
4. Aho A.V, Hopcroft J. E and Ullman J.D., “Data Structures and Algorithms”, 1st Edition, Reprint, Pearson Education, 2003.

5. Gilberg R. F and Forouzan B. A., “Data Structures”, Second Edition, Thomson India.

COURSE OUTCOMES:

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

CO1: Analyze the time complexity of various algorithms.

CO2: Define and use list, stack and queue Abstract Data Types.

CO3: Define and use Tree ADT.

CO4: Explain Tree and Graph Traversals.

CO5: Use suitable sorting and hashing technique.

COURSE OBJECTIVES:

- To understand Object Oriented Programming concepts and basic characteristics of Java.
- To know the principles of inheritance and interfaces and string handling operations.
- To define multithreading and use of exception handling.
- To Understand I/O streams and use of collection frame work.
- To design and build simple Graphical User Interfaces.

UNIT-I: OOP FUNDAMENTALS AND BASICS OF JAVA PROGRAMMING 9

OOP Concepts – Classes and Objects – Abstraction – Encapsulation – Inheritance – Polymorphism – OOP fundamentals implementation – Instance variables – Methods – Access specifiers – Coding standards– Identifiers – Variables– Data types – Operators– Control structures– Java architecture– Methods – Pass by value and Pass by reference – Recursive methods – Arrays – Package – Accessing sub-package and classes.

UNIT-II: INHERITANCE AND INTERFACE 9

Constructor – Types of constructor – Static keyword and its use – Final keyword and its use – Inheritance – Types of Inheritance – Polymorphism – Static polymorphism and dynamic polymorphism – Abstract keyword – Abstract class – Interface – Extending the interface – Implementation of interface – Difference between abstract class and interface. String: String Methods – String buffer class – String builder class – String tokenizer class.

UNIT-III: MULTITHREADING AND EXCEPTION HANDLING 9

Introduction to multi – Threading – Thread life cycle – Implementation of multithreading – Thread synchronization – Inter thread communication – Introduction to exception handling – Types of exception – Try and catch – Multiple catch block and nested try block – Finally block.

UNIT-IV: FILE HANDLING AND COLLECTION FRAMEWORK 9

Input / output basics – Streams – Byte streams and character streams – Reading and writing console – Reading and writing files. Collection interfaces – Collection classes.

UNIT-V: EVENT DRIVEN PROGRAMMING 9

Graphics programming – Frame – Components –Working with 2D shapes – Using color, fonts, and images – Basics of event handling – Event handlers – Adapter classes – Actions –Mouse events – AWT event hierarchy – Introduction to Swing – Layout management – Swing Components – Text Fields, Text Areas – Buttons– Check boxes – Radio buttons – Lists–choices– Scrollbars – Windows – Menus – Dialog Boxes

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Herbert Schildt, “Java The complete reference”, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann and Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition,

Prentice Hall, 2013.

3. Paul Deitel and Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
4. Steven Holzner, “Java 2 Black book”, Dreamtech press, 2011.
5. Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education, 2000.

COURSE OUTCOMES:

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

CO1: Develop Java programs using OOP principles.

CO2: Develop Java programs with the concepts of inheritance and interfaces.

CO3: Build Java applications using exceptions and multithreading.

CO4: Develop Java applications with I/O streams and collection frame work.

CO5: Develop GUI based Java programs using swings.

COURSE OBJECTIVES:

- To make students understand the basic structure and operation of digital computer.
- To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
- To expose the students to the concept of pipelining, parallelism and multi-core processors.
- To understand the memory hierarchies, cache memories and virtual memories.
- To learn the different ways of communication with I/O devices.

UNIT-I: BASIC STRUCTURE OF COMPUTERS 9

Functional units, Basic operational concepts, Performance, Instructions, Operations and Operands, representing instructions, Logical operations, Control operations, MIPS addressing, RISC, CISC.

UNIT-II: ARITHMETIC FOR COMPUTERS 9

ALU, Addition and Subtraction, Multiplication, Division, Floating point representation, Floating point operations, Sub word parallelism.

UNIT-III: PROCESSOR AND CONTROL UNIT 9

Basic MIPS implementation, Hardwired control, Micro programmed control, Pipelining, Pipelined data path and control, Handling Data Hazards & Control Hazards – Exception Handling.

UNIT-IV: PARALLELISIM 9

Parallel processing challenges, Flynn's classification – SISD, MIMD, SIMD, SPMD, Vector architectures, Hardware multithreading, Multi-core processors, Introduction to Graphics Processing units, Clusters, Warehouse scale computers.

UNIT-V: MEMORY AND I/O SYSTEMS 9

Memory hierarchy, Memory technologies, Cache basics, Measuring and improving cache performance, Virtual memory, TLBs, Input/output system, programmed I/O, DMA and interrupts, I/O processors.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", 5th Edition, Morgan Kaufmann / Elsevier, 2014.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", 6th Edition, Tata McGraw Hill, 2012.
3. William Stallings, "Computer Organization and Architecture – Designing for Performance", 8th Edition, Pearson Education, 2010.
4. John P. Hayes, "Computer Architecture and Organization", 3rd Edition, Tata McGraw Hill, 2012.
5. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative

Approach”, 5th Edition, Morgan Kaufmann / Elsevier Publishers, 2012.

6. David A. Patterson, John L. Hennessy, “Computer Organization and Design, The Hardware/Software Interface”, Sixth Edition, Morgan Kaufmann/Elsevier, 2020

COURSE OUTCOMES:

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

CO1: Design arithmetic and logic unit.

CO2: Design and analyze pipelined control units.

CO3: Understand parallel processing architectures.

CO4: Evaluate performance of memory systems.

CO5: Understand parallel processing architectures.

COURSE OBJECTIVES:

- To know about Indian constitution.
- To know about central government functionalities in India.
- To know about state government functionalities in India.
- To know about Indian society.
- To know about election commission of India.

UNIT-I: INTRODUCTION**9**

Constitution - Definition, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental rights and duties, Directive principles of State policy.

UNIT -II: UNION GOVERNMENT AND ITS ADMINISTRATION**9**

Structure of the Indian Union: Federalism, Centre – State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha.

UNIT-III: STATE GOVERNMENT AND ITS ADMINISTRATION**9**

Governor: Role and position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions.

UNIT-IV: LOCAL ADMINISTRATION**9**

District's administration head: Role and Importance, Municipalities: Introduction, Mayor and role of elected representative, CEO of Municipal corporation, Panchayat raj: Introduction, PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Position and role, Block level: Organizational hierarchy (Different departments), Village level: Role of elected and appointed officials, Importance of grass root democracy.

UNIT-V: ELECTION COMMISSION**9**

Election Commission: Role and functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and functioning, Institute and bodies for the welfare of SC/ST/OBC and women.

Contact periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Sharma and Brij Kishore, "Introduction to the Consitution of India," Prentice Hall of India, New Delhi, 2018.
2. Durga Das Basu, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi, 2018.

3. Laxmikanth M., “Indian Polity”, McGraw Hill Education (India) Private Limited, 2016.
4. Agarwal R.C., “Indian Political System”, S. Chand and Company, New Delhi, 2004.

COURSE OUTCOMES:

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

CO1: Understand the concepts of constitution assembly.

CO2: Develop knowledge of union government and its administration.

CO3: Develop knowledge of state government and its administration.

CO4: Develop knowledge of local administration.

CO5: Learn to use the function of election commission.

COURSE OBJECTIVES:

- To implement the linear data structures.
- To implement the application of linear data structures.
- To implement the nonlinear data structures.
- To implement the sorting techniques.
- To implement the hashing techniques.

LIST OF EXPERIMENTS:

1. Stack Operations in array and Linked List Implementation
2. Queue operations in array and Linked List Implementation
3. Application of stacks: Recursion, Infix to postfix conversion
4. Application of Queue: Simulation of FCFS and Round Robin Scheduling
5. Linked list: Circularly linked list, doubly linked list
6. Application of Linked List: Polynomial Manipulations
7. Trees: Operations on binary tree and binary search tree
8. Implementation of AVL Tree
9. Implementation of Tree and Graph Traversal Algorithms
10. Implementation of Minimum Spanning Algorithms
11. Implementation of hashing techniques
12. Implementation of sorting techniques
13. Mini Project

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods

COURSE OUTCOMES:

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

CO1: Implement linear data structures using arrays and Linked Lists.

CO2: Implement applications of linked list.

CO3: Implement nonlinear data structures.

CO4: Implement various sorting techniques.

CO5 Implement hashing techniques.

LIST OF EQUIPMENT'S AND COMPONENTS

- Software Required – TURBOC version 3 or GCC version 3.3.4.
- Operating System – WINDOWS 2000 / XP / NT OR LINUX
- Computers Required – 30 Nos. (Minimum Requirement: Pentium III or Pentium IV with 256 RAM and 40 GB hard disk)

COURSE OBJECTIVES:

- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages.
- To understand and apply the concepts of interfaces, array list.
- To understand and apply the concepts of exception handling and file processing.
- To develop applications using generic programming and event handling.

LIST OF EXPERIMENTS:

1. Develop a Java Application to generate Electricity Bill.
2. Develop a Java Application to implement currency convertor, distance convertor and time convertor.
3. Design and develop a java application for the Employee Payroll system using inheritance.
4. Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.
5. Implement a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
6. Implement a java program to accept integer or string values from the user within a specified range. (Range has to be specified with minimum and maximum by the user). If the input violates the range, appropriate exception needs to be raised.
7. Implement a Java program that reads a file name from the user, displays information about whether the file exists, the file is readable, or writable, the type of file and the length of the file in bytes.
8. Design and implement an application that executes two threads. First thread displays the alphabets A to Z at every one second. The Second thread will display the alphabets Z to A at every two seconds. Both the threads need to synchronize with each other for printing alphabets. The Second thread has to wait until the first thread finishes its execution. The application waits for all the threads to finish the execution.
9. Implement a program to design an application for banking operation (deposit and withdrawal) using files.
10. Write a java program to find the maximum value from the given type of elements using a generic function.
11. Design a calculator using event-driven programming paradigm of Java.
12. Develop a mini project for any application using Java concepts.

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods

COURSE OUTCOMES:

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

CO1: Implement Java programs for simple applications that make use of classes, packages.

CO2: Implement the concepts of interfaces and array list.

CO3: Implement the concepts of exception handling and file processing.

CO4: Implement Java programs with multithreading.

CO5: Design applications using file processing, generic programming and event handling.

LIST OF EQUIPMENT'S AND COMPONENTS

- Software Required – Net Beans OR Eclipse IDE with JDK.
- Operating System – WINDOWS 2000 / XP / NT OR LINUX.
- Computers Required – 30 Nos. (Minimum Requirement: Pentium III or Pentium IV with 256 RAM and 40 GB hard disk).

COURSE OBJECTIVES:

- To extend students logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
- To understand the basic concepts of graph theory.
- To familiarize the applications of algebraic structures.
- To understand the concepts and significance of lattices and Boolean algebra which are widely used in computer science and engineering.

UNIT-I: LOGIC AND PROOFS**9+3**

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

UNIT-II: COMBINATORICS**9+3**

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

UNIT-III: GRAPHS**9+3**

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

UNIT-IV: ALGEBRAIC STRUCTURES**9+3**

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

UNIT-V: LATTICES AND BOOLEAN ALGEBRA**9+3**

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

Contact Periods:

Lecture: 45 Periods Tutorial: 15 Periods Practical: 0 Periods Total: 60 Periods

REFERENCES:

1. Rosen K. H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.
2. Tremblay J. P and Manohar R., "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2017.
3. Grimaldi R.P., "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2013.
4. Lipschutz S and Mark Lipson , "Discrete Mathematics", Schaum's Outlines, 3rd Edition,

- Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2010.
5. Koshy T., "Discrete Mathematics with Applications", Elsevier Publications, 2006.
 6. T Veera rajan, "Discrete Mathematics and its Applications" 7th Edition, Tata McGraw Hill Pub. Co. Ltd, New Delhi, July 2017.

COURSE OUTCOMES:

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

- CO1:** Have knowledge of the concepts needed to test the logic of a program.
- CO2:** Have Knowledge in identifying structures on many levels.
- CO3:** Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
- CO4:** Be aware of the counting principles.
- CO5:** Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

COURSE OBJECTIVES:

- To understand the basic concepts and functions of operating systems.
- To understand Processes Scheduling algorithms and Threads.
- To understand the concept of Deadlocks.
- To analyze various memory management & I/O management schemes.
- To be familiar with the basics of Linux system and Mobile OS like iOS and Android.

UNIT-I: OPERATING SYSTEM OVERVIEW 7

Computer system overview – Basic elements, Instruction execution, Interrupts, Memory hierarchy, Cache memory, Direct Memory Access, Multiprocessor and multicore organization. Operating system overview – Objectives and functions, Evolution of operating system, Computer system organization operating system structure and operations – System calls, System programs, OS generation and system boot.

UNIT-II: PROCESS MANAGEMENT 11

Processes – Process concept, Process scheduling, Operations on Processes, Inter process Communication; CPU Scheduling – Scheduling criteria, Scheduling algorithms, Multiprocessor scheduling, Real time scheduling; Threads – Overview, Multithreading models, Threading issues; Process Synchronization – The critical-section problem, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock – System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT-III: STORAGE MANAGEMENT 9

Main Memory – Background, Swapping, Contiguous memory allocation, Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture examples; Virtual memory – Background, Demand Paging, Page replacement, Allocation, Thrashing; Allocating kernel memory, OS Examples.

UNIT-IV: FILE SYSTEMS AND I/O SYSTEMS 9

Mass storage system – Overview of mass storage structure, Disk structure, Disk scheduling and management, Swap space management; File-System interface – File concept, Access methods, Directory structure, Directory organization, File system mounting, File sharing and protection; File system implementation – File system structure, Directory implementation, Allocation methods, Free space management, Efficiency and performance, Recovery; I/O systems – I/O hardware, Application I/O interface, Kernel I/O subsystem, Streams, Performance.

UNIT-V: CASE STUDY 9

Linux system – Design principles, Kernel modules, Process management, Scheduling, Memory management, Input-Output management, File system, Inter-Process communication; Mobile OS – IOS and android – Architecture and SDK framework, Media layer, Services layer, Core OS layer, File system.

Practical**List of Experiments**

1. Basics of UNIX commands

2. Write C programs to implement the various CPU Scheduling Algorithms
3. Implementation of Semaphores
4. Bankers Algorithm for Deadlock Avoidance
5. Implementation of Paging Technique of Memory Management
6. Implementation of the following Page Replacement Algorithms FIFO, LRU, LFU
7. Implementation of the various File Organization Techniques
8. Implementation of IO System call in Linux

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 15 Periods Total: 60 Periods

REFERENCES:

1. Abraham Silberschatz, “Peter Baer Galvin and Greg Gagne”, “Operating System Concepts”, 13th Edition, John Wiley and Sons Inc., 2019.
2. Achyut S.Godbole and Atul Kahate, “Operating Systems”, McGraw Hill Education, 2016.
3. Ramaz Elmasri, A. Gil Carrick and David Levine, Operating Systems – A Spiral Approach Tata McGraw Hill Edition, 2010.
4. Daniel P. Bovet and Marco Cesati, “Understanding the Linux kernel”, 3rd Edition, ‘Reilly, 2005.
5. Gary Nutt, “Operating Systems”, 3rd Edition, Pearson Education, 2004.
6. Harvey M. Deitel, “Operating Systems”, 3rd Edition, Pearson Education, 2004.
7. Andrew S. Tanenbaum, “Modern Operating Systems”, 2nd Edition, Pearson Education, 2004.
8. Neil Smyth, “iPhone iOS 4 Development Essentials – Xcode”, 4th Edition, Payload media, 2011.

COURSE OUTCOMES:

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

- CO1:** Analyze various scheduling algorithms.
- CO2:** Implement deadlock, prevention and avoidance algorithms.
- CO3:** Compare and contrast various memory management schemes.
- CO4:** Implement the functionality of file systems.
- CO5:** Analyze and characterize phenomenon of Linux Operating System.

COURSE OBJECTIVES:

- To expose the students to the fundamentals of Database Management Systems and SQL.
- To make clear the students with ER diagrams.
- To understand the essential concepts of transaction processing, concurrency control and recovery procedures.
- To comprehend the internal storage structures using different file and indexing techniques.
- To have an introductory knowledge about the distributed and object-oriented database.

UNIT-I: INTRODUCTION TO DBMS 9

Purpose of database system – Views of data – Data models – Database languages – Database system architecture – Introduction to relational databases – Keys – Relational algebra Operations – SQL Fundamentals – Integrity – Advanced SQL Features – Embedded SQL – Dynamic SQL

UNIT-II: DATABASE DESIGN 9

Entity Relationship model – ER Diagrams – Enhanced ER model – ER to Relational mapping – Normalization – Functional dependencies – Decomposition – First, Second, Third Normal Forms – Boyce Codd normal form – Multivalued dependencies and Fourth normal form – Join dependencies and Fifth normal form

UNIT-III: TRANSACTION PROCESSING AND CONCURRENCY CONTROL 9

Transaction concepts – ACID Properties – Transaction recovery – System recovery – Media recovery – Save points – Isolation levels – Serializability – Concurrency control – Need for concurrency – Locking protocols – Two phase locking – Dead Lock – SQL Facilities for concurrency and recovery

UNIT-IV: IMPLEMENTATION TECHNIQUES 9

Overview of physical storage media – Magnetic disks – RAID – Tertiary storage – File organization – Organization of records in files – Indexing and hashing – Ordered indices – B+ Tree index files – B Tree index files – Static hashing – Dynamic hashing – Query processing Overview – Catalog information for cost estimation – Selection operation – Sorting – Join operation

UNIT-V: ADVANCED TOPICS 9

Introduction to distributed databases – Architecture – Data storage – Transaction processing – object based databases – Object database concepts – Object relational features – ODMG object model – ODL – OQL – XML databases – XML hierarchical model – DTD – XML schema – Xquery-NoSQL.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Raghu Ramakrishnan, - “Database Management Systems”, 4th Edition, McGraw-Hill College Publications, 2015
2. RamezElmasri and Shamkant B. Navathe, - Fundamentals of Database Systems, Sixth Edition, Pearson Education, 2011.

3. Abraham Silberschatz, Henry F. Korth and Sudharshan S., - Database System Concepts, Sixth Edition, Tata McGraw Hill, 2011
4. Gupta G.K., “Database Management Systems”, Tata Mc Graw Hill, 2011.
5. Date C. J, Kannan A and Swamynathan S, - “An Introduction to Database Systems”, 8th Edition, Pearson Education, 2006
6. Singh S. K., “Database Systems Concepts, Design and Applications”, 1st Edition, Pearson Education, 2006.

COURSE OUTCOMES:

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

CO1: Design Databases for applications.

CO2: Map ER model to Relational model to make database design.

CO3: Apply concurrency control and recovery mechanisms for real-world problems.

CO4: Compare the several indexing strategies in different database systems.

CO5: Learn advanced database concepts and assess how it differ from traditional databases.

COURSE OBJECTIVES:

- To understand Software Engineering Lifecycle Models
- To Perform software requirements analysis
- To gain knowledge of the System Analysis and Design concepts using UML.
- To understand software testing and maintenance approaches
- To work on project management scheduling using DevOps

UNIT-I: SOFTWARE PROCESS AND AGILE DEVELOPMENT 9

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models –Introduction to Agility-Agile process-SCRUM-Extreme programming-XP Process-Case Study.

UNIT-II: REQUIREMENTS ANALYSIS AND SPECIFICATION 9

Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification – Formal system specification – Finite State Machines – Petrinets – Object modelling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Functional modelling – Data Flow Diagram- CASE TOOLS.

UNIT-III: SOFTWARE DESIGN 9

Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns – Model-view-controller – Publish-subscribe – Adapter – Command – Strategy – Observer – Proxy – Facade – Architectural styles – Layered - Client Server - Tiered - Pipe and filter- User interface design-Case Study.

UNIT-IV: SOFTWARE TESTING AND MAINTENANCE 9

Testing – Unit testing – Black box testing– White box testing – Integration and System testing– Regression testing – Debugging - Program analysis – Symbolic execution – Model Checking-Case Study

UNIT-V: PROJECT MANAGEMENT 9

Software Project Management- Software Configuration Management - Project Scheduling- DevOps: Motivation-Cloud as a platform-Operations- Deployment Pipeline:Overall Architecture Building and Testing-Deployment- Tools- Case Study

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Roger S. Pressman, Software Engineering A Practitioners Approach, Mc Graw-Hill International Edition, 2019.
2. Len Bass, Ingo Weber and Liming Zhu, “DevOps: A Software Architect’s Perspective”, Pearson Education, 2016.
3. Roger S. Pressman, Object-Oriented Software Engineering: An Agile Unified Methodology, First Edition, Mc Graw-Hill International Edition, 2014.

4. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd edition, PHI Learning Pvt. Ltd., 2010.
5. Stephen Schach, Object-Oriented and Classical Software Engineering, 8th ed, McGraw-Hill, 2010.
6. Bernd Bruegge and Allen H. Dutoit, “Object-Oriented Software Engineering: Using UML, Patterns and Java”, Third Edition, Pearson Education, 2009.

COURSE OUTCOMES:

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

CO1: Compare various Software Development Lifecycle Models

CO2: Evaluate project management approaches as well as cost and schedule estimation strategies.

CO3: Perform formal analysis on specifications.

CO4: Use UML diagrams for analysis and design.

CO5: Architect and design using architectural styles and design patterns, and test the system.

COURSE OBJECTIVES:

- To learn and analyze critical algorithmic solutions for the same problem.
- To know different algorithm design techniques.
- To understand the dynamic programming and greedy techniques.
- To learn backtracking and iterative improvement.
- To understand the limitations of algorithmic power.

UNIT-I: INTRODUCTION 9

Importance – Role of algorithms in computing– Fundamentals of the analysis of algorithmic efficiency – Analysis framework - Asymptotic notations and properties –Mathematical analysis for recursive and non-recursive algorithms.

UNIT-II: BRUTE FORCE, DIVIDE AND CONQUER METHODOLOGY 9

Brute force methodology – Finding maximum and minimum element –Sequential search and string matching – Depth first search and Breadth first search, Assignment problem. Divide and Conquer methodology – Merge sort – Quick sort – Heap sort – Binary tree traversals multiplication of large integers.

UNIT-III: DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 9

Dynamic programming – Warshall’s and Floyd’s algorithm –Principle of optimality – Coin Changing problem– Multi stage graph – Knapsack problem. Greedy Method – Optimal Merge pattern – Huffman trees – Prim’s algorithm – Kruskal's algorithm.

UNIT-IV: BACKTRACKING AND ITERATIVE IMPROVEMENT 9

Backtracking: n – Queens problem – Hamiltonian Circuit problem – Subset Sum problem. The Simplex method – The Maximum-Flow Problem – Maximum matching in Bipartite graphs.

UNIT-V: COPING WITH THE LIMITATIONS OF ALGORITHM POWER 9

Lower – Bound arguments – P, NP, NP-Complete and NP Hard Problems. Branch and Bound – Assignment problem – Knapsack problem – Travelling Salesman problem – Approximation algorithms for NP-Hard Problems.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Malik And Preeti, Dimri And Sushil C, “Algorithms Design and Analysis”, De Gruyter, 2021.
2. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, 3rd Edition, Pearson Education, 2012.
3. Horowitz S. Sahni and S. Rajasekaran, “Computer Algorithms,” 2nd Edition, Galgotia, Publications, 2008.
4. Jeffrey J McConnell, “Analysis of Algorithms”, Jones and Bartlett Publishers, 2008.
5. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2007.

6. Jon Kleinberg and Eva Tardos, “Algorithm Design”, Pearson Education, 2006.

COURSE OUTCOMES:

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

CO1: Explain the algorithms for different computing problem frameworks.

CO2: Analyze brute force and divide and conquer methods for various problems.

CO3: Utilize dynamic programming and greedy technique for problem solving.

CO4: Interpret the role of backtracking.

CO5: Critically analyze the P and NP problems with the help of branch and bound.

COURSE OBJECTIVES:

- To understand the data science fundamentals and process.
- To learn to describe the data for the data science process.
- To learn to describe the relationship between data.
- To utilize the Python libraries for data wrangling.
- To present and interpret data using visualization libraries in Python

UNIT-I: INTRODUCTION**9**

Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model– presenting findings and building applications - Data Mining - Data Warehousing – Basic Statistical descriptions of Data

UNIT-II: DESCRIBING DATA**9**

Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores- Privacy and Data Protection.

UNIT-III: DESCRIBING RELATIONSHIPS**9**

Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r^2 –multiple regression equations –regression towards the mean

UNIT-IV: PYTHON LIBRARIES FOR DATA WRANGLING**9**

Basics of Numpy arrays – aggregations – computations on arrays – comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables

UNIT-V: DATA VISUALIZATION**9**

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

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Shakeel Ahmed Memon, Qurban A, Khoja, “Data Science Theory, Analysis and Applications”, CRC Press Taylor and Francis, 2021.
2. Andrew Park , “Data Science for Beginners”, 2020.
3. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017. (Units II and III)

4. David Cielien, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016. (Unit I)
5. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016. (Units IV and V)
6. Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea Press, 2014.

COURSE OUTCOMES:

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

CO1: Define the Data Science process.

CO2: Understand different types of data description for data science process

CO3: Gain knowledge on relationships between data

CO4: Use the Python Libraries for Data Wrangling

CO5: Apply visualization Libraries in Python to interpret and explore data

COURSE OBJECTIVES:

- To understand the python libraries for data science.
- To understand the basic Statistical and Probability measures for data science.
- To learn descriptive analytics on the benchmark data sets.
- To apply correlation and regression analytics on standard data sets.
- To present and interpret data using visualization packages in Python.

LIST OF EXPERIMENTS:

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.
2. Working with Numpy arrays.
3. Working with Pandas data frames.
4. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.
5. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
 - a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
 - b. Bivariate analysis: Linear and logistic regression modeling
 - c. Multiple Regression analysis
 - d. Also compare the results of the above analysis for the two data sets
6. Apply and explore various plotting functions on UCI data sets.
 - a. Normal curves
 - b. Density and contour plots
 - c. Correlation and scatter plots
 - d. Histograms
 - e. Three dimensional plotting
7. Visualizing Geographic Data with Base map.
8. Mini Project

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods

COURSE OUTCOMES:

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

- CO1:** Make use of the python libraries for data science.
- CO2:** Make use of the basic Statistical and Probability measures for data science.
- CO3:** Perform descriptive analytics on the benchmark data sets.
- CO4:** Perform correlation and regression analytics on standard data sets.
- CO5:** Present and interpret data using visualization packages in Python.

LIST OF EQUIPMENT'S AND COMPONENTS

Tools: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh

Note: Example data sets like: UCI, Iris, Pima Indians Diabetes etc.

COURSE OBJECTIVES:

- To learn data definition and data manipulation commands.
- To be familiar with query language.
- To comprehend function, triggers and procedures.
- To learn the use of frontend tool.
- To be exposed to implementation of database applications.

LIST OF EXPERIMENTS:

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements
2. Database Querying - Simple queries, Nested queries, Sub queries and Joins
3. Creation of Views, Sequences, Synonyms
4. High level programming language extensions (Control structures, Procedures and Functions).
5. Database Programming: Implicit and Explicit Cursors
6. Creation of database triggers
7. Exception Handling
8. Forms
9. Database Connectivity with Front End Tools
10. Mini project (Any one Application Development using Oracle/ Mysql)
 - i. Inventory Control System.
 - ii. Material Requirement Processing.
 - iii. Hospital Management System.
 - iv. Railway Reservation System.
 - v. Personal Information System.
 - vi. Web Based User Identification System.
 - vii. Timetable Management System.
 - viii. Hotel Management System

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods

COURSE OUTCOMES:

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

- CO1:** Use typical data definitions and manipulation commands
CO2: Design applications to test Nested and Join Queries
CO3: Create and maintain tables using PL/SQL.
CO4: Prepare reports.
CO5: Implement applications that require a Front-end Tool

LIST OF EQUIPMENT'S AND COMPONENTS

Software:

Front end: VB/VC ++/JAVA or Equivalent

Back end: Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent

COURSE OBJECTIVES:

- To understand the concepts of probability and random variables.
- To know about some standard probability distributions and their properties.
- To understand the basic concepts of two-dimensional random variables applicable to engineering which can describe real life phenomenon.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of Engineering

UNIT - I: PROBABILITY AND RANDOM VARIABLES**9+3**

Probability – Axioms of probability – Conditional probability – Baye’s theorem – Random Variables – Properties – Discrete random variables – Continuous random variables.

UNIT- II: STANDARD PROBABILITY DISTRIBUTIONS**9+3**

Moments – Moment generating functions – Discrete distributions: Binomial distribution – Poisson distribution – Continuous distributions: Exponential distribution- Normal distribution.

UNIT-III: TWO - DIMENSIONAL RANDOM VARIABLES**9+3**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables.

UNIT-IV: TESTING OF HYPOTHESIS**9+3**

Large sample tests based on Normal distribution for single mean and difference of means - Tests based on t, Chi-square and F distributions for testing mean and variance - Contingency table (test for independent) - Goodness of fit.

UNIT -V: DESIGN OF EXPERIMENTS**9+3**

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

Contact Periods:**Lecture: 45 Periods****Tutorial: 15 Periods****Practical: 0 Periods****Total: 60 Periods****REFERENCES:**

1. Ibe, O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund’s Probability and Statistics for Engineers", Pearson Education, Asia, 9th, Edition, 2018
3. Hwei Hsu., "Schaum’s Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2015.

4. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2018.
5. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020
6. Jay Devore, "Probability and Statistics for Engineering and the Sciences", 9th Edition, Cengage Learning, 2016.

COURSE OUTCOMES:

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

- CO1:** Acquire the fundamental knowledge of the concepts of probability and random variables.
- CO2:** Understand the basic knowledge of standard probability distributions which can describe real life phenomenon.
- CO3:** Understand the basic concepts of two-dimensional random variables and apply in Engineering applications.
- CO4:** Apply the concept of testing of hypothesis for small and large samples in real life problems.
- CO5:** Apply the basic concepts of classifications of design of experiments in the field of Engineering.

COURSE OBJECTIVES:

- To acquire knowledge in hypertext markup language and cascading style sheet.
- To describe client-side programming using Java script.
- To understand server-side programming using Servlet, JSP and PHP.
- To study knowledge in XML and Ajax enabled Internet application design.
- To define server-side development.

UNIT-I: INTRODUCTION TO WEBSITES, HTML 5 AND CSS 3 9

Introduction to Internet – Websites and Web servers – Internet and Intranet – Web 1.0 vs Web 2.0 vs Web 3.0 – HTML 5: Basic HTML elements, Input and page structure elements, Positioning elements, Backgrounds, Element dimensions, Box model and Text flow, Media types and queries, Shadows, Gradients, animations, Transitions and transformations, Web font, Multi column layout – Cascading style sheet 3: Inline, Internal and external CSS.

UNIT-II: CLIENT-SIDE SCRIPTING 9

Java script: Programming basics – Introduction to scripting, Control statement, Functions, Objects, Event handling, Regular expressions, Exception handling, Validation – Built in objects: Math, String, Date, Arrays, Boolean, Document objects – Document object model.

UNIT-III: SERVER-SIDE PROGRAMMING 9

Servlets: Java Servlet architecture – Servlet life cycle – Form GET and POST actions – Session handling – Understanding cookies – Installing and configuring Apache Tomcat web server – Database connectivity: JDBC perspectives, JDBC program example – JSP: Understanding Java server pages – JSP Standard Tag Library(JSTL) – Creating HTML forms by embedding JSP code – An introduction to PHP: PHP – Using PHP – Variables – Program control – Built-in functions – Connecting to database – Using cookies – Regular expressions.

UNIT-IV: XML, JSON AND AJAX ENABLED RICH INTERNET APPLICATIONS 9

XML: Basics, Structuring data, XML name spaces, DTDs – Schema documents, Extensible style sheet language and XSL transformation, DOM – Web application development: Traditional Vs Ajax web application development, RIA with Ajax, XML HTTP request object, Using XML and DOM, Application creation. Introduction to JSON.

UNIT-V: SERVER-SIDE DEVELOPMENT WITH JSF AND JAVA 9

Java server faces: Application development, Model view controller architecture, JSF components, Validation, Session tracking, Accessing databases in web apps, Web services: SOAP, REST, JSON, Publishing and consuming SOAP based web services, REST based XML Web services and REST based JSON Web service.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Archana Patel, Narayan C, Debnath and Bhushan, “Semantic Web Technologies Research and Applications” CRC Press Taylor & Francis Group, 2022.
2. Paul Deitel, Harvey Deitel, Abbey Deitel “Internet and World Wide Web- How to Program”, 5th Edition, Pearson, 2012.
3. Nicholas C. Zakas, “Professional Java script for Web Developers”, 3rd Edition, Wrox Press, 2011.
4. Gopalan N.P and Akilandeswari J., “Web Technology”, Prentice Hall of India, 2011.
5. Jon Duckett, “Beginning Web Programming with HTML, XHTML and CSS”, Wrox Press, 2004.
6. Achyut Godbole and AtulKahate, “Web Technologies: TCP/IP to Internet Application Architectures”, Tata McGraw-Hill Education, 2002.

COURSE OUTCOMES:

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

- CO1:** Develop websites using Hypertext markup language and cascading style sheet.
- CO2:** Design client-side programming using Java script.
- CO3:** Write server-side programming using Servlet, JSP and PHP.
- CO4:** Acquire knowledge in XML and Ajax enabled Internet application design.
- CO5:** Create server-side application using JSF and Java.

COURSE OBJECTIVES:

- To understand the protocol layering and physical level communication.
- To describe the performance of a network.
- To know the various components required to build different networks.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer.

UNIT-I: INTRODUCTION AND PHYSICAL LAYER 9

Networks – Network types – Protocol layering – TCP/IP Protocol suite – OSI model – Physical layer: Performance – Transmission media – Switching – Circuit-switched networks – Packet switching.

UNIT-II: DATA-LINK LAYER & MEDIA ACCESS 9

Introduction – Link layer addressing – DLC services – Data link layer protocols – HDLC – PPP – Media access control – Wired LANs: Ethernet – Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting devices.

UNIT-III: NETWORK LAYER 9

Network layer services – Packet switching – Performance – IPV4 addresses – Forwarding of IP packets – Network layer protocols: IP, ICMP v4 – Unicast routing algorithms – Protocols – Multicasting basics – IPV6 addressing – IPV6 protocol.

UNIT-IV: TRANSPORT LAYER 9

Introduction – Transport layer protocols – Services – Port numbers – User Datagram Protocol – Transmission Control Protocol – SCTP.

UNIT-V: APPLICATION LAYER 9

World Wide Web and hypertext transfer protocol – File transfer protocol – Email – MIME – Telnet – Secure Shell – Domain Name System – Simple Network Management Protocol.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Behrouz A. Forouzan, “Data Communications and Networking”, 5th Edition TMH, 2013.
2. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, 5th Edition, Morgan Kaufmann Publishers Inc., 2012.
3. William Stallings, “Data and Computer Communications”, 10th Edition, Pearson Education, 2013.
4. Nader F. Mir, “Computer and Communication Networks”, 2nd Edition, Prentice Hall, 2014.

5. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill Publisher, 2011.
6. James F. Kurose, Keith W. Ross, “Computer Networking, A Top-Down Approach Featuring the Internet”, 6th Edition, Pearson Education, 2013.

COURSE OUTCOMES:

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

CO1: Gain the knowledge of basic layers and its functions in computer networks.

CO2: Evaluate the performance of a network.

CO3: Discovered the basics of how data flows from one node to another.

CO4: Design protocols for various functions in the network.

CO5: Develop real world applications using various application layer protocols.

COURSE OBJECTIVES:

- To understand basic notations and to construct automata for any given pattern.
- To find equivalent regular expressions for Finite automata.
- To design a context free grammar for any given language and normalize it.
- To construct PDA for any context free language and find equivalence.
- To expose Turing machines and undecidable problems.

UNIT-I: FINITE AUTOMATA**9**

Introduction – Basic mathematical notation and techniques – Introduction to formal proof - Basic definitions – Finite automaton – DFA – NDFA - Finite automata with epsilon transitions
Grammar introduction – Types of grammar.

UNIT-II: REGULAR LANGUAGES**9**

Regular languages – Regular expression – Equivalence of NFA and DFA – Equivalence of NDFA with and without epsilon transitions – Equivalence of finite automaton and regular expressions – Equivalence and minimization of automata – Closure properties of regular languages – Pumping lemma for regular sets.

UNIT-III: CONTEXT FREE GRAMMARS**9**

Context free grammars and languages – Parse trees ambiguity in grammars and languages – Simplification of CFG: Elimination of useless symbols – Unit productions – Null productions – Chomsky normal form – Greiback normal form.

UNIT-IV: PUSHDOWN AUTOMATA**9**

Pushdown automata – Definitions – Instantaneous descriptions – Languages of a pushdown automata – Deterministic pushdown automata – Equivalence of pushdown automata and CFG – Pumping lemma for CFL – Closure properties of CFL.

UNIT-V: TURING MACHINES**9**

Definitions of Turing machines – Programming techniques for TM – Multi head and multi tape Turing machines – Universal Turing machine – The Halting problem – Partial solvability – Recursive and recursively enumerable languages – Undecidable problems about TM.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Witold Pedrycz, Wladyslaw Homenda, “Automata Theory and Formal Languages”, De Gruyter, 2022.
2. John E Hopcroft, “Introduction to Automata Theory, Languages, and Computation”, 3rd Edition, Pearson, 2018.

3. John C Martin, "Introduction to Languages and the Theory of Computation", 4th Edition, Tata McGraw Hill, 2011. (UNIT 4, 5).
4. Kamala Krithivasan and Rama R., "Introduction to Formal Languages, Automata Theory and Computation", Pearson Education 2009.
5. Hopcroft J.E, Motwani R and Ullman J.D., "Introduction to Automata Theory, Languages and Computations", 3rd Edition, Pearson Education, 2008 (UNIT 1, 2, 3).
6. Mishra K L P and Chandrasekaran N., "Theory of Computer Science - Automata, Languages and Computation", 3rd Edition, Prentice Hall of India, 2004.
7. Harry R. Lewis and Christos H. Papadimitriou, "Elements of the Theory of Computation", 2nd Edition, Prentice Hall of India, Pearson Education, New Delhi, 2003.
8. Peter Linz, "An Introduction to Formal Language and Automata", 3rd Edition, Narosa Publishers, New Delhi, 2002.

COURSE OUTCOMES:

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

- CO1:** Construct DFA, NFA and NFA with Epsilon transition for regular languages.
- CO2:** Generate Equivalence of Regular expression and finite automata with minimization.
- CO3:** Write Context free grammar for any construct and normalize it.
- CO4:** Design PDA for any CFL and find equivalence of PDA and CFG.
- CO5:** Develop Turing machines and halting problem.

COURSE OBJECTIVES:

- To be familiar with Web page design using HTML/XML and style sheets.
- To learn to create dynamic web pages using client-side scripting.
- To build and write Client Server applications.
- To understand the PHP programming.
- To be exposed to creating applications with AJAX.

LIST OF EXPERIMENTS:

1. Designing static web pages using HTML
2. Designing dynamic web pages using different cascading style sheets
3. Programs using Java Script
4. Programs using Java servlets
5. Programs using JSP
6. Designing web applications using PHP
7. Designing XML Schemas
8. Programs using JSON and Ajax
9. Designing web applications in Net Beans Environment
10. Database Connectivity with MySQL using Java Servlets, JSP, and PHP

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods

COURSE OUTCOMES:

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

- CO1:** Construct web pages using HTML/XML and stylesheets.
CO2: Design dynamic web pages with validation using Java script objects and by applying different event handling mechanisms.
CO3: Develop dynamic web pages using server-side scripting.
CO4: Apply PHP programming to develop web applications.
CO5: Generate web applications using AJAX and web services.

LIST OF EQUIPMENT'S AND COMPONENTS

- Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server, WAMP/XAMPP.

COURSE OBJECTIVES:

- To learn and use network commands.
- To explain socket programming.
- To implement and analyze various network protocols.
- To focus and use simulation tools.
- To use simulation tools to analyze the performance of various network protocols.

LIST OF EXPERIMENTS:

1. Learn to use commands like Tcpdump, Netstat, Ifconfig, Nslookup and Traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine
2. Write a HTTP web client program to download a web page using TCP sockets
3. Applications using TCP sockets like:
 - i. Echo client and Echo server
 - ii. Chat
 - iii. File Transfer
4. Simulation of DNS using UDP sockets
5. Write a code simulating ARP /RARP protocols
6. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS3
7. Study of TCP/UDP performance using Simulation tool
8. Simulation of Distance Vector/ Link State Routing algorithm
9. Performance evaluation of Routing protocols using Simulation tool
10. Simulation of Cyclic Redundancy Code.

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods

COURSE OUTCOMES:

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

CO1: Implement various protocols using TCP and UDP.

CO2: Compare the performance of different transport layer protocols.

CO3: Use simulation tools to analyze the performance of various network protocols.

CO4: Analyze various routing algorithms.

CO5: Implement error correction codes.

LIST OF EQUIPMENT'S AND COMPONENTS

- Software Required – C / C++ / Java / Python / Equivalent Compiler Network simulator like NS3/OPNET IT Guru / Wireshark packet analyzer / Packet Tracer / Equivalent.
- Hardware Required – Standalone desktops 30 Nos.

22CSPC601	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	SEMESTER VI
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COURSE OBJECTIVES:

- Study about uninformed and Heuristic search techniques.
- Learn techniques for reasoning under uncertainty
- Introduce Machine Learning and supervised learning algorithms
- Study about ensembling and unsupervised learning algorithms
- Learn the basics of deep learning using neural networks

UNIT-I: PROBLEM SOLVING 9

Introduction to AI - AI Applications - Problem solving agents – search algorithms – uninformed search strategies – Heuristic search strategies – Local search and optimization problems – adversarial search – constraint satisfaction problems (CSP)

UNIT-II: PROBABILISTIC REASONING 9

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

UNIT-III: SUPERVISED LEARNING 9

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

UNIT-IV: ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING 9

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

UNIT-V: NEURAL NETWORKS 9

Perceptron - Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

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

Edition, Pearson Education, 2021.

2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
3. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Pearson Education, 2007
4. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008
5. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006
6. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016

COURSE OUTCOMES:

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

CO1: Use appropriate search algorithms for problem solving

CO2: Apply reasoning under uncertainty

CO3: Build supervised learning models

CO4: Develop ensembling and unsupervised models

CO5: Build deep learning neural network models

COMPILER DESIGN

SEMESTER VI

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COURSE OBJECTIVES:

- To learn the various phases of compiler.
- To learn to implement tokens of the compiler.
- To learn the various parsing techniques.
- To understand intermediate code generation and run-time environment.
- To learn to implement code generator and optimize the code.

UNIT-I: INTRODUCTION TO COMPILERS 9

Translators – Compilation and Interpretation – Language processors –The phases of compiler-errors encountered in different phases – The grouping of phases – Compiler construction tools programming language basics.

UNIT-II: LEXICAL ANALYSIS 9

Need and role of Lexical analyzer – Lexical errors – Expressing tokens by regular expressions converting regular expression to DFA – Minimization of DFA – Language for specifying lexical analyzers – LEX.

UNIT-III: SYNTAX ANALYSIS 9

Need and role of the parser – Context free grammars –Top down parsing – General strategies Recursive descent parser predictive parser – LL (1) Parser-shift reduce parser – LR parser-LR (0) Item – Construction of SLR parsing table - Introduction to LALR parser – Error handling and recovery in syntax analyzer–YACC.

UNIT-IV: INTERMEDIATE CODE GENERATION 9

Syntax directed definitions, Evaluation orders for syntax directed definitions, Intermediate Languages: syntax tree, Three address code, Types and declarations, Translation of expressions, Type checking.

UNIT-V: CODE GENERATION AND CODE OPTIMIZATION 9

Storage organization, Stack allocation space, Access to Non-Local data on the stack, Heap management – Issues in Code Generation – Design of a simple Code Generator – Principal sources of optimization – Peep-hole optimization – DAG – Optimization of basic blocks – Global data flow analysis – Efficient data flow algorithm.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D. Ullman, “Compilers – Principles, Techniques and Tools”, 2nd Edition, Pearson Education, 2007.
2. Randy Allen and Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence-based Approach”, Morgan Kaufmann Publishers, 2002.
3. Steven S. Muchnick, “Advanced Compiler Design and Implementation”, Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
4. Keith D. Cooper and Linda Torczon, “Engineering a Compiler”, Morgan Kaufmann

Publishers Elsevier Science, 2004.

5. Charles N. Fischer, Richard. J. LeBlanc, “Crafting a Compiler with C”, Pearson Education, 2008.

COURSE OUTCOMES:

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

CO1: Analyze the different phases of compiler.

CO2: Design a lexical analyzer for a sample language.

CO3: Apply different parsing algorithms to develop the parsers for a given grammar.

CO4: Interprets syntax-directed translation and code generation.

CO5: Learn to implement code optimization techniques and a simple code generator.

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COURSE OBJECTIVES:

- To understand smart objects and IoT architectures.
- To learn about various IoT-related protocols.
- To build simple IoT systems using Arduino and Raspberry Pi.
- To understand data analytics and cloud in the context of IoT.
- To develop IoT infrastructure for popular applications.

UNIT-I: FUNDAMENTALS OF IoT**9**

Evolution of internet of things –Enabling technologies – IoT architectures: oneM2M, IoT World Forum (IoTWF) and alternative IoT models – Simplified IoT architecture and core IoT functional stack – fog, Edge and cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart objects and Connecting smart objects.

UNIT-II: IOT PROTOCOLS**9**

IoT access technologies: Physical and MAC layers, topology and security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network layer: IP versions, Constrained nodes and constrained networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over low power and lossy networks – Application transport methods: Supervisory control and data acquisition – Application layer protocols: CoAP and MQTT.

UNIT-III: DESIGN AND DEVELOPMENT**9**

Design methodology – Embedded computing logic – Microcontroller, System on chips –IoT system building blocks – Arduino – Board details, IDE programming – Raspberry Pi -Interfaces and raspberry Pi with Python programming.

UNIT-IV: DATA ANALYTICS AND SUPPORTING SERVICES**9**

Structured Vs Unstructured data and data in motion Vs data in rest – Role of machine learning – No SQL databases – Hadoop ecosystem – Apache Kafka, Apache spark – Edge streaming analytics and network analytics – Xively cloud for IoT, Python Web application framework – Django – AWS for IoT – System management with NETCONF – YANG.

UNIT-V: CASE STUDIES AND INDUSTRIAL APPLICATIONS**9**

Cisco IoT system – IBM Watson IoT platform – Manufacturing – Converged plant wide Ethernet model (CPwE) – Power utility industry – Grid blocks reference model – Smart and connected cities: Layered architecture, Smart lighting, Smart parking architecture and Smart traffic control.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, “IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things”, Cisco Press, 2017.
2. Arshdeep Bahga and Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015.
3. Olivier Hersent, David Boswarthick and Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012 .
4. Jan Ho ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatias, Karnouskos, Stefan Avesand, David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), Architecting the Internet of Things, Springer, 2011.
6. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O’Reilly Media, 2011.

COURSE OUTCOMES:

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

CO1: Explain the concept of IoT.

CO2: Analyze various protocols for IoT.

CO3: Design a PoC of an IoT system using Rasperry Pi/Arduino.

CO4: Apply data analytics and use cloud offerings related to IoT.

CO5: Analyze applications of IoT in real time scenario.

22CAMC604	QUANTITATIVE AND REASONING SKILLS	SEMESTER VI			
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COURSE OBJECTIVES:

- To model and draw conclusions or make decisions with mathematical, statistical, and quantitative information.
- To interpret and communicate quantitative information and mathematical and statistical concepts
- To increase comfort and facility with numeracy, the processes and skills of mathematics.
- To experience mathematical challenges and use the tools required to persist and succeed through them.
- To understand, analysis and critique of self-created or reported statistical information and statistical summaries.

UNIT-I: QUANTITATIVE ABILITY – BASIC MATHEMATICS **9**

Number System, Simplification, Average, Problems on Ages, Percentages, Ratio and Proportion.

UNIT-II: QUANTITATIVE ABILITY – APPLIED MATHEMATICS **9**

Profit and Loss, Simple Interest, Time, Speed and Distance, Time & Work, Mixtures and Allegation and Blood Relations.

UNIT-III: DATA INTERPRETATION **9**

Data Interpretation, Visual Reasoning, Data Arrangements, Tables, Column Graphs, Bar Graphs, Line Charts, Pie Chart, Venn Diagrams.

UNIT-IV: LOGICAL REASONING **9**

Progressions, Geometry and Quadratic Equations, Series, Analogy and Odd Man Out.

UNIT-V: CRITICAL THINKING **9**

Coding – Decoding, Calendars, Clocks, Seating Arrangement, Syllogism, Mathematical Operations.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Aggarwal R S, "Quantitative Aptitude for Competitive Examinations", 3rd Edition, S Chand Publishing, New Delhi, 2017.
2. ETHNUS , "Aptimithra", 1st Edition, McGraw-Hill Education Pvt Ltd, 2013
3. FACE , "Aptipedia Aptitude Encyclopedia", 1st Edition, Wiley Publications, Delhi, 2016.
4. Sijwali B S, Analytical and Logical reasoning for CAT and other management entrance

test.

5. Abhijit Guha, Quantitative Aptitude by Competitive Examinations by Abhijit Guha 4th edition.

COURSE OUTCOMES:

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

CO1: Understand the core concepts of quantitative aptitude

CO2: Understand the primary concepts of reasoning.

CO3: Attain adequate competency in use of logical reasoning and skills

CO4: Handle campus placement test involving quantitative aptitude and reason.

CO5: Compete in various competitive exams

COURSE OBJECTIVES:

- To learn to implement uninformed and informed search techniques.
- To build supervised learning models.
- To explore the regression models.
- To implement Clustering algorithms
- To develop Neural Network Models

LIST OF EXPERIMENTS:

1. Implementation of Uninformed search algorithms (BFS, DFS)
2. Implementation of Informed search algorithms (A*, memory-bounded A*)
3. Implement naïve Bayes models
4. Implement Bayesian Networks
5. Build Regression models
6. Build decision trees and random forests
7. Build SVM models
8. Implement ensembling techniques
9. Implement clustering algorithms
10. Implement EM for Bayesian networks
11. Build simple NN models
12. Build deep learning NN models

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods

COURSE OUTCOMES:

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

- CO1:** Implement uninformed and informed search techniques
CO2: Build Supervised learning models
CO3: Develop regression models
CO4: Implement Clustering algorithms
CO5: Demonstrate simple and deep Network models.

LIST OF EQUIPMENT'S AND COMPONENTS

List of Equipment's: The programs can be implemented in either Python or R.

COURSE OBJECTIVES:

- To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
- To understand how to work with various mobile application development frameworks.
- To learn the basic and important design concepts and issues of development of mobile applications.
- To understand the capabilities and limitations of mobile devices.

LIST OF EXPERIMENTS:

1. Develop an application that uses GUI components, Font and Colors
2. Develop an application that uses Layout Managers and event listeners
3. Write an application that draws basic graphical primitives on the screen
4. Develop an application that makes use of databases.
5. Develop an application that makes use of Notification Manager
6. Implement an application that uses Multi-threading
7. Develop a native application that uses GPS location information
8. Implement an application that writes data to the SD card
9. Implement an application that creates an alert upon receiving a message
10. Write a mobile application that makes use of RSS feed
11. Develop a mobile application to send an email
12. Develop a Mobile application for simple needs (Mini Project)

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods

COURSE OUTCOMES:

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

- CO1:** Develop mobile applications using GUI and layouts.
- CO2:** Develop mobile applications using event listener.
- CO3:** Develop mobile applications using databases.
- CO4:** Develop mobile applications using RSS Feed, Internal/External storage, SMS, Multi-threading and GPS.
- CO5:** Analyze and discover own mobile app for simple needs.

LIST OF EQUIPMENT'S AND COMPONENTS

- Standalone desktops with Windows or Android or iOS or Equivalent Mobile Application Development. Tools with appropriate emulators and debuggers - 30 Nos.

COURSE OBJECTIVES:

- To understand number theory used for network security.
- To understand the design concept of cryptography.
- To understand the concept of authentication.
- To understand the design concepts of internet security.
- To develop experiments on algorithm used for security.

UNIT-I: INTRODUCTION 9

Security trends – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: Substitution techniques, Transposition techniques, steganography – Number theory: Introduction to Number theory Euclid’s algorithm (extended), Totient function, Testing for Primality, Fermat’s and Euler’s theorem – The Chinese remainder theorem – Exponentiation and logarithm.

UNIT-II: SYMMETRIC KEY CRYPTOGRAPHY 9

Data Encryption Standard (DES) algorithm – Overview of the DES algorithm; Double and Triple DES – Double DES, Triple DES; Security of the DES; Advanced Encryption Standard (AES).

UNIT-III: PUBLIC KEY CRYPTOGRAPHY 9

Asymmetric Key Ciphers: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange – ElGamal cryptosystem – Elliptic curve Arithmetic – Elliptic curve cryptography.

UNIT-IV: MESSAGE AUTHENTICATION AND INTEGRITY 9

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA – Digital signature and authentication protocols – DSS – Entity Authentication: Biometrics, Passwords, Challenge Response protocols – Authentication applications – Kerberos, X.509.

UNIT-V: SECURITY PRACTICE AND SYSTEM SECURITY 9

Electronic Mail security – PGP, S/MIME – IP security – Web Security – System Security: Intruders – Malicious software – Viruses – Firewalls.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. William Stallings, “Cryptography and Network Security: Principles and Practice”, PHI 8th Edition, 2023.
2. Shyamala C.K, Harini N and Dr. Padmanabhan T. R., “Cryptography and Network Security”, Wiley India Pvt. Ltd, 2011.
3. Behrouz A. Foruzan, “Cryptography and Network Security”, Tata McGraw Hill 2007.
4. Charlie Kaufman, Radia Perlman and Mike Speciner, “Network Security: Private Communication in a Public World”, Prentice Hall, ISBN 0-13-046019-2.

5. M Stamp, “Information Security: Principles and Practice”, Third Edition 2021, Wiley.

COURSE OUTCOMES:

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

CO1: Learn the fundamentals of networks security, security architecture, threats and vulnerabilities.

CO2: Apply the different cryptographic operations of symmetric cryptographic algorithms.

CO3: Apply the different cryptographic operations of public key cryptography.

CO4: Apply the various Authentication schemes to simulate different applications.

CO5: Learn various Security practices and analyze system security standards.

COURSE OBJECTIVES:

- To provide a sound knowledge in UI & UX
- To understand the need for UI and UX
- To understand the various Research Methods used in Design
- To explore the various Tools used in UI & UX
- Creating a wireframe and prototype

UNIT-I: FOUNDATIONS OF DESIGN

9

UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy

UNIT-II: FOUNDATIONS OF UI DESIGN

9

Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides

UNIT-III: FOUNDATIONS OF UX DESIGN

9

Introduction to User Experience - Why You Should Care about User Experience – Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals

UNIT-IV: WIREFRAMING, PROTOTYPING AND TESTING

9

Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration

UNIT-V: RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE

9

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods – Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams – Flow Mapping - Information Architecture

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Joel Marsh, “UX for Beginners”, O’Reilly , 2022
2. Jon Yablonski, “Laws of UX using Psychology to Design Better Product & Services” O’Reilly 2021
3. Jenifer Tidwell, Charles Brewer, Aynne Valencia, “Designing Interface” 3rd Edition , O’Reilly 2020
4. Steve Schoger, Adam Wathan “Refactoring UI”, 2018
5. Steve Krug, “Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile”, 3rd Edition, 2015

COURSE OUTCOMES:

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

CO1: Build UI for user Applications

CO2: Evaluate UX design of any product or application

CO3: Demonstrate UX Skills in product development

CO4: Implement Sketching principles

CO5: Create Wireframe and Prototype

COURSE OBJECTIVES:

- To enable the students to study the evolution of Management.
- To learn the functions and principles of management.
- To learn the application of the principles in an organization.

UNIT-I: INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur – Types of managers – Managerial roles and skills – Evolution of Management – Scientific, Human relations, System and contingency approaches – Types of Business organization – Sole proprietorship, partnership, Company – Public and Private sector enterprises – Organization culture and environment – Current trends and issues in management.

UNIT-II: PLANNING 9

Nature and purpose of planning – Planning process – Types of planning – Objectives – Setting objectives – Policies – Planning premises – Strategic management – Planning tools and Techniques – Decision making steps and process.

UNIT-III: ORGANISING 9

Nature and purpose – Formal and informal organization – Organization chart – Organization structure – Types – Line and staff authority – Departmentalization – Delegation of authority – Centralization and Decentralization – Job design – Human Resource management – HR Planning, Recruitment, selection, Training and Development, Performance management, Career planning and management

UNIT-IV: DIRECTING 9

Foundations of individual and group behavior – Motivation – Motivation theories – Motivational techniques – Job satisfaction – Job enrichment – Leadership – Types and theories of leadership – Communication – Process of communication – Barrier in communication – Effective communication – Communication and IT.

UNIT-V: CONTROLLING 9

System and process of controlling – Budgetary and Non-budgetary control techniques – Use of computers and IT in Management control – Productivity problems and management – Control and performance – Direct and preventive control – Reporting.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Stephen P. Robbins and Mary Coulter, “Management”, Prentice Hall (India) Pvt. Ltd., 15th Edition, 2020.
2. JAF Stoner, Freeman R.E and Daniel R. Gilbert, “Management”, Pearson Education, 6th Edition, 2004.
3. Harold Koontz and Heinz Weihrich, “Essentials of management”, Tata McGraw Hill, 8th edition 2008.

4. Robert Kreitner and Mamata Mohapatra, "Management", Biztantra, 2008.
5. Tripathy PC and Reddy PN, "Principles of Management", Tata McGraw Hill, 1999.

COURSE OUTCOMES:

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

CO1: Have same basic knowledge on international aspect of management.

CO2: Use managerial function planning.

CO3: Use managerial function organizing and staffing.

CO4: Use managerial function Directing.

CO5: Use managerial function controlling.

COURSE OBJECTIVES:

- To understand the design concept of cryptography and authentication.
- To understand the design concepts of internet security.
- To develop experiments on algorithm used for security.

LIST OF EXPERIMENTS:

- Perform encryption, decryption using the following substitution techniques
 - i. Ceaser cipher
 - ii. Playfair cipher
 - iii. Hill Cipher
 - iv. Vigenere cipher
- Perform encryption and decryption using following transposition techniques
 - i. Rail fence
 - ii. Row & Column Transformation
- Apply DES algorithm for practical applications
- Apply AES algorithm for practical applications
- Implement RSA Algorithm using HTML and JavaScript
- Implement the Diffie-Hellman Key Exchange algorithm for a given problem
- Calculate the message digest of a text using the SHA-1 algorithm
- Implement the SIGNATURE SCHEME – Digital Signature Standard
- Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w
- Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool
- Defeating Malware
 - i. Building Trojans
 - ii. Rootkit Hunter

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 45 Periods Total: 45 Periods

COURSE OUTCOMES:

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

- CO1:** Develop code for classical Encryption Techniques to solve the problems.
CO2: Build cryptosystems by applying symmetric and public key encryption algorithms.
CO3: Construct code for authentication algorithms.
CO4: Develop a signature scheme using Digital signature standard.
CO5: Demonstrate the network security system using open source tools.

LIST OF EQUIPMENT'S AND COMPONENTS

- Software: C / C++ / Java or equivalent compiler GnuPG, Snort, N-Stalker or Equivalent.
- Hardware: Standalone desktops – 30 Nos. (or) Server supporting 30 terminals or more.

22CSEE705

MINI PROJECT

SEMESTER VII

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To develop their own innovative prototype of ideas.
- To train the students in preparing mini project reports and examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department and prepares a comprehensive mini project report after completing the work to the satisfaction. The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department. A mini project report is required at the end of the semester. The mini project work is evaluated based on oral presentation and the mini project report jointly by external and internal examiners constituted by the Head of the Department.

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical:45 Periods Total: 45 Periods

COURSE OUTCOMES:

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

CO1: On completion of the mini project work students will be in a position to take up their final year project work and find solution by formulating proper methodology.

22CSEE801

PROJECT WORK

SEMESTER VIII

L	T	P	C
0	0	16	8

COURSE OBJECTIVES:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical:240 Periods Total: 240 Periods

COURSE OUTCOMES:

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

CO1: On completion of the project work students will be in a position to take up their project work to formulating proper model.

PROFESSIONAL ELECTIVE (PE) – I (SEMESTER V)

22CSPE501	DATA WAREHOUSING AND DATA MINING	SEMESTER V			
		L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To build data warehouse using data model, warehouse architecture and OLAP server.
- To learn about association mining techniques used for the development of efficient data mining system.
- To understand classification and prediction methods.
- To summarize clustering the data using clustering techniques and Applications of data mining.
- To know Weka tool and R programming.

UNIT-I: DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING (OLAP) 9

Basic concepts – Data warehousing components – Building a data warehouse – Data base architectures for parallel processing – Parallel DBMS vendors – Multi dimensional data model – Data warehouse schemas for decision support, Concept hierarchies –Characteristics of OLAP systems – Typical OLAP operations, OLAP and OLTP.

UNIT-II: INTRODUCTION TO DATA MINING 9

Introduction to data mining systems – Knowledge discovery process – Data mining techniques – Issues – applications – Data objects and attribute types, statistical description of data, Data preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT-III: DATA MINING – FREQUENT PATTERN ANALYSIS 9

Mining frequent patterns, Associations and correlations – Mining methods- Pattern evaluation method – Pattern mining in multilevel, Multi-Dimensional space – Constraint based frequent pattern mining, Classification using frequent patterns.

UNIT-IV: CLASSIFICATION AND CLUSTERING 9

Decision tree induction – Bayesian classification – Rule based classification – Classification by back propagation – Support vector machines – Lazy learners – Model evaluation and selection – Techniques to improve classification accuracy. Clustering techniques – Cluster analysis –Partitioning methods – Hierarchical methods – Density based methods – Grid based methods – Evaluation of clustering – Clustering high dimensional data – Clustering with constraints, Outlier analysis – outlier detection methods.

UNIT-V: WEKA TOOL AND R PROGRAMMING 9

Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database – Introduction to WEKA, The explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association – rule learners – Introduction to R Programming – Data Mining Using R.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Jiawei Han, Jian Pei, Hanghang Tong, “Data Mining Concepts and Techniques”, Fourth Edition, Elsevier Science, 2022.
2. Alex Berson and Stephen J. Smith, “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, 35th Reprint 2016.
3. Ian H. Witten and Eibe Frank, Mark A. Hall, Christopher J. Pal “Data Mining: Practical Machine Learning Tools and Techniques”, Elsevier, 4th Edition, 2016.
4. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.
5. Soman K.P, Shyam Diwakar and Ajay V., “Insight into Data Mining Theory and Practice”, Eastern Economy Edition, Prentice Hall of India, 2006.

COURSE OUTCOMES:

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

- CO1:** Design a Data warehouse system and perform business analysis with OLAP tools.
- CO2:** Apply suitable pre-processing and visualization techniques for data analysis.
- CO3:** Create frequent pattern and association rule mining techniques for data analysis.
- CO4:** Compare appropriate classification and clustering techniques for data analysis.
- CO5:** Analyze the data using Weka tool and R Programming.

COURSE OBJECTIVES:

- To understand the basics of software testing.
- To learn how to do the testing and planning effectively.
- To build test cases and execute them.
- To focus on wide aspects of testing and understanding multiple facets of testing.
- To get an insight about test automation and the tools used for test automation.

UNIT-I: FOUNDATIONS OF SOFTWARE TESTING 9

Introduction to Software Testing - Black-Box Testing and White-Box Testing, Software Testing Life Cycle V - model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errors and Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing.

UNIT-II: TEST PLANNING 9

The Goal of Test Planning, High Level Expectations, Intergroup Responsibilities, Test Phases, Test Strategy, Resource Requirements, Tester Assignments, Test Schedule, Test Cases, Bug Reporting, Metrics and Statistics.

UNIT-III: TEST DESIGN AND EXECUTION 9

Test Objective Identification, Test Design Factors, Requirement identification, Testable Requirements, Modeling a Test Design Process, Modeling Test Results, Boundary Value Testing, Equivalence Class Testing, Path Testing, Data Flow Testing, Test Design Preparedness Metrics, Test Case Design Effectiveness, Model-Driven Test Design, Test Procedures, Test Case Organization and Tracking, Bug Reporting, Bug Life Cycle.

UNIT-IV: ADVANCED TESTING CONCEPTS 9

Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Testing, Configuration Testing, Compatibility Testing, Usability Testing, Testing the Documentation, Security testing, Testing in the Agile Environment, Testing Web and Mobile Applications.

UNIT-V: TEST AUTOMATION AND TOOLS 9

Automated Software Testing, Automate Testing of Web Applications, Selenium: Introducing WebDriver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Matthew Heusser, Michael Larsen, "Software Testing Strategies", Packt Publishing, 2023.

2. Carl Cocchiaro, Selenium Framework Design in Data-Driven Testing, 2018, Packt Publishing.
3. Unmesh Gundecha, Satya Avasarala, "Selenium Web Driver3 Practical Guide"-Second Edition 2018.
4. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, Fourth Edition, 2014, Taylor & Francis Group.
5. Satya Avasarala, Selenium Web Driver Practical Guide, 2014, Packt Publishing.
6. Yogesh Singh, "Software Testing", Cambridge University Press, 2012.
7. Glenford J. Myers, Corey Sandler, Tom Badgett, The Art of Software Testing, 3rd Edition, 2012, John Wiley & Sons, Inc.
8. Elfriede Dustin, Thom Garrett, Bernie Gaurf, Implementing Automated Software Testing, 2009, Pearson Education, Inc.
9. Ron Patton, Software testing, 2ndEdition, 2006, Sams Publishing.

COURSE OUTCOMES:

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

- CO1:** Gain the basic concepts of software testing and the need for software testing.
- CO2:** Design Test planning and different activities involved in test planning.
- CO3:** Generate effective test cases that can uncover critical defects in the application.
- CO4:** Carryout advanced types of testing.
- CO5:** Automate the software testing using Selenium and TestNG.

COURSE OBJECTIVES:

- To understand the principles of iterative and recursive algorithms.
- To learn concurrent data structures.
- To develop dynamic and greedy algorithms.
- To get an awareness of NP completeness and randomized algorithms.

UNIT-I: INTRODUCTION**9**

The Role of algorithms in computing – Getting started – Growth of functions – Divide-and-conquer – The maximum – Subarray problem – Strassen’s algorithm for matrix multiplication – The substitution method for solving recurrences – The recurrence tree method for solving recurrences – The master method for solving recurrences – Probabilistic analysis and randomized algorithms – The hiring problem – Random variables – Randomized algorithms. Amortized analysis – Aggregate analysis – The accounting method – The potential method – Dynamic tables.

UNIT-II: HEAP**9**

Min-Max heaps – Deaps – Leftist heaps – Binomial heaps – Fibonacci heaps – Skew heaps – Lazy-binomial heaps.

UNIT-III: TREE**9**

Optimal binary search trees – AVL trees – 2-3 trees – 2-3-4 trees – Red-black trees – B-trees – splay trees – Tries.

UNIT-IV: DESIGN AND ANALYSIS TECHNIQUES**9**

Dynamic programming – Matrix chain multiplication – Elements of dynamic programming – Longest common sequences Greedy Algorithms – Activity selection problem – Elements of greedy strategy – Huffman code. String matching – The naïve string – Matching algorithm – The Robin-Karp algorithm – String matching with finite automata – The Knuth-Morris-Pratt algorithm.

UNIT-V: NP COMPLETE AND APPROXIMATION PROBLEM**9**

NP-Completeness – Polynomial time – Polynomial time verification – NP-complete problems – Approximation algorithms – The vertex-cover problem – The traveling salesman problem – The set-covering problem.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES

1. Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, “Fundamentals of Data Structures in C++”, 2nd Edition, Universities Press, Hyderabad, 2008.
2. Thomas H. Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, “Introduction to Algorithms”, 3rd Edition, Prentice Hall of India, New Delhi, 2009.
3. Horowitz E , Sahni S and Rajasekaran S., “Fundamentals of Computer Algorithms”, 2nd Edition, University Press, 2008.

4. David P. Williamson and David B. Shmoys, "The Design of Approximation Algorithms", Cambridge University Press, 2011.
5. Jon Kleinberg, "Algorithm Design", Addison-Wesley, 2013.
6. Herlihy M and Shavit N, "The Art of Multiprocessor Programming", Morgan Kaufmann, 2012.

COURSE OUTCOMES:

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

- CO1:** Show the ability to analyze algorithms.
- CO2:** Ability to have knowledge of heap concepts.
- CO3:** Demonstrate different methods for traversing trees.
- CO4:** Solve problems by implementing learned algorithm design techniques and data structures.
- CO5:** Design approximation algorithms and NP-completeness.

COURSE OBJECTIVES:

- To understand Big Data.
- To learn and use NoSQL big data management.
- To apply map reduce analytics using Hadoop and related tools.
- To work with map reduce applications.
- To comprehend the usage of Hadoop related tools for Big Data Analytics.

UNIT-I: UNDERSTANDING BIG DATA 9

Introduction to big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data applications – big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.

UNIT-II: NOSQL DATA MANAGEMENT 9

Introduction to NoSQL – aggregate data models – key – value and document data models – relationships – graph data bases – schema less data bases – materialized views – distribution models – master - slave replication – consistency - Cassandra – Cassandra data model – Cassandra examples – Cassandra clients.

UNIT-III: MAP REDUCE APPLICATIONS 9

Map Reduce workflows – unit tests with MR Unit – test data and local tests – anatomy of Map Reduce job run – classic Map – reduce – YARN – failures in classic Map – reduce and YARN – job scheduling – shuffle and sort – task execution – Map Reduce types –input formats – output formats.

UNIT-IV: BASICS OF HADOOP 9

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures - Cassandra – Hadoop integration.

UNIT-V: HADOOP RELATED TOOLS 9

Hbase – data model and implementations – Hbase clients – Hbase examples – praxis.Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – Hive QL data definition – Hive QL data manipulation – Hive QL queries.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Chandramouli Subramanian, Asha A George, C R Rene Robin, D Doreen Hephzibah Miriam, J Jasmine Christina Magdalene, "Big Data Analytics", Universities Press (India) Pvt. Ltd., 2023.
2. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley,

2013.

3. SadaJage, PramodJ, "No SQL distilled", 2013.
4. EricSammer, "HadoopOperations", O'Reilley, 2012.
5. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
6. Alan Gates, "Programming Pig", O'Reilley, 2011.
7. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
8. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.

COURSE OUTCOMES:

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

- CO1:** Analyze big data and use cases from selected business domains.
- CO2:** Evaluate NoSQL big data management.
- CO3:** Gain Knowledge about Install, configure, and run Hadoop and HDFS.
- CO4:** Perform map – reduce analytics using Hadoop.
- CO5:** Use Hadoop – related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.

COURSE OBJECTIVES:

- To understand the foundations of distributed systems.
- To learn issues related to clock Synchronization and the need for global state in distributed systems.
- To explain distributed mutual exclusion and deadlock detection algorithms.
- To implement the significance of agreement, fault tolerance and recovery protocols in distributed systems.
- To focus the characteristics of peer-to-peer and distributed shared memory systems.

UNIT-I: INTRODUCTION**9**

Introduction: Definition – Relation to computer system components – Motivation – Relation to parallel systems – Message-passing systems versus shared memory systems – Primitives for distributed communication – Synchronous versus asynchronous executions – Design issues and challenges. A model of distributed computations: A distributed program – A model of distributed executions – Models of communication networks – Global state – Cuts – Past and future cones of an event – Models of process communications. Logical Time: A framework for a system of logical clocks – Scalar time – Vector time – Physical clock synchronization: NTP.

UNIT-II: MESSAGE ORDERING & SNAPSHOTS**9**

Message ordering and group communication: Message ordering paradigms – Asynchronous execution with synchronous communication – Synchronous program order on an asynchronous system – Group communication – Causal order (CO) – Total order. Global state and snapshot recording algorithms: Introduction – System model and definitions – Snapshot algorithms for FIFO channels.

UNIT-III: DISTRIBUTED MUTEX & DEADLOCK**9**

Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport's algorithm – Ricart – Agrawala algorithm – Maekawa's algorithm – Suzuki – Kasami's broadcast algorithm. Deadlock detection in distributed systems: Introduction – System model – Preliminaries – Models of deadlocks – Knapp's classification – Algorithms for the single resource model, the AND model and the OR model.

UNIT-IV: RECOVERY & CONSENSUS**9**

Check pointing and rollback recovery: Introduction – Background and definitions – Issues in failure recovery – Checkpoint – Based recovery – Log – based rollback recovery – Coordinated check pointing algorithm – Algorithm for asynchronous check pointing and recovery. Consensus and agreement algorithms: Problem definition – Overview of results – Agreement in a failure-free system – Agreement in synchronous systems with failures.

UNIT-V: P2P & DISTRIBUTED SHARED MEMORY**9**

Peer-to-peer computing and overlay graphs: Introduction – Data indexing and overlays – Chord – Content addressable networks – Tapestry. Distributed shared memory: Abstraction and advantages – Memory consistency models – Shared memory mutual exclusion.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Nabanita Dash, Ultimate Parallel and Distributed Computing with Julia For Data Science: Excel in Data Analysis, Statistical Modeling and Machine Learning by leveraging MLBase.jl and MLJ.jl to optimize workflows, First Edition, Orange Education Pvt Ltd., 2023.
2. George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, 5th Edition, Pearson Education, 2012.
3. Kshemkalyani, Ajay D, and MukeshSinghal, “Distributed computing: principles, algorithms and systems”, Cambridge University Press, 2011.
4. Tanenbaum A.S and Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.
5. Pradeep K. Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
6. Liu M.L., “Distributed Computing, Principles and Applications”, Pearson Education, 2004.
7. Nancy A. Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, USA, 2003.
8. MukeshSinghal and Niranjan G. Shivaratri, “Advanced concepts in operating systems”, McGraw-Hill, Inc., 1994.

COURSE OUTCOMES:

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

- CO1:** Elucidate the foundations and issues of distributed systems.
- CO2:** Organize the various synchronization issues and global state for distributed systems.
- CO3:** Analyze the Mutual Exclusion and Deadlock detection algorithms in distributed systems.
- CO4:** Describe the agreement protocols and fault tolerance mechanisms in distributed systems.
- CO5:** Provide the features of peer-to-peer and distributed shared memory systems.

COURSE OBJECTIVES:

- To examine and explore the online market.
- To understand search engine optimization.
- To learn E-Mail and mobile marketing.
- To gain knowledge about social media marketing
- To focus on how digital transformation in recent trends.

UNIT-I: INTRODUCTION TO ONLINE MARKET 9

Online Market space- Digital Marketing Strategy- Components - Opportunities for building Brand Website - Planning and Creation - Content Marketing.

UNIT-II: SEARCH ENGINE OPTIMISATION 9

Search Engine optimisation - Keyword Strategy- SEO Strategy - SEO success factors -On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works- SEM components- PPC advertising -Display Advertisement.

UNIT-III: E- MAIL MARKETING 9

E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns-Profiling and targeting.

UNIT-IV: SOCIAL MEDIA MARKETING 9

Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz. Successful /benchmark Social media campaigns. Engagement Marketing- Building Customer relationships - Creating Loyalty drivers - Influencer Marketing.

UNIT-V: DIGITAL TRANSFORMATION 9

Digital Transformation & Channel Attribution- Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Simon Kingsnorth, "Digital Marketing Strategy: An Integrated Approach to Online Marketing", Third Edition, Kogan Page, 2022.
2. Barker, Barker, Bormann and Neher (2017), Social Media Marketing: A Strategic Approach, 2E South-Western, Cengage Learning.
3. First edition (July 2017); ISBN-10: 933258737X; ISBN-13: 978-9332587373.
4. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler; Publisher: Wiley; 1st edition (April 2017); ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN: 8126566930

5. Digital Marketing by Vandana Ahuja; Publisher: Oxford University Press (April 2015). ISBN10: 0199455449
6. Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited.
7. Puneet Singh Bhatia, "Fundamentals of Digital Marketing", Pearson Education, 2017
8. Pulizzi, J Beginner's Guide to Digital Marketing, Mcgraw Hill Education, 2014.

COURSE OUTCOMES:

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

- CO1:** Analyze the role and importance of digital marketing in today's rapidly changing business environment.
- CO2:** Demonstrate how digital marketing can be utilized by organizations and describe its effectiveness can be measured.
- CO3:** Evaluate the key elements of a digital marketing strategy.
- CO4:** Perform how the effectiveness of a digital marketing campaign can be measured.
- CO5:** Demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs.

PROFESSIONAL ELECTIVE (PE) – II (SEMESTER VI)

22CSPE601	DIGITAL SIGNAL PROCESSING	SEMESTER VI			
		L	T	P	C
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COURSE OBJECTIVES:

- To understand the basics of discrete time signals, systems and their classifications.
- To analyze the discrete time signals in both time and frequency domain.
- To design low pass digital IIR filters according to predefined specifications based on analog filter theory and analog-to-digital filter transformation.
- To design Linear phase digital FIR filters using Fourier method, window technique.
- To realize the concept and usage of DSP in various engineering fields.

UNIT-I: DISCRETE TIME SIGNALS AND SYSTEMS 9

Introduction to DSP – Basic elements of DSP – Sampling of continuous time signals – Representation, Operation and classification of discrete time signal – Classification of discrete time systems – Discrete convolution: Linear and circular – Correlation.

UNIT-II: ANALYSIS OF LTI DISCRETE TIME SIGNALS AND SYSTEMS 9

Analysis of LTI Discrete time systems using DFT – Properties of DFT – Inverse DFT –analysis of LTI Discrete time systems using FFT algorithms – Inverse DFT using FFT algorithm.

UNIT-III: INFINITE IMPULSE RESPONSE FILTERS 9

Frequency response of Analog and Digital IIR filters – Realization of IIR filter – Design of analog low pass filter – Analog to Digital filter transformation using Bilinear transformation and Impulse Invariant method – Design of digital IIR filters (LPF, HPF, BPF, and BRFF) using various transformation techniques.

UNIT-IV: FINITE IMPULSE RESPONSE FILTERS 9

Linear Phase FIR filter – Phase delay– Group delay – Realization of FIR filter – Design of causal and Non-causal FIR filters (LPF, HPF, BPF and BRFF) using window method (Rectangular, Hamming window, Hanning window) – Frequency sampling technique.

UNIT-V: APPLICATIONS OF DSP 9

Multirate signal processing: Decimation, Interpolation, Spectrum of the sampled signal – Processing of audio and radar signal.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. John G. Proakis and Dimitris G. Manolakis, “Digital Signal Processing – Principles, Algorithms & Applications”, 4th Edition, Pearson Education / Prentice Hall, 2007.
2. Richard G. Lyons, “Understanding Digital Signal Processing”, 2nd Edition, Pearson Education.
3. Oppenheim A.V, Schafer R.W and Buck J.R., “Discrete-Time Signal Processing”, 8th Indian Reprint, Pearson, 2004.
4. Emmanuel C. Ifeachor, and Barrie W. Jervis, “Digital Signal Processing”, 2nd Edition, Pearson Education / Prentice Hall, 2002.
5. William D. Stanley, “Digital Signal Processing”, 2nd Edition, Reston Publications.

COURSE OUTCOMES:

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

CO1: Perform mathematical operations on signals.

CO2: Model the sampling theorem and perform sampling on continuous-time signals to get discrete time signal by applying advanced knowledge of the sampling theory.

CO3: Transform the time domain signal into frequency domain signal and vice-versa.

CO4: Apply the relevant theoretical knowledge to design the digital IIR/FIR filters for the given analog specifications.

CO5: Identify the applications of DSP.

COURSE OBJECTIVES:

- To understand the principles of cloud architecture, models and infrastructure.
- To understand the concepts of virtualization and virtual machines.
- To gain knowledge about virtualization Infrastructure.
- To explore and experiment with various Cloud deployment environments.
- To learn about the security issues in the cloud environment

UNIT-I: CLOUD ARCHITECTURE MODELS AND INFRASTRUCTURE 9

Understanding Cloud Computing: Definition, Origin and Influences, Basic Concepts, Goals and Benefits- Cloud Characteristics -Cloud Architecture: System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – Cloud deployment models – Cloud service models; Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Design Challenges.

UNIT-II: VIRTUALIZATION BASICS 9

Virtual Machine Basics – Taxonomy of Virtual Machines – Hypervisor – Key Concepts – Virtualization structure – Implementation levels of virtualization – Virtualization Types: Full Virtualization – Para Virtualization – Hardware Virtualization – Virtualization of CPU, Memory and I/O devices.

UNIT-III: VIRTUALIZATION INFRASTRUCTURE AND DOCKER 9

Desktop Virtualization – Network Virtualization – Storage Virtualization – System-level of Operating Virtualization – Application Virtualization – Virtual clusters and Resource Management – Containers vs. Virtual Machines – Introduction to Docker – Docker Components – Docker Container – Docker Images and Repositories.

UNIT-IV: CLOUD DEPLOYMENT ENVIRONMENT 9

Introduction to Google Cloud Platform (GCP): Overview and History, GCP Services and Products, GCP Architecture - GCP Core Services - Introduction to Azure (Microsoft): Overview and History, Azure Services and Products, Azure Architecture- Comparison: Azure vs. GCP - Google App Engine – Amazon AWS –Cloud Software Environments – Eucalyptus – OpenStack

UNIT-V: CLOUD SECURITY 9

Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyper jacking. Data Security and Storage; Identity and Access Management (IAM) - IAM Challenges - IAM Architecture and Practice.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
2. Thomas Erl, Ricardo Puttini, and Zaigham Mahmood , "Cloud Computing: Concepts, Technology & Architecture" , Pearson, 2013 .
3. James Turnbull, “The Docker Book”, O’Reilly Publishers, 2014
4. Krutz, R. L., Vines, R. D, “Cloud security. A Comprehensive Guide to Secure Cloud Computing”, Wiley Publishing, 2010.
5. James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
6. Tim Mather, Subra Kumaraswamy, and Shahed Latif, “Cloud Security and Privacy: an enterprise perspective on risks and compliance”, O’Reilly Media, Inc., 2009.
7. Jonah Carrio Andersson ,“Learning Microsoft Azure”, O’Reilly Media, Inc,2023 .
8. Praveen Kukreti, “Google Cloud Platform All-In-One Guide: Get Familiar with a Portfolio of Cloud based Services in GCP”, BPB Publications, 2023.

COURSE OUTCOMES:

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

CO1: Analyze the cloud architecture and design challenges.

CO2: Apply the concept of virtualization and its types.

CO3: Experiment with virtualization of hardware resources and Docker.

CO4: Develop and deploy services on the cloud and set up a cloud environment.

CO5: Explain security challenges in the cloud environment.

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To learn development of native applications with basic GUI Components
- To develop cross-platform applications with event handling
- To develop applications with location and data storage capabilities
- To develop web applications with database access

UNIT I : FUNDAMENTALS OF MOBILE & WEB APPLICATION DEVELOPMENT

9

Basics of Web and Mobile application development, Native App, Hybrid App, Cross-platform App, What is Progressive Web App, Responsive Web design,

UNIT II : NATIVE APP DEVELOPMENT USING JAVA

9

Native Web App, Benefits of Native App, Scenarios to create Native App, Tools for creating Native App, Cons of Native App, Popular Native App Development Frameworks, Java & Kotlin for Android, Swift & Objective-C for iOS, Basics of React Native, Native Components, JSX, State, Props

UNIT III: HYBRID APP DEVELOPMENT

9

Hybrid Web App, Benefits of Hybrid App, Criteria for creating Native App, Tools for creating Hybrid App, Cons of Hybrid App, Popular Hybrid App Development Frameworks, Ionic, Apache Cordova.

UNIT IV: CROSS-PLATFORM APP DEVELOPMENT USING REACT-NATIVE

9

What is Cross-platform App, Benefits of Cross-platform App, Criteria for creating Cross-platform App, Tools for creating Cross-platform App, Cons of Cross-platform App, Popular Crossplatform App Development Frameworks, Flutter, Xamarin, React-Native, Basics of React Native, Native Components, JSX, State, Props

UNIT V: NON-FUNCTIONAL CHARACTERISTICS OF APP FRAMEWORKS

9

Comparison of different App frameworks, Build Performance, App Performance, Debugging capabilities, Time to Market, Maintainability, Ease of Development, UI/UX, Reusability

Contact Periods:**Lecture: 45 Periods****Tutorial: 0 Periods****Practical: 0 Periods****Total: 45 Periods****REFERENECS:**

1. Head First Android Development, Dawn Griffiths, O'Reilly, 1st edition, 2021.
2. Apache Cordova in Action, Raymond K. Camden, Manning. 2015
3. Full Stack React Native: Create beautiful mobile apps with JavaScript and React Native, Anthony Accomazzo, Houssein Djirdeh, Sophia Shoemaker, Devin Abbott, FullStack publishing

4. Android Programming for Beginners, John Horton, Packt Publishing, 2nd Edition
5. Native Mobile Development by Shaun Lewis, Mike Dunn
6. Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active Learning Approach, Pawan Lingras, Matt Triff, Rucha Lingras
7. Apache Cordova 4 Programming, John M Wargo, 2015

COURSE OUTCOMES:

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

- CO1:** Develop Native applications with GUI Components.
- CO2:** Develop hybrid applications with basic event handling.
- CO3:** Implement cross-platform applications with location and data storage capabilities.
- CO4:** Implement cross platform applications with basic GUI and event handling.
- CO5:** Develop web applications with cloud database access.

COURSE OBJECTIVES:

- To learn the basic concepts of soft computing.
- To become familiar with soft computing techniques like neural networks.
- To Familiarize about fuzzy systems.
- To learn genetic algorithms.
- To apply soft computing techniques to solve problems.

UNIT-I: INTRODUCTION TO SOFT COMPUTING 9

Introduction – Artificial intelligence – Artificial Neural Networks – Fuzzy systems – Genetic algorithm and evolutionary programming – Swarm intelligent systems – Classification of ANNS – Mcculloch and Pitts neuron model – Learning rules: Hebbian and Delta – Perceptron network – Adaline network – Madaline network.

UNIT-II: ARTIFICIAL NEURAL NETWORKS 9

Back propagation neural networks – Kohonen neural network – Learning vector quantization – Hamming Neural network – Hopfield Neural network – Bi-directional Associative memory – Adaptive resonance theory neural networks – Support vector machines – Spike neuron models.

UNIT-III: FUZZY SYSTEMS 9

Introduction to fuzzy logic, Classical sets and Fuzzy sets – Classical relations and Fuzzy relations – Membership functions – Defuzzification – Fuzzy arithmetic and Fuzzy measures – Fuzzy rule base and Approximate reasoning – Introduction to fuzzy decision making.

UNIT-IV: GENETIC ALGORITHMS 9

Basic concepts – Working principles – Encoding – Fitness function – Reproduction – Inheritance operators – Cross over – Inversion and deletion – Mutation operator – Bit-wise operators – Convergence of Genetic algorithm.

UNIT-V: HYBRID SYSTEMS 9

Hybrid systems – Neural networks, Fuzzy logic and Genetic – GA based weight determination – LR – Type fuzzy numbers – Fuzzy neuron – Fuzzy BP architecture – Learning in Fuzzy BP – Inference by Fuzzy BP – Fuzzy Art Map: A brief introduction – Soft computing tools – GA in Fuzzy logic controller design – Fuzzy logic controller.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Sivanandam S.N and Deepa S.N., “Principles of Soft Computing”, Wiley India Pvt. Ltd.,

2nd Edition, 2011.

2. Padhy N.P and Simon S.P., “Soft Computing with MATLAB Programming”, Oxford University Press, 2015.
3. Rajasekaran S and Vijayalakshmi Pai G.A., “Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications “, PHI Learning Pvt. Ltd., 2017.
4. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2002.
5. Kwang H. Lee, “First course on Fuzzy Theory and Applications”, Springer, 2005.
6. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1996.
7. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Addison Wesley, 2003.

COURSE OUTCOMES:

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

- CO1:** Apply various soft computing frame works.
- CO2:** Design of various neural networks.
- CO3:** Use fuzzy logic.
- CO4:** Apply genetic programming.
- CO5:** Discuss hybrid soft computing.

22CSPE605	CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES	SEMESTER VI			
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COURSE OBJECTIVES:

- To understand the basics of Blockchain
- To learn Different protocols and consensus algorithms in Blockchain
- To learn the Blockchain implementation frameworks
- To understand the Blockchain Applications
- To experiment the Hyper ledger Fabric, Ethereum networks

UNIT-I: INTRODUCTION TO BLOCKCHAIN 9

Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree.

UNIT-II: BITCOIN AND CRYPTOCURRENCY 9

A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay.

UNIT-III: BITCOIN CONSENSUS 9

Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW ,monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

UNIT-IV: HYPERLEDGER FABRIC & ETHEREUM 9

Architecture of Hyperledger fabric v1.1- chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.

UNIT-V: BLOCKCHAIN APPLICATIONS 9

Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance,etc- Case Study.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, 2017.
2. 2.Andreas Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”, O’Reilly, 2014.
3. Daniel Drescher, “Blockchain Basics”, First Edition, Apress, 2017.

4. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.
5. Melanie Swan, “Blockchain: Blueprint for a New Economy”, O’Reilly, 2015
6. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Blockchain”, Packt Publishing
7. Handbook of Research on Blockchain Technology, published by Elsevier Inc. ISBN: 9780128198162, 2020.

COURSE OUTCOMES:

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

- CO1:** Understand emerging abstract models for Blockchain Technology.
- CO2:** Identify major research challenges and technical gaps existing between theory and practice in the crypto currency domain.
- CO3:** It provides conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.
- CO4:** Apply hyperledger Fabric and Ethereum platform.
- CO5:** implement the Block chain Application.

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To outline an overview of exploratory data analysis.
- To implement data visualization using Matplotlib.
- To perform univariate data exploration and analysis.
- To apply bivariate data exploration and analysis.
- To use Data exploration and visualization techniques for multivariate and time series data.

UNIT I : EXPLORATORY DATA ANALYSIS 9

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

UNIT II : EDA USING PYTHON 9

Data Manipulation using Pandas – Pandas Objects – Data Indexing and Selection – Operating on Data – Handling Missing Data – Hierarchical Indexing – Combining datasets – Concat, Append, Merge and Join – Aggregation and grouping – Pivot Tables – Vectorized String Operations.

UNIT III: UNIVARIATE ANALYSIS 9

Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality.

UNIT IV: BIVARIATE ANALYSIS 9

Relationships between Two Variables - Percentage Tables - Analysing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines.

UNIT V: MULTIVARIATE AND TIME SERIES ANALYSIS 9

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

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENECS:

1. Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with python”, Packt Publishing, 2020.
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", First Edition, O Reilly, 2017.

3. Catherine Marsh, Jane Elliott, “Exploring Data: An Introduction to Data Analysis for Social Scientists”, Wiley Publications, 2nd Edition, 2008.
4. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
5. Claus O. Wilke, “Fundamentals of Data Visualization”, O’reilly publications, 2019.
6. Matthew O. Ward, Georges Grinstein, Daniel Keim, “Interactive Data Visualization: Foundations, Techniques, and Applications”, 2nd Edition, CRC press, 2015.

COURSE OUTCOMES:

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

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

PROFESSIONAL ELECTIVE (PE) – III (SEMESTER VI)

22CSPE607

DEVOPS

SEMESTER VI

L	T	P	C
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COURSE OBJECTIVES:

- To introduce DevOps terminology, definition & concepts
- To understand the different Version control tools like Git, Mercurial
- To understand the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment
- To understand Configuration management using Ansible
- Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems

UNIT I : INTRODUCTION TO DEVOPS 9

Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.

UNIT II : COMPILE AND BUILD USING MAVEN & GRADLE 9

Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build, test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand build using Gradle

UNIT III: CONTINUOUS INTEGRATION USING JENKINS 9

Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.

UNIT IV: CONFIGURATION MANAGEMENT USING ANSIBLE 9

Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible

UNIT V: BUILDING DEVOPS PIPELINES USING AZURE 9

Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENECS:

1. Roberto Vormittag, “A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises”, Second Edition, Kindle Edition, 2016.
2. Jason Cannon, “Linux for Beginners: An Introduction to the Linux Operating System and Command Line”, Kindle Edition, 2014
3. Hands-On Azure Devops: Cidc Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni
4. Jeff Geerling, “Ansible for DevOps: Server and configuration management for humans”, First Edition, 2015.
5. David Johnson, “Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps”, Second Edition, 2016.
6. <https://www.jenkins.io/user-handbook.pdf>
7. <https://maven.apache.org/guides/getting-started/>

COURSE OUTCOMES:

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

- CO1:** Understand different actions performed through Version control tools like Git.
- CO2:** Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.
- CO3:** Ability to Perform Automated Continuous Deployment
- CO4:** Ability to do configuration management using Ansible
- CO5:** Understand to leverage Cloud-based DevOps tools using Azure DevOps

COURSE OBJECTIVES:

- To grasp the fundamental knowledge of Multimedia elements and systems
- To get familiar with Multimedia file formats and standards
- To learn the process of Authoring multimedia presentations
- To learn the techniques of animation in 2D and 3D and for the mobile UI
- To explore different popular applications of multimedia

UNIT-I: INTRODUCTION TO MULTIMEDIA

9

Definitions, Elements, Multimedia Hardware and Software, Distributed multimedia systems, challenges: security, sharing / distribution, storage, retrieval, processing, computing. Multimedia metadata, Multimedia databases, Hypermedia, Multimedia Learning.

UNIT-II: MULTIMEDIA FILE FORMATS AND STANDARDS

9

File formats – Text, Image file formats, Graphic and animation file formats, Digital audio and Video file formats, Color in image and video, Color Models. Multimedia data and file formats for the web.

UNIT-III: MULTIMEDIA AUTHORIZING

9

Authoring metaphors, Tools Features and Types: Card and Page Based Tools, Icon and Object Based Tools, Time Based Tools, Cross Platform Authoring Tools, Editing Tools, Painting and Drawing Tools, 3D Modeling and Animation Tools, Image Editing Tools, audio Editing Tools, Digital Movie Tools, Creating interactive presentations, virtual learning, simulations.

UNIT-IV: ANIMATION

9

Principles of animation: staging, squash and stretch, timing, onion skinning, secondary action, 2D, 2 ½ D, and 3D animation, Animation techniques: Keyframe, Morphing, Inverse Kinematics, Hand Drawn, Character rigging, vector animation, stop motion, motion graphics, Fluid Simulation, skeletal animation, skinning Virtual Reality, Augmented Reality.

UNIT-V: MULTIMEDIA APPLICATIONS

9

Multimedia Big data computing, social networks, smart phones, surveillance, Analytics, Multimedia Cloud Computing, Multimedia streaming cloud, media on demand, security and forensics, Online social networking, multimedia ontology, Content based retrieval from digital libraries.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, Fundamentals of Multimedia”, Third

Edition, Springer Texts in Computer Science, 2021. (UNIT-I, II, III)

2. John M Blain, The Complete Guide to Blender Graphics: Computer Modeling & Animation, CRC press, 3rd Edition, 2016.
3. Gerald Friedland, Ramesh Jain, “Multimedia Computing”, Cambridge University Press, 2018
4. Prabhat K. Andleigh, Kiran Thakrar, “Multimedia System Design”, Pearson Education, 1st Edition, 2015
5. Mohsen Amini Salehi, Xiangbo Li, “Multimedia Cloud Computing Systems”, Springer Nature, 1st Edition, 2021.
6. Mark Gaimbruno, “3D Graphics and Animation”, Second Edition, New Riders, 2002.
7. Rogers David, “Animation: Master – A Complete Guide (Graphics Series)”, Charles River Media, 2006.
8. Rick parent, “Computer Animation: Algorithms and Techniques”, Morgan Kauffman, 3rd Edition, 2012.
9. Emilio Rodriguez Martinez, Mireia Alegre Ruiz, “UI Animations with Lottie and After Effects: Create, render, and ship stunning After Effects animations natively on mobile with React Native”, Packt Publishing, 2022.

COURSE OUTCOMES:

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

- CO1:** Get the bigger picture of the context of Multimedia and its applications
- CO2:** Use the different types of media elements of different formats on content pages
- CO3:** Author 2D and 3D creative and interactive presentations for different target multimedia applications.
- CO4:** Use different standard animation techniques for 2D, 2 1/2 D, 3D applications
- CO5:** Understand the complexity of multimedia applications in the context of cloud, security, bigdata streaming, social networking and CBIR

COURSE OBJECTIVES:

- To understand the basics in deep learning.
- To gain knowledge in recurrent neural networks.
- To learn about convolutional neural networks.
- To understand the auto encoder and restricted botzmann machine.
- To gain knowledge in generative, bayesian and reinforcement deep learning.

UNIT-I: DEEP LEARNING FUNDAMENTALS 9

Artificial Intelligence, Machine Learning and Deep Learning - Need for Deep Learning - Data Representations for Neural Networks - Tensor Operations - Error Functions - Optimization Techniques - Activation functions - Initialization Techniques.

UNIT-II: RECURRENT NEURAL NETWORKS 11

Recurrent Neural Networks Architecture - Backpropagation through time (BPTT) -Vanishing and Exploding Gradients – Bidirectional RNN - Truncated BPTT – GRU- LSTMs – Neural Turing Machine - Recursive Neural Networks - Applications of RNN.

UNIT-III: CONVOLUTIONAL NEURAL NETWORKS 8

Layers in CNN architecture – ReLu and the variants - Feature Map – Weight sharing – Translation invariance - Pretrained Models - Transfer Learning - Applications of CNN.

UNIT-IV: AUTOENCODER, RESTRICTED BOLTZMANN MACHINE 9

Features of autoencoders – Vanilla autoencoder – Convolutional autoencoder – Regularized autoencoders - Denoising autoencoder - Sparse Autoencoders -Contractive Autoencoder - Applications of autoencoder. RBM – Deep Belief Networks.

UNIT-V: GENERATIVE, BAYESIAN, REINFORCEMENT DEEP LEARNING 8

Generative Modeling – Variational autoencoders -Generative Adversarial Networks – Bayesian Deep Learning – Deep Reinforcement Learning.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville , "Deep Learning", MIT Press, 2016
2. Thomas Farth , "Deep Learning: A Comprehensive Guide for Beginners", Atlantic Publishers, 2019.
3. Eugene Charniak , "Introduction to Deep Learning", MIT Press, London, 2018.
4. David Foster , "Generative Deep Learning", O'Reilly Media, Inc., 2019.
5. Francois Chollet , "Deep Learning with Python", Manning Publications, New York, 2018.
6. S Lovelyn Rose, L Ashok Kumar, D Karthika Renuka , "Deep Learning using Python", Wiley India Pvt. Ltd., New Delhi,2019.

COURSE OUTCOMES:

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

CO1: Analyze the key computations underlying deep learning.

CO2: Acquire knowledge in recurrent neural network and its application.

CO3: Apply convolutional neural networks and its variants for suitable applications.

CO4: Explain different type of auto encoders and Boltzmann machine.

CO5: Apply generative, bayesian and reinforcement deep learning for varies applications.

COURSE OBJECTIVES:

- To understand the need for multi-core processors and their architecture.
- To understand the challenges in parallel and multi-threaded programming.
- To learn about the various parallel programming paradigms.
- To develop multicore programs and design parallel solutions.

UNIT-I: MULTI-CORE PROCESSORS 9

Single core to Multi-core architectures – SIMD and MIMD systems – Interconnection networks – Symmetric and Distributed Shared Memory architectures – Cache coherence – Performance issues – Parallel program design.

UNIT-II: PARALLEL PROGRAM CHALLENGES 9

Performance – Scalability – Synchronization and data sharing – Data races – Synchronization primitives (Mutexes, Locks, Semaphores, Barriers) – Deadlocks and Livelocks – Communication between threads (Condition variables, Signals, Message queues and pipes).

UNIT-III: SHARED MEMORY PROGRAMMING WITH OpenMP 9

OpenMP Execution Model – Memory model – Open MP directives – Work-sharing constructs – Library functions – Handling data and Functional parallelism – Handling loops – Performance considerations.

UNIT-IV: DISTRIBUTED MEMORY PROGRAMMING WITH MPI 9

MPI program execution – MPI constructs – Libraries – MPI send and receive – Point-to-Point and Collective communication – MPI derived datatypes – Performance evaluation.

UNIT-V: PARALLEL PROGRAM DEVELOPMENT 9

Case studies – N-Body solvers – Tree search – Open MP and MPI implementations and comparison.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Peter S. Pacheco, “An Introduction to Parallel Programming”, Morgan-Kaufman/Elsevier, 2011.
2. Darryl Gove, “Multicore Application Programming for Windows”, Linux, and Oracle Solaris, Pearson, 2011 (unit 2).
3. Michael J Quinn, “Parallel programming in C with MPI and Open MP”, Tata McGraw Hill, 2003.

4. Victor Alessandrini, “Shared Memory Application Programming”, 1st Edition, Concepts and Strategies in Multicore Application Programming, Morgan Kaufmann, 2015.
5. Yan Solihin, “Fundamentals of Parallel Multicore Architecture”, CRC Press, 2015.

COURSE OUTCOMES:

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

CO1: Describe multicore architectures and identify their characteristics and challenges.

CO2: Identify the issues in programming parallel processors.

CO3: Write programs using Open MP and MPI.

CO4: Design parallel programming solutions to common problems.

CO5: Compare and contrast programming for serial processors and programming for parallel.

COURSE OBJECTIVES:

- To understand the basics of computer based vulnerabilities.
- To explore different foot printing, reconnaissance and scanning methods.
- To expose the enumeration and vulnerability analysis methods.
- To understand hacking options available in Web and wireless applications.
- To explore the options for network protection.

UNIT-I: INTRODUCTION TO HACKING 9

Ethical Hacking Overview - Role of Security and Penetration Testers. - Penetration-Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing. - Network and Computer Attacks - Malware – Protecting Against Malware Attacks. - Intruder Attacks - Addressing Physical Security

UNIT-II: FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS 9

Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering - Footprinting Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall

UNIT-III: VULNERABILITY ASSESSMENT 9

Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - 152 Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded Oss

UNIT-IV: SYSTEM HACKING 9

Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – WardrivingWireless Hacking - Tools of the Trade

UNIT-V: NETWORK PROTECTION SYSTEMS 9

Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems - Network-Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams – Honeypots

Contact Periods:**Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods****REFERENCES:**

1. Michael T. Simpson, Kent Backman, and James E. Corley, Hands-On Ethical Hacking and Network Defense, Course Technology, Delmar Cengage Learning, 2010.
2. The Basics of Hacking and Penetration Testing - Patrick Engebretson, SYNGRESS, Elsevier, 2013.
3. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, Dafydd Stuttard and Marcus Pinto, 2011.
4. Black Hat Python: Python Programming for Hackers and Pentesters, Justin Seitz , 2014.

COURSE OUTCOMES:

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

- CO1:** To express knowledge on basics of computer based vulnerabilities
- CO2:** To gain understanding on different foot printing, reconnaissance and scanning methods
- CO3:** To demonstrate the enumeration and vulnerability analysis methods
- CO4:** To gain knowledge on hacking options available in Web and wireless applications.
- CO5:** To acquire knowledge on the options for network protection. **CO6:** To use tools to perform ethical hacking to expose the vulnerabilities

COURSE OBJECTIVES:

- To formulate and solve linear programming problems (LPP)
- To evaluate Integer Programming Problems, Transportation and Assignment Problems.
- To obtain a solution to network problems using CPM and PERT techniques.
- Able to optimize the function subject to the constraints.
- To Identify and solve problems under Markovian queuing models

UNIT-I: LINEAR MODELS**9**

Introduction of Operations Research - mathematical formulation of LPP- Graphical Methods to solve LPP- Simplex Method- Two-Phase method

UNIT-II: INTEGER PROGRAMMING AND TRANSPORTATION PROBLEMS**9**

Integer programming: Branch and bound method- Transportation and Assignment problems - Traveling salesman problem.

UNIT-III: PROJECT SCHEDULING**9**

Project network -Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM.

UNIT-IV: CLASSICAL OPTIMIZATION THEORY**9**

Unconstrained problems – necessary and sufficient conditions - Newton-Raphson method, Constrained problems – equality constraints – inequality constraints - Kuhn-Tucker conditions.

UNIT-V: QUEUING MODELS**9**

Introduction, Queuing Theory, Operating characteristics of a Queuing system, Constituents of a Queuing system, Service facility, Queue discipline, Single channel models, multiple service channels.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Peter S. Pacheco, “An Introduction to Parallel Programming”, Morgan-Kaufman/Elsevier, 2011.
2. Darryl Gove, “Multicore Application Programming for Windows”, Linux, and Oracle Solaris, Pearson, 2011 (unit 2).
3. Michael J Quinn, “Parallel programming in C with MPI and Open MP”, Tata McGraw Hill, 2003.
4. Victor Alessandrini, “Shared Memory Application Programming”, 1st Edition, Concepts

- and Strategies in Multicore Application Programming, Morgan Kaufmann, 2015.
5. Yan Solihin, “Fundamentals of Parallel Multicore Architecture”, CRC Press, 2015.

COURSE OUTCOMES:

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

CO1: Describe multicore architectures and identify their characteristics and challenges.

CO2: Identify the issues in programming parallel processors.

CO3: Write programs using Open MP and MPI.

CO4: Design parallel programming solutions to common problems.

CO5: Compare and contrast programming for serial processors and programming for parallel.

PROFESSIONAL ELECTIVE (PE) – IV (SEMESTER VII)

22CSPE701

VIRTUALIZATION TECHNIQUES

SEMESTER VII

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To explore the various virtualization principles that are to be implemented in a cloud Environment
- To study about system virtualization
- To know the fundamentals and necessity of Network
- To learn the need of Network and Storage virtualization
- To understand the vulnerabilities in virtualization and techniques for securing the Virtualized environment.

UNIT-I: INTRODUCTION

9

INTRODUCTION TO VIRTUALIZATION Virtualization and cloud computing - Need of virtualization - cost, administration, fast deployment, reduce infrastructure cost - limitations - Types of hardware virtualization : Full virtualization - partial virtualization - Paravirtualization - Types of Hypervisors.

UNIT-II: SERVER AND DESKTOP VIRTUALIZATION

9

Virtual machine basics - Types of virtual machines - Understanding Server Virtualization - types of server virtualization - Business Cases for Server Virtualization - Uses of Virtual Server Consolidation - Selecting Server Virtualization Platform - Desktop Virtualization -Types of Desktop Virtualization.

UNIT-III: NETWORK VIRTUALIZATION

9

Introduction to Network Virtualization-Advantages - Functions - Tools for Network Virtualization - VLAN - WAN Architecture -WAN Virtualization.

UNIT-IV: STORAGE VIRTUALIZATION

9

Memory Virtualization -Types of Storage Virtualization - Block, File - Address space Remapping - Risks of Storage Virtualization-SAN-NAS-RAID.

UNIT-V: VIRTUALIZATION SECURITY

9

Fundamentals of Virtualization Security – Securing Hypervisors – Designing Virtual networks for security – comparing virtual and physical networks – Security recommendations for management platforms – virtual machine threats and vulnerabilities – logging and auditing.

Contact Periods:

Lecture: 45 Periods

Tutorial: 0 Periods

Practical: 0 Periods

Total: 45 Periods

REFERENCES:

1. Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaec, Klaus Rindtorff, “Pervasive Computing:Technology and Architecture of Mobile Internet Applications”, Sixth Edition, Pearson Education, New Delhi, 2009.
2. Seng Loke, “Context-Aware Computing Pervasive Systems”, Auerbach Pub., Taylor and Francis Group, New York, 2007.

3. John Krumm, “Ubiquitous Computing Fundamentals”, CRC Press, 2010.
4. Zivko Bojovic, “Application of Network function virtualization in modern computer environments”, Now Publishers, 2024
5. Dave Shackelford, “Virtualization Security: Protecting Virtualized Environments”, Sybex Publishers, 2012
6. Prasad Mukhedkar, “Mastering KVM Virtualization”, Packt Publishing, 2016

COURSE OUTCOMES:

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

- CO1:** Suggest appropriate virtualization needs for an organization to maximize resource utilization
- CO2:** Design the server and desktop virtualization
- CO3:** Use network Virtualization and its function
- CO4:** Apply storage virtualization
- CO5:** Identify the vulnerabilities in the organizations’ infrastructure and provide security algorithms for virtualized resources

COURSE OBJECTIVES:

- To understand basic concepts of molecular biology and genetics.
- To teach the concepts of computer science that relate to problems in biological sciences.
- To utilize computer as a tool for biomedical research.
- To gain important functional relationships from gene data.
- To give the overview of micro array technology.

UNIT-I: INTRODUCTION

9

Need for Bioinformatics technologies – Overview of bioinformatics technologies structural bioinformatics – Data format and processing – Secondary resources and applications – Role of Structural bioinformatics – Biological data integration system.

UNIT-II: DATA WAREHOUSING AND DATA MINING IN BIOINFORMATICS

9

Bioinformatics data – Data warehousing architecture – Data quality – Biomedical data analysis – DNA data analysis – Protein data analysis – Machine learning – Neural network architecture and applications in bioinformatics.

UNIT-III: MODELING FOR BIOINFORMATICS

9

Hidden Markov modeling for biological data analysis – Sequence identification – Sequence classification – Multiple alignment generation – Comparative modeling – Protein modeling – Genomic modeling – Probabilistic modeling – Bayesian networks – Boolean networks – Molecular modeling – Computer programs for molecular modeling.

UNIT-IV: PATTERN MATCHING AND VISUALIZATION

9

Gene regulation – Motif recognition – Motif detection – Strategies for Motif detection – Visualization – Fractal analysis – DNA walk models – One dimension – Two dimension – Higher dimension – Game representation of Biological sequences – DNA, Protein, Amino acid sequences.

UNIT-V: MICROARRAY ANALYSIS

9

Microarray technology for genome expression study – Image analysis for data extraction – preprocessing – Segmentation – Gridding – Spot extraction – Normalization, Filtering – Cluster analysis – Gene network analysis – Compared evaluation of scientific data management systems – Cost matrix – Evaluation model – Benchmark – Tradeoffs.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Yi-Ping Phoebe Chen (Ed), “Bio Informatics Technologies”, First Indian Reprint, Springer Verlag, 2007.
2. Zoe Iacox and Terence Critchlow, “Bio Informatics-Managing Scientific data”, First Indian Reprint, Elsevier, 2004.
3. Bryan Bergeron, “Bio Informatics Computing”, 2nd Edition, Pearson Education, 2003.
4. Arthur M. Lesk, “Introduction to Bioinformatics”, 2nd Edition, Oxford University Press,

2005.

COURSE OUTCOMES:

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

CO1: Basic concepts of molecular biology and genetics.

CO2: Comprehend the concepts of computer science that relate to problems in biological Sciences.

CO3: Usage of computer in biomedical research.

CO4: Compare pattern matching and visualization techniques.

CO5: Design and implement systems with micro array technology.

COURSE OBJECTIVES:

- To learn digital image fundamentals and be exposed to simple image processing techniques.
- To summarize the mathematical foundations of different image transformation concepts.
- To familiarize with image restoration and segmentation techniques.
- To explain the various compressions standards and interpret on image applications.
- To apply image processing techniques practically using MATLAB.

UNIT-I: DIGITAL IMAGE FUNDAMENTALS 9

Introduction – Origin – Steps in digital image processing – Components – Elements of visual perception – Image sensing and acquisition – Image sampling and quantization – Relationships between pixels – Color models.

UNIT-II: IMAGE ENHANCEMENT 9

Spatial Domain: Gray level transformations – Histogram processing – Basics of spatial filtering – Smoothing and sharpening spatial filtering – **Frequency Domain:** Introduction to Fourier transform – Smoothing and sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

UNIT-III: IMAGE RESTORATION AND SEGMENTATION 9

Noise models – Mean filters – Order statistics – Adaptive filters – Band reject filters – Band pass filters – Notch filters – Optimum notch filtering – Inverse filtering – Wiener filtering
Segmentation: Detection of discontinuities – Edge linking and Boundary detection – Region based segmentation – Morphological processing – Erosion and dilation.

UNIT-IV: WAVELETS AND IMAGE COMPRESSION 9

Wavelets – Sub band coding – Multi-resolution expansions – **Compression:** Fundamentals – image compression models – Error free compression – Variable length coding – Bit-Plane coding – Lossless predictive coding – Lossy compression – Lossy predictive coding – Compression standards.

UNIT-V: DIGITAL IMAGE PROCESSING SIMULATION 9

Histograms equalization, Detection and recognition, Enhancement techniques, Image compression.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Rafael C. Gonzales and Richard E. Woods, “Digital Image Processing”, 4th Edition, Pearson Education, 2018.
2. Rafael C. Gonzalez, Richard E. Woods and Steven L. Eddins, “Digital Image Processing Using MATLAB”, 2nd Edition Tata Mc Graw Hill Pvt. Ltd., 2017.
3. Anil Jain K., “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.
4. Jayaraman S, Veerakumar T. and Esakkirajan S., “Digital Image Processing”, 1st Edition, McGraw Hill Education, 2009.

5. William K. Pratt, "Digital Image Processing", 4th Edition, John Wiley, New York, 2007.

COURSE OUTCOMES:

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

- CO1:** Understand the digital image fundamentals and be exposed to simple image processing techniques.
- CO2:** Analyze the basic concept of different image transformation.
- CO3:** Summarize image restoration and segmentation techniques.
- CO4:** Explain the various compressions standards and interpret on image applications.
- CO5:** Apply image processing techniques practically using MATLAB.

COURSE OBJECTIVES:

- To learn the foundations of Human Computer Interaction.
- To become familiar with design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.
- To learn the guidelines for user interface.

UNIT-I: FOUNDATIONS OF HCI**9**

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – Processing and networks; Interaction: Models – Frameworks – Ergonomics – Styles – Elements – Interactivity – Paradigms – Case studies.

UNIT-II: DESIGN & SOFTWARE PROCESS**9**

Interactive Design: Basics – Process – Scenarios – Navigation – Screen design – Iteration and prototyping. HCI in software process: Software life cycle – Usability engineering – Prototyping in practice – Design rationale. Design rules: Principles, Standards, Guidelines, Rules. Evaluation Techniques – Universal Design.

UNIT-III: MODELS AND THEORIES**9**

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models – Hypertext, Multimedia and WWW.

UNIT-IV: MOBILE HCI**9**

Mobile Ecosystem: Platforms, Application frameworks – Types of mobile applications: Widgets, Applications, Games – Mobile information Architecture, Mobile 2.0, Mobile design: Elements of Mobile design, Tools – Case studies

UNIT-V: WEB INTERFACE DESIGN**9**

Designing Web interfaces – Drag & Drop, Direct selection, Contextual tools, Overlays, Inlays and Virtual pages, Process flow – Case studies.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Alan Dix, Janet Finlay, Gregory Abowd and Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004.
2. Brian Fling, “Mobile Design and Development”, 1st Edition, O’Reilly Media Inc., 2009.
3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, 1st Edition, O’Reilly, 2009.

COURSE OUTCOMES:

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

- CO1:** Design effective dialog for HCI.
- CO2:** Design effective HCI for individuals and persons with disabilities.
- CO3:** Assess the importance of user feedback.
- CO4:** Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- CO5:** Develop meaningful user interface.

COURSE OBJECTIVES:

- To impart the fundamental aspects and principles of AR/VR technologies.
- To know the internals of the hardware and software components involved in the development of AR/VR enabled applications.
- To learn about the graphical processing units and their architectures.
- To gain knowledge about AR/VR application development.
- To know the technologies involved in the development of AR/VR based applications.

UNIT-I: INTRODUCTION VIRTUAL REALITY AND AUGMENTED REALITY 9

Introduction to Virtual Reality and Augmented Reality – Definition – Introduction to Trajectories and Hybrid Space -Three I's of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality – Components of VR System – Introduction to AR - AR Technologies - Input Devices – 3D Position Trackers – Types of Trackers.

UNIT-II: VR MODELING 9

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants –Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management.

UNIT-III: VR PROGRAMMING 9

VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World Tool Kit and Java 3D

UNIT-IV: AUGMENTED REALITY 9

Introduction to Augmented Reality-Computer vision for AR – Interaction - Modelling and Annotation – Navigation - Wearable devices.

UNIT-V: AR TECHNIQUES 9

Marker-based approach- Introduction to marker-based tracking, types of markers, marker camera pose and identification, visual tracking, mathematical representation of matrix multiplication - Marker types- Template markers, 2D barcode markers, imperceptible markers. Marker-less approach- Localization based augmentation.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Charles Palmer, John Williamson, “Virtual Reality Blueprints: Create compelling VR experiences for mobile”, Packt Publisher, 2018.
2. Dieter Schmalstieg, Tobias Hollerer, “Augmented Reality: Principles & Practice”, Addison Wesley, 2016Press, 2014.

3. John Vince, "Introduction to Virtual Reality", Springer-Verlag, 2004.
4. William R. Sherman, Alan B. "Craig: Understanding Virtual Reality – Interface, Application, Design", Morgan Kaufmann, 2003.
5. Jesse Glover and Jonathan Linowes, "Complete Virtual Reality and Augmented Reality Development with Unity", Packt publishing, 2nd Edition, 2019.
6. Chetankumar G Shetty, "Augmented Reality", Mc Graw Hill, 1st Edition 2020

COURSE OUTCOMES:

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

- CO1:** Understand the basic concepts of AR and VR
- CO2:** Understand the tools and technologies related to AR/VR
- CO3:** Know the working principle of AR/VR related Sensor devices
- CO4:** Design of various models using modeling techniques
- CO5:** Develop AR/VR applications in different domains

COURSE OBJECTIVES:

- To learn basics of Embedded Systems Architecture.
- To understand the intricacies of Embedded programming.
- To be aware of communication interfaces and protocols.
- To know the embedded systems Operating systems.
- To solve real time computational problems with embedded system architectures.

UNIT-I: INTRODUCTION TO EMBEDDED SYSTEM 9

Introduction - A Systems Engineering Approach to Embedded System Design - Architecture - Importance - System model - Programming Languages and Examples - Standards and Networking - Multiple standards-based device.

UNIT-II: MEMORY AND INTERRUPTS 9

Types of Memory - Memory Access Procedure - Memory Management techniques – Memory Testing - Common Memory problems - Interrupts - Interrupt Service Routines

UNIT-III: COMMUNICATION INTERFACES AND PROTOCOLS 9

Interfacing Buses - Serial Interfaces - RS232/UART – UART Programming - RS422/RS485 - I2C Interface - SPI Interface - I2C/SPI Programming - USB

UNIT-IV: OS FOR EMBEDDED SYSTEM 9

Process - Multitasking and Process Management - POSIX - OS Performance Guidelines - selecting right OS's and Board Support Packages (BSPs) - Middleware and Application Software - Development Tools for Embedded System - Embedded C programming.

UNIT-V: REAL TIME OPERATING SYSTEMS 9

Real-Time Concepts - Task Management - Task Scheduling - Classification of Scheduling Algorithms - Clock Driven Scheduling - Event Driven Scheduling - Resource Sharing - Priority Inheritance Protocol – Priority Ceiling Protocol - Commercial RTOS

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Tammy Noergaard, “Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers”, Second Edition, Elsevier Embedded Technology Series, Newnes Publication, 2012
2. Arnold S Berger, “Embedded Systems Design - An Introduction to Processes, Tools and Techniques”, Elsevier, New Delhi, 2011
3. Prasad K V K K, “Embedded/Real-Time Systems: Concepts, Design and Programming - The Ultimate Reference”, Himal Impressions, New Delhi, 2003
4. Sriram V Iyer and Pankaj Gupta, “Embedded Real-time Systems Programming”, TataMcGraw-Hill Publishing Company Limited, New Delhi, 2006.

COURSE OUTCOMES:

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

- CO1:** Comprehend the architecture of Embedded systems
- CO2:** Types of memory and interrupts in embedded system
- CO3:** Use communication interfaces and protocols
- CO4:** Understand operating systems for embedded systems
- CO5:** Apply embedded systems in real time operating systems

PROFESSIONAL ELECTIVE (PE) – V (SEMESTER VII)

22CSPE707

QUANTUM COMPUTING

SEMESTER I

L	T	P	C
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COURSE OBJECTIVES:

- To know the background of classical computing and quantum computing.
- To learn the fundamental concepts behind quantum computation.
- To study the details of quantum mechanics and its relation to Computer Science.
- To gain knowledge about the basic hardware and mathematical models of quantum computation.
- To learn the basics of quantum information and the theory behind it.

UNIT-I: QUANTUM COMPUTING BASIC CONCEPTS 9

Complex Numbers - Linear Algebra - Matrices and Operators - Global Perspectives Postulates of Quantum Mechanics – Quantum Bits - Representations of Qubits – Superpositions

UNIT-II: QUANTUM GATES AND CIRCUITS 9

Universal logic gates - Basic single qubit gates - Multiple qubit gates - Circuit development - Quantum error correction

UNIT-III: QUANTUM ALGORITHMS 9

Quantum parallelism - Deutsch's algorithm - The Deutsch–Jozsa algorithm - Quantum Fourier transform and its applications - Quantum Search Algorithms: Grover's Algorithm

UNIT-IV: QUANTUM INFORMATION THEORY 9

Data compression - Shannon's noiseless channel coding theorem - Schumacher's quantum noiseless channel coding theorem - Classical information over noisy quantum channels

UNIT-V: QUANTUM CRYPTOGRAPHY 9

Classical cryptography basic concepts - Private key cryptography - Shor's Factoring Algorithm - Quantum Key Distribution - BB84 - Ekert 91

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Parag K Lala, Mc Graw Hill Education, "Quantum Computing, A Beginners Introduction", First edition (1 November 2020).
2. Michael A. Nielsen, Issac L. Chuang, "Quantum Computation and Quantum Information", Tenth Edition, Cambridge University Press, 2010.
3. Chris Bernhardt, The MIT Press; Reprint edition (8 September 2020), "Quantum Computing for Everyone".
4. Scott Aaronson, "Quantum Computing Since Democritus", Cambridge University Press, 2013.
5. N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge University Press, 2007.

COURSE OUTCOMES:

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

- CO1:** Understand the basics of quantum computing.
- CO2:** Understand the background of Quantum Mechanics.
- CO3:** Analyze the computation models.
- CO4:** Model the circuits using quantum computation. environments and frameworks.
- CO5:** Understand the quantum operations such as noise and error–correction.

COURSE OBJECTIVES:

- To comprehend various Agile methodologies.
- To understand the basic concepts of Agile software process.
- To Apply principles of Agile testing.
- To know the benefits and pitfalls of working in an Agile team.
- To understand agile development and testing.

UNIT-I: AGILE METHODOLOGIES**9**

Theories for Agile management – Agile software development – Traditional model vs. Agile model – Agile development - Classification of Agile methods – Agile manifesto and principles Simple practices and project tools – Agile project management – Agile team interactions – Ethics in Agile teams - Agility in design, testing – Agile documentations – Agile drivers, Capabilities and values.

UNIT-II: AGILE SOFTWARE PROCESSES**9**

Lean Production – SCRUM, Crystal, Feature driven development– Adaptive software development – Extreme programming: Method overview – Lifecycle – Work products, Roles and practices – Common mistakes and misunderstandings – Adoption strategies.

UNIT-III: AGILITY AND KNOWLEDGE MANAGEMENT**9**

Agile information systems – Agile decision making – Earl_S schools of KM – Institutional knowledge evolution cycle – Development, Acquisition, Refinement, Distribution, deployment, Leveraging – KM in software Engineering – Managing software knowledge – Challenges of migrating to Agile methodologies – Agile knowledge sharing – Role of story – Cards – Story-Card Maturity Model (SMM).

UNIT-IV: AGILITY AND REQUIREMENTS ENGINEERING**9**

Impact of Agile Processes in RE-Current Agile Practices – Variance – Overview of RE using Agile – Managing unstable requirements – Requirements ELICITATION – Agile requirements abstraction model – Requirements management in Agile environment, Agile requirements prioritization – Agile requirements modeling and generation – Concurrency in Agile requirements generation.

UNIT-V: AGILITY AND QUALITY ASSURANCE**9**

Agile product development – Agile metrics – Feature Driven Development (FDD) – Financial and production metrics in FDD – Agile approach to quality Assurance – Test driven development – Agile approach in Global software development.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. David J. Anderson and Eli Schragenheim, “Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results”, Prentice Hall, 2003.

2. Hazza and Dubinsky, “Agile Software Engineering, Series: Undergraduate Topics Computer Science”, Springer, 2009.
3. Craig Larman, “Agile and Iterative Development: A Manager’s Guide”, Addison-Wesley, 2004.
4. Kevin C. Desouza, “Agile Information Systems: Conceptualization, Construction, and Management”, Butterworth-Heinemann, 2007.

COURSE OUTCOMES:

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

- CO1:** Gain knowledge in the area of various Agile methodologies.
- CO2:** Develop Agile software process.
- CO3:** Progress techniques and tools for educating team collaboration.
- CO4:** Execute Software process improvement as an ongoing task for development teams.
- CO5:** Show the uses of agile approaches in enterprise level.

COURSE OBJECTIVES:

- To provide a foundational understanding of Generative AI concepts and models.
- To explore advanced techniques in Natural Language Processing (NLP).
- To develop proficiency in ChatGPT and Prompt Engineering.
- To apply language modeling techniques for effective text generation.
- To implement advanced generative AI and reinforcement learning techniques in real-world applications.

UNIT-I: INTRODUCTION TO GENERATIVE AI 9

Introduction to Generative AI-Importance and Applications-Types of Generative models-Autoencoders and Variational Autoencoders (VAEs)-Generative Adversarial Networks (GANs)-Autoregressive Models-Generative Neural Networks and RBMs-Applications of Generative AI in Various Domains-Data Augmentation and Anomaly Detection-Text Generation and Language Modeling.

UNIT-II: ADVANCED NATURAL LANGUAGE PROCESSING 9

Foundations of Advanced NLP-Word Embeddings and Representation Learning-Sequence-to-Sequence Models-Encoder-Decoder Architectures-Advanced Text Generation and Understanding-Language Generation Models-Advanced NLP Applications- Emerging Trends in NLP.

UNIT-III: INTRODUCTION TO CHATGPT & PROMPT ENGINEERING 9

Introduction to ChatGPT-Fine-Tuning and Specialization-Generating Human-Like Text-Prompt Engineering for effective Interaction-Understanding Prompt Engineering-Designing Effective Prompts- Fine-Tuning with Prompts-Customizing Model Output-Applications and Practical Exercises.

UNIT-IV: TEXT GENERATION AND LANGUAGE MODELS 9

Introduction to Text Generation and Language Models-Language Modeling Fundamentals-Neural Language Models and Basics-Advanced Language Models-Transformer Architecture-Techniques for Text Generation-Advanced Text Generation Techniques-Multimodal Language Models-Multimodal Language Models-Cutting-Edge Advances and Future Directions.

UNIT-V: ADVANCED GENERATIVE AI 9

Foundations of Advanced Generative AI-Generative Models-Hierarchical and Structured Generative Models-Generative AI in Real-World Applications-Generative AI in Healthcare-Reinforcement Learning and Generative Models-Meta-Learning and Few-Shot Learning-Industry Applications-Generative AI for Scientific Applications.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Altaf Rehmani, Generative AI for everyone: Understanding the essentials and applications of this breakthrough technology, Kindle Edition 2024.
2. Numa Dhamani, Introduction to Generative AI , Kindle Edition, 2024.

3. Joseph Babcock, Raghav Bali "Generative AI with Python and TensorFlow 2: Create images, text, and music with VAES, GANS, LSTMs, Transformer models" PACKT Publishing.
4. Iqbal Hussain "Introduction to Prompt Engineering with ChatGPT: A Beginner's Guide" Amazon Kindle edition.
5. Jacob Emerson "Ripples of Generative AI: How Generative AI Impacts, Informs, and Transforms Our Lives" Amazon Kindle Edition.
6. NPTEL/Online Courses:
 1. <https://www.coursera.org/learn/introduction-to-generative-ai>
 2. <https://www.coursera.org/learn/generative-ai-with-llms>

COURSE OUTCOMES:

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

- CO1:** Understand the fundamental concepts of Generative AI.
- CO2:** Understand basics of advanced NLP.
- CO3:** Understand the concepts of ChatGPT and Prompt Engineering.
- CO4:** Apply language modelling techniques for text generation.
- CO5:** Apply reinforcement learning techniques in advanced Applications.

COURSE OBJECTIVES:

- To understand the Software Project Planning and Evaluation techniques.
- To plan and manage projects at each stage of the software development life cycle (SDLC).
- To learn about the activity planning and risk management principles.
- To manage software projects and control software deliverables.
- To develop skills to manage the various phases involved in project management and people management.

UNIT-I: PROJECT EVALUATION AND PROJECT PLANNING 9

Importance of software project management – Activities – Methodologies – Categorization of software projects – Setting objectives – Management principles – Management control – Project portfolio management – Cost-benefit evaluation technology – Risk evaluation – Strategic program management – Stepwise project planning.

UNIT-II: PROJECT LIFE CYCLE AND EFFORT ESTIMATION 9

Software process and Process Models – Choice of Process models - Rapid Application development – Agile methods – Dynamic System Development method – Extreme programming – Managing interactive processes – Basics of software estimation – Effort and cost estimation techniques – COSMIC full function points – COCOMO II – A Parametric productivity model.

UNIT-III: ACTIVITY PLANNING AND RISK MANAGEMENT 9

Objectives of activity planning – Project schedules – Activities – Sequencing and scheduling – Network planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk planning – Risk Management – PERT technique – Monte carlo simulation – Resource allocation – Creation of critical paths – Cost schedules.

UNIT-IV: PROJECT MANAGEMENT AND CONTROL 9

Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring– Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.

UNIT-V: STAFFING IN SOFTWARE PROJECTS 9

Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Bob Hughes, Mike Cotterell and Rajib Mall “Software Project Management”, Tata McGraw Hill, New Delhi, 2021.

2. Robert K. Wysocki, "Effective Software Project Management", Wiley Publication, 2011.
3. Walker Royce "Software Project Management", Addison-Wesley, 1998.
4. Gopaldaswamy Ramesh, "Managing Global Software Projects", McGraw Hill Education (India), Fourteenth Reprint 2013.

COURSE OUTCOMES:

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

- CO1:** Apply Project Management principles while developing software.
- CO2:** Gain extensive knowledge about the basic project management concepts, framework and the process models.
- CO3:** Obtain adequate knowledge about software process models and software effort estimation techniques.
- CO4:** Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.
- CO5:** Learn staff selection process and the issues related to people management.

COURSE OBJECTIVES:

- To learn fundamentals of XML.
- To provide an overview of Service Oriented Architecture.
- To learn web services and their importance.
- To learn web services standards and technologies.
- To learn service-oriented analysis and design for developing SOA based applications.

UNIT-I: INTRODUCTION TO XML**9**

XML document structure – Well-formed and valid documents – DTD – XML Schema – Parsing XML using DOM, SAX – XPath - XML Transformation and XSL – X Query.

UNIT-II: SERVICE ORIENTED ARCHITECTURE (SOA) BASICS**9**

Characteristics of SOA, Benefits of SOA, Comparing SOA with Client-Server and Distributed architectures – Principles of Service Orientation – Service layers.

UNIT-III: WEB SERVICES (WS) AND STANDARDS**9**

Web Services Platform – Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI – Service-Level Interaction Patterns – Orchestration and Choreography.

UNIT-IV: WEB SERVICES EXTENSIONS**9**

WS Addressing – WS Reliable Messaging – WS Policy – WS Coordination – WS Transactions – WS Security – Examples.

UNIT-V: SERVICE ORIENTED ANALYSIS AND DESIGN**9**

SOA delivery strategies – Service oriented analysis – Service Modelling – Service oriented design – Standards and composition guidelines – Service design – Business process design – Case Study.

Contact Periods:**Lecture: 45 Periods****Tutorial: 0 Periods****Practical: 0 Periods****Total: 45 Periods****REFERENCES:**

1. Thomas Erl, “Service Oriented Architecture: Concepts, Technology and Design”, Pearson Education, 2005.
2. Sandeep Chatterjee and James Webber, “Developing Enterprise Web Services: An Architect's Guide”, Prentice Hall, 2004.
3. James McGovern, Sameer Tyagi, Michael E Stevens and Sunil Mathew, “Java Web Services Architecture”, Elsevier, 2003.
4. Ron Schmelzer et al. \ XML and Web Services., Pearson Education, 2002.
5. Frank P.Coyle, \XML, Web Services and the Data Revolution., Pearson Education, 2002
6. Thomas Erl, “Service Oriented Architecture: Concepts, Technology, and Design”, Pearson Education, 2005.

COURSE OUTCOMES:

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

CO1: Able to build applications based on XML.

CO2: Know the service orientation concepts, benefits of SOA.

CO3: Develop web services and WS standards.

CO4: Use web services extensions to develop solutions.

CO5: Apply service modeling, service oriented analysis and design for application development.

COURSE OBJECTIVES:

- To understand the various components of full stack development
- To learn Node.js features and applications
- To develop applications with MongoDB
- To understand the role of Angular and Express in web applications
- To develop simple web applications with React

UNIT-I: BASICS OF FULL STACK**9**

Understanding the Basic Web Development Framework - User - Browser – Webserver - Backend Services – MVC Architecture - Understanding the different stacks –The role of Express – Angular – Node – Mongo DB – React.

UNIT-II: NODE JS**9**

Basics of Node JS – Installation – Working with Node packages – Using Node package manager – Creating a simple Node.js application – Using Events – Listeners –Timers - Callbacks – Handling Data I/O – Implementing HTTP services in Node.js.

UNIT-III: MONGO DB**9**

Understanding NoSQL and MongoDB – Building MongoDB Environment – User accounts – Access control – Administering databases – Managing collections – Connecting to MongoDB from Node.js – simple applications.

UNIT-IV: EXPRESS AND ANGULAR**9**

Implementing Express in Node.js - Configuring routes - Using Request and Response objects - Angular - Typescript - Angular Components - Expressions - Data binding - Built-in directives.

UNIT-V: REACT**9**

MERN STACK – Basic React applications – React Components – React State – Express REST APIs - Modularization and Webpack - Routing with React Router – Server-side rendering.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Brad Dayley, Brendan Dayley, Caleb Dayley, ‘Node.js, MongoDB and Angular Web Development’, Addison-Wesley, Second Edition, 2018
2. Vasan Subramanian, ‘Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node’, Second Edition, Apress, 2019.
3. Chris Northwood, ‘The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer’, Apress; 1st edition, 2018
4. Kirupa Chinnathambi, ‘Learning React: A Hands-On Guide to Building Web Applications Using React and Redux’, Addison-Wesley Professional, 2nd edition, 2018
5. https://www.tutorialspoint.com/the_full_stack_web_development/index.asp
<https://www.coursera.org/specializations/full-stack-react>
<https://www.udemy.com/course/the-full-stack-web-development/>

COURSE OUTCOMES:

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

- CO1:** Understand the various stacks available for web application development
- CO2:** Use Node.js for application development
- CO3:** Develop applications with MongoDB
- CO4:** Use the features of Angular and Express
- CO5:** Develop React applications

PROFESSIONAL ELECTIVE (PE) – VI (SEMESTER VIII)

22CSPE801	PROFESSIONAL ETHICS IN ENGINEERING	SEMESTER VIII			
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COURSE OBJECTIVES:

- To understand the importance of Values and Ethics in their professional careers.
- To know the different ideas of engineering ethics.
- To Infer moral judgment concerning the profession.
- To inculcate the sense of social responsibility.
- To know the global issues of ethics.

UNIT-I: HUMAN VALUES 9

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT-II: ENGINEERING ETHICS 9

Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg’s theory – Gilligan’s theory – Consensus and Controversy – Models of professional roles – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical theories.

UNIT-III: ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation – Engineers as responsible experimenters – Codes of Ethics – A balanced outlook on law.

UNIT-IV: SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and Risk – Assessment of safety and risk – Risk benefit analysis and reducing risk – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Occupational crime – Professional rights – Employee rights – Intellectual property rights (IPR) – Discrimination.

UNIT-V: GLOBAL ISSUES 9

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons development – Engineers as managers – Consulting Engineers – Engineers as expert Witnesses and advisors – Moral leadership – Code of conduct – Corporate social responsibility.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 5th Edition 2022.
2. Govindarajan M, Natarajan S and Senthil Kumar V.S., “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.
3. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.

4. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, 2009.
5. John R. Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.
6. Edmund G. Seebauer and Robert L. Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.
7. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility” Mc Graw Hill Education, India Pvt. Ltd., New Delhi, 2013.

COURSE OUTCOMES:

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

CO1: Apply human values.

CO2: Apply ethical issues related to Engineering.

CO3: Realize the code of Ethics.

CO4: Realize the responsibilities and rights in the society.

CO5: Know Global Issues.

COURSE OBJECTIVES:

- To give an idea about IPR.
- To understand registration of IPRs.
- To have knowledge on patents Act.
- To introduces the different aspects IP laws.
- To understand enforcement of IPRs.

UNIT-I: INTRODUCTION

9

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – The way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, Technological Research, Inventions and Innovations – Important examples of IPR.

UNIT-II: REGISTRATION OF IPRs

9

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT-III: AGREEMENTS AND LEGISLATIONS

9

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT-IV: DIGITAL PRODUCTS AND LAW

9

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

UNIT-V: ENFORCEMENT OF IPRs

9

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

Contact periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Scople Vinod V., “Managing Intellectual Property”, Prentice Hall of India pvt Ltd, 2012.
2. Satakar S. V., “Intellectual Property Rights and Copy Rights”, Ess Publications, New Delhi, 2002.
3. Deborah E. Bouchoux, “Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets”, Cengage Learning, Third Edition, 2012.
4. Prabuddha Ganguli, “Intellectual Property Rights: Unleashing the Knowledge Economy”, McGraw Hill Education, 2011.
5. Derek Bosworth and Elizabeth Webster, “The Management of Intellectual Property”, Edward Elgar Publishing Ltd., 2013.

COURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Ability to manage Intellectual Property portfolio to enhance the value of the firm.

CO2: Have Knowledge on different registration of IPRs.

CO3: Ability to recognize on patents Act.

CO4: Knowledge on different aspects IP laws.

CO5: Knowledge on enforcement of IPRs.

COURSE OBJECTIVES:

- To familiarize the Basics of robots.
- To understand Control system.
- To understand end effectors.
- To familiarize Sensor technology.
- To familiarize Industrial application of robot.

UNIT-I: INTRODUCTION**9**

Basic concepts – Robot anatomy – Manipulators – Kinematics: Forward and inverse kinematics – Precision movement, Robot specifications and work volume, Types of Robot drives – Basic Robot motions – Point to point control, Continuous path control.

UNIT-II: END EFFECTORS**9**

End effectors – Classification – Mechanical, Magnetic, Vacuum and adhesive gripper – Gripper force analysis and design. Robot control, Unit control system concept – Servo and non-servo control of Robot joints, Adaptive and Optimal control.

UNIT-III: SENSORS**9**

Sensor devices, Types of sensors – Contact, Position and displacement sensors, Force and torque sensors – Proximity and range sensors – Acoustic sensors – Robot vision systems – Sensing and digitizing – Image processing and analysis.

UNIT-IV: ROBOT PROGRAMMING**9**

Robot language classification – Programming methods – Off and On-line programming – Lead through method – Teach pendent method – VAL systems and language, Simple program.

UNIT-V: INDUSTRIAL APPLICATIONS**9**

Application of robots – Material handling – Machine loading and unloading, Assembly, Inspection, Welding, Spray painting, Mobile robot, Microbots – Recent developments in robotics – Safety considerations.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Deb S.R., “Robotics technology and flexible automation”, Tata McGraw Hill publishing company limited, New Delhi, 1994.
2. Mikel P. Groover, “Industrial Robotics Technology Programming and Applications”, Tata McGraw Hill publishing, Singapore, 1995.
3. Klafter R.D, Chmielewski, T.A and Noggins, “Robot Engineering: An integrated Approach”, Prentice Hall of India Pvt. Ltd., New Delhi, 1994.
4. Fu K.S, Gonealez R.C and Lee C.S.G., “Robotics Control, Sensing, Vision and Intelligence”, McGraw Hi 'Book Co., Singapore, 1987.
5. Craig J.J., “Introduction to Robotics Mechanics and Control”, Addison-Wesley, London. 1999.

COURSE OUTCOMES:

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

CO1: Know about the basics of robotics.

CO2: Comprehend the control system for end effectors.

CO3: Awareness on sensors for robotics.

CO4: Develop robotic programming.

CO5: Develop robotic based applications.

COURSE OBJECTIVES:

- To understand the basics of Information retrieval.
- To understand machine learning techniques for text classification and
- To understand techniques for clustering.
- To understand various search engine system operations.
- To learn different techniques of recommender system.

UNIT-I: INTRODUCTION**9**

Information retrieval – Early developments – The IR problem – The user’s task – Information versus data retrieval – The IR system – The software architecture of the IR system – The retrieval and ranking processes – The Web – The e-Publishing era – How the web changed search – Practical issues on the Web – How people search – Search interfaces today – Visualization in search interfaces.

UNIT-II: MODELING AND RETRIEVAL EVALUATION**9**

Basic IR models – Boolean model – TF-IDF (Term frequency/Inverse document frequency) Weighting – Vector model – Probabilistic model – Latent semantic indexing model – Neural Network model – Retrieval evaluation – Retrieval metrics – Precision and recall – Reference collection – User-based evaluation – Relevance feedback and Query expansion – Explicit relevance feedback.

UNIT-III: TEXT CLASSIFICATION AND CLUSTERING**9**

A characterization of text classification – Unsupervised algorithms: Clustering – Naïve text classification – Supervised algorithms – Decision tree – k-NN Classifier – SVM classifier – Feature selection or dimensionality reduction – Evaluation metrics – Accuracy and error – Organizing the classes – Indexing and searching – Inverted indexes – Sequential searching – Multi-dimensional indexing.

UNIT-IV: WEB RETRIEVAL AND WEB CRAWLING**9**

The Web – Search engine architectures – Cluster based architecture – Distributed architectures – Search engine ranking – Link based ranking – Simple ranking functions – Learning to rank – evaluations – Search engine ranking – Search engine user interaction – Browsing – applications of a Web crawler – Taxonomy – Architecture and implementation – Scheduling algorithms – Evaluation.

UNIT-V: RECOMMENDER SYSTEM**9**

Recommender systems functions – Data and knowledge sources – Recommendation techniques – Basics of content-based recommender systems – High level architecture – Advantages and drawbacks of content-based filtering – Collaborative filtering – Matrix factorization models – Neighborhood models.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, “Modern Information Retrieval: The

- Concepts and Technology behind Search”, 2nd Edition, ACM Press Books, 2011.
2. Ricci F, Rokach L, Shapira and Kantor B., “Recommender Systems Handbook”, 1st Edition, 2011.
 3. Manning C, Raghavan P and Schütze H., “Introduction to Information Retrieval”, Cambridge University Press, 2008.
 4. Stefan Buettcher, Charles L.A. Clarke and Gordon V. Cormack, “Information Retrieval: Implementing and Evaluating Search Engines”, The MIT Press, 2010.

COURSE OUTCOMES:

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

- CO1:** Use an open-source search engine framework and explore its capabilities.
- CO2:** Use the models for evaluation
- CO3:** Apply appropriate method of classification or clustering.
- CO4:** Design and implement innovative features in a search engine.
- CO5:** Design and implement a recommender system.

COURSE OBJECTIVES:

- To learn the fundamentals of natural language processing.
- To understand the use of CFG.
- To understand the use of PCFG in NLP.
- To understand the role of semantics of sentences and pragmatics.
- To apply the NLP techniques to IR applications.

UNIT-I: INTRODUCTION**9**

Origins and challenges of NLP – Language modeling: Grammar-based LM, Statistical LM – Regular expressions, Finite-state Automata – English morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting spelling errors, Minimum edit distance.

UNIT-II: WORD LEVEL ANALYSIS**9**

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and backoff – Word classes, Part-of-speech tagging, Rule-based, Stochastic and transformation-based tagging, Issues in PoS tagging – Hidden Markov and maximum entropy models.

UNIT-III: SYNTACTIC ANALYSIS**9**

Context-Free grammars, Grammar rules for English, Treebank's, Normal Forms for grammar – Dependency grammar – Syntactic parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic lexicalized CFGs – Feature structures, Unification of feature structures.

UNIT-IV: SEMANTICS AND PRAGMATICS**9**

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT-V: DISCOURSE ANALYSIS AND LEXICAL RESOURCES**9**

Discourse segmentation, Coherence – Reference phenomena, Anaphora resolution using Hobbs and Centering algorithm – Coreference resolution – Resources: Porter stemmer, Lemmatizer, Penn tree bank, Brill's tagger, Word Net, Prop Bank, Frame Net, Brown corpus, British National Corpus (BNC).

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", 1st Edition, O Reilly Media, 2009.
3. Breck Baldwin, "Language Processing with Java and Ling Pipe Cookbook", Atlantic

Publisher, 2015.

4. Richard M. Reese, “Natural Language Processing with Java”, OReilly Media, 2015.
5. Nitin Indurkha and Fred J. Damerau, “Handbook of Natural Language Processing”, 2nd Edition, Chapman and Hall/CRC Press, 2010.
6. Tanveer Siddiqui and Tiwary U.S., “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008.

COURSE OUTCOMES:

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

- CO1:** Tag a given text with basic Language features.
- CO2:** Design an innovative application using NLP components.
- CO3:** Implement a rule-based system to tackle morphology/syntax of a language.
- CO4:** Design a tag set to be used for statistical processing for real-time applications.
- CO5:** Compare and contrast the use of different statistical approaches for different types.

COURSE OBJECTIVES:

- To provide an understanding of principal concepts, major issues, technologies and basic approaches in information security.
- To acquire knowledge on the legal, ethical and professional issues in Information Security.
- To understand the risk management schemes.
- To become aware of several standards.
- To see the technological aspects of information security.

UNIT-I: INTRODUCTION TO INFORMATION SECURITY 9

Information Security – History – 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 – Secure software development – An overview of computer security – Access control matrix, Policy – Security policies, Confidentiality policies, Integrity policies and Hybrid policies.

UNIT-III: SECURITY ANALYSIS 9

Risk Management: Identifying and assessing risk, Assessing and controlling risk – Systems: Access Control Mechanisms, Information flow and Confinement problem.

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 SECURITY 9

Security technology, IDS, Scanning and analysis tools, Cryptography, Access control devices, Physical security: Physical vulnerability assessment – Choosing site location for security – Locks and entry controls – Physical intrusion detection.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Michael E. Whitman and Herbert J Mattord, “Principles of Information Security”, Vikas Publishing House, New Delhi, 2021
2. Micki Krause and Harold F. Tipton, “Handbook of Information Security Management”, Vol 1-3 CRC Press LLC, 2004.
3. Stuart McClure, Joel Scrambray and George Kurtz, “Hacking Exposed”, Tata McGraw Hill, 2003.
4. Matt Bishop, “Computer Security Art and Science”, Pearson/PHI, 2002.
5. Mark Rhodes Ousley “Information Security The Complete Reference” 2nd Edition, McGraw Hill Professional, 2013.

COURSE OUTCOMES:

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

CO1: Acquire knowledge on the essentials of Information Security.

CO2: Identify threats and attacks to the information within systems.

CO3: Show the features of risk management.

CO4: Aware of several standards in information security.

CO5: Implement the security techniques and backup to ensure high availability of data.

COURSE OBJECTIVES:

- To understand the fundamental concepts related to Image formation and processing.
- To learn feature detection, matching and detection
- To become familiar with feature based alignment and motion estimation
- To develop skills on 3D reconstruction
- To understand image based rendering and recognition

UNIT-I: INTRODUCTION TO IMAGE FORMATION AND PROCESSING 9

Computer Vision - Geometric primitives and transformations - Photometric image formation – The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization.

UNIT-II: FEATURE DETECTION, MATCHING AND SEGMENTATION 9

Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge - Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods.

UNIT-III: FEATURE-BASED ALIGNMENT & MOTION ESTIMATION 9

2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration – Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment - Constrained structure and motion - Translational alignment - Parametric motion - Spline-based motion - Optical flow – Layered motion.

UNIT-IV: 3D RECONSTRUCTION 9

Shape from X - Active rangefinding - Surface representations - Point-based representations Volumetric representations - Model-based reconstruction - Recovering texture maps and albedosos.

UNIT-V: IMAGE-BASED RENDERING AND RECOGNITION 9

View interpolation Layered depth images - Light fields and Lumigraphs - Environment mattes - Videobased rendering-Object detection - Face recognition - Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets..

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer- Texts in Computer Science, Second Edition, 2022.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015.
3. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
4. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006
5. E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012.
6. Salman Khan, Hossein Rahmani, Syed Afaq Ali Shah, Mohammed Bennamoun, “ A Guide

to Convolutional Neural Networks for Computer Vision”, Synthesis Lectures on Computer Vision, Morgan & Claypool publishers, 2018.

COURSE OUTCOMES:

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

- CO1:** To understand basic knowledge, theories and methods in image processing and computer vision.
- CO2:** To implement basic and some advanced image processing techniques in OpenCV.
- CO3:** To apply 2D a feature-based based image alignment, segmentation and motion estimations.
- CO4:** To apply 3D image reconstruction techniques
- CO5:** To design and develop innovative image processing and computer vision applications.

COURSE OBJECTIVES:

- Study the morality and ethics in AI
- Learn about the Ethical initiatives in the field of artificial intelligence
- Study about AI standards and Regulations
- Study about social and ethical issues of Robot Ethics
- Study about AI and Ethics- challenges and opportunities

UNIT-I: INTRODUCTION **9**

Definition of morality and ethics in AI-Impact on society-Impact on human psychology-Impact on the legal system-Impact on the environment and the planet-Impact on trust.

UNIT-II: ETHICAL INITIATIVES IN AI **9**

International ethical initiatives-Ethical harms and concerns-Case study: healthcare robots, Autonomous Vehicles , Warfare and weaponization.

UNIT-III: AI STANDARDS AND REGULATION **9**

Model Process for Addressing Ethical Concerns During System Design - Transparency of Autonomous Systems-Data Privacy Process- Algorithmic Bias Considerations - Ontological Standard for Ethically Driven Robotics and Automation Systems.

UNIT-IV: ROBOETHICS: SOCIAL AND ETHICAL IMPLICATION OF ROBOTICS **9**

Robot-Roboethics- Ethics and Morality- Moral Theories-Ethics in Science and Technology – Ethical Issues in an ICT Society- Harmonization of Principles- Ethics and Professional ResponsibilityRoboethics Taxonomy.

UNIT-V: AI AND ETHICS- CHALLENGES AND OPPORTUNITIES **9**

Challenges - Opportunities- ethical issues in artificial intelligence- Societal Issues Concerning the Application of Artificial Intelligence in Medicine- decision-making role in industries- National and International Strategies on AI.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Eleanor Bird, Jasmin Fox-Skelly, Nicola Jenner, Ruth Larbey, Emma Weitkamp and Alan Winfield ,”The ethics of artificial intelligence: Issues and initiatives”, EPRS European Parliamentary Research Service Scientific Foresight Unit March 2020.
2. Patrick Lin, Keith Abney, George A Bekey,” Robot Ethics: The Ethical and Social Implications of Robotics”, The MIT Press- January 2014
3. Towards a Code of Ethics for Artificial Intelligence (Artificial Intelligence: Foundations, Theory, and Algorithms) by Paula Boddington, November 2017
4. Mark Coeckelbergh,” AI Ethics”, The MIT Press Essential Knowledge series, April 2020
5. Research Methodology for Natural Sciences by Soumitro Banerjee, IISc Press, January 2022
6. The Nonreligious: Understanding Secular People and Societies, Luke W. Galen Oxford

University Press, 2016.

COURSE OUTCOMES:

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

CO1: Learn about morality and ethics in AI

CO2: Acquire the knowledge of real time application ethics, issues and its challenges.

CO3: Understand the ethical harms and ethical initiatives in AI

CO4: Learn about AI standards and Regulations like AI Agent, Safe Design of Autonomous and Semi-Autonomous Systems

CO5: Understand the concepts of Roboethics and Morality with professional responsibilities.

COURSE OBJECTIVES:

- To learn the fundamentals of cryptography.
- To learn the key management techniques and authentication approaches.
- To explore the network and transport layer security techniques.
- To understand the application layer security standards.
- To learn the real time security practices.

UNIT-I: INTRODUCTION**9**

Basics of cryptography, conventional and public-key cryptography, hash functions, authentication and digital signatures.

UNIT-II: KEY MANAGEMENT AND AUTHENTICATION**9**

Key Management and Distribution: Symmetric Key Distribution, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure. User Authentication: Remote User-Authentication Principles, Remote User-Authentication Using Symmetric Encryption, Kerberos Systems, Remote User Authentication Using Asymmetric Encryption.

UNIT-III: ACCESS CONTROL AND SECURITY**9**

Network Access Control: Network Access Control, Extensible Authentication Protocol, IEEE 802.1X Port-Based Network Access Control - IP Security - Internet Key Exchange (IKE). Transport-Level Security: Web Security Considerations, Secure Sockets Layer, Transport Layer Security, HTTPS standard, Secure Shell (SSH) application.

UNIT-IV: APPLICATION LAYER SECURITY**9**

Electronic Mail Security: Pretty Good Privacy, S/MIME, DomainKeys Identified Mail. Wireless Network Security: Mobile Device Security

UNIT-V: FIREWALLS**9**

Firewalls and Intrusion Detection Systems: Intrusion Detection Password Management, Firewall Characteristics Types of Firewalls, Firewall Basing, Firewall Location and Configurations. Blockchains, Cloud Security and IoT security

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Cryptography and Network Security: Principles and Practice, 6th Edition, William Stallings, 2014, Pearson, ISBN 13:9780133354690.
2. Network Security: Private Communications in a Public World, M. Speciner, R. Perlman, C. Kaufman, Prentice Hall, 2002.
3. Linux iptables Pocket Reference, Gregor N. Purdy, O'Reilly, 2004.
4. Linux Firewalls, by Michael Rash, No Starch Press, October 2007, ISBN: 978-1-59327-141-1.
5. Network Security, Firewalls And VPNs, J. Michael Stewart, Jones & Bartlett Learning, 2013, ISBN-10: 1284031675, ISBN-13: 978-1284031676.

6. The Network Security Test Lab: A Step-By-Step Guide, Michael Gregg, Dreamtech Press, 2015, ISBN-10:8126558148, ISBN-13: 978-8126558148.

COURSE OUTCOMES:

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

- CO1:** Classify the encryption techniques
- CO2:** Illustrate the key management technique and authentication.
- CO3:** Evaluate the security techniques applied to network and transport layer
- CO4:** Discuss the application layer security standards.
- CO5:** Apply security practices for real time applications.

COURSE OBJECTIVES:

- To understand the basics in R programming in terms of constructs, control statements, string functions.
- To learn to apply R programming for Text processing.
- To expose the use of R Big Data analytics.
- To able to appreciate and apply the R programming from a statistical perspective.
- To make clear the concept for data visualization and statistics and probability.

UNIT-I: INTRODUCTION TO R**9**

Introducing to R – R Data Structures – Help functions in R – Vectors – Scalars – Declarations – recycling – Common Vector operations – Using all and any – Vectorized operations – NA and NULL values – Filtering – Vectorised if-then else – Vector Equality – Vector Element name.

UNIT-II: MATRICES, ARRAYS AND LISTS**9**

Matrices, Arrays and Lists Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction – Avoiding Dimension Reduction – Higher Dimensional arrays – lists – Creating lists – General list operations – Accessing list components and values – applying functions to lists – recursive lists.

UNIT-III: DATA FRAMES**9**

Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames – Factors and Tables – factors and levels – Common functions used with factors – Working with tables - Other factors and table related functions.

UNIT-IV: CONTROL STATEMENTS, FUNCTIONS, R GRAPHS**9**

Control statements – Arithmetic and Boolean operators and values – Default values for arguments - Returning Boolean values – functions are objects – Environment and Scope issues – Writing Upstairs - Recursion – Replacement functions – Tools for composing function code – Math and Simulations in R Creating Graphs – Customizing Graphs – Saving graphs to files – Creating three-dimensional plots.

UNIT-V: INTERFACING**9**

Interfacing R to other languages – Parallel R – Basic Statistics – Linear Model – Generalized Linear models – Non-linear models – Time Series and Auto-correlation – Clustering.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Andy Vickler, “R Programming: This book includes: R Basics for Beginners + R Data Analysis and Statistics + R Data Visualization”, Ladoo Publishing LLC, 2022.
2. Jared P. Lander, “R for Everyone: Advanced Analytics and Graphics”, Addison-Wesley

Data & Analytics Series, 2013.

3. Mark Gardener, “ Beginning R – The Statistical Programming Language”, Wiley, 2013.
4. Robert Knell, “Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R”, Amazon Digital South Asia Services Inc, 2013.
5. Norman Mat off, “The Art of R Programming: A Tour of Statistical Software Design”, No Starch Press, 2011.

COURSE OUTCOMES:

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

- CO1:** Create artful graphs to visualize complex data sets and functions.
- CO2:** Write more efficient code using parallel R and vectorization.
- CO3:** Interface R with C / C++ and Python for increased speed or functionality.
- CO4:** Evaluate new packages for text analysis, image manipulation, and perform statistical analysis of the same.
- CO5:** Develop interfacing R to other Languages.

COURSE OBJECTIVES:

- To understand .Net as simple, modern, object- oriented computer programming language
- To understand CLR Framework
- To design web services
- To design and build interactive webpages and server side logic
- To understand the data access

UNIT-I: INTRODUCTION TO .NET FRAMEWORK AND MANAGED CODE 9

Introduction to .NET Framework: Managed Code and the CLR- Intermediate Language, Metadata and JIT Compilation - Automatic Memory Management

UNIT-II: LANGUAGE CONCEPTS, CLR, AND FRAMEWORK CLASS LIBRARY 9

Language Concepts and the CLR: Visual Studio .NET - Using the .NET Framework. The Framework Class Library: NET objects - ASP .NET - .NET web services – Windows Forms

UNIT-III: ASP.NET FEATURES AND WEB SERVICES 9

ASP.NET Features: Change the Home Directory in IIS - Add a Virtual Directory in IIS- Set a Default Document for IIS - Change Log File Properties for IIS - Stop, Start, or Pause a Web Site

UNIT-IV: WEB CONTROLS AND CREATING WEB FORMS 9

Creating Web Controls: Web Controls - HTML Controls, Using Intrinsic Controls, Using Input Validation Controls, Selecting Controls for Applications - Adding web controls to a Page. Creating Web Forms: Server Controls - Types of Server Controls - Adding ASP.NET Code to a Page.

UNIT-V: ASP.NET DATA ACCESS 9

ASP.NET Data Access: Data Binding Server Controls-Viewing Data Collections in a Grid. ASP.NET Caching Mechanism for caching Dynamic response data. Page Output Caching.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Jason N. Gaylord, Christian Wenz, Pranav Rastogi, Todd Miranda, and Scott Hanselman "Professional ASP.NET 4.5 in C# and VB"
2. Jonas Fagerberg , "ASP.NET Core 5 for Beginners"
3. Alex Homer, Dave Sussman, Professional ASP.NET 1.1, Wrox Publication
4. .NET Framework, OREILY Publication.
5. Deitel and Deitel, Visual Basic.NET How to Program, Pearson Education,2nd edition Greg Buczek, ASP.NET Developer's Guide, Tata McGraw-Hill, 2002.

COURSE OUTCOMES:

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

CO1: Learn fundamentals of .net framework

CO2: Enrich knowledge about Windows Forms, Controls and ASP.NET based applications.

CO3: Create Web services for web based application.

CO4: Create Web forms for web applications

CO5: Web-based applications and Reports using .net technologies

COURSE OBJECTIVES:

- To Gain knowledge about graphics hardware devices and software used.
- To Understand the two dimensional graphics and their transformations.
- To Understand the three dimensional graphics and their transformations.
- To Appreciate illumination and color models.
- To be familiar with understand clipping techniques.

UNIT-I: INTRODUCING**9**

Survey of computer graphics, Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems, Graphics monitors and Workstations, Input devices, Hard copy Devices, Graphics Software; Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.

UNIT-II: TWO DIMENSIONAL GRAPHICS**9**

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; widow-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms

UNIT-III: THREE DIMENSIONAL GRAPHICS**9**

Three dimensional concepts; Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

UNIT-IV: ILLUMINATION AND COLOUR MODELS**9**

Light sources - basic illumination models – halftone patterns and dithering techniques; Properties of light - Standard primaries and chromaticity diagram; Intuitive colour concepts - RGB colour model - YIQ colour model - CMY colour model - HSV colour model - HLS colour model; Colour selection.

UNIT-V: ANIMATIONS & REALISM**9**

ANIMATION GRAPHICS: Design of Animation sequences – animation function – raster animation – key frame systems – motion specification –morphing – tweening. COMPUTER GRAPHICS REALISM: Tiling the plane – Recursively defined curves – Koch curves – C curves – Dragons – space filling curves – fractals – Grammar based models – fractals – turtle graphics – ray tracing.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. John F. Hughes, Andries Van Dam, Morgan Mc Guire, David F. Sklar , James D. Foley, Steven K. Feiner and Kurt Akeley ,”Computer Graphics: Principles and Practice”, , 3rd Edition, AddisonWesley Professional,2013. (UNIT I, II, III, IV).
2. Donald Hearn and Pauline Baker M, “Computer Graphics”, Prentice Hall, New Delhi, 2007 (UNIT V).
3. Donald Hearn and M. Pauline Baker, Warren Carithers,“Computer Graphics With Open GL”, 4th Edition, Pearson Education, 2010.
4. Jeffrey McConnell, “Computer Graphics: Theory into Practice”, Jones and Bartlett Publishers, 2006.
5. Hill F S Jr., "Computer Graphics", Maxwell Macmillan” , 1990

COURSE OUTCOMES:

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

- CO1:** Identify graphics hardware devices and software used.
- CO2:** Design and apply two dimensional transformations
- CO3:** Design three dimensional graphics.
- CO4:** Apply Illumination and color models.
- CO5:** Apply clipping techniques to graphics and Design animation sequences.

COURSE OBJECTIVES:

- To understand the concepts of BI and ETL.
- To inculcate and express knowledge of Talend architecture and its various components.
- To explain the different integration process using advanced components.
- To examine Big Data, Hadoop concepts and the benefits of integrating Talend with Hadoop.
- To focus the various Hadoop Eco systems.

UNIT-I: FUNDAMENTALS OF BI AND ETL **9**

Introduction to Business Problem Analysis – Business Intelligence, Data warehousing, Data Collection and Description, Data Extraction – ETL Process, Schema Integration, Data integration, Data Quality

UNIT-II: INTRODUCTION TO TALEND **9**

Introduction – Architecture of Talend Tool, Starting a Talend Tool, Talend models, Talend Metadata, Managing Metadata, Data Integration features, Data integration Components

UNIT-III: INTRODUCTION TO BIG DATA **9**

Introduction - Historical Interpretation of Big Data - Defining Big Data From 3Vs to 3²Vs - Big Data Analytics and Machine Learning - Big Data Analytics and Cloud Computing - Real-Time Analytics: Characteristics of Real-Time Systems, Real-Time Processing for Big Data — Concepts and Platforms

UNIT-IV: BASICS OF HADOOP **9**

Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – file-based data structures

UNIT-V: HADOOP ECOSYSTEM **9**

Introduction to Sqoop components – Tables and Databases, Introduction to Pig Components – Load and Store operations, Grouping and joining, Combining and splitting, Filtering and Sorting Spark and Hbase - Basic Concepts.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Domenico Talia, Paolo Trunfio, Fabrizio Marozzo, Loris Belcastro, Riccardo Cantini, Alessio Orsino, “Programming Big Data Applications: Scalable Tools And Frameworks For Your Needs Hardcover”, World Scientific Europe Ltd, 2024.
2. Wilfried Grossmann, Stefanie Rinderle-Ma, “Fundamentals of Business Intelligence”, Springer-Verlag Berlin and Heidelberg GmbH & Co. K, 2016.
3. Rajkumar Buyya, Rodrigo N. Calheiros, Amir Vahid Dastjerdi, “Big Data Principles and Paradigms”, Morgan Kaufmann, 2016.
4. Marz N and Warren J, “Big Data”, Manning Publications, 2015.
5. Richard Daniel Barton, “Talend Open Studio Cookbook”, Packt Pub Ltd, 2013.

6. Chuck Lam, “Hadoop in Action”, Manning Publications, 2010.

COURSE OUTCOMES:

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

- CO1:** Gain the basic concepts of BI and ETL schema and architecture.
- CO2:** Apply Talend tool architecture and suitable components for data analysis.
- CO3:** Design various integration techniques using different components.
- CO4:** Compare appropriate Hadoop concepts with integrating Talend to observe Big Data.
- CO5:** Automate the different Hadoop Eco systems.

COURSE 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 a game engine.
- To survey the gaming development environment and tool kits.
- To learn and develop simple games using Pygame environment

UNIT-I: 3D GRAPHICS FOR GAME DESIGN**9**

Genres of Games, Basics of 2D and 3D Graphics for Game Avatar, Game Components – 2D and 3D Transformations – Projections – Color Models – Illumination and Shader Models – Animation – Controller Based Animation.

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 Preproduction, 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 – Pathfinding.

UNIT-IV: OVERVIEW OF 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 and 3D interactive games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating music and sound – Asset Creations – Game Physics Algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based Arcade Games – Puzzle Games.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Sanjay Madhav, “Game Programming Algorithms and Techniques: A Platform Agnostic Approach”, Addison Wesley,2013.
2. Will McGugan, “Beginning Game Development with Python and Pygame: From Novice to Professional”, Apress,2007.
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.
6. Y.Narahari, “Game Theory and Mechanism Design”, IISC Press, World Scientific.

COURSE OUTCOMES:

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

- CO1:** Explain the concepts of 2D and 3D Graphics
- CO2:** Design game design documents.
- CO3:** Implementation of gaming engines.
- CO4:** Survey gaming environments and frameworks.
- CO5:** Implement a simple game in Pygame

COURSE OBJECTIVES:

- Characterize the functionalities of logical and physical components of storage
- Describe various storage networking technologies
- Identify different storage virtualization technologies
- Discuss the different backup and recovery strategies
- Understand common storage management activities and solutions

UNIT I : STORAGE SYSTEMS 9

Introduction to Information Storage: Digital data and its types, Information storage, Key characteristics of data center and Evolution of computing platforms. Information Lifecycle Management. Third Platform Technologies: Cloud computing and its essential characteristics, Cloud services and cloud deployment models, Big data analytics, Social networking and mobile computing, Characteristics of third platform infrastructure and Imperatives for third platform transformation. Data Center Environment: Building blocks of a data center, Compute systems and compute virtualization and Software-defined data center.

UNIT II : INTELLIGENT STORAGE SYSTEMS AND RAID 9

Components of an intelligent storage system, Components, addressing, and performance of hard disk drives and solid-state drives, RAID, Types of intelligent storage systems, Scale-up and scaleout storage Architecture.

UNIT III: STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION 9

Block-Based Storage System, File-Based Storage System, Object-Based and Unified Storage. Fibre Channel SAN: Software-defined networking, FC SAN components and architecture, FC SAN topologies, link aggregation, and zoning, Virtualization in FC SAN environment. Internet Protocol SAN: iSCSI protocol, network components, and connectivity, Link aggregation, switch aggregation, and VLAN, FCIP protocol, connectivity, and configuration. Fibre Channel over Ethernet SAN: Components of FCoE SAN, FCoE SAN connectivity, Converged Enhanced Ethernet, FCoE architecture.

UNIT IV: BACKUP, ARCHIVE AND REPLICATION 9

Introduction to Business Continuity, Backup architecture, Backup targets and methods, Data deduplication, Cloud-based and mobile device backup, Data archive, Uses of replication and its characteristics, Compute based, storage-based, and network-based replication, Data migration, Disaster Recovery as a Service (DRaaS).

UNIT V: SECURING STORAGE INFRASTRUCTURE 9

Information security goals, Storage security domains, Threats to a storage infrastructure, Security controls to protect a storage infrastructure, Governance, risk, and compliance, Storage infrastructure management functions, Storage infrastructure management processes.

Contact Periods:**Lecture: 45 Periods****Tutorial: 0 Periods****Practical: 0 Periods****Total: 45 Periods****REFERENECS:**

8. Brad Dayley, Brendan Dayley, Caleb Dayley, 'Node.js, MongoDB and Angular Web Development', Addison-Wesley, Second Edition, 2018
9. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node', Second Edition, Apress, 2019.
10. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018
11. Kirupa Chinnathambi, 'Learning React: A Hands-On Guide to Building Web Applications Using React and Redux', Addison-Wesley Professional, 2nd edition, 2018
12. https://www.tutorialspoint.com/the_full_stack_web_development/index.asp
13. <https://www.coursera.org/specializations/full-stack-react>

COURSE OUTCOMES:

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

- CO1:** Demonstrate the fundamentals of information storage management and various models of Cloud infrastructure services and deployment
- CO2:** Illustrate the usage of advanced intelligent storage systems and RAID
- CO3:** Interpret various storage networking architectures - SAN, including storage subsystems and virtualization
- CO4:** Examine the different role in providing disaster recovery and remote replication technologies
- CO5:** Infer the security needs and security measures to be employed in information storage management

COURSE OBJECTIVES:

- To understand the foundations of the recommender system.
- To learn the significance of machine learning and data mining algorithms for Recommender systems
- To learn about collaborative filtering
- To make students design and implement attack resisted recommender system.
- To learn about evaluating recommender system

UNIT-I: INTRODUCTION**9**

Introduction and basic taxonomy of recommender systems - Traditional and non-personalized Recommender Systems - Overview of data mining methods for recommender systems- similarity measures- Dimensionality reduction – Singular Value Decomposition (SVD) - Applications of recommendation systems, Issues with recommender system.

UNIT-II: CONTENT-BASED RECOMMENDATION SYSTEMS**9**

High level architecture of content-based systems, Advantages and drawbacks of content based filtering, Item profiles, Discovering features of documents, Obtaining item features from tags, CO1, CO2 Representing item profiles, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.

UNIT-III: COLLABORATIVE FILTERING**9**

A systematic approach, Nearest-neighbour collaborative filtering (CF), user-based and item-based CF, components of neighbourhood methods (rating normalization, similarity weight computation, and neighbourhood selection)

UNIT-IV: ATTACK-RESISTANT RECOMMENDER SYSTEMS**9**

Introduction – Types of Attacks – Detecting attacks on recommender systems – Individual attack – Group attack – Strategies for robust recommender design - Robust recommendation algorithms.

UNIT-V: EVALUATING RECOMMENDER SYSTEMS**9**

Introduction, General properties of evaluation research, Evaluation designs, Evaluation on historical datasets, Error metrics, Decision-Support metrics, User-Centred metrics. Evaluating Paradigms – User Studies – Online and Offline evaluation – Goals of evaluation design – Design Issues – Accuracy metrics – Limitations of Evaluation measures

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016
2. Jannach D., Zanker M. and Felfering A., Recommender Systems: An Introduction, Cambridge University Press (2011), 1st edition.
3. Francesco Ricci , Lior Rokach , Bracha Shapira , Recommender Sytems Handbook, 1st ed, Springer (2011)

4. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1st edition
5. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rd edition, Cambridge University Press, 2020.
6. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013),1st edition

COURSE OUTCOMES:

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

- CO1:** Understand the basic concepts of recommender systems.
- CO2:** Evaluate Types of recommender systems: non-personalized, content based filtering
- CO3:** Implementation of Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics.
- CO4:** Design and implement attack resisted recommender system.
- CO5:** Evaluate the recommender system

COURSE OBJECTIVES:

- Study about uninformed and Heuristic search techniques.
- Learn techniques for reasoning under uncertainty.
- Introduce Machine Learning and supervised learning algorithms
- Study about ensembling and unsupervised learning algorithms
- Learn the basics of deep learning using neural networks.

UNIT-I: PROBLEM-SOLVING

9

Introduction to AI - AI Applications – Problem-solving agents – Search algorithms – Uninformed search strategies – Heuristic search strategies – Local search and optimization problems – Adversarial search – Constraint satisfaction problems (CSP)

UNIT-II: PROBABILISTIC REASONING

9

Acting under uncertainty – Bayesian inference – Naïve bayes models. Probabilistic reasoning – Bayesian networks – Exact inference in BN – Approximate inference in BN – Causal networks.

UNIT-III: SUPERVISED LEARNING

9

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

UNIT-IV: ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING

9

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

UNIT-V: NEURAL NETWORKS

9

Perceptron – Multilayer perceptron, activation functions, network training – Gradient descent optimization – Stochastic gradient descent, error backpropagation, from shallow networks to deep networks – Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.

Contact periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Fourth Edition, Pearson Education, 2021.
2. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Fourth Edition, 2020.
3. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007.
4. Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2008.
5. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006.

COURSE OUTCOMES:

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

CO1: Use appropriate search algorithms for problem solving.

CO2: Apply reasoning under uncertainty.

CO3: Build supervised learning models.

CO4: Understand ensembling and unsupervised models.

CO5: Outline the deep learning neural network models.

COURSE OBJECTIVES:

- To know the hardware requirement of wearable systems.
- To describe the energy harvesting for wearable devices.
- To know the concepts of BAN in health care.
- To understand the security aspects in the wearable devices
- To know the applications of wearable devices in the field of medicine

UNIT-I: INTRODUCTION TO WEARABLE SYSTEMS AND SENSORS 9

Wearable Systems – Introduction, Need for Wearable Systems, Drawbacks of Conventional Systems for Wearable Monitoring, Applications of Wearable Systems, Types of Wearable Systems, Components of wearable Systems. Sensors for wearable systems – Inertia movement sensors, Respiration activity sensor, Inductive plethysmography, Impedance plethysmography, pneumography, Wearable ground reaction force sensor.

UNIT-II: SIGNAL PROCESSING AND ENERGY HARVESTING FOR WEARABLE DEVICE 9

Wearability issues – Physical shape and placement of sensor, Technical challenges – Sensor design, signal acquisition, sampling frequency for reduced energy consumption, Rejection of irrelevant information. Power Requirements – Solar cell, Vibration based, Thermal based, Human body as a heat source for power generation, Hybrid thermoelectric photovoltaic energy harvests, Thermopiles

UNIT-III: WIRELESS HEALTH SYSTEMS 9

Need for wireless monitoring, Definition of Body area network, BAN and Healthcare, Technical Challenges – System security and reliability, BAN Architecture – Introduction, Wireless communication Techniques.

UNIT-IV: SMART TEXTILE 9

Introduction to smart textile- Passive smart textile, active smart textile. Fabrication Techniques Conductive Fibres, Treated Conductive Fibres, Conductive Fabrics, Conductive Inks. Case study-smart fabric for monitoring biological parameters – ECG, respiration.

UNIT-V: APPLICATIONS OF WEARABLE SYSTEMS 9

Medical Diagnostics, Medical Monitoring-Patients with chronic disease, Hospital patients, Elderly patients, neural recording, Gait analysis, Sports Medicine.

Contact periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45Periods

REFERENCES:

1. Annalisa Bonfiglio and Danilo De Rossi, Wearable Monitoring Systems, Springer, 2011.
2. Zhang and Yuan-Ting, Wearable Medical Sensors and Systems, Springer, 2013.
3. Edward Sazonov and Micheal R Neuman, Wearable Sensors: Fundamentals, Implementation and Applications, Elsevier, 2014.

4. Mehmet R. Yuce and JamilY.Khan, Wireless Body Area Networks Technology, Implementation applications, Pan Stanford Publishing Pte. Ltd, Singapore, 2012.
5. Sandeep K.S, Gupta, Tridib Mukherjee and Krishna Kumar Venkatasubramanian, Body Area Networks Safety, Security, and Sustainability, Cambridge University Press, 2013.

COURSE OUTCOMES:

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

- CO1:** Describe the concepts of wearable system.
- CO2:** Explain the energy harvestings in wearable device.
- CO3:** Use the concepts of BAN in health care.
- CO4:** Illustrate the concept of smart textile.
- CO5:** Compare the various wearable devices in healthcare system.

COURSE OBJECTIVES:

- To Learn fault models and fault simulation techniques.
- To understand faults in combinational logic circuits.
- To Have Knowledge on faults in sequential logic circuits.
- To introduces the different testability methods.
- To understand fault diagnosis approaches.

UNIT-I: FAULT MODELLING AND SIMULATION 9

Introduction to testing – Faults in digital circuits – Modeling of faults – Logical fault models – Fault detection – Fault location – Fault dominance – Single stuck fault model and multiple stuck.

UNIT-II: TESTING FOR SINGLE STUCK AT FAULTS 9

Test generation algorithms for combinational circuits – Fault oriented ATG – D Algorithm – Examples – PODEM – Fault independent ATG – Random Test generation – ATGs for SSFs in sequential circuits – TG using iterative array models – Random test generation.

UNIT-III: DELAY TEST 9

Delay test problem – Path delay test – Test generation for combinational circuits, Number of paths in a circuit– Transition faults – Delay test methodologies – Slow clock combinational test, Enhanced scan test, normal scan sequential test, Variable – Clock Non-scan sequential test, Rated-clock Non-scan sequential test.

UNIT-IV: DESIGN FOR TESTABILITY 9

Testability – Controllability and observability, Ad-hoc design for testability techniques – Controllability and observability by means of scan registers – Storage cells for scan design – Level sensitive scan design (LSSD) – Partial scan using I-Paths – Boundary scan standards.

UNIT-V: FAULT DIAGNOSIS 9

Logical level diagnosis – Diagnosis by UUT reduction – Fault diagnosis for combinational circuits – Self-checking design – System level diagnosis.

Contact periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Abramovici M, Breuer A and Friedman D., "Digital Systems Testing and Testable Design", Jaico Publishing House, 2002.
2. Parag K. Lala, "Fault Tolerant and Fault Testable Hardware Design", BS Publications, 2002.
3. Michael L. Bushnell and Vishwani D. Agarwal, "Essentials of Electronic Testing for Digital, Memory and Mixed Signal Circuits", Springer, Verlag2000.
4. Stanley L. Hurst, "VLSI Testing: Digital and Mixed Analogue Digital Techniques", Institute of Electrical Engineers, 1998.

5. Xiaoqing Wen, Cheng Wen Wu and LaungTerng Wang, “VLSI Test Principles and Architectures: Design for Testability”, Cambridge University Press, 2000.

COURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Discuss various fault models and fault simulation techniques.

CO2: Examine faults in combinational logic circuits.

CO3: Analyze faults in sequential logic circuits.

CO4: Explain different testability methods.

CO5: Outline fault diagnosis approaches.

COURSE OBJECTIVES:

- To understand the basics of IoT.
- To get knowledge about the various services provided by IoT.
- To familiarize themselves with various communication techniques and networking.
- To know the implementation of IoT with different tools.
- To understand the various applications in IoT.

UNIT-I: INTRODUCTION TO INTERNET OF THINGS 9

Rise of the machines – Evolution of IoT – Web 3.0 view of IoT – Definition and characteristics of IoT – IoT Enabling Technologies – IoT Architecture – Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects – IoT levels and deployment templates – A panoramic view of IoT applications.

UNIT-II: MIDDLEWARE AND PROTOCOLS OF IOT 9

Middleware technologies for IoT system (IoT Ecosystem Overview – Horizontal Architecture Approach for IoT Systems – SOA based IoT Middleware) Middleware architecture of RFID, WSN, SCADA, M2M – Interoperability challenges of IoT-Protocols for RFID, WSN, SCADA, M2M – Zigbee, KNX, BACNet, MODBUS – Challenges Introduced by 5G in IoT Middleware.

UNIT-III: COMMUNICATION AND NETWORKING 9

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks.

UNIT-IV: IOT IMPLEMENTATION TOOLS 9

Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor-based applications through embedded system platform, Implementing IoT concepts with Python, Implementation of IoT with Raspberry Pi.

UNIT-V: APPLICATIONS AND CASE STUDIES 9

Home automations - Smart cities – Environment – Energy – Retail – Logistics – Agriculture – Industry - Health and life style – Case study.

Contact periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45Periods

REFERENCES:

1. Honbo Zhou, “Internet of Things in the cloud:A middleware perspective”, CRC press, 2012.
2. Vijay Madiseti and Arshdeep Bahga, “Internet of Things (A Hands-onApproach)”, VPT, 1st Edition, 2014.
3. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017
4. Constandinos X. Mavromoustakis, George Mastorakis, Jordi MongayBatalla, “Internet of Things (IoT) in 5G Mobile Technologies” Springer International Publishing Switzerland 2016..

5. Dieter Uckelmann, Mark Harrison, Florian Michahelles, “Architecting the Internet of Things” Springer-Verlag Berlin Heidelberg, 2011.

COURSE OUTCOMES:

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

CO1: Articulate the main concepts, key technologies, strength and limitations of IoT.

CO2: Identify the architecture, infrastructure models of IoT

CO3: Analyze the networking and how the sensors are communicated in IoT.

CO4: Analyze and design different models for IoT implementation.

CO5: Identify and design the new models for market strategic interaction

COURSE OBJECTIVES:

- Introduce tools & techniques of design thinking for innovative products.
- Development Illustrate customer-centric product innovation.
- Use cases Demonstrate development of Minimum usable Prototypes
- Outline principles of solution concepts & their evaluation
- Describe system thinking principles as applied to complex systems.

UNIT-I: DESIGN THINKING PRINCIPLES 9

Exploring Human-centered Design – Understanding the Innovation process, discovering areas of opportunity, Interviewing & empathy – Building techniques, Mitigate validation risk with FIR [Forge Innovation rubric] – Case studies.

UNIT-II: ENDUSER-CENTRIC INNOVATION 9

Importance of customer-centric innovation – Problem Validation and Customer Discovery – Understanding problem significance and problem incidence – Customer Validation. Target user, User persona & user stories. Activity: Customer development process – Customer interviews and field visits.

UNIT-III: APPLIED DESIGN THINKING TOOLS 9

Concept of Minimum Usable Prototype [MUP] – MUP challenge brief – Designing & Crafting the value proposition – Designing and Testing Value Proposition; Design a compelling value proposition; Process, tools and techniques of Value Proposition Design.

UNIT-IV: CONCEPT GENERATION 9

Solution Exploration, Concepts Generation and MUP design – Conceptualize the solution concept; explore, iterate and learn; build the right prototype; Assess capability, usability and feasibility. Systematic concept generation; evaluation of technology alternatives and the solution concepts.

UNIT-V: SYSTEM THINKING 9

System Thinking, Understanding Systems, Examples and Understandings, Complex Systems.

Contact periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Steve Blank, (2013), The four steps to epiphany: Successful strategies for products that win, Wiley.
2. Alexander Osterwalder, Yves Pigneur, Gregory Bernarda, Alan Smith, Trish Papadacos, (2014), Value.
3. Proposition Design: How to Create Products and Services Customers Want, Wiley.
4. Donella H. Meadows, (2015), “Thinking in Systems -A Primer”, Sustainability Institute.
5. Tim Brown,(2012) “Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation”, Harper Business.

COURSE OUTCOMES:

At the end of each unit, the students will be able to -

CO1: Define & test various hypotheses to mitigate the inherent risks in product innovations.

CO2: Understand customer-centric product innovation.

CO3: Design the solution concept based on the proposed value by exploring alternate solutions to achieve value-price fit.

CO4: Develop skills in empathizing, critical thinking, analyzing, storytelling & pitching

CO5: Apply system thinking in a real-world scenario.

COURSE OBJECTIVES:

- To providing an overview of thermal power plants and detailing the role of mechanical engineers in their operation and maintenance.
- To understand construction and operation of diesel, gas turbine and combined cycle power plants.
- To understand construction and operation of nuclear power plants.
- To learn about power from wind and solar.
- To know about the energy, economic and environmental issues of power plants.

UNIT-I: COAL BASED THERMAL POWER PLANTS 9

Layout of modern coal power plant, super critical boilers, FBC boilers, subsystems of thermal power plants – Fuel and ash handling and draught system, feed water treatment.

UNIT-II: DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 9

Components of diesel and gas turbine power plants - Combined cycle power plants - Integrated gasifier based combined cycle systems.

UNIT-III: NUCLEAR POWER PLANTS 9

Basics of nuclear engineering, layout and subsystems of nuclear power plants, working of nuclear Reactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada Deuterium-Uranium reactor (CANDU), breeder, gas cooled and liquid metal cooled reactors. safety measures for nuclear power plants.

UNIT-IV: POWER FROM RENEWABLE ENERGY 9

Hydroelectric power plants – Classification, typical layout and associated components. Principle, construction and working of Wind, Tidal, Solar thermal and Fuel cell power systems.

UNIT-V: ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS 9

Power tariff types, load distribution parameters, load curve, comparison of site selection criteria, relative merits & demerits, capital & operating cost of different power plants. Pollution control technologies including waste disposal options for coal and nuclear power plants.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Nag P. K., “Power Plant Engineering”, 4th Edition, Tata McGraw – Hill Publishing Company Ltd., 2014.
2. El -Wakil M. M., “Power Plant Technology”, Tata McGraw – Hill Publishing Company Ltd., 2010.
3. Godfrey Boyle, “Renewable energy”, Open University, Oxford University Press in association with the Open University, 2004.
4. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, “Standard Handbook of Power

COURSE OUTCOMES:

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

- CO1:** Understand the layout, construction and working of the components inside a thermal power plant.
- CO2:** Acquire knowledge about the layout, construction and working of the components inside a diesel, gas and combined cycle power plants.
- CO3:** Gain the basic knowledge of construction and working of the components inside nuclear power plants.
- CO4:** Explore the construction and working of the components inside renewable energy power plants.
- CO5:** Analysis and solve energy and economic related issues in power sector.

COURSE OBJECTIVES:

- To understand the concepts of measurement technology.
- To learn the various motion, proximity and ranging sensors used to measure various physical parameters.
- To understand the various force, magnetic and heading sensors used to measure various physical parameters.
- To know the various optical, pressure and temperature sensors used to measure various physical parameters.
- To understand the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

UNIT I : INTRODUCTION**9**

Basics of measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor output signal types.

UNIT II : MOTION, PROXIMITY AND RANGING SENSORS**9**

Motion sensors – Potentiometers, resolver, encoders – Optical, magnetic, inductive, capacitive, LVDT – RVDT – Synchro – Microsyn, accelerometer – GPS, bluetooth, range sensors – Ultrasonic ranging, Laser range sensor (LIDAR).

UNIT III : FORCE, MAGNETIC AND HEADING SENSORS**9**

Strain gage, Load cell, Magnetic sensors – Types, principle, requirement and advantages: Magneto resistive – Hall effect – Current sensor, heading sensors – Compass, gyroscope.

UNIT IV : OPTICAL, PRESSURE AND TEMPERATURE SENSORS**9**

Photo conductive cell, Photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, bellows, Piezoelectric – Tactile sensors, Temperature – IC, thermistor, RTD, thermocouple. Acoustic Sensors – Flow and level measurement, radiation sensors – Smart Sensors – MEMS & Nano sensors.

UNIT V : SIGNAL CONDITIONING AND DAQ SYSTEMS**9**

Amplification – Filtering – Sample and hold circuits – Data acquisition: single channel and multi channel data acquisition – Data logging – Applications – Automobile, aerospace, home appliances, manufacturing, environmental monitoring.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Ernest O. Doebelin, “Measurement Systems - Applications and Design”, Tata McGraw-Hill, 2009.
2. Sawney A K and Puneet Sawney, “A Course in Mechanical Measurements and Instrumentation and Control”, 12th Edition, Dhanpat Rai & Co, New Delhi, 2013.
3. Patranabis D., “Sensors and Transducers”, 2nd Edition, PHI, New Delhi, 2010.
4. John Turner and Martyn Hill, “Instrumentation for Engineers and Scientists”, Oxford

SciencePublications, 1999.

5. Richard Zurawski, "Industrial Communication Technology Handbook" 2nd Edition, CRC Press, 2015.

COURSE OUTCOMES:

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

- CO1:** Expertise in various calibration techniques and signal types for sensors.
- CO2:** Apply the various sensors in the automotive and mechatronics applications.
- CO3:** Study the basic principles of various magnetic sensors.
- CO4:** Study the basic principles of various smart sensors.
- CO5:** Implement the DAQ systems with different sensors for real time applications.

COURSE OBJECTIVES:

- To provide knowledge about different types of hybrid energy systems.
- To analyze the various electrical Generators used for the Wind Energy Conversion Systems.
- To design the power converters used in SPV Systems.
- To analyze the various power converters used in hybrid energy systems and to understand the importance of standalone and grid-connected operation in Hybrid renewable energy systems.
- To analyze the performance of the various hybrid energy systems

UNIT-I: INTRODUCTION TO HYBRID ENERGY SYSTEMS 9

Hybrid Energy Systems – Need for Hybrid Energy Systems – Solar-Wind-Fuel Cell-Diesel, Wind- Biomass-Diesel, Micro-Hydel-PV, Ocean and geyser energy - Classification of Hybrid Energy systems – Importance of Hybrid Energy systems – Advantages and Disadvantages - Environmental aspects of renewable energy - Impacts of renewable energy generation on the environment - Present Indian and international energy scenario of conventional and RE sources - Ocean energy, Hydel Energy - Wind Energy, Biomass energy, Hydrogen energy - Solar Photovoltaic (PV) and Fuel cells: Operating principles and characteristics.

UNIT-II: ELECTRICAL MACHINES FOR WIND ENERGY CONVERSION SYSTEMS (WECS) 9

Review of reference theory fundamentals –Construction, Principle of operation and analysis: Squirrel Cage Induction Generator (SCIG), Doubly Fed Induction Generator (DFIG) - Permanent Magnet Synchronous Generator (PMSG).

UNIT-III: POWER CONVERTERS AND ANALYSIS OF SOLAR PV SYSTEMS 9

Power Converters for SPV Systems - Line commutated converters (inversion-mode) - Boost and buck- boost converters- selection of inverter, battery sizing, array sizing - Analysis of SPV Systems - Block diagram of the solar PV systems - Types of Solar PV systems: Stand-alone PV systems.

UNIT-IV: ANALYSIS OF POWER CONVERTERS FOR HYBRID ENERGY SYSTEMS 9

Introduction to Power Converters – Stand-alone Converters -AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters - Bi-Directional Converters - Grid-Interactive Inverters - Matrix converter – Merits and Limitations.

UNIT-V: CASE STUDIES FOR HYBRID RENEWABLE ENERGY SYSTEMS 9

Hybrid Systems- Range and type of Hybrid systems – Performance Analysis – Cost Analysis - Case studies of Diesel-PV, Wind-PV-Fuel-cell, Micro-hydel-PV, Biomass-Diesel-Fuel-cell systems.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Bahman Zohuri, "Hybrid Energy Systems", Springer, First Edition, 2018.
2. S.M. Muyeen, "Wind Energy Conversion Systems", Springer First Edition, 2012
3. Md. Rabiul Islam, Md. Rakibuzzaman Shah, Mohd Hasan Ali, "Emerging Power Converters for Renewable Energy and Electric Vehicles", CRC Press, First Edition, 2021
4. Ernst Joshua, Wind Energy Technology, PHI, India, 2018, 3rd Edition.
5. S.N.Bhadra, D. Kastha, & S. Banerjee "Wind Electrical Systems", Oxford University Press, 7th Impression, 2005.
6. Rashid.M. H "Power electronics Hand book", Academic press, 4th Edition, 2018.

COURSE OUTCOMES:

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

- CO1:** Analyze the impacts of hybrid energy technologies on the environment and demonstrate them to harness electrical power.
- CO2:** Select a suitable Electrical machine for wind energy conversion systems and simulate wind energy conversion system
- CO3:** Design the power converters such as AC-DC, DC-DC, and AC-AC converters for SPV systems.
- CO4:** Analyze the power converters such as AC-DC, DC-DC, and AC-AC converters for Hybrid energy systems.
- CO5:** Interpret the hybrid renewable energy systems

COURSE OBJECTIVES:

- To provide knowledge about the physical foundations of biological systems.
- To grasp the various electro physiological measurements in the human body.
- To get knowledge on the measurement of non-electrical parameters in the human body.
- To study the various medical imaging techniques and their applications.
- To provide knowledge in medical assisting and therapy equipment.

UNIT-I: PHYSIOLOGY**9**

Man instrument system – Problems encountered in measuring a living system – Transducers for biomedical applications – Cell and its structure – Resting and action potential – Propagation of action potentials – The heart and cardiovascular system – Electrophysiology of cardiovascular system – Physiology of the respiratory system – Nervous system – Central nervous system and Peripheral nervous system – Electrode theory – Bio-potential electrodes.

UNIT-II: ELECTRO PHYSIOLOGICAL MEASUREMENT**9**

ECG – Vector cardiographs – EEG – EMG – ERG – EOG – Lead system and recording methods – Typical waveforms.

UNIT-III: NON- ELECTRICAL PARAMETER MEASUREMENTS**9**

Measurement of blood pressure, blood flow and cardiac output – Plethysmography – Measurement of heart sounds – Gas analysers – Blood gas analysers – Oximeters.

UNIT-IV: MEDICAL IMAGING AND TELEMETRY**9**

X-ray machine – Echocardiography – Computer tomography – MRI – Diagnostic ultrasound – PET – SPECT – Electrical impedance tomography – Thermograph – Biotelemetry.

UNIT-V: ASSISTING AND THE RAPEUTIC DEVICE**9**

Pacemakers – Defibrillators – Ventilator – Anesthesia machine – Nerve and muscle stimulator – Heart lung machine – Kidney machine – Audiometers – Diathermy – Endoscopes – Lasers in biomedicine.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", PHI, New Delhi, 2015.
2. Khandpur R.S., "Handbook of Biomedical Instrumentation", 2nd Edition, Tata McGraw Hill 2016.
3. Geddes L. A and Baker L.E., "Principles of Applied Biomedical Instrumentation", 3rd Edition, John Wiley, New York, 2015.
4. Richard Aston, "Principles of Bio-medical Instrumentation and Measurement", Merrill Publishing Company, New York, 2016.
5. Ed. Joseph D. Bronzino, "The Biomedical Engineering Handbook" 2nd Edition, Boca Raton, CRC Press LLC, 2014.

COURSE OUTCOMES:

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

CO1: Understand the physical foundations of biological systems.

CO2: Realize the various electro physiological measurements in the human body.

CO3: Acquire knowledge on the measurement of non-electrical parameters in the human body.

CO4: Analyze the various medical imaging techniques and their applications.

CO5: Apply the concepts on the working of medical assisting and therapy equipment.

COURSE OBJECTIVES:

- To understand the operation and architecture of electric and hybrid vehicles
- To identify various energy source options like battery and fuel cell
- To select suitable electric motor for applications in hybrid and electric vehicles.
- To explain the role of power electronics in hybrid and electric vehicles
- To analyze the energy and design requirement for hybrid and electric vehicles.

UNIT-I: DESIGN CONSIDERATIONS FOR ELECTRIC VEHICLES 9

Need for Electric vehicle- Comparative study of diesel, petrol, hybrid and electric Vehicles. Advantages and Limitations of hybrid and electric Vehicles. - Design requirement for electric vehicles- Range, maximum velocity, acceleration, power requirement, mass of the vehicle. Various Resistance- Transmission efficiency- Electric vehicle chassis and Body Design, Electric Vehicle Recharging and Refuelling Systems.

UNIT-II: ENERGY SOURCES 9

Battery Parameters- - Different types of batteries – Lead Acid- Nickel Metal Hydride - Lithium ion- Sodium based- Metal Air. Battery Modelling - Equivalent circuits, Battery charging- Quick Charging devices. Fuel Cell- Fuel cell Characteristics- Fuel cell types-Half reactions of fuel cell. Ultra capacitors. Battery Management System.

UNIT-III: MOTORS AND DRIVES 9

Types of Motors- DC motors- AC motors, PMSM motors, BLDC motors, Switched reluctance motors working principle, construction and characteristics.

UNIT-IV: POWER CONVERTERS AND CONTROLLERS 9

Solid state Switching elements and characteristics – BJT, MOSFET, IGBT, SCR and TRIAC - Power Converters – rectifiers, inverters and converters - Motor Drives - DC, AC motor, PMSM motors, BLDC motors, Switched reluctance motors – four quadrant operations –operating modes

UNIT-V: HYBRID AND ELECTRIC VEHICLES 9

Main components and working principles of a hybrid and electric vehicles, Different configurations of hybrid and electric vehicles. Power Split devices for Hybrid Vehicles - Operation modes - Control Strategies for Hybrid Vehicle - Economy of hybrid Vehicles - Case study on specification of electric and hybrid vehicles.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Iqbal Husain, “Electric and Hybrid Vehicles-Design Fundamentals”, CRC Press,2003
2. Mehrdad Ehsani, “Modern Electric, Hybrid Electric and Fuel Cell Vehicles”, CRC Press,2005.
3. James Larminie and John Lowry, “Electric Vehicle Technology Explained “John Wiley & Sons,2003
4. Lino Guzzella, “Vehicle Propulsion System” Springer Publications,2005

5. Ron Hod Kinson, “Light Weight Electric/ Hybrid Vehicle Design”, Butterworth Heinemann Publication,2005.

COURSE OUTCOMES:

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

- CO1:** Learn the operation and architecture of electric and hybrid vehicles
- CO2:** Classify various energy source options like battery and fuel cell
- CO3:** Select suitable electric motor for applications in hybrid and electric vehicles.
- CO4:** Explicate the role of power electronics in hybrid and electric vehicles
- CO5:** Analyze the energy and design requirement for hybrid and electric vehicles.

COURSE OBJECTIVES:

- Understanding of the current topics in MANETs and WSNs, both from an industry and research point of views.
- Understanding of the principles of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks.
- Understand how proactive routing protocols function and their implications on data transmission delay and bandwidth consumption.
- Know about routing protocol
- Analyze various routing algorithms

9

UNIT-I: INTRODUCTION

Introduction to ad-hoc networks – definition, characteristics features, applications. Characteristics of wireless channel, ad-hoc mobility models: indoor and outdoor models.

9

UNIT-II:MEDIUM ACCESS PROTOCOLS

MAC Protocols: Design issues, goals and classification. Contention based protocols – with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

9

UNIT-III: NETWORK PROTOCOLS

Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, energy aware routing algorithm, hierarchical routing, QoS aware routing.

9

UNIT-IV: END-END DELIVERY AND SECURITY

Transport Layer: Issues in designing – Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols

9

UNIT-V: CROSS LAYER DESIGN

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, cross layer cautionary perspective. Integration of adhoc with Mobile IP networks.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

7. Behrouz A. Forouzan, “Data Communications and Networking”, 5th Edition TMH, 2013.
8. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, 5th Edition, Morgan Kaufmann Publishers Inc., 2012.
9. William Stallings, “Data and Computer Communications”, 10th Edition, Pearson Education, 2013.
10. C. Siva Ram Murthy and B. S. Manoj, Ad hoc Wireless Networks Architecture and Protocols, 2nd edition, Pearson Edition, 2007.

11. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000.
12. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan Stojmenovic, Mobile ad-hoc networking, Wiley-IEEE press, 2004.

COURSE OUTCOMES:

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

- CO1:** Gain the knowledge of basic layers of adhoc networks.
- CO2:** Evaluate the performance MAC protocols and standards.
- CO3:** Understand the functions of routing protocols.
- CO4:** Know different protocols involved in network security enhancement.
- CO5:** Analyze the necessity of cross layer designs and Mobile IP networks.

COURSE OBJECTIVES:

- To assess blockchain applications in a structured manner.
- To impart knowledge in block chain techniques and able to present the concepts clearly and structured.
- To understand the modern concepts of blockchain technology.
- To get familiarity with future currencies and to create own crypto token.
- To analyze the market scenario of cryptocurrency.

UNIT I: BASIC CONCEPTS 9

Introduction - Decentralized society - Disturbed Database, Byzantine General problem - Fault tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete - P2P network - Private key - Public key - Cryptography - Hash Function - Digital Signature - ECDSA - Memory Hard Algorithm - Zero Knowledge Proof.

UNIT II: BLOCKCHAIN 9

Introduction - Advantage over conventional distributed database – Network and protocols - Block chain network - Mining - Mechanism - Life Cycle of Block chain - Distributed consensus - Merkle Patricia Tree - Gas Limit - Transactions and Fee - Anonymity - Reward - Chain policy- Life of Block chain applications -Soft and Hard Fork - Private and Public blockchain.

UNIT III: DISTRIBUTED CONSENSUS 9

Nakamoto consensus - Proof of work - Proof of Stake - Proof of Burn - Difficulty level - Sybil Attack - Energy Utilization and alternate – Fabric model - SDKs - Components of Fabric Model - Architecture of Hyperledger fabric.

UNIT IV: CRYPTOCURRENCY 9

History - Distributed ledger - Bitcoin protocols - Mining strategy and rewards - Ethereum - construction - Truffle - DAO - dApps - Smart Contract - Boot strapping - GHOST Vulnerability - Attacks - Sidechain - Namecoin.

UNIT V: CRYPTOCURRENCY REGULATIONS 9

Stakeholders - Roots and Bitcoin - Legal Aspects - Crypto currency exchange - Black market and Global economy. Applications : IoT - Medical Record Management system - Domain Name Service and future of Blockchain - Business applications and assessing blockchain projects.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 30 Periods Total: 75 Periods

REFERENECS:

1. Imran Bashir, “Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained”, Second Edition, Packt Publishing, 2018.
2. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, “Bitcoin and Cryptocurrency

- Technologies: A Comprehensive Introduction” Princeton University Press, 2016
3. Antonopoulos, Mastering Bitcoin, O’Reilly Publishing, 2014. .
 4. Antonopoulos and G. Wood, “Mastering Ethereum: Building Smart Contracts and Dapps”, O’Reilly Publishing, 2018.
 5. D. Drescher, Blockchain Basics. Apress, 2017.

COURSE OUTCOMES:

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

- CO1:** Understand the various technologies and its business use.
- CO2:** Analyse the block chain applications in a structure manner.
- CO3:** Explain the modern concepts of block chain technology systematically.
- CO4:** Handle the cryptocurrency.
- CO5:** Understand the modern currencies and its market usage

COURSE OBJECTIVES:

- To differentiate open source software and commercial software.
- To familiarize with Linux operating system.
- To examine web applications using open source web technologies like Apache, MySQL and PHP (LAMP/XAMP).
- To implement table commands and table joins.
- To learn cookies and sessions with PHP and MySQL.

UNIT-I: OPEN SOURCE**9**

Introduction to Open Source – Open Source vs. Commercial Software – What is Linux? - Free Software – Basics of Linux - Linux Kernel – Linux Distributions.

UNIT-II: LINUX**9**

Introduction to Linux Essential Commands - File system Concept - Standard Files - The Linux Security Model - Vi Editor - Partitions creation - Shell Introduction - String Processing - Investigating and Managing Processes - Network Clients – Installing Application.

UNIT-III: APACHE**9**

Apache Explained - Starting, Stopping, and Restarting Apache - Modifying the Default Configuration - Securing Apache - Set User and Group - Consider Allowing Access to Local Documentation - Don't Allow public html Web sites - Apache control with .htaccess.

UNIT-IV: MYSQL**9**

Introduction to MYSQL - The Show Databases and Table - The USE command - Create Database and Tables - Describe Table - Select, Insert, Update, and Delete statement - Some Administrative detail - Table Joins - Loading and Dumping a Database.

UNIT-V: PHP**9**

Introduction- General Syntactic Characteristics - PHP Scripting - Commenting your code -Primitives, Operations and Expressions - PHP Variables - Operations and Expressions Control Statement - Array - Functions - Basic Form Processing - File and Folder Access - Cookies - Sessions - Database Access with PHP - MySQL - MySQL Functions - Inserting Records - Selecting Records - Deleting Records - Update Records.

Contact Periods:**Lecture: 45 Periods****Tutorial: 0 Periods****Practical: 0 Periods****Total: 45 Periods****REFERENCES:**

1. Steven Weber, "The success of Open Source", Harvard University Press October 31, First Edition, 2021.
2. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, "Linux in a Nutshell", Sixth Edition, OReilly Media, 2009.
3. James Lee and Brent Ware, "Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP", Dorling Kindersley (India) Pvt. Ltd, 2008.

4. Eric Rosebrock, Eric Filson, "Setting Up LAMP: Getting Linux, Apache, MySQL, and PHP and working Together", Published by John Wiley and Sons, 2004.

COURSE OUTCOMES:

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

CO1: Compare the open source software and commercial software.

CO2: Study, install and run Linux operating system.

CO3: Identify and install open source web technology Apache and manage applications.

CO4: Manage users and privileges in MySQL and to handle SQL functions.

CO5: Design and develop complete website using PHP.

COURSE OBJECTIVES:

- To facilitate students to understand android SDK
- To gain a basic understanding of Android application development
- To inculcate working knowledge of creating mobile interface
- To learn about testing of android application
- To create basic android applications

UNIT-I: INTRODUCTION TO ANDROID 9

The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building your First Android application, Understanding Anatomy of Android Application, Android Manifest file.

UNIT-II: ANDROID APPLICATION DESIGN ESSENTIALS: 9

Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

UNIT-III: ANDROID USER INTERFACE DESIGN ESSENTIALS 9

User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation

UNIT-IV: TESTING ANDROID APPLICATION 9

Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

UNIT-V: ANDROID APPLICATION 9

Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2nd ed. (2011)
2. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd
3. Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd
4. Android Application Development All in one for Dummies by Barry Burd, Edition: I

COURSE OUTCOMES:

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

CO1: Identify various concepts of mobile programming that make it unique from

- programming for other platforms,
- CO2:** Critique mobile applications on their design pros and cons,
 - CO3:** Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces
 - CO4:** Program mobile applications for the Android operating system that use basic and advanced phone features
 - CO5:** Deploy applications to the Android marketplace for distribution

COURSE OBJECTIVES:

- To understand basic digital forensics and techniques.
- To understand digital crime and investigation.
- To understand how to be prepared for digital forensic readiness.
- To understand and use forensics tools for iOS devices.
- To understand and use forensics tools for Android devices.

UNIT I : INTRODUCTION TO DIGITAL FORENSICS 9

Forensic Science – Digital Forensics – Digital Evidence – The Digital Forensics Process – Introduction – The Identification Phase – The Collection Phase – The Examination Phase – The Analysis Phase – The Presentation Phase

UNIT II : DIGITAL CRIME AND INVESTIGATION 9

Digital Crime – Substantive Criminal Law – General Conditions – Offenses – Investigation Methods for Collecting Digital Evidence – International Cooperation to Collect Digital Evidence

UNIT III: DIGITAL FORENSIC READINESS 9

Introduction – Law Enforcement versus Enterprise Digital Forensic Readiness – Rationale for Digital Forensic Readiness – Frameworks, Standards and Methodologies – Enterprise Digital Forensic Readiness – Challenges in Digital Forensics

UNIT IV: iOS FORENSICS 9

Mobile Hardware and Operating Systems - iOS Fundamentals – Jailbreaking – File System – Hardware – iPhone Security – iOS Forensics – Procedures and Processes – Tools – Oxygen Forensics – MobilEdit – iCloud

UNIT V: ANDROID FORENSICS 9

Android basics – Key Codes – ADB – Rooting Android – Boot Process – File Systems – Security – Tools – Android Forensics – Forensic Procedures – ADB – Android Only Tools – Dual Use Tools – Oxygen Forensics – MobilEdit – Android App Decompiling

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENECS:

1. Andre Arnes, “Digital Forensics”, Wiley, 2018.
2. Chuck Easttom, “An In-depth Guide to Mobile Device Forensics”, First Edition, CRC Press, 2022.
3. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.

COURSE OUTCOMES:

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

- CO1:** Have knowledge on digital forensics.
- CO2:** Know about digital crime and investigations.
- CO3:** Be forensic ready.
- CO4:** Investigate, identify and extract digital evidence from iOS devices.
- CO5:** Investigate, identify and extract digital evidence from Android devices.

COURSE OBJECTIVES:

- Basic fundamentals of materials and their properties.
- Various mechanical testing methods, processes, properties and applications.
- Different types of NDT testing methods, processes, properties and applications.
- The different methods of materials, their properties, classifications and applications and acquire knowledge to apply on the respective fields.
- Various tests on different materials and know about the failure mechanism.

UNIT I: INTRODUCTION TO MATERIALS TESTING**9**

Overview of materials, Classification of material testing, Purpose of testing, Selection of material, Development of testing, Testing organizations and its committee, Testing standards, Result Analysis, Advantages of testing.

UNIT II: MECHANICAL TESTING**9**

Introduction to mechanical testing, Hardness test (Vickers, Brinell, Rockwell), Tensile test, Impact test (Izod, Charpy) - Principles, Techniques, Methods, Advantages and Limitations, Applications. Bend test, Shear test, Creep and Fatigue test - Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT III: NON-DESTRUCTIVE TESTING**9**

Visual inspection, Liquid penetrant test, Magnetic particle test, Thermography test – Principles, Techniques, Advantages and Limitations, Applications. Radiographic test, Eddy current test, Ultrasonic test, Acoustic emission- Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT IV: MATERIAL CHARACTERIZATION TESTING**9**

Macroscopic and Microscopic observations, Optical and Electron microscopy (SEM and TEM) – Principles, Types, Advantages and Limitations, Applications. Diffraction techniques, Spectroscopic Techniques, Electrical and Magnetic Techniques- Principles, Types, Advantages and Limitations, Applications.

UNIT-V: OTHER TESTING**9**

Thermal Testing: Differential scanning calorimetry, Differential thermal analysis. Thermomechanical and Dynamic mechanical analysis: Principles, Advantages, Applications. Chemical Testing: X-Ray Fluorescence, Elemental Analysis by Inductively Coupled Plasma-Optical Emission Spectroscopy and Plasma-Mass spectrometry.

Contact periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Baldev Raj, T.Jayakumar, M.Thavasimuthu “Practical Non-Destructive Testing”, Narosa Publishing House, 2009.
2. Cullity, B. D., “Elements of X-ray diffraction”, 3rdEdition, Addison-Wesley CompanyInc., NewYork, 2000.
3. P. Field Foster, “The Mechanical Testing of Metals and Alloys” 7thEdition, CousensPress, 2007.
4. Brandon D.G., “Modern Techniques in Metallography”, Von Nostrand Inc. NJ, USA,1986.
5. Metals Handbook: Mechanical testing, (Volume 8) ASM Handbook Committee, 9thEdition, American Society for Metals, 1978.
6. ASM Metals Handbook, “Non-Destructive Evaluation and Quality Control”, American Society of Metals, Metals Park, Ohio, USA 2000.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to

- CO1:**Apply the fundamental concepts of material selection and acquire knowledge on testing.
- CO2:**Identify the suitable testing methods and process to attain the specified microstructural changes in the metal.
- CO3:**Choose the different types of methods and testing on the basis of the material andmake use of them in their specific application areas.
- CO4:**Identify the different methods of materials, their properties, classifications andapplications and acquire knowledge to apply on the respective fields.
- CO5:**Select the various tests on different materials and know about the failure mechanism.

COURSE OBJECTIVES:

- To study the gas and arc welding processes.
- To learn the resistance welding processes.
- To understand the solid state welding processes.
- To study the special welding processes.
- To understanding of inspection methods of welded products and also helps to know the material considerations of this operation.

UNIT-I: GAS AND ARC WELDING PROCESSES**9**

Fundamental principles – Air Acetylene welding, Oxyacetylene welding, Carbon arc welding, Shielded metal arc welding, Submerged arc welding, TIG & MIG welding, Plasma arc welding and Electroslag welding processes - Advantages, Limitations and Applications.

UNIT-II: RESISTANCE WELDING PROCESSES**9**

Spot welding, Seam welding, Projection welding, Resistance Butt welding, Flash Butt welding, Percussion welding and High frequency resistance welding processes –Advantages, Limitations and Applications.

UNIT-III: SOLID STATE WELDING PROCESSES**9**

Cold welding, Diffusion bonding, Explosive welding, Ultrasonic welding, Friction welding, Forge welding, Roll welding and Hot pressure welding processes - Advantages, Limitations and Applications.

UNIT-IV: OTHER WELDING PROCESSES**9**

Thermit welding, Atomic hydrogen welding, Electron beam welding, Laser Beam welding, Friction stir welding, Under Water welding, Welding automation in aerospace, Nuclear and surface transport vehicles.

UNIT-V: DESIGN OF WELD JOINTS, WELDABILITY AND TESTING OF WELDMENTS**9**

Various weld joint designs – Welding defects – Causes and remedies – Weldability of Aluminium, Copper, and Stainless steels. Destructive and non-destructive testing of weldments.

Contact periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. O.P.Khanna, “Welding Technology”, Dhanpat Rai and sons, 2011.
2. Davis A.C., “The Science and Practice of Welding”, Cambridge University Press, Cambridge, 2010.
3. Little R.L., “Welding and welding Technology”, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 34th reprint, 2008.

4. Parmer R.S., “Welding Engineering and Technology”, 1st Edition, Khanna Publishers, New Delhi, 2008.
5. Nadkarni S.V., “Modern Arc Welding Technology”, South Asia Books, 2008.
6. Parmer R.S., “Welding Processes and Technology”, Khanna Publishers, New Delhi, 1992

COURSE OUTCOMES:

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

CO1: Understand the construction and working principles of gas and arc welding process.

CO2: Understand the construction and working principles of resistance welding process.

CO3: Understand the construction and working principles of various solid state welding process.

CO4: Understand the construction and working principles of various special welding processes.

CO5: Understand the concepts on weld joint design, Weldability and testing of weldments.

COURSE OBJECTIVES:

- To study about the safety concept Technical and Managerial roles in the Industries.
- To apply knowledge on investigation and reporting in the working environment.
- To use quality of safety education and training to foresee and solve issues in the industrial situations.
- To learn about the safety management associated with the agencies.
- To familiarize with safety audit and regulation.

UNIT I: SAFETY CONCEPT**9**

Evolution of modern safety concept – History of safety movement –Influence of environmental safety – Hazards – Safety policy – Safety survey, Safety inspection safety culture and Behavioural safety.

UNIT II: ACCIDENT INVESTIGATION AND REPORTING**9**

Concept of an accident, Reportable and non reportable accidents – Principles of accident prevention accident investigation and analysis – Documentation of accidents – Unsafe act and unsafe condition domino sequence – Role of safety committee and cost of accident.

UNIT III: SAFETY EDUCATION AND TRAINING**9**

Importance of training – Training methods –Method of promoting safe practice – Motivation – Role of government agencies and private consulting agencies in safety training – Creating awareness – Safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign.

UNIT IV: SAFETY MANAGEMENT**9**

General concept of safety management – National Safety Council-OSHA, their roles in safety propagation – Evolution of modern safety concept – Planning for safety for optimization of productivity – Line and staff functions for safety – Safety sampling, fault tree analysis.

UNIT-V: SAFETY AUDIT AND SAFETY REGULATION**9**

Components of safety audit, types of audit, audit methodology, non-conformity reporting (NCR), audit checklist and report – Review of inspection, safety measures in factories act, pollution control act for water, air, and land. OSHAS18001, ISO14001.

Contact periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

- 1.Vollman TE., “Manufacturing Planning and Control Systems”, Galgotia Publications, 2002.
- 2.Elwood S. Buffa, and Rakesh K. Sarin, “Modern Production/Operation Management”, 8th Edition, John Wiley & Sons, 2000.
- 3.Krishnan N.V, “Safety management in Industry”,Jaico Publishing House,Bombay,1997.
- 4.Dan Petersen, “Techniques of Safety Management”, Mc Graw-Hill Company,Tokyo, 1981.

5. "Accident Prevention Manual for Industrial Operations", N.S.C Chicago, 1980.

6. Heinrich H.W, "Industrial accident Prevention", McGraw-Hill Company, New York, 1980.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to

CO1: Anticipate, identify, evaluate, and control workplace hazardous conditions and practices.

CO2: Develop effective safe operating procedures and comprehensive safety and health programs.

CO3: Address identified hazards, conditions, and practices in a cost effective manner.

CO4: Apply the general concept of safety management and planning for safety for optimization of productivity.

CO5: Measure and evaluate occupational safety and health performance.

COURSE OBJECTIVES:

- To familiarize with the basic concepts, and techniques of salesmanship.
- To learn and behave about the quality of salesman.
- To create awareness of marketing Remuneration / Compensation.
- To analyse and solve marketing problems in the complex and fast changing business environment.
- To understand the behaviour of consumers.

UNIT I: SALESMANSHIP**9**

Meaning, Definition, Characteristics, Concept, Kinds, Nature – Evolution, and psychology in selling, Scope, Limitations and importance – Sales management: meaning, definition, Characteristics, Principles, Functions and importance, Difference between sales management and marketing management.

UNIT II: SALESMAN**9**

Types, Qualities, Objectives, Duties and responsibilities of good salesman, Recruitment, selection and training of salesman: Sources of recruitment, Principles of selection, Selection procedure, Meaning, Advantages, Disadvantages, Methods, Principles and limitation, Subject matter and Types of good training programme.

UNIT III: REMUNERATION/ COMPENSATION**9**

Essentials of Good Remuneration Plan, Objectives – Methods, Factors determining Remuneration Plan, Comparative study of various plans. Motivating sales force: Meaning, Definition, Objectives, Importance and methods.

UNIT IV: SALES PLANNING**9**

Meaning, Components, Elements, Types, Importance and limitations, Sales fields or territories: Meaning, Definition, Objectives, Factors determining Size, Allocation of sales territories, Steps in setting sales territories. Sales quota: Meaning, Definition, Objectives, Factors determining sales quota, Methods of determining sales quota, Types, Principles of successful sales quota, Advantages and disadvantages of sales quota.

UNIT-V: CONSUMER BEHAVIOUR**9**

Meaning, Definition, Variables and factors affecting Consumer behaviour – Buying Motives: Meaning, Kinds, Chief buying motives – Different types of consumers – Behaviour and customer service.

Contact periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

- 1.Santoki, “Sales Management”, Kalyani Publisher 2010.
- 2.Gupta S L., “Sales and Distribution Management”, Excel Books, New Delhi, 2008.
- 3.Still R and Richard, “Sales Management”, Pearson Prentice Hall, Delhi 2007.
- 4.Schiffman, Kanuk and Kumar, “Consumer Behaviour”, Pearson, 10th Edition 2005.
- 5.Kotler and Keller, “Marketing Management”, Pearson Publication 2004.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to

CO1:Understand the concepts for salesmanship.

CO2:Developed knowledge of salesman responsibilities.

CO3:Understand the concepts for remuneration and compensation methods.

CO4:Developed knowledge of sales planning techniques.

CO5: Understand the use of consumer behaviour concepts.

COURSE OBJECTIVES:

- To study the principles, functions and practices adapted in industry for the successful management of maintenance activities.
- To identify the different maintenance categories like Preventive maintenance and Total Productive Maintenance.
- To illustrate some of the simple instruments used for condition monitoring in industry.
- To learn the fundamental components of mechanical systems functions and predict the faulty locations.
- To study the appropriate repair methods and maintaining records.

UNIT I: PRINCIPLES AND PRACTICES OF MAINTENANCE PLANNING 9

Basic principles of maintenance planning – Objectives and principles of planned maintenance – Importance and benefits of sound maintenance systems – Reliability and machine availability – MTBF, MTTR and MWT – Factors of availability – Maintenance organization – Maintenance economics.

UNIT II: MAINTENANCE POLICIES – PREVENTIVE MAINTENANCE 9

Maintenance categories – Comparative merits of each category – Preventive maintenance, maintenance schedules, Repair cycle – Principles and methods of lubrication – TPM.

UNIT III: CONDITION MONITORING 9

Condition monitoring – Cost comparison with and without CM – On-load testing and off-load testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – Wear debris analysis.

UNIT IV: REPAIR METHODS FOR BASIC MACHINE ELEMENTS 9

Repair methods for beds, slide ways, Spindles, Gears, Lead screws and bearings – Failure analysis – Failures and their development – Logical fault location methods – Sequential fault location.

UNIT-V: REPAIR METHODS FOR MATERIAL HANDLING EQUIPMENT 9

Repair methods for material handling equipment – Equipment records – Job order systems – Use of computers in maintenance.

Contact periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

REFERENCES:

1. Bhattacharya S N., “Installation, Servicing and Maintenance”, S. Chand and Co., 2013.
2. Venkataraman K., “Maintenance Engineering and Management”, PHI Learning Pvt. Ltd. 2010.
3. Srivastava S.K., “Industrial Maintenance Management”, - S. Chand and Co., 2006.
4. Higgins L R., Maintenance Engineering Hand book”, McGraw Hill, 5th Edition, 1994.
5. White E N., “Maintenance Planning”, I Documentation, Gower Press, 1979.

6.Garg M R., “Industrial Maintenance”, S. Chand & Co., 1987.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to

CO1: Explain basic principle of maintenance and practices the maintenance in organization and economics.

CO2:Practice the various maintenance policies and the various preventive maintenances.

CO3:Describe various aspects of condition monitoring and able to perform estimationAnalysis.

CO4:Practice various repairs and able to predict the faulty locations.

CO5:Familiarize various methods of repairing material handling equipments.