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.TECH (INFORMATION TECHNOLOGY)

CURRICULA AND SYLLABI

REGULATION

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 emerge as a Centre of Excellence with focus on Education, Research and rapid Technological advancements in the field of Information Technology for the enrichment of society.

Mission of the Department

M1: To strive for viable academic Quality in Information Technology through effective Teaching Learning practices with recent tools and methodologies.

M2: To provide framework for career with competent skill-set for nurturing graduates to be excellent Technocrats, Researchers and Entrepreneurs.

M3: To produce socially and morally responsible IT professionals with ethical values to serve 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.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To empower graduates with a strong mathematical foundation, scientific, engineering and concepts of Information Technology to solve problems by analyzing and designing solutions.

PEO2: To inculcate graduates with qualities like excellent communication skills, teamwork, moral values, ethical conduct and technical excellence for real world challenges.

PEO3: To empower graduates for lifelong learning through innovative activities, advanced technology and higher studies.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: To understand the concepts of theoretical working of computing-machines and their applications in the field of software technology, application and system programming, data analytics, machine learning, networking and other relevant areas.

PSO2: To have an ability to apply knowledge of automation and usage of modern hardware and software tools related to Information Technology for solving complex problems.

PSO3: To have the capability to analyze, comprehend, design and development of computing systems for multi-disciplinary engineering applications with ethical values for societal wellbeing.

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	22CAES302	Digital Principles and Computer Organization	3	0	0	3
3	22CAPC303	Data Structures and Algorithms	3	0	0	3
4	22CAPC304	Object Oriented Programming	3	0	0	3
5	22ITPC305	Foundations of Data Science	3	0	2	4
6	22CAMC306	Constitution of India	3	0	0	0
PRACTICAL						
6	22CAPC307	Data Structures Laboratory	0	0	3	1.5
7	22CAPC308	Object Oriented Programming Laboratory	0	0	3	1.5
		Total	**18**	**1**	**8**	**20**

SEMESTER IV

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	22CABS401	Discrete Mathematics	3	1	0	4
2	22ITPC402	Operating Systems	3	0	0	3
3	22CAPC403	Database Management Systems	3	0	0	3
4	22CAPC404	Object Oriented Software Engineering	3	0	0	3
5	22ITES405	Principles of Communication	3	0	0	3
6	22CAHS306	Environmental Science and Engineering	3	0	0	3
PRACTICAL						
7	22ITPC407	Operating Systems Laboratory	0	0	3	1.5
8	22CAPC408	Database Management Systems Laboratory	0	0	3	1.5
		Total	**18**	**1**	**6**	**22**

SEMESTER V

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	22CAPC503	Computer Networks	3	0	0	3
2	22ITPC501	Full Stack Web Development	3	0	0	3
3	22ITPC502	Artificial Intelligence and Machine Learning	3	0	2	4
4	22ITPC503	Distributed Computing	3	0	0	3
5	PE	Professional Elective - I	3	0	0	3
6	OE	Open Elective	3	0	0	3
PRACTICAL						
7	22CAPC506	Computer Networks Laboratory	0	0	3	1.5
8	22ITPC504	Full Stack Web Development Laboratory	0	0	3	1.5
		Total	**18**	**0**	**8**	**22**

SEMESTER VI

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	22ITPC601	Embedded Systems and IoT	3	0	0	3
2	22CAPC504	Theory of Computation	3	0	0	3
3	22ITPC602	Software Testing and Automation	3	0	0	3
4	PE	Professional Elective - II	3	0	0	3
5	PE	Professional Elective - III	3	0	0	3
6	OE	Open Elective	3	0	0	3
7	22CAMC604	Quantitative and Reasoning Skills	3	0	0	0
PRACTICAL						
8	22ITPC603	Mobile Application Development Laboratory	0	0	3	1.5
9	22ITPC604	Software Testing and Automation Laboratory	0	0	3	1.5
		Total	**18**	**0**	**8**	**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	22ITPC702	Cloud Computing	3	0	0	3
3	22CAHS703	Principles of Management	3	0	0	3
4	PE	Professional Elective - IV	3	0	0	3
5	OE	Open Elective	3	0	0	3
PRACTICAL						
6	22CAPC704	Security Laboratory	0	0	3	1.5
7	22ITPC705	Cloud Computing Laboratory	0	0	3	1.5
8	22ITEE706	Mini Project	0	0	4	2
		Total	**15**	**0**	**10**	**20**

SEMESTER VIII

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	PE	Professional Elective - V	3	0	0	3
2	PE	Professional Elective - VI	3	0	0	3
PRACTICAL						
3	22ITEE801	Project Work	0	0	20	10
		Total	**9**	**0**	**20**	**16**

Total Credits: 21+23+20+22+22+21+20+16=165

PROFESSIONAL ELECTIVE (PE) – I (SEMESTER V)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22ITPE501	Digital Marketing	3	0	0	3
2	22ITPE502	Multimedia and Animation	3	0	0	3
3	22ITPE503	DevOps	3	0	0	3
4	22ITPE504	Business Analytics	3	0	0	3
5	22ITPE505	Probability and Queueing Theory	3	0	0	3
6	22ITPE506	Knowledge Engineering	3	0	0	3

PROFESSIONAL ELECTIVE (PE) – II (SEMESTER VI)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22ITPE601	Digital Signal Processing	3	0	0	3
2	22ITPE602	Soft Computing	3	0	0	3
3	22ITPE603	UI and UX Design	3	0	0	3
4	22ITPE604	Web Application Security	3	0	0	3
5	22ITPE605	Graph Theory and Applications	3	0	0	3
6	22ITPE606	Principles of Programming Languages	3	0	0	3

PROFESSIONAL ELECTIVE (PE) – III (SEMESTER VI)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22ITPE607	Data Mining for Business Intelligence	3	0	0	3
2	22ITPE608	Service Oriented Architecture	3	0	0	3
3	22ITPE609	Numerical Methods	3	0	0	3
4	22ITPE610	Augmented Reality & Virtual Reality	3	0	0	3
5	22ITPE611	Storage Technologies	3	0	0	3
6	22ITPE612	Software Defined Networks	3	0	0	3

PROFESSIONAL ELECTIVE(PE) – IV (SEMESTER VII)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22ITPE701	Cryptocurrency and Blockchain Technologies	3	0	0	3
2	22ITPE702	Digital Image Processing	3	0	0	3
3	22ITPE703	Optimization Techniques	3	0	0	3
4	22ITPE704	Software Project Management	3	0	0	3
5	22ITPE705	Human Computer Interaction	3	0	0	3
6	22ITPE706	Ethical Hacking	3	0	0	3

PROFESSIONAL ELECTIVE(PE) – V (SEMESTER VIII)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22ITPE801	Professional Ethics in Engineering	3	0	0	3
2	22ITPE802	Natural Language Processing	3	0	0	3
3	22ITPE803	Neural Networks and Deep Learning	3	0	0	3
4	22ITPE804	Cyber Security	3	0	0	3
5	22ITPE805	3D Printing and Design	3	0	0	3
6	22ITPE806	Multimedia Data Compression and Storage	3	0	0	3

PROFESSIONAL ELECTIVE(PE) -VI (SEMESTER VIII)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22ITPE807	Information Retrieval Techniques	3	0	0	3
2	22ITPE808	Robotics Process Automation	3	0	0	3
3	22ITPE809	Intellectual Property Rights	3	0	0	3
4	22ITPE810	Cognitive Science	3	0	0	3
5	22ITPE811	Stream Processing	3	0	0	3
6	22ITPE812	Security and Privacy in Cloud	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EE)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22ITEE706	Mini Project	0	0	4	2
2	22ITEE801	Project Work	0	0	20	10

MANDATORY / AUDIT COURSES (AC) (NO - CREDIT)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1	22CAMC306	Constitution of India	3	0	0	0
2	22CAMC604	Quantitative and Reasoning Skills	3	0	0	0

OPEN ELECTIVES (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	22ECOE01	Computational Intelligence	3	0	0	3
12	22ECOE02	Wearable Devices	3	0	0	3
13	22ECOE03	VLSI Testing and Design For Testability	3	0	0	3
14	22ECOE04	IoT Based Systems Design	3	0	0	3
15	22ECOE05	Design Thinking	3	0	0	3
16	22EEOE01	Power Plant Engineering	3	0	0	3
17	22EEOE02	Sensors and Transducers	3	0	0	3
18	22EEOE03	Hybrid Energy Technology	3	0	0	3
19	22EEOE04	Biomedical Instrumentation	3	0	0	3
20	22EEOE05	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	22MEOE01	Testing of Materials	3	0	0	3
27	22MEOE02	Welding Technology	3	0	0	3
28	22MEOE03	Industrial Safety Engineering	3	0	0	3
29	22MEOE04	Marketing Management	3	0	0	3
30	22MEOE05	Maintenance Engineering	3	0	0	3

SUMMARY OF CREDIT DISTRIBUTION

S.No.	Course Work Subject Area	CREDITS PER SEMESTER								Total Credits	% of Credits	Credit Range	
		I	II	III	IV	V	VI	VII	VIII			PA	AICTE
1	**HS**	5	4		3			3		**15**	9.09	**15**	12
2	**BS**	11.5	7	4	4					**26.5**	16.06	**26.5**	25
3	**ES**	4.5	12	3	3					**22.5**	13.63	**22.5**	24
4	**PC**			13	12	16	12	9		**62**	37.57	**62**	48
5	**PE**					3	6	3	6	**18**	10.90	**18**	18
6	**OE**					3	3	3		**9**	5.45	**9**	18
7	**EE**							2	10	**12**	7.27	**12**	15
8	**AC**												-
	Total	**21**	**23**	**20**	**22**	**22**	**21**	**20**	**16**	**165**	100	**165**	165

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 ;
AC – Audit Courses; VA – Value Added Courses

22CAHS101 **PROFESSIONAL ENGLISH - I** **SEMESTER I**

L	T	P	C
3	0	0	3

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.

22CABS102 **MATRICES AND CALCULUS** **SEMESTER I**

L	T	P	C
3	1	0	4

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.

22CABS103 **ENGINEERING PHYSICS** **SEMESTER I**

L	T	P	C
3	0	0	3

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.

22CABS104 ENGINEERING CHEMISTRY SEMESTER I

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on 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 (Tg) – significance - factors affecting Tg, 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.

22CAES105 **C PROGRAMMING** **SEMESTER I**

L	T	P	C
3	0	0	3

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.

22CAHS109 **HERITAGE OF TAMILS** **SEMESTER I**

L	T	P	C
1	0	0	1

UNIT-I: LANGUAGE AND LITERATURE **3**

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

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

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

UNIT-III: FOLK AND MARTIAL ARTS **3**

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

UNIT-IV: THINAI CONCEPT OF TAMILS **3**

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

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

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

TOTAL : 15 PERIODS

REFERENCES:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் 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.

22CAES106 PROGRAMMING IN C LABORATORY SEMESTER I

L	T	P	C
0	0	3	1.5

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.

22CABS107 PHYSICS AND CHEMISTRY LABORATORY SEMESTER I

L	T	P	C
0	0	3	1.5

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.

22CAHS108 COMMUNICATION SKILLS LABORATORY SEMESTER I

L	T	P	C
0	0	2	1

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.

22CAHS201 **PROFESSIONAL ENGLISH - II** **SEMESTER II**

L	T	P	C
3	0	0	3

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 SOVING **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

Vocabulary - Cliches, Redundancies

9

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.

22CABS202 **ADVANCED CALCULUS AND ITS APPLICATIONS** **SEMESTER II**

L	T	P	C
3	1	0	4

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 [$F(p,q) = 0$ 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.

22CAES203 **PYTHON PROGRAMMING** **SEMESTER II**

L	T	P	C
3	0	0	3

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.

22CABS204 PHYSICS FOR INFORMATION SCIENCE SEMESTER II

L	T	P	C
3	0	0	3

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.

22CAES205 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING **SEMESTER II**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To introduce the basics of electric circuits and analysis.
- To impart knowledge in the basics of working principles and application of electrical machines.
- To introduce analog devices and their characteristics.
- To educate on the fundamental concepts of digital electronics.
- To introduce the functional elements and working of measuring instruments.

UNIT I ELECTRICAL CIRCUITS 9

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources – Simple problems.

Introduction to AC Circuits and Parameters: Waveforms, Average value, Value, RMS Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only)

UNIT II ELECTRICAL MACHINES 9

Construction and Working principle - DC Separately and Self-excited Generators, Types – emf Equation and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor.

UNIT III ANALOG ELECTRONICS 9

Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: PN Junction Diodes, Zener Diode – I-V Characteristics - Rectifiers – Bipolar Junction Transistor, JFET, SCR, MOSFET, IGBT – I-V Characteristics - Applications

UNIT IV DIGITAL ELECTRONICS 9

Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions - SOP and POS forms, K-map representations – minimization using K maps (Simple Problems only)**.**

UNIT V MEASUREMENTS AND INSTRUMENTATION 9

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

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

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.

22CAES104 **ENGINEERING GRAPHICS** **SEMESTER II**

L	T	P	C
1	0	4	3

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 3Dobjects.

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.

22CAHS202 TAMILS AND TECHNOLOGY SEMESTER II

L	T	P	C
1	0	0	1

UNIT-I: WEAVING AND CERAMIC TECHNOLOGY 3

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

UNIT -II: DESIGN AND CONSTRUCTION TECHNOLOGY 3

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

UNIT-III: MANUFACTURING TECHNOLOGY 3

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

UNIT-IV: AGRICULTURE AND IRRIGATION TECHNOLOGY 3

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

UNIT-V: SCIENTIFIC TAMIL & TAMIL COMPUTING 3

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

TOTAL : 15 PERIODS

REFERENCES:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் 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.

22CAES107 ENGINEERING PRACTICES LABORATORY SEMESTER II

L	T	P	C
0	0	3	1.5

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.

22CAES206 PYTHON PROGRAMMING LABORATORY SEMESTER II

L	T	P	C
0	0	3	1.5

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.

22CABS301 **TRANSFORM TECHNIQUES AND ITS APPLICATIONS** **SEMESTER III**

L	T	P	C
3	1	0	4

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.

22CAES302 **DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION** SEMESTER III

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand and realize the Boolean postulates using basic gates.
- To acquire knowledge for the design of the combinational circuit and sequential circuit.
- To understand the basic structure and operation of a digital computer.
- To study the design of data path unit, control unit for processor and to familiarize with the hazards.
- To understand the concept of various memories and I/O interfacing.

UNIT-I: BASIC CONCEPTS OF DIGITAL SYSTEMS **9**

Review of Number systems - Number Representation - Boolean algebra - Boolean postulates and laws - De-Morgan's Theorem - Simplifications of Boolean functions using Karnaugh map - Realization of Boolean functions using basic gates.

UNIT-II: COMBINATIONAL & SEQUENTIAL CIRCUITS **9**

Combinational circuits - Design of combinational circuits: Adder, Subtractor , Code Converters, Decoders and Encoders , Multiplexers and Demultiplexers – Sequential Circuits – Flip Flops, Registers, Counters.

UNIT-III: COMPUTER FUNDAMENTALS **9**

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

UNIT-IV: PROCESSOR **9**

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

UNIT-V: MEMORY AND I/O **9**

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

Contact Periods:

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

REFERENECS:

1. M. Morris Mano, Michael D. Ciletti, “Digital Design : With an Introduction to the VerilogHDL, VHDL, and System Verilog”, Sixth Edition, Pearson Education, 2018.
2. David A. Patterson, John L. Hennessy, “Computer Organization and Design, TheHardware/Software Interface”, Sixth Edition, Morgan Kaufmann/Elsevier, 2020.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, “Computer Organizationand Embedded Systems”, Sixth Edition, Tata McGraw-Hill, 2012.
4. William Stallings, “Computer Organization and Architecture – Designing for Performance”,Tenth Edition, Pearson Education, 2016.
5. M. Morris Mano, “Digital Logic and Computer Design”, Pearson Education, 2016.

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

CO1: Simplify Boolean function and realize the logic circuits.
CO2: Design various Combinational and sequential circuits using logic gates.
CO3: State the fundamentals of computer systems and analyze the execution of an instruction
CO4: Analyze different types of control design and identify hazards
CO5: Identify the characteristics of various memory systems and I/O communication

22CAPC303 DATA STRUCTURES AND ALGORITHMS SEMESTER III

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the need of data structures and algorithms
- To understand the concepts of array and list
- To design linear data structures – stacks, and queues
- To understand the concept of tree structures
- To apply Graph structures

UNIT I : INTRODUCTION **9**

Need for Data Structures - Types of Data Structures - Abstract Data Type - Program Development Life Cycle - Algorithms - Characteristics of Algorithms - Recursive Algorithms - Complexity Analysis - Best case and worst-case complexities - Asymptotic notations -Master theorem.

UNIT II : ARRAYS AND LISTS **9**

Array Representation and Operations - Linear Search and Binary Search - Insertion and Bubble Sort - Matrix representation using Multi-dimensional arrays - Linked List Representation - Operations on a Singly Linked List - Types of Linked List - Polynomial Addition - Sparse Matrices.

UNIT III: STACKS AND QUEUES **9**

Stack ADT - Representation and Operations - Expression Handling - Role of Stack in implementing recursive algorithms - Queue ADT - Representation and Operations - Types of Queues - Circular Queue - Deque - Priority Queue.

UNIT IV: TREE STRUCTURES **9**

Terminologies - Binary Tree - Traversal - Expression Trees - Threaded Binary Tree - Binary Heap – Heap Sort - Priority Queue implementation using Binary Heap - Binary Search Tree - B Tree - B+ Tree - Applications - AVL Tree – Trie Structure.

UNIT V: GRAPH STRUCTURES **9**

Hash Table - Hash Functions - Resolving Collisions - Rehashing - GRAPH Terminologies - Types of Graphs - Representation - Breadth First Search - Depth First Search - Topological Sort – Shortest Paths – Minimum spanning tree.

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

REFERENECS:

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, “Data Structures & Algorithms in Python”, An Indian Adaptation, John Wiley & Sons Inc., 2021
2. Lee, Kent D., Hubbard, Steve, “Data Structures and Algorithms with Python” Springer Edition 2015
3. Rance D. Necaise, “Data Structures and Algorithms Using Python”, John Wiley & Sons, 2011

4. Aho, Hopcroft, and Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, “Introduction to Algorithms", Second Edition, McGraw Hill, 2002.
6. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Fourth Edition, Pearson Education, 2014

COURSE OUTCOMES:

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

CO1: Understanding the need of data structures and algorithms
CO2: Understanding the concepts of array and list
CO3: Implement Stack and Queue structures to solve problems.
CO4: Implement and apply trees structures to solve problems.
CO5: Implement and apply graph structures to solve problems.

22CAPC304 OBJECT ORIENTED PROGRAMMING SEMESTER III

L	T	P	C
3	0	0	3

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 should 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.

22ITPC305 FOUNDATIONS OF DATA SCIENCE SEMESTER III

L	T	P	C
3	0	2	4

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.

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 r2 –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.

45 PERIODS

PRACTICAL EXERCISES **30 PERIODS**

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Stats models 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. 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

6. Visualizing Geographic Data with Basemap

Contact Periods:
Lecture: 45 Periods Tutorial: 0 Periods Practical: 30 Periods Total: 75 Periods

REFERENECS:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016.
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.
3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.
4. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

COURSE OUTCOMES:
At the end 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

22CAMC306	CONSTITUTION OF INDIA	SEMESTER III

L	T	P	C
3	0	0	0

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: Organisation, 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.

22CAPC307 DATA STRUCTURES LABORATORY SEMESTER III

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To implement the linear data structures.
- To implement the Nonlinear data structures.
- To implement the sorting and hashing techniques.

LIST OF EXPERIMENTS:

1. Implement simple ADTs as Python classes
2. Implement recursive algorithms in Python
3. Implement List ADT using Python arrays
4. Linked list implementations of List
5. Implementation of Stack and Queue ADTs
6. Applications of List, Stack and Queue ADTs
7. Implementation of sorting and searching algorithms
8. Implementation of Hash tables
9. Tree representation and traversal algorithms
10. Implementation of Binary Search Trees
11. Implementation of Heaps
12. Graph representation and Traversal algorithms
13. Implementation of single source shortest path algorithm
14. Implementation of minimum spanning tree algorithms
15. 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 ADTs as Python classes.

CO2: Design, implement, and analyse linear data structures, such as lists, queues, and stacks, according to the needs of different applications.

CO3: Design, implement, and analyze efficient tree structures to meet requirements such as searching, indexing, and sorting.

CO4: Model problems as graph problems and implement efficient graph algorithms to solve them.

CO5: Develop a mini project using concepts of Data structures

LIST OF EQUIPMENT'S AND COMPONENTS

Lab Requirements: for a batch of 30 students

Operating Systems: Linux / Windows

Front End Tools: Python IDLE / Pycharm / Jupyter Notebook

22CAPC308	OBJECT ORIENTED PROGRAMMING LABORATORY	SEMESTER III

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, array list, 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 timeconvertor.
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, whether 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 should be able to:

CO1: Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.

CO2: Implement Java programs with array list, exception handling and multithreading.

CO3: Design applications using file processing and generic programming.

CO4: Develop and implement java programs using event handling

CO5: Develop a mini projects using java concepts.

LIST OF EQUIPMENT'S AND COMPONENTS

Lab Requirements: for a batch of 30 students

Operating Systems: Linux / Windows

Front End Tools: Eclipse IDE / Netbeans IDE

22CABS401 DISCRETE MATHEMATICS SEMESTER IV

L	T	P	C
3	1	0	4

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.

22ITPC402 **OPERATING SYSTEMS** **SEMESTER IV**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the basic concepts and functions of operating systems.
- To understand Processes and Threads.
- To analyze Scheduling algorithms.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To understand I/O management and File systems.
- 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, Multiple-processor 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.

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

REFERENCES:

1. Abraham Silberschatz, "Peter Baer Galvin and Greg Gagne", "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.
2. Ramaz Elmasri, A. Gil Carrick and David Levine, Operating Systems – A Spiral Approach Tata McGraw Hill Edition, 2010.
3. Achyut S.Godbole and Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.
4. Andrew S. Tanenbaum, "Modern Operating Systems", 2nd Edition, Pearson Education, 2004.
5. Gary Nutt, "Operating Systems", 3rd Edition, Pearson Education, 2004.
6. Harvey M. Deitel, "Operating Systems", 3rd Edition, Pearson Education, 2004.

COURSE OUTCOMES:

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

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

22CAPC403 DATABASE MANAGEMENT SYSTEMS SEMESTER IV

L	T	P	C
3	0	0	3

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

Contact Periods:

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

REFERENCES:

1. Abraham Silberschatz, Henry F. Korth and Sudharshan S., - Database System Concepts, Sixth Edition, Tata McGraw Hill, 2011.
2. RamezElmasri and Shamkant B. Navathe, - Fundamentals of Database Systems, Sixth Edition, Pearson Education, 2011.
3. Raghu Ramakrishnan, - "Database Management Systems", 4th Edition, McGraw-Hill College Publications, 2015.
4. Date C. J, Kannan A and Swamynathan S, - "An Introduction to Database Systems", 8th Edition, Pearson Education, 2006.
5. Gupta G.K., "Database Management Systems", Tata Mc Graw Hill, 2011.
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.

22CAPC404 OBJECT ORIENTED SOFTWARE ENGINEERING SEMESTER IV

L	T	P	C
3	0	0	3

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-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 SchedulingDevOps: 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. Bernd Bruegge and Allen H. Dutoit, “Object-Oriented Software Engineering: Using UML, Patterns and Java”, Third Edition, Pearson Education, 2009.

2. Roger S. Pressman, Object-Oriented Software Engineering: An Agile Unified Methodology, First Edition, Mc Graw-Hill International Edition, 2014.
3. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd edition, PHI Learning Pvt. Ltd., 2010.Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston, "Object Oriented Analysis & Design with Applications, Third Edition, Pearson Education,2010.
4. Len Bass, Ingo Weber and Liming Zhu, "DevOps: A Software Architect's Perspective", Pearson Education, 2016.
5. Stephen Schach, Object-Oriented and Classical Software Engineering, 8th ed, McGrawHill, 2010.

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

22ITES405 PRINCIPLES OF COMMUNICATION SEMESTER IV

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To introduce Analog Modulation Schemes
- To impart knowledge in random process
- To study various Digital techniques
- To introduce the importance of sampling & quantization
- To impart knowledge in demodulation techniques

UNIT I : AMPLITUDE MODULATION 9

Review of signals and systems, Time and Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals. SSB Generation – Filter and Phase Shift Methods, VSB Generation – Filter Method, Hilbert Transform, Pre-envelope & complex envelope AM techniques, Superheterodyne Receiver.

UNIT II : RANDOM PROCESS & SAMPLING 9

Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and Deemphasis, Threshold effect in angle modulation. Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Nyquist criterion- Logarithmic Companding –PAM, PPM, PWM, PCM – TDM, FDM

UNIT III: DIGITAL TECHNIQUES 9

Pulse modulation Differential pulse code modulation. Delta modulation, Noise considerations in PCM,, Digital Multiplexers, Channel coding theorem - Linear Block codes - Hamming codes – Cyclic codes - Convolutional codes - Viterbi Decoder

UNIT IV: DIGITAL MODULATION SCHEME 9

Geometric Representation of signals - Generation, detection, IQ representation, PSD & BER of Coherent BPSK, BFSK, & QPSK - QAM - Carrier Synchronization - Structure of Non-coherent Receivers Synchronization and Carrier Recovery for Digital modulation, Spectrum Analysis – Occupied bandwidth – Adjacent channel power, EVM, Principle of DPSK

UNIT V: DEMODULATION TECHNIQUES 9

Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Baseband Pulse Transmission- Inter symbol Interference, Optimum demodulation of digital signals over band- limited channels.

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

REFERENECS:

1. Simon Haykins," Communication Systems", Wiley, 5th Edition, 2009.
2. B.P.Lathi, "Modern Digital and Analog Communication Systems", 4th Edition, Oxford University Press, 2011.
3. Wayner Tomasi, Electronic Communication System, 5th Edition, Pearson Education,2008.
4. D.Roody, J.Coolen, Electronic Communications, 4th edition PHI 2006
5. A.Papoulis, "Probability, Random variables and Stochastic Processes", McGraw Hill, 3rd edition, 1991.
6. B.Sklar, "Digital Communications Fundamentals and Applications", 2nd Edition Pearson Education 2007.

COURSE OUTCOMES:

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

CO1: Gain knowledge in amplitude modulation techniques
CO2: Understand the concepts of Random Process to the design of communication systems
CO3: Gain knowledge in digital techniques
CO4: Gain knowledge in sampling and quantization
CO5: Understand the importance of demodulation techniques

22CAHS306 **ENVIRONMENTAL SCIENCE AND ENGINEERING** **SEMESTER IV**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To learn about natural resources, exploitation and its conservation.
- To understand the concept of ecosystem and preservation of biodiversity.
- To acquire knowledge about the role of a human being in maintaining a clean and useful environment for the future generation.
- To impart awareness of various social issues affecting the environment.
- To know about population explosion in the environment.

UNIT-I: ENVIRONMENT AND NATURAL RESOURCES **10**

Definition, scope and importance of environment – Forest resources: Use and over exploitation – Deforestation – Dams and their effects on forests and tribal people – Water resources: Use and over utilization of surface and ground water – Mineral resources: Use and over exploitation – Environmental effects of extracting and using mineral resources – Food resources : changes caused by agriculture – Effects of modern agriculture – fertilizer – pesticide problems, water logging, salinity – Energy resources: Growing energy needs, renewable and non-renewable energy sources, Use of alternate energy sources – Role of an individual in conservation of natural resources.

UNIT -II: ECOSYSTEMS AND BIODIVERSITY **10**

Concept of an ecosystem – Structure and function of an ecosystem – Energy flow in the ecosystem – Ecological succession – Food chains, food webs – Forest ecosystem – Introduction to biodiversity – Genetic, species and ecosystem diversity – Value of biodiversity – India as a mega – diversity nation – Hot-spots of biodiversity – Threats to biodiversity – Endangered and endemic species – Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT-III: POLLUTION AND SOLID WASTE MANAGEMENT **10**

Definition – Causes, effects and control measures of – Air pollution, Water pollution, Soil pollution, Marine pollution and Noise pollution – Solid waste management: Causes, Effects and Control measures of municipal solid wastes – Role of an individual in prevention of pollution – Disaster management: Floods, Earthquake, Cyclone and Landslides.

UNIT-IV: SOCIAL ISSUES AND THE ENVIRONMENT **8**

From unsustainable to sustainable development – Urban problems related to energy – Water conservation – Rain water harvesting – Watershed management – Resettlement and rehabilitation of people – Climate change – Global warming – Acid rain – Ozone layer depletion, Nuclear accidents and holocaust – Consumerism and waste products – 12 principles of green chemistry – Environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Forest conservation act.

UNIT-V: HUMAN POPULATION AND THE ENVIRONMENT **7**

Population growth, variation among nations – Population explosion – Family welfare programme – Environment and human health – Human rights – Value education – HIV / AIDS – Women and child welfare – Environmental impact assessment (EIA) – GIS – Remote sensing – Role of information technology in environment protection and human

health.

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

REFERENCES:

1. Deswal.S and Deswal.A, "A Basic Course in Environmental Studies", Dhanpat Rai & Co (P) Ltd, New Delhi, 2021.
2. Anubha Kaushik and C.P.Kaushik, "Perspectives in Environmental Studies", Sixth edition, New Age International Publishers, New Delhi, 2019.
3. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2016.
4. Erach Bharucha, "Textbook of Environmental Studies", Universities Press (I) Pvt. Ltd., Hyderabad, 2015
5. Tyler. G Miller and Scott E. Spoolman, Environmental Science, Cengage Learning India PVT, LTD, Delhi, 2014.
6. Gilbert M. Masters and Wendell P.Ela "Introduction to Environmental Engineering and Science", Third Edition, Pearson Education, 2013.

COURSE OUTCOMES:

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

CO1: Develop an understanding of different types of natural resources
CO2: Realise the importance of ecosystem and biodiversity for maintaining ecological balance.
CO3: Create awareness about environmental pollution and role of human being in environmental protection.
CO4: Gain adequate knowledge about the social issues of the environment and solutions to solve the issues.
CO5: Understand the population explosion and current technology to protect the environment and human health.

22ITPC407 OPERATING SYSTEMS LABORATORY SEMESTER IV

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To learn Unix commands and shell programming.
- To implement various CPU Scheduling Algorithms.
- To implement Process Creation and Inter Process Communication.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms.
- To implement Page Replacement Algorithms.
- To implement File Organization and File Allocation Strategies.

LIST OF EXPERIMENTS:

1. Basics of UNIX commands
2. Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir
3. Write C programs to simulate UNIX commands like cp, ls, grep, etc.
4. Shell Programming
5. Write C programs to implement the various CPU Scheduling Algorithms
6. Implementation of Semaphores
7. Implementation of Shared memory and IPC
8. Bankers Algorithm for Deadlock Avoidance
9. Implementation of Deadlock Detection Algorithm
10. Write C program to implement Threading & Synchronization Applications
11. Implementation of the following Memory Allocation Methods for fixed partition
    i. First Fit ii. Worst Fit iii. Best Fit
12. Implementation of Paging Technique of Memory Management
13. Implementation of the following Page Replacement Algorithms FIFO, LRU, LFU
14. Implementation of the various File Organization Techniques
15. Implementation of the following File Allocation Strategies
    i. Sequential ii. Indexed iii. Linked

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: Compare the performance of various CPU Scheduling Algorithms.
CO2: Implement Deadlock avoidance and Detection Algorithms.
CO3: Implement Semaphores and Create processes and implement IPC.
CO4: Analyze the performance of the various Page Replacement Algorithms.
CO5: Implement File Organization and File Allocation Strategies.

LIST OF EQUIPMENT'S AND COMPONENTS

- Standalone desktops with C /C++ /Java/Equivalent complier
  (or)
  Server with C /C++ /Java /Equivalent complier supporting

22CAPC408	DATABASE MANAGEMENT SYSTEMS LABORATORY	SEMESTER IV

L	T	P	C
0	0	3	1.5

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 front end 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. 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 should 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/ PostgreSQL / DB2 or Equivalent

22CAPC503 COMPUTER NETWORKS SEMESTER V

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the protocol layering and physical level communication.
- To analyse the performance of a network.
- To understand 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.

22ITPC501 FULL STACK WEB DEVELOPMENT SEMESTER V

L	T	P	C
3	0	0	3

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

REFERENECS:

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

6. https://www.coursera.org/specializations/full-stack-react

COURSE OUTCOMES:

At the end of this course, the students will 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

22ITPC502	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	SEMESTER V

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To study about uninformed and Heuristic search techniques.
- To learn techniques for reasoning under uncertainty
- To introduce Machine Learning and supervised learning algorithms
- To study about ensembling and unsupervised learning algorithms
- To 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 **7**

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 **11**

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: 30 Periods Total: 75 Periods

Practical Exercises:

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

REFERENECS:

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. Christopher M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006.

COURSE OUTCOMES:

At the end 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: Build ensembling and unsupervised models
CO5: Build deep learning neural network models

22ITPC503 DISTRIBUTED COMPUTING SEMESTER V

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To introduce the computation and communication models of distributed systems
- To illustrate the issues of synchronization and collection of information in distributed systems
- To describe distributed mutual exclusion and distributed deadlock detection techniques
- To elucidate agreement protocols and fault tolerance mechanisms in distributed systems
- To explain the cloud computing models and the underlying concepts

UNIT I : INTRODUCTION **9**

Introduction: Definition-Relation to Computer System Components – Motivation – 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 of a Distributed System.

UNIT II : LOGICAL TIME AND GLOBAL STATE **9**

Logical Time: Physical Clock Synchronization: NTP – A Framework for a System of Logical Clocks – Scalar Time – Vector Time; Message Ordering and Group Communication: Message Ordering Paradigms – Asynchronous Execution with Synchronous Communication – Synchronous Program Order on Asynchronous System – Group Communication – Causal Order – Total Order; Global State and Snapshot Recording Algorithms: Introduction – System Model and Definitions – Snapshot Algorithms for FIFO Channels.

UNIT III: DISTRIBUTED MUTEX AND DEADLOCK **9**

Distributed Mutual exclusion Algorithms: Introduction – Preliminaries – Lamport's algorithm – Ricart- Agrawala's Algorithm — Token-Based Algorithms – Suzuki-Kasami's Broadcast Algorithm; Deadlock Detection in Distributed Systems: Introduction – System Model – Preliminaries – Models of Deadlocks – Chandy-Misra-Haas Algorithm for the AND model and OR Model.

UNIT IV: CONSENSUS AND RECOVERY **9**

Consensus and Agreement Algorithms: Problem Definition – Overview of Results – Agreement in a Failure-Free System(Synchronous and Asynchronous) – Agreement in Synchronous Systems with Failures; Checkpointing and Rollback Recovery: Introduction – Background and Definitions – Issues in Failure Recovery – Checkpoint-based Recovery – Coordinated Checkpointing Algorithm -- Algorithm for Asynchronous Checkpointing and Recovery

UNIT V: CLOUD COMPUTING **9**

Definition of Cloud Computing – Characteristics of Cloud – Cloud Deployment Models – Cloud Service Models – Driving Factors and Challenges of Cloud – Virtualization – Load Balancing – Scalability and Elasticity – Replication – Monitoring – Cloud Services and Platforms: Compute Services – Storage Services – Application Services

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

REFERENECS:

Arshdeep Bagga, Vijay Madisetti, " Cloud Computing: A Hands-On Approach", Universities Press, 2014.

1.
2. Kshemkalyani Ajay D, Mukesh Singhal, "Distributed Computing: Principles, Algorithms and Systems", Cambridge Press, 2011.
3. Mukesh Singhal, Niranjan G Shivaratri, "Advanced Concepts in Operating systems", McGraw Hill Publishers, 1994.
4. George Coulouris, Jean Dollimore, Time Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.
5. Pradeep L Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007
6. Tanenbaum A S, Van Steen M, "Distributed Systems: Principles and Paradigms", Pearson Education, 2007.

COURSE OUTCOMES:

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

CO1: Explain the foundations of distributed systems
CO2: Solve synchronization and state consistency problems
CO3: Use resource sharing techniques in distributed systems
CO4: Apply working model of consensus and reliability of distributed systems
CO5: Explain the fundamentals of cloud computing

22CAPC506 COMPUTER NETWORKS LABORATORY SEMESTER V

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To learn and use network commands.
- To learn socket programming.
- To implement and analyze various network protocols.
- To learn 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.

22ITPC504 FULL STACK WEB DEVELOPMENT LAB SEMESTER V

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To develop full stack applications with clear understanding of user interface, business logic and data storage.
- To design and develop user interface screens for a given scenario
- To develop the functionalities as web components as per the requirements
- To implement the database according to the functional requirements
- To integrate the user interface with the functionalities and data storage.

LIST OF EXPERIMENTS:

1. Develop a portfolio website for yourself which gives details about yourself for a potential recruiter.
2. Create a web application to manage the TO-DO list of users, where users can login and manage their to-do items
3. Create a simple micro blogging application (like twitter) that allows people to post their content which can be viewed by people who follow them.
4. Create a food delivery website where users can order food from a particular restaurant listed in the website.
5. Develop a classifieds web application to buy and sell used products.
6. Develop a leave management system for an organization where users can apply different types of leaves such as casual leave and medical leave. They also can view the available number of days.
7. Develop a simple dashboard for project management where the statuses of various tasks are available. New tasks can be added and the status of existing tasks can be changed among Pending, InProgress or Completed.
8. Develop an online survey application where a collection of questions is available and users are asked to answer any random 5 questions.

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: Design full stack applications with clear understanding of user interface, business logic and data storage.
CO2: Design and develop user interface screens
CO3: Implement the functional requirements using appropriate tool
CO4: Design and develop database based on the requirements
CO5: Integrate all the necessary components of the application

LIST OF EQUIPMENT'S AND COMPONENTS

- Software Required – Javascript / Python IDE / Equivalent web components like React, Angular, Node.js server, Express.js, MongoDB, Visual Studio
- Hardware Required – Standalone desktops 30 Nos.

22ITPC601 EMBEDDED SYSTEMS AND IOT SEMESTER VI

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To learn the internal architecture and programming of an embedded processor.
- To introduce interfacing I/O devices to the processor.
- To introduce the evolution of the Internet of Things (IoT).
- To build a small low-cost embedded and IoT system using Arduino/Raspberry Pi/ open platform.
- To apply the concept of Internet of Things in real world scenario.

UNIT I : 8-BIT EMBEDDED PROCESSOR **9**

8-Bit Microcontroller – Architecture – Instruction Set and Programming – Programming Parallel Ports – Timers and Serial Port – Interrupt Handling.

UNIT II : EMBEDDED C PROGRAMMING **9**

Memory And I/O Devices Interfacing – Programming Embedded Systems in C – Need For RTOS – Multiple Tasks and Processes – Context Switching – Priority Based Scheduling Policies.

UNIT III: IOT AND ARDUINO PROGRAMMING **9**

Introduction to the Concept of IoT Devices – IoT Devices Versus Computers – IoT Configurations – Basic Components – Introduction to Arduino – Types of Arduino – Arduino Toolchain – Arduino Programming Structure – Sketches – Pins – Input/Output From Pins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators with Arduino.

UNIT IV: IOT COMMUNICATION AND OPEN PLATFORMS **9**

IoT Communication Models and APIs – IoT Communication Protocols – Bluetooth – WiFi – ZigBee – GPS – GSM modules – Open Platform (like Raspberry Pi) – Architecture – Programming – Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud.

UNIT V: APPLICATIONS DEVELOPMENT **9**

Complete Design of Embedded Systems – Development of IoT Applications – Home Automation – Smart Agriculture – Smart Cities – Smart Healthcare.

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

REFERENECS:

1. Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, “The 8051 Microcontroller and Embedded Systems”, Pearson Education, Second Edition, 2014
2. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, CISCO Press, 2017.
3. Michael J. Pont, “Embedded C”, Pearson Education, 2007.

4. Wayne Wolf, “Computers as Components: Principles of Embedded Computer System Design”, Elsevier, 2006.
5. Andrew N Sloss, D. Symes, C. Wright, “Arm System Developer's Guide”, Morgan Kauffman/ Elsevier, 2006.
6. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015

COURSE OUTCOMES:

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

CO1: Explain the architecture of embedded processors.
CO2: Write embedded C programs.
CO3: Design simple embedded applications.
CO4: Compare the communication models in IOT
CO5: Design IoT applications using Arduino/Raspberry Pi /open platform.

22CAPC504 THEORY OF COMPUTATION SEMESTER VI

L	T	P	C
3	0	0	3

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.

22ITPC602 SOFTWARE TESTING AND AUTOMATION SEMESTER VI

L	T	P	C
3	0	0	3

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**

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

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 Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports.

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

REFERENECS:

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

COURSE OUTCOMES:

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

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

22CAMC604 QUANTITATIVE AND REASONING SKILLS SEMESTER VI

L	T	P	C
3	0	0	0

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

22ITPC603 **MOBILE APPLICATIONS DEVELOPMENT LABORATORY** **SEMESTER VI**

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- Use of Android Studio/Flutter/Kotlin multi-platform environment for building cross-platform mobile applications.
- Demonstrate the knowledge of different programming techniques and patterns for mobile application development.
- Identify the components and structure of mobile application development frameworks.
- Understand the capabilities and limitations of different platforms.
- Design and develop real-time mobile applications.

LIST OF EXPERIMENTS:

1. Study and installation of Flutter/Kotlin/Android Studio multi-platform environment
2. Develop an application that uses Widgets, GUI components, Fonts, and Colors.
3. Develop a native calculator application.
4. Develop a gaming application that uses 2-D animations and gestures.
5. Develop a movie rating application (similar to IMDB)
6. Develop an application to connect to a web service and to retrieve data with HTTP.
7. Develop a simple shopping application.
8. Design a web server supporting push notifications.
9. Develop an application by integrating Google maps
10. Mini Projects involving Android Studio/Flutter/Kotlin multi-platform

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: Design and build simple mobile applications supporting multiple platforms.
CO2: Apply various programming techniques and patterns to build mobile applications.
CO3: Use Components of development frameworks.
CO4: Build gaming and multimedia based mobile applications
CO5: Build real-time mobile applications for society/environment

LIST OF EQUIPMENT'S AND COMPONENTS

- Software Required – Flutter / Kotlin / Android Studio equivalent.
- Hardware Required – Standalone desktops 30 Nos.

22ITPC604	SOFTWARE TESTING AND AUTOMATION LABORATORY	SEMESTER VI			
		L	T	P	C
		0	0	3	1.5

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

LIST OF EXPERIMENTS:

1. Develop the test plan for testing an e-commerce web/mobile application (www.amazon.in).
2. Design the test cases for testing the e-commerce application
3. Test the e-commerce application and report the defects in it.
4. Develop the test plan and design the test cases for an inventory control system.
5. Execute the test cases against a client server or desktop application and identify the defects.
6. Test the performance of the e-commerce application.
7. Automate the testing of e-commerce applications using Selenium.
8. Integrate TestNG with the above test automation.
9. Mini Project:
10. Build a data-driven framework using Selenium and TestNG
11. Build Page object Model using Selenium and TestNG
12. Build BDD framework with Selenium, TestNG and Cucumber

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: Understand the basic concepts of software testing and the need for software testing
CO2: Design Test planning and different activities involved in test planning
CO3: Design effective test cases that can uncover critical defects in the application
CO4: Carry out advanced types of testing
CO5: Automate the software testing using Selenium and TestNG

LIST OF EQUIPMENT'S AND COMPONENTS

- Software Required – Selenium / TestNG / Load Runner / Cucumber / equivalent.
- Hardware Required – Standalone desktops 30 Nos.

22CAPC701 CRYPTOGRAPHY AND NETWORK SECURITY SEMESTER VII

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand number theory used for network security.
- 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.

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.

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.

22ITPC702 CLOUD COMPUTING SEMESTER VII

L	T	P	C
3	0	0	3

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

Google App Engine – Amazon AWS – Microsoft Azure; 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.

22CAHS703 PRINCIPLES OF MANAGEMENT SEMESTER VII

L	T	P	C
3	0	0	3

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.

22CAPC704 **SECURITY LABORATORY** **SEMESTER VII**

L	T	P	C
0	0	3	1.5

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:

13. Perform encryption, decryption using the following substitution techniques
    i. Ceaser cipher
    ii. Playfair cipher
    iii. Hill Cipher
    iv. Vigenere cipher
14. Perform encryption and decryption using following transposition techniques
    i. Rail fence
    ii. Row & Column Transformation
15. Apply DES algorithm for practical applications
16. Apply AES algorithm for practical applications
17. Implement RSA Algorithm using HTML and JavaScript
18. Implement the Diffie-Hellman Key Exchange algorithm for a given problem
19. Calculate the message digest of a text using the SHA-1 algorithm
20. Implement the SIGNATURE SCHEME – Digital Signature Standard
21. Demonstrate Intrusion Detection System (IDS) using any tool eg. Snort or any other s/w
22. Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool
23. 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.

22ITPC705 CLOUD COMPUTING LABORATORY SEMESTER VII

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To Explore about virtualization Infrastructure.
- To explore and experiment with various Cloud deployment environments.
- To learn about the security issues in the cloud environment.

LIST OF EXPERIMENTS:

1. Install Virtualbox/VMware/ Equivalent open source cloud Workstation with different flavours of Linux or Windows OS on top of windows 8 and above.
2. Install a C compiler in the virtual machine created using a virtual box and execute Simple Programs
3. Install Google App Engine. Create a hello world app and other simple web applications using python/java.
4. Use the GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Install Hadoop single node cluster and run simple applications like wordcount.
8. Creating and Executing Your First Container Using Docker.
9. Run a Container from Docker Hub

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: Understand the design challenges in the cloud.
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.

LIST OF EQUIPMENT'S AND COMPONENTS

- Software: Vmware, Cloudsim, GAE Launcher Docker, python/java or Equivalent.
- Hardware: Standalone desktops – 30 Nos. (or) Server supporting 30 terminals or more.

22ITEE706 **MINI PROJECT** **SEMESTER VII**

L	T	P	C
0	0	4	2

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.

22ITEE801 **PROJECT WORK** **SEMESTER VIII**

L	T	P	C
0	0	20	10

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: 300 Periods Total: 300 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)

22ITPE501 DIGITAL MARKETING SEMESTER V

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- The primary objective of this course is to examine and explore the role and importance of digital marketing in today's rapidly changing business environment.
- It also focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.

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

REFERENCES:

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: Pearson Education; First edition (July 2017);ISBN-10: 933258737X;ISBN-13: 978-9332587373.
2. Digital Marketing by Vandana Ahuja ;Publisher: Oxford University Press (April 2015). ISBN-10: 0199455449
3. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler;Publisher: Wiley; 1st edition (April 2017); ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN: 8126566930.
4. Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited..
5. Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South-Western ,Cengage Learning.
6. Pulizzi,J Beginner's Guide to Digital Marketing , Mcgraw Hill Education

COURSE OUTCOMES:

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

CO1: To examine and explore the role and importance of digital marketing in today's rapidly changing business environment.

CO2: To focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.

CO3: To know the key elements of a digital marketing strategy.

CO4: To study how the effectiveness of a digital marketing campaign can be measured.

CO5: To demonstrate advanced practical.

22ITPE502 MULTIMEDIA AND ANIMATION SEMESTER V

L	T	P	C
3	0	0	3

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 AUTHORING 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: Key frame- 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

REFERENCES:

1. Ze-Nian Li, Mark S. Drew, Jiangchuan Liu, Fundamentals of Multimedia", Third Edition, Springer Texts in Computer Science, 2021.
2. ohn 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. Rick parent, "Computer Animation: Algorithms and Techniques", Morgan Kauffman, 3rd Edition, 2012.
7. https://opensource.com/article/18/2/open-source-audio-visual-production-tools

8. https://developer.android.com/training/animation/overview

COURSE OUTCOMES:

Upon successful completion of the course, students should 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, 21/2 D, 3D applications.
CO5: Understand the complexity of multimedia applications in the context of cloud, security, bigdata streaming, social networking, CBIR etc.,

22ITPE503 **DEVOPS** **SEMESTER V**

L	T	P	C
3	0	0	3

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**

REFERENCES:

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: CICD Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: (English Edition) January 2020
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. Mariot Tsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer", Second

Edition, 2019.
7. https://www.jenkins.io/user-handbook.pdf
8. https://maven.apache.org/guides/getting-started/

COURSE OUTCOMES:

Upon successful completion of the course, students should 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.

22ITPE504 **BUSINESS ANALYTICS** **SEMESTER V**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the Analytics Life Cycle.
- To comprehend the process of acquiring Business Intelligence.
- To understand various types of analytics for Business Forecasting.
- To model the supply chain management for Analytics.
- To apply analytics for different functions of a business.

UNIT-I: INTRODUCTION TO BUSINESS ANALYTICS **9**

Analytics and Data Science – Analytics Life Cycle – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modeling – Validation and Evaluation – Interpretation – Deployment and Iteration

UNIT-II: BUSINESS INTELLIGENCE **9**

Data Warehouses and Data Mart - Knowledge Management –Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence –OLAP – Analytic functions

UNIT-III: BUSINESS FORECASTING **9**

Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models Data Mining and Predictive Analysis Modelling –Machine Learning for Predictive analytics

UNIT-IV: HR & SUPPLY CHAIN ANALYTICS **9**

Human Resources – Planning and Recruitment – Training and Development - Supply chain network - Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain - Applying HR Analytics to make a prediction of the demand for hourly employees for a year

UNIT-V: MARKETING & SALES ANALYTICS **9**

Marketing Strategy, Marketing Mix, Customer Behaviour- selling Process – Sales Planning – Analytics applications in Marketing and Sales - predictive analytics for customers' behaviour in marketing and sales

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

REFERENCES:

1. R. Evans James, Business Analytics, 2nd Edition, Pearson, 2017.
2. R N Prasad, Seema Acharya, Fundamentals of Business Analytics, 2nd Edition, Wiley, 2016.
3. Philip Kotler and Kevin Keller, Marketing Management, 15th edition, PHI, 2016.
4. VSP RAO, Human Resource Management, 3rd Edition, Excel Books, 2010.
5. Mahadevan B, "Operations Management -Theory and Practice",3rd Edition, Pearson Education,2018.
6. U. Dinesh Kumar, "Business Analytics: The Science of Data-Driven Decision Making", Wiley, First Edition, 2017.

COURSE OUTCOMES:

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

CO1: Explain the real world business problems and model with analytical solutions.
CO2: Identify the business processes for extracting Business Intelligence.
CO3: Apply predictive analytics for business fore-casting.
CO4: Apply analytics for supply chain and logistics management.
CO5: Use analytics for marketing and sales.

22ITPE505 PROBABILITY AND QUEUEING THEORY SEMESTER V

L	T	P	C
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COURSE OBJECTIVES:

- To understand the concepts of probability and random variables.
- To know about some standard distributions and their properties.
- To understand the basic concepts of two dimensional random variables applicable to engineering which can describe real life phenomenon.
- To be familiar with the basic concepts of random processes.
- To understand the concepts of queueing models.

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: RANDOM PROCESSES 9+3

Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.

UNIT-V: QUEUEING MODELS 9+3

Markovian queues – Birth and death processes – Single and multiple server queueing models – Little's formula - Queues with finite waiting rooms.

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

REFERENCES:

1. Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., ―Fundamentals of Queueing Theory", Wiley Student 5th Edition, 2018.
2. Ibe, O.C., ―Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
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. Taha, H.A., "Operations Research", 10th Edition, Pearson India Education Services, Delhi, 2019.
5. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2018.
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 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 random processes in engineering disciplines.

CO5: Acquire skills in analyzing queueing models.

22ITPE506 KNOWLEDGE ENGINEERING SEMESTER V

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Knowledge Engineering.
- To discuss methodologies and modeling for Agent Design and Development.
- To design and develop ontologies.
- To apply reasoning with ontologies and rules.
- To understand learning and rule learning.

UNIT-I: REASONING UNDER UNCERTAINTY 9

Introduction – Abductive reasoning – Probabilistic reasoning: Enumerative Probabilities – Subjective Bayesian view – Belief Functions – Baconian Probability – Fuzzy Probability – Uncertainty methods - Evidence-based reasoning – Intelligent Agent – Mixed-Initiative Reasoning – Knowledge Engineering.

UNIT-II: METHODOLOGY AND MODELING 9

Conventional Design and Development – Development tools and Reusable Ontologies – Agent Design and Development using Learning Technology – Problem Solving through Analysis and Synthesis – Inquiry-driven Analysis and Synthesis – Evidence-based Assessment – Believability Assessment – Drill-Down Analysis, Assumption-based Reasoning, and What-If Scenarios.

UNIT-III: ONTOLOGIES – DESIGN AND DEVELOPMENT 9

Concepts and Instances – Generalization Hierarchies – Object Features – Defining Features – Representation – Transitivity – Inheritance – Concepts as Feature Values – Ontology Matching. Design and Development Methodologies – Steps in Ontology Development – Domain Understanding and Concept Elicitation – Modelling-based Ontology Specification.

UNIT-IV: REASONIING WITH ONTOLOGIES AND RULES 9

Production System Architecture – Complex Ontology-based Concepts – Reduction and Synthesis rules and the Inference Engine – Evidence-based hypothesis analysis – Rule and Ontology Matching – Partially Learned Knowledge – Reasoning with Partially Learned Knowledge.

UNIT-V: LEARNING AND RULE LEARNING 9

Machine Learning – Concepts – Generalization and Specialization Rules – Types – Formal definition of Generalization. Modelling, Learning and Problem Solving – Rule learning and Refinement – Overview – Rule Generation and Analysis – Hypothesis Learning.

Contact Periods:

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

REFERENCES:

1. Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning, Cambridge University Press, First Edition, 2016.
2. Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.
3. Ela Kumar, Knowledge Engineering, I K International Publisher House, 2018.
4. John F. Sowa: Knowledge Representation: Logical, Philosophical, and Computational Foundations, Brooks/Cole, Thomson Learning, 2000.
5. King, Knowledge Management and Organizational Learning, Springer, 2009.
6. Jay Liebowitz, Knowledge Management Learning from Knowledge Engineering, 1st Edition,2001.

COURSE OUTCOMES:

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

CO1: Understand the basics of Knowledge Engineering.
CO2: Apply methodologies and modelling for Agent Design and Development.
CO3: Design and develop ontologies.
CO4: Apply reasoning with ontologies and rules.
CO5: Understand learning and rule learning.

PROFESSIONAL ELECTIVE(PE) – II (SEMESTER VI)

		SEMESTER VI			
22ITPE601	**DIGITAL SIGNAL PROCESSING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

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 BRF) 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 BRF) 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.

22ITPE602	SOFT COMPUTING	SEMESTER VI

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.
- To provide the mathematical background for carrying out the optimization associated with neural network learning
- To learn various evolutionary Algorithms.
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems.
- To introduce case studies utilizing the above and illustrate the Intelligent behavior of programs based on soft computing

UNIT I : INTRODUCTION TO SOFT COMPUTING AND FUZZY LOGIC **9**

Introduction - Fuzzy Logic - Fuzzy Sets, Fuzzy Membership Functions, Operations on Fuzzy Sets, Fuzzy Relations, Operations on Fuzzy Relations, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems

UNIT II : NEURAL NETWORKS **9**

Supervised Learning Neural Networks – Perceptrons - Backpropagation -Multilayer Perceptrons – Unsupervised Learning Neural Networks – Kohonen Self-Organizing Networks

UNIT III: GENETIC ALGORITHMS **9**

Chromosome Encoding Schemes -Population initialization and selection methods – Evaluation function - Genetic operators- Cross over – Mutation - Fitness Function – Maximizing function

UNIT IV: NEURO FUZZY MODELING **9**

ANFIS architecture – hybrid learning – ANFIS as universal approximator – Coactive Neuro fuzzy modeling – Framework – Neuron functions for adaptive networks – Neuro fuzzy spectrum - Analysis of Adaptive Learning Capability

UNIT V: APPLICATIONS **9**

Modeling a two input sine function - Printed Character Recognition – Fuzzy filtered neural networks – Plasma Spectrum Analysis – Hand written neural recognition - Soft Computing for Color Recipe Prediction.

Contact Periods:

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

REFERENECS:

1. Himanshu Singh, Yunis Ahmad Lone, Deep Neuro-Fuzzy Systems with Python With Case Studies and Applications from the Industry, Apress, 2020
2. S.N. Sivanandam, S.N. Deepa, Principles of Soft Computing, Third Edition, Wiley India pvt Ltd, 2019.
3. Roj Kaushik and Sunita Tiwari, Soft Computing-Fundamentals Techniques and Applications, 1st Edition, McGraw Hill, 2018.
4. SaJANG, J.-S. R., SUN, C.-T., & MIZUTANI, E. (1997). Neuro-fuzzy and soft computing: A computational approach to learning and machine intelligence. Upper Saddle River, NJ, Prentice Hall,1997
5. Samir Roy, Udit Chakraborthy, Introduction to Soft Computing, Neuro Fuzzy and Genetic Algorithms, Pearson Education, 2013.
6. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996

COURSE OUTCOMES:

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

CO1: Understand the fundamentals of fuzzy logic operators and inference mechanisms
CO2: Understand neural network architecture for AI applications such as classification and clustering
CO3: Learn the functionality of Genetic Algorithms in Optimization problems
CO4: Use hybrid techniques involving Neural networks and Fuzzy logic
CO5: Apply soft computing techniques in real world applications

22ITPE603	UI AND UX DESIGN	SEMESTER VI

L	T	P	C
3	0	0	3

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

REFERENECS:

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” 3 rd 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”, Third Edition, 2015
6. https://www.interaction-design.org/literature.

COURSE OUTCOMES:

At the end of this course, the students will 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

22ITPE604 WEB APPLICATION SECURITY SEMESTER VI

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the fundamentals of web application security
- To focus on wide aspects of secure development and deployment of web applications
- To learn how to build secure APIs
- To learn the basics of vulnerability assessment and penetration testing
- To get an insight about Hacking techniques and Tools

UNIT I : FUNDAMENTALS OF WEB APPLICATION SECURITY **9**

The history of Software Security-Recognizing Web Application Security Threats, Web Application Security, Authentication and Authorization, Secure Socket layer, Transport layer Security, Session Management-Input Validation

UNIT II : SECURE DEVELOPMENT AND DEPLOYMENT **9**

Web Applications Security - Security Testing, Security Incident Response Planning, The Microsoft Security Development Lifecycle (SDL), OWASP Comprehensive Lightweight Application Security Process (CLASP), The Software Assurance Maturity Model (SAMM)

UNIT III: SECURE API DEVELOPMENT **9**

API Security- Session Cookies, Token Based Authentication, Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability, Encryption, Audit logging, Securing service-to-service APIs: API Keys , OAuth2, Securing Microservice APIs: Service Mesh, Locking Down Network Connections, Securing Incoming Requests.

UNIT IV: VULNERABILITY ASSESSMENT AND PENETRATION TESTING **9**

Vulnerability Assessment Lifecycle, Vulnerability Assessment Tools: Cloud-based vulnerability scanners, Host-based vulnerability scanners, Network-based vulnerability scanners, Database based vulnerability scanners, Types of Penetration Tests: External Testing, Web Application Testing, Internal Penetration Testing, SSID or Wireless Testing, Mobile Application Testing.

UNIT V: HACKING TECHNIQUES AND TOOLS **9**

Social Engineering, Injection, Cross-Site Scripting(XSS), Broken Authentication and Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite.

Contact Periods:

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

REFERENECS:

1. Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Applications, First Edition, 2020, O'Reilly Media, Inc.
2. Bryan Sullivan, Vincent Liu, Web Application Security: A Beginners Guide, 2012, The McGraw-Hill Companies.
3. Neil Madden, API Security in Action, 2020, Manning Publications Co., NY, USA.
4. Michael Cross, Developer's Guide to Web Application Security, 2007, Syngress Publishing, Inc.
5. Ravi Das and Greg Johnson, Testing and Securing Web Applications, 2021, Taylor & Francis Group, LLC.
6. Prabath Siriwardena, Advanced API Security, 2020, Apress Media LLC, USA.
7. Malcom McDonald, Web Security for Developers, 2020, No Starch Press, Inc.

COURSE OUTCOMES:

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

CO1: Understanding the basic concepts of web application security and the need for it

CO2: Be acquainted with the process for secure development and deployment of web applications

CO3: Acquire the skill to design and develop Secure Web Applications that use Secure APIs

CO4: Be able to get the importance of carrying out vulnerability assessment and penetration testing

CO5: Acquire the skill to think like a hacker and to use hackers tool sets

22ITPE605 GRAPH THEORY AND APPLICATIONS SEMESTER VI

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the graph models and basic concepts of graphs.
- To study the characterization and properties of trees and graph connectivity.
- To provide an exposure to the Eulerian and Hamiltonian graphs.
- To introduce Graph colouring and explain its significance.
- To provide an understanding of Optimization Graph Algorithms.

UNIT I : INTRODUCTION TO GRAPHS **9**

Graphs and Graph Models – Connected graphs – Common classes of graphs – Multi graphs and Digraphs – Degree of a vertex – Degree Sequence – Graphs and Matrices – Isomorphism of graphs.

UNIT II : TREES AND CONNECTIVITY **9**

Bridges – Trees – Characterization and properties of trees – Cut vertices – Connectivity.

UNIT III: TRAVERSABILITY **9**

Eulerian graphs – Characterization of Eulerian graphs – Hamiltonian graphs – Necessary condition for Hamiltonian graphs – Sufficient condition for Hamiltonian graphs.

UNIT IV: PLANARITY AND COLOURING **9**

Planar Graphs – The Euler Identity – Non planar Graphs – Vertex Colouring – Lower and Upper bounds of chromatic number.

UNIT V: OPTIMIZATION GRAPH ALGORITHMS **9**

Dijkstra's shortest path algorithm – Kruskal's and Prim's minimum spanning tree algorithms – Transport Network – The Max-Flow Min-Cut Theorem – The Labeling Procedure – Maximum flow problem.

Contact Periods:

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

REFERENECS:

1. Gary Chatrand and Ping Zhang, "Introduction to Graph Theory", Tata McGraw – Hill companies Inc., New York, 2006.
2. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics, An applied introduction" Fifth edition, Pearson Education, Inc, Singapore, 2004.
3. Balakrishnan R. and Ranganathan K., "A Text Book of Graph Theory", Springer – Verlag, New York, 2012.
4. Douglas B. West, "Introduction to Graph Theory", Pearson, Second Edition, New York, 2018.

COURSE OUTCOMES:

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

CO1: Apply graph models for solving real world problem.

CO2: Understand the importance the natural applications of trees and graph connectivity.

CO3: Understand the characterization study of Eulerian graphs and Hamiltonian graphs.
CO4: Apply the graph colouring concepts in partitioning problems.
CO5: Apply the standard optimization graph algorithms in solving application problems.

22ITPE606 PRINCIPLES OF PROGRAMMING LANGUAGES SEMESTER VI

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand and describe syntax and semantics of programming languages
- To understand data, data types, and basic statements
- To understand call-return architecture and ways of implementing them
- To understand object-orientation, concurrency, and event handling in programming languages
- To develop programs in non-procedural programming paradigms

UNIT I : SYNTAX AND SEMANTICS **9**

Evolution of programming languages – describing syntax – context-free grammars – attribute grammars – describing semantics – lexical analysis – parsing – recursive-descent – bottom up parsing

UNIT II : DATA, DATA TYPES, AND BASIC STATEMENTS **9**

Names – variables – binding – type checking – scope – scope rules – lifetime and garbage collection - primitive data types – strings – array types – associative arrays – record types – union types – pointers and references – Arithmetic expressions – overloaded operators – type conversions – relational and boolean expressions – assignment statements – mixed mode assignments – control structures – selection – iterations – branching – guarded statements

UNIT III: SUBPROGRAMS AND IMPLEMENTATIONS **9**

Subprograms – design issues – local referencing – parameter passing – overloaded methods – generic methods – design issues for functions – semantics of call and return – implementing simple subprograms – stack and dynamic local variables – nested subprograms – blocks – dynamic scoping

UNIT IV: OBJECT-ORIENTATION, CONCURRENCY &EVENT HANDLING **9**

Object-orientation – design issues for OOP languages – implementation of object-oriented constructs – concurrency – semaphores – monitors – message passing – threads – statement level concurrency – exception handling – event handling

UNIT V: FUNCTIONAL AND LOGIC PROGRAMMING LANGUAGES **9**

Introduction to lambda calculus – fundamentals of functional programming languages – Programming with Scheme – Programming with ML – Introduction to logic and logic programming – Programming with Prolog – multi-paradigm languages

Contact Periods:

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

REFERENECS:

1. Robert W. Sebesta, "Concepts of Programming Languages", Twelfth Edition (Global Edition), Pearson, 2022.
2. Michael L. Scott, "Programming Language Pragmatics", Fourth Edition, Elsevier, 2018.
3. R. Kent Dybvig, "The Scheme programming language", Fourth Edition, Prentice Hall, 2011.
4. Jeffrey D. Ullman, "Elements of ML programming", Second Edition, Pearson, 1997.
5. W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.

COURSE OUTCOMES:

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

CO1: Describe syntax and semantics of programming languages

CO2: Explain data, data types, and basic statements of programming languages

CO3: Design and implement subprogram constructs

CO4: Apply object-oriented, concurrency, and event handling programming constructs and Develop programs in Scheme, ML, and Prolog

CO5: Understand and adopt new programming languages

22ITPE607 DATA MINING FOR BUSINESS INTELLIGENCE SEMESTER VI

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To know how to derive meaning form huge volume of data and information
- To understand how knowledge discovering process is used in business decision making.

UNIT I : INTRODUCTION 9

Data mining, Text mining, Web mining, Spatial mining, Process mining, Data warehouse and datamarts.

UNIT II : DATA MINING PROCESS 9

Data mining process KDD, CRISP-DM, SEMMA and Domain-Specific, Classification and Prediction performance measures -RSME, MAD, MAP, MAPE, Confusion matrix, Receiver Operating Characteristic curve & AUC;ValidationTechniques - hold-out, k-fold cross-validation, LOOCV, random subsampling, and bootstrapping.

UNIT III: PREDICTION TECHNIQUES 9

Data visualization, Time series ARIMA, Winter Holts, Vector Autoregressive analysis, Multivariate regression analysis.

UNIT IV: CLASSIFICATION AND CLUSTERING TECHNIQUES 9

Classification- Decision trees, k nearest neighbour, Logistic regression, Discriminant analysis; Clustering; Market basket analysis;

UNIT V: MACHINE LEARNING AND AI 9

Genetic algorithms, Neural network, Fuzzy logic, Support Vector Machine, Optimization techniques Ant Colony, Particle Swarm, DEA

Contact Periods:

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

REFERENECS:

1. Alex Berson and Stephen J.Smith, “Data Warehousing, Data Mining and OLAP”, Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.
3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Person Education, 2007.
4. K.P. Soman, Shyam Diwakar and V. Aja, “Insight into Data Mining Theory and Practice”, Eastern Economy Edition, Prentice Hall of India, 2006.

5. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Eastern Economy Edition, Prentice Hall of India, 2006.
6. Daniel T.Larose, “Data Mining Methods and Models”, Wiley-Interscience, 2006.

COURSE OUTCOMES:

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

CO1: Have knowledge on data storage models

CO2: Analyzing the purpose of business analytics

CO3: Apply data mining techniques and methods to large data sets.

CO4: Compare and contrast the various classifiers

CO5: Understand different clustering techniques

22ITPE608 SERVICE ORIENTED ARCHITECTURE SEMESTER VI

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To learn the concepts of distributed application development
- To differentiate XML based web services from other standard models
- To study the importance of service composition

UNIT I : SOA FUNDAMENTALS 9

SOA – Services – Loose Coupling – The Enterprise service bus – Service Classification – Business process management – SOA and the organization – SOA and the organization - SOA in context – Message exchange patterns – SOA life cycle – Versioning – Web services

UNIT II : SERVICE-ORIENTED ANALYSIS AND DESIGN 9

SOA Terminology and Concepts - REST Design Constraints and Goals - RESTful ServiceOrientation - Service Contracts with REST - Service-Orientation and REST Service-Oriented Analysis and Design with REST - Mainstream SOA Methodology - Analysis and Service Modeling with REST - Service-Oriented Design with REST HTML - Cookies - Simple PHP scripts

UNIT III: SERVICE COMPOSITION 9

Service Composition with REST - Fundamental Service Composition with REST - Advanced Service Composition with REST - Service Composition with REST Case Study - Design Patterns for SOA with REST- Service Versioning with REST - Uniform Contract Profiles

UNIT IV: RESTFUL SERVICES AND THE RESOURCE- ORIENTED ARCHITECTURE 9

Introducing the Simple Storage Service - Object-Oriented Design of S3 - URIs - Addressability - Statelessness

- Representations - Links and Connectedness - The Uniform Interface - Resource Design - Turning Requirements into Read-Only Resources - Service Implementation - Web service case studies - Connect Resources to Each Other - Controller Code - Model Code

UNIT V: SOA TRANSACTION AND SECURITY 9

SOA and performance - SOA and security – Service Management - Model driven service deployment – Establishing SOA and SOA governance

Contact Periods:

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

REFERENECS:

1. Nicolai M.Josuttis, SOA in design - The art of distributed system design, O'REILLY

publication, 2007.

2. Raj Balasubramanian, Benjamin Carlyle, Thomas Erl, Cesare Pautasso, "SOA with REST - Principles, Patterns & Constraints for building Enterprise solutions with REST", Prentice Hall/PearsonPTR , 2012.
3. Leonard Richardson and Sam Ruby, RESTful Web Services, O'REILLY publication, 2007.
4. Thomas Erl, “Service Oriented Architecture: Concepts, Technology, and Design”, Pearson education,2005.

COURSE OUTCOMES:

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

CO1: Understanding the fundamental of SOA

CO2: Analyze and design SOA based solutions

CO3: Create RESTful and SOAP based services

CO4: Define workflow automation and develop BPM based applications

CO5: Analyze various security policies

22ITPE609 **NUMERICAL METHODS** **SEMESTER VI**

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals in real life situations.
- To acquaint the student with understanding of numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.
- To understand the knowledge of various techniques and methods of solving various types of partial differential equations.

UNIT I : SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS **12**

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

UNIT II : INTERPOLATION AND APPROXIMATION **12**

Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation – Cubic Splines - Difference operators and relations - Interpolation with equal intervals - Newton's forward and backward difference formulae.

UNIT III: NUMERICAL DIFFERENTIATION AND INTEGRATION **12**

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's Method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV: INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS **12**

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

UNIT V: BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS **12**

Finite difference methods for solving second order two - point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

Contact Periods:

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

REFERENECS:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10 th Edition, New Delhi, 2015.
3. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi, 2007.
4. Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6 th Edition, New Delhi, 2006.
5. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2 nd Edition, Prentice Hall, 1992.
6. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3rd Edition, New Delhi, 2007.
7. Sastry, S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015.

COURSE OUTCOMES:

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

CO1: Understand the basic concepts and techniques of solving algebraic and transcendental equations.

CO2: Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.

CO3: Apply the numerical techniques of differentiation and integration for engineering problems.

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

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

22ITPE610 AUGMENTED REALITY & VIRTUAL REALITY SEMESTER VI

L	T	P	C
4	0	0	3

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 **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 – Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices – Output Devices – Graphics Display – Human Visual System – Personal Graphics Displays – Large Volume Displays – Sound Displays – Human Auditory System.

UNIT II : VR MODELING **9**

VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D

UNIT III: VR PROGRAMMING **9**

VR Programming – Toolkits and Scene Graphs – World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D

UNIT IV: APPLICATIONS **9**

Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics – Information Visualization – VR in Business – VR in Entertainment – VR in Education.

UNIT V: AUGMENTED REALITY **9**

Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation Navigation-Wearable devices

Contact Periods:

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

REFERENECS:

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, 2016
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

COURSE OUTCOMES:

At the end of this course, the students will 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

22ITPE611 STORAGE TECHNOLOGIES SEMESTER VI

L	T	P	C
3	0	0	3

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 scale-out 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:

1. EMC Corporation, Information Storage and Management, Wiley, India
2. Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, Introduction to Storage Area Networks, Ninth Edition, IBM - Redbooks, December 2017
3. Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein ,Storage Networks Explained, Second Edition, Wiley, 2009

COURSE OUTCOMES:

At the end of this course, the students will 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

22ITPE612 SOFTWARE DEFINED NETWORKS SEMESTER VI

L	T	P	C
4	0	0	3

COURSE OBJECTIVES:

- To understand the need for SDN and its data plane operations
- To understand the functions of control plane
- To comprehend the migration of networking functions to SDN environment
- To explore various techniques of network function virtualization
- To comprehend the concepts behind network virtualization

UNIT I : SDN: INTRODUCTION **9**

Evolving Network Requirements – The SDN Approach – SDN architecture - SDN Data Plane , Control plane and Application Plane

UNIT II : SDN DATA PLANE AND CONTROL PLANE **9**

Data Plane functions and protocols - OpenFLow Protocol - Flow Table - Control Plane Functions - Southbound Interface, Northbound Interface – SDN Controllers - Ryu, OpenDaylight, ONOS - Distributed Controllers

UNIT III: SDN APPLICATIONS **9**

SDN Application Plane Architecture – Network Services Abstraction Layer – Traffic Engineering – Measurement and Monitoring – Security – Data Center Networking

UNIT IV: NETWORK FUNCTION VIRTUALIZATION **9**

Network Virtualization - Virtual LANs – OpenFlow VLAN Support - NFV Concepts – Benefits and Requirements – Reference Architecture

UNIT V: NFV FUNCTIONALITY **9**

NFV Infrastructure – Virtualized Network Functions – NFV Management and Orchestration – NFV Use cases – SDN and NFV

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

REFERENECS:

1. William Stallings, “Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud”, Pearson Education, 1st Edition, 2015.

2. Ken Gray, Thomas D. Nadeau, “Network Function Virtualization”, Morgan Kauffman, 2016.
3. Thomas D Nadeau, Ken Gray, “SDN: Software Defined Networks”, O’Reilly Media, 2013.
4. Fei Hu, “Network Innovation through OpenFlow and SDN: Principles and Design”, 1st Edition, CRC Press, 2014.
5. Paul Goransson, Chuck Black Timothy Culver, “Software Defined Networks: A Comprehensive Approach”, 2nd Edition, Morgan Kaufmann Press, 2016.
6. Oswald Coker, Siamak Azodolmolky, “Software-Defined Networking with OpenFlow”, 2nd Edition, O’Reilly Media, 2017.

COURSE OUTCOMES:

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

CO1: Describe the motivation behind SDN
CO2: Identify the functions of the data plane and control plane
CO3: Design and develop network applications using SDN
CO4: Orchestrate network services using NFV
CO5: Explain various use cases of SDN and NFV

PROFESSIONAL ELECTIVE(PE) – IV (SEMESTER VII)

22ITPE701	CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES	SEMESTER VII			
		L	T	P	C
		3	0	0	3

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, TransactionsThe 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. 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.

22ITPE702 OPTIMIZATION TECHNIQUES SEMESTER VII

L	T	P	C
3	0	0	3

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-Kauffman/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.

22ITPE703 DIGITAL IMAGE PROCESSING SEMESTER VII

L	T	P	C
3	0	0	3

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.

9

UNIT-V: DIGITAL IMAGE PROCESSING SIMULATION

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., 2015.
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.

22ITPE704 SOFTWARE PROJECT MANAGEMENT SEMESTER VII

L	T	P	C
3	0	0	3

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. Gopalaswamy 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.

22ITPC705 INTERNET OF THINGS SEMESTER VII

L	T	P	C
3	0	0	3

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, Stamatis, 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.

22ITPE706 ETHICAL HACKING SEMESTER VII

L	T	P	C
3	0	0	3

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

PROFESSIONAL ELECTIVE(PE) – V (SEMESTER VIII)

22ITPE801 PROFESSIONAL ETHICS IN ENGINEERING SEMESTER VIII

L	T	P	C
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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.

22ITPE802 NATURAL LANGUAGE PROCESSING SEMESTER VIII

L	T	P	C
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COURSE OBJECTIVES:

- To learn the fundamentals of natural language processing.
- To understand the use of CFG and 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, 3rd Edition, 2025.
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 Indurkhya 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.

22ITPE803 NEURAL NETWORKS AND DEEP LEARNING SEMESTER VIII

L	T	P	C
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COURSE OBJECTIVES:

- To understand the basics in deep neural networks
- To understand the basics of associative memory and unsupervised learning networks
- To apply CNN architectures of deep neural networks
- To analyze the key computations underlying deep learning, then use them to build and train deep neural networks for various tasks.
- To apply auto encoders and generative models for suitable applications.

UNIT I : INTRODUCTION 9

Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction-Evolution of Neural Networks-Basic Models of Artificial Neural Network- Important Terminologies

of ANNs-Supervised Learning Network.

UNIT II : ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS **9**

Training Algorithms for Pattern Association-Autoassociative Memory Network-Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Autoassociative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network.

UNIT III: THIRD-GENERATION NEURAL NETWORKS **9**

Spiking Neural Networks - Convolutional Neural Networks - Deep Learning Neural Networks – Extreme Learning Machine Model - Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Neuroscientific Basis – Applications: Computer Vision, Image Generation, Image Compression.

UNIT IV: DEEP FEEDFORWARD NETWORKS **9**

History of Deep Learning - A Probabilistic Theory of Deep Learning - Gradient Learning – Chain Rule and Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization- VC Dimension and Neural Nets.

UNIT V: RECURRENT NEURAL NETWORKS **9**

Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs – Deep Recurrent Networks – Applications: Image Generation, Image Compression, Natural Language Processing. Complete Autoencoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders.

Contact Periods:

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

REFERENECS:

1. Francois Chollet, “Deep Learning with Python”, Second Edition, Manning Publications, 2021.
2. Charu C. Aggarwal, “Neural Networks and Deep Learning: A Textbook”, Springer International Publishing, 1st Edition, 2018.
3. Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn and TensorFlow, Oreilly, 2018.
4. Josh Patterson, Adam Gibson, “Deep Learning: A Practitioner’s Approach”, O’Reilly Media, 2017.
5. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.
6. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020.
7. S Rajasekaran, G A Vijayalakshmi Pai, “Neural Networks, FuzzyLogic and Genetic Algorithm, Synthesis and Applications”, PHI Learning, 2017.

COURSE OUTCOMES:

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

CO1: Apply Convolution Neural Network for image processing.
CO2: Understand the basics of associative memory and unsupervised learning networks.
CO3: Apply CNN and its variants for suitable applications.
CO4: Analyze the key computations underlying deep learning and use them to build and train deep

neural networks for various tasks.

CO5: Apply autoencoders and generative models for suitable applications.

22ITPE804 **CYBER SECURITY** **SEMESTER VII**

L	T	P	C
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COURSE OBJECTIVES:

- To learn cybercrime and cyberlaw.
- To understand the cyber attacks and tools for mitigating them.
- To understand information gathering.
- To learn how to detect a cyber attack.
- To learn how to prevent a cyber attack.

UNIT I : INTRODUCTION **9**

Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.

UNIT II : ATTACKS AND COUNTERMEASURES **9**

OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.

UNIT III: RECONNAISSANCE **9**

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

UNIT IV: INTRUSION DETECTION **9**

Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.

UNIT V: INTRUSION PREVENTION **9**

Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.

Contact Periods:

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

REFERENECS:

1. Anand Shinde, “Introduction to Cyber Security Guide to the World of Cyber Security”, Notion Press, 2021.
2. David Kim, Michael G. Solomon, “Fundamentals of Information Systems Security”, Jones & Bartlett Learning Publishers, 2013.

3. Patrick Engebretson, “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy”, Elsevier, 2011.
4. Kimberly Graves, “CEH Official Certified Ethical hacker Review Guide”, Wiley Publishers, 2007.
5. William Stallings, Lawrie Brown, “Computer Security Principles and Practice”, Third Edition, Pearson Education, 2015.
6. Nina Godbole, Sunit Belapure, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley Publishers, 2011.

COURSE OUTCOMES:

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

CO1: Explain the basics of cyber security, cyber crime and cyber law
CO2: Classify various types of attacks and learn the tools to launch the attacks
CO3: Apply various tools to perform information gathering.
CO4: Apply intrusion techniques to detect intrusion
CO5: Apply intrusion prevention techniques to prevent intrusion

22ITPE805 3D PRINTING AND DESIGN SEMESTER VII

L	T	P	C
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COURSE OBJECTIVES:

- To discuss on basics of 3D printing
- To explain the principles of 3D printing technique
- To explain and illustrate inkjet technology
- To explain and illustrate laser technology
- To discuss the applications of 3D printing

UNIT-I: INTRODUCTION **9**

Introduction; Design considerations – Material, Size, Resolution, Process; Modelling and viewing - 3D; Scanning; Model preparation – Digital; Slicing; Software; File formats

UNIT-II: PRINCIPLE **9**

Processes – Extrusion, Wire, Granular, Lamination, Photopolymerisation; Materials - Paper, Plastics, Metals, Ceramics, Glass, Wood, Fiber, Sand, Biological Tissues, Hydrogels, Graphene; Material Selection - Processes, applications, limitations.

UNIT-III: INKJET TECHNOLOGY **9**

Printer - Working Principle, Positioning System, Print head, Print bed, Frames, Motion control; Print head Considerations – Continuous Inkjet, Thermal Inkjet, Piezoelectric Drop-On-Demand; Material Formulation for jetting; Liquid based fabrication – Continous jet, Mulitjet; Powder based fabrication – Colourjet.

UNIT-IV: LASER TECHNOLOGY **9**

Light Sources – Types, Characteristics; Optics – Deflection, Modulation; Material feeding and flow – Liquid, powder. Printing machines – Types, Working Principle, Build Platform, Print bed Movement, Support structures.

UNIT-V: INDUSTRIAL APPLICATIONS **9**

Product Models, manufacturing – Printed electronics, Biopolymers, Packaging, Healthcare,

Food, Medical, Biotechnology, Displays; Future trends.

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

REFERENCES:

1. Christopher Barnatt, 3D Printing: The Next Industrial Revolution, CreateSpace Independent Publishing Platform, 2013.
2. Ian M. Hutchings, Graham D. Martin, Inkjet Technology for Digital Fabrication, John Wiley & Sons, 2013.
3. Chua, C.K., Leong K.F. and Lim C.S., Rapid prototyping: Principles and applications, second edition, World Scientific Publishers, 2010
4. Ibrahim Zeid, Mastering CAD CAM Tata McGraw-Hill Publishing Co., 2007
5. Joan Horvath, Mastering 3D Printing, APress, 2014
6. Matthew Dipaola ,3D Printing in Orthopaedic Surgery, Elsevier 2019 ISBN 978 -0-323-662116

COURSE OUTCOMES:

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

CO1: Outline and examine the basic concepts of 3D printing technology
CO2: Outline 3D printing workflow`
CO3: Explain and categorise the concepts and working principles of 3D printing using inkjet technique
CO4: Explain and categorise the working principles of 3D printing using laser technique
CO5: Explain various method for designing and modeling for industrial applications

22ITPE806	MULTIMEDIA DATA COMPRESSION AND STORAGE	SEMESTER VII

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of compression techniques
- To understand the categories of compression for text, image and video
- To explore the modalities of text, image and video compression algorithms
- To know about basics of consistency of data availability in storage devices
- To understand the concepts of data streaming services

UNIT I : BASICS OF DATA COMPRESSION **9**

Introduction —Lossless and Lossy Compression– Basics of Huffmann coding- Arithmetic coding- Dictionary techniques- Context based compression – Applications

UNIT II : IMAGE COMPRESSION **9**

Lossless Image compression – JPEG-CALIC-JPEG LS-Prediction using conditional averages – Progressive Image Transmission – Lossless Image compression formats – Applications - Facsimile encoding

UNIT III: VIDEO COMPRESSION **9**

Introduction – Motion Compensation – Video Signal Representation – H.261 – MPEG-1- MPEG-2- H.263.

UNIT IV: DATA PLACEMENT ON DISKS **9**

Statistical placement on Disks – Striping on Disks – Replication Placement on Disks – Constraint allocation on Disks – Tertiary storage Devices – Continuous Placement on Hierarchical storage system – Statistical placement on Hierarchical storage systems – Constraint allocation on Hierarchical storage system

UNIT V: DISK SCHEDULING METHODS **9**

Scheduling methods for disk requests – Feasibility conditions of concurrent streams– Scheduling methods for request streams

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

REFERENECS:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Series in Multimedia Information and Systems, 2018, 5th Edition.
2. Lenald Best, Best's Guide to Live Stream Video Broadcasting, BCB Live Teaching series, 2017.
3. Yun-Qing Shi, Image And Video Compression For Multimedia Engineering Fundamentals Algorithms And Standards, Taylor& Francis, 2019.
4. Philip K.C.Tse, Multimedia Information Storage and Retrieval: Techniques and Technologies, 2008.
5. David Salomon, A concise introduction to data compression, 2008.
6. Irina Bocharova, Compression for Multimedia, Cambridge University Press; 1st edition, 2009.

COURSE OUTCOMES:

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

CO1: Understand the basics of text, Image and Video compression.
CO2: Understand the various compression algorithms for multimedia content.
CO3: Explore the applications of various compression techniques.
CO4: Explore knowledge on multimedia storage on disks.
CO5: Understand scheduling methods for request streams.

PROFESSIONAL ELECTIVE(PE) -VI (SEMESTER VIII)

22ITPE807 INFORMATION RETRIEVAL TECHNIQUES SEMESTER VIII

L	T	P	C
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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.

22ITPE808 INTELLECTUAL PROPERTY RIGHTS SEMESTER VIII

L	T	P	C
3	0	0	3

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.

22ITPE809 ROBOTICS AND ITS APPLICATIONS SEMESTER VIII

L	T	P	C
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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.

22ITPE810 **COGNITIVE SCIENCE** **SEMESTER VIII**

L	T	P	C
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COURSE OBJECTIVES:

- To know the theoretical background of cognition.
- To understand the link between cognition and computational intelligence.
- To explore probabilistic programming language.
- To study the computational inference models of cognition.
- To study the computational learning models of cognition.

UNIT-I: PHILOSOPHY, PSYCHOLOGY AND NEUROSCIENCE 9

Philosophy: Mental-physical Relation – From Materialism to Mental Science – Logic and the Sciences of the Mind – Psychology: Place of Psychology within Cognitive Science – Science of Information Processing –Cognitive Neuroscience – Perception – Decision – Learning and Memory – Language Understanding and Processing.

UNIT-II: COMPUTATIONAL INTELLIGENCE 9

Machines and Cognition – Artificial Intelligence – Architectures of Cognition – Knowledge Based Systems – Logical Representation and Reasoning – Logical Decision Making –Learning – Language – Vision.

UNIT-III: PROBABILISTIC PROGRAMMING LANGUAGE 9

WebPPL Language – Syntax – Using Javascript Libraries – Manipulating probability types and distributions – Finding Inference – Exploring random computation – Coroutines: Functions that receive continuations –Enumeration

UNIT-IV: INFERENCE MODELS OF COGNITION 9

Generative Models – Conditioning – Causal and statistical dependence – Conditional dependence – Data Analysis – Algorithms for Inference.

UNIT-V: LEARNING MODELS OF COGNITION 9

Learning as Conditional Inference – Learning with a Language of Thought – Hierarchical Models– Learning (Deep) Continuous Functions – Mixture Models.

Contact Periods:

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

REFERENCES:

1. Vijay V Raghavan,Venkat N.Gudivada, VenuGovindaraju, C.R. Rao, Cognitive Computing: Theory and Applications: (Handbook of Statistics 35), Elsevier publications, 2016
2. Judith Hurwitz, Marcia Kaufman, Adrian Bowles, Cognitive Computing and Big Data Analytics, Wiley Publications, 2015
3. Robert A. Wilson, Frank C. Keil, “The MIT Encyclopedia of the Cognitive Sciences”,The MIT Press, 1999.
4. Jose Luis Bermúdez, Cognitive Science -An Introduction to the Science of the Mind, Cambridge University Press 2020
5. Noah D. Goodman, Andreas Stuhlmuller, “The Design and Implementation of Probabilistic Programming Languages”, Electronic version of book, https://dippl.org/.
6. Noah D. Goodman, Joshua B. Tenenbaum, The ProbMods Contributors, “Probabilistic

Models of Cognition", Second Edition, 2016, https://probmods.org/.

COURSE OUTCOMES:

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

CO1: Understand the underlying theory behind cognition.
CO2: Connect to the cognition elements computationally.
CO3: Implement mathematical functions through WebPPL.
CO4: Develop applications using cognitive inference model.
CO5: Develop applications using cognitive learning model.

22ITPE811 STREAM PROCESSING SEMESTER VIII

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Introduce Data Processing terminology, definition & concepts
- Define different types of Data Processing
- Explain the concepts of Real-time Data processing
- Select appropriate structures for designing and running real-time data services in a business environment
- Illustrate the benefits and drive the adoption of real-time data services to solve real world Problems

UNIT-I: FOUNDATIONS OF DATA SYSTEMS 9

Introduction to Data Processing, Stages of Data processing, Data Analytics, Batch Processing, Stream processing, Data Migration, Transactional Data processing, Data Mining, Data Management Strategy, Storage, Processing, Integration, Analytics, Benefits of Data as a Service, Challenges.

UNIT-II: REAL-TIME DATA PROCESSING 9

Introduction to Big data, Big data infrastructure, Real-time Analytics, Near real-time solution, Lambda architecture, Kappa Architecture, Stream Processing, Understanding Data Streams, Message Broker, Stream Processor, Batch & Real-time ETL tools, Streaming Data Storage

UNIT-III: DATA MODELS AND QUERY LANGUAGES 9

Relational Model, Document Model, Key-Value Pairs, NoSQL, Object-Relational Mismatch, Manyto-One and Many-to-Many Relationships, Network data models, Schema Flexibility, Structured Query Language, Data Locality for Queries, Declarative Queries, Graph Data models, Cypher Query Language, Graph Queries in SQL, The Semantic Web, CODASYL, SPARQL

UNIT-IV: EVENT PROCESSING WITH APACHE KAFKA 9

Apache Kafka, Kafka as Event Streaming platform, Events, Producers, Consumers, Topics, Partitions, Brokers, Kafka APIs, Admin API, Producer API, Consumer API, Kafka Streams API, Kafka Connect API

UNIT-V: REAL-TIME PROCESSING USING SPARK STREAMING 9

Structured Streaming, Basic Concepts, Handling Event-time and Late Data, Fault-tolerant Semantics, Exactly-once Semantics, Creating Streaming Datasets, Schema Inference, Partitioning of Streaming datasets, Operations on Streaming Data, Selection, Aggregation,

Projection, Watermarking, Window operations, Types of Time windows, Join Operations, Deduplication

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

REFERENCES:

1. Streaming Systems: The What, Where, When and How of Large-Scale Data Processing by Tyler Akidau, Slava Chemyak, Reuven Lax, O'Reilly publication
2. Designing Data-Intensive Applications by Martin Kleppmann, O'Reilly Media
3. Practical Real-time Data Processing and Analytics : Distributed Computing and Event Processing using Apache Spark, Flink, Storm and Kafka, Packt Publishing

COURSE OUTCOMES:
Upon successful completion of the course, students should be able to:
CO1: Understand the applicability and utility of different streaming algorithms.
CO2: Describe and apply current research trends in data-stream processing.
CO3: Analyze the suitability of stream mining algorithms for data stream systems.
CO4: Program and build stream processing systems, services and applications.
CO5: Solve problems in real-world applications that process data streams.

22ITPE812 SECURITY AND PRIVACY IN CLOUD SEMESTER VIII

L	T	P	C
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COURSE OBJECTIVES:
- To Introduce Cloud Computing terminology, definition & concepts
- To understand the security design and architectural considerations for Cloud
- To know the Identity, Access control in Cloud
- To follow best practices for Cloud security using various design patterns
- To be able to monitor and audit cloud applications for security

UNIT-I: FUNDAMENTALS OF CLOUD SECURITY CONCEPTS 9
Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Nonrepudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures.

UNIT-II: SECURITY DESIGN AND ARCHITECTURE FOR CLOUD 9
Security design principles for Cloud Computing - Comprehensive data protection - End-to-end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies – Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key

UNIT-III: ACCESS CONTROL AND IDENTITY MANAGEMENT 9
Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot - Intruder

Detection and prevention

UNIT-IV: CLOUD SECURITY DESIGN PATTERNS **9**

Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud

UNIT-V: MONITORING, AUDITING AND MANAGEMENT **9**

Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing – Record generation, Reporting and Management, Tamper-proofing audit logs, Quality of Services, Secure Management, User management, Identity management, Security Information and Event Management

Contact Periods:

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

REFERENCES:

1. Raj Kumar Buyya , James Broberg, andrzejGoscinski, ―Cloud Computing:II, Wiley 2013
2. Dave shackleford, ―Virtualization Security‖, SYBEX a wiley Brand 2013.
3. Mather, Kumaraswamy and Latif, ―Cloud Security and Privacy, OREILLY 2011
4. Mark C. Chu-Carroll ―Code in the Cloud,CRC Press, 2011

COURSE OUTCOMES:

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

CO1: Understand the cloud concepts and fundamentals.
CO2: Explain the security challenges in the cloud.
CO3: Define cloud policy and Identity and Access Management
CO4: Understand various risks and audit and monitoring mechanisms in the cloud.
CO5: Define the various architectural and design considerations for security in the cloud.

OPEN ELECTIVE

22ADOE01 COMPUTER VISION

L	T	P	C
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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.

22ADOE02 ETHICS AND AI

L	T	P	C
3	0	0	3

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.

22ADOE03 NETWORK SECURITY AND FIREWALLS

L	T	P	C
3	0	0	3

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.

22ADOE04 R PROGRAMMING

L	T	P	C
3	0	0	3

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.

22ADOE05 PROGRAMMING WITH ASP.NET

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand .Net as simple, modem, 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

22CSOE01 COMPUTER GRAPHICS AND SIMULATION

L	T	P	C
3	0	0	3

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.

22CSOE02 DATA INTEGRATION AND BIG DATA

L	T	P	C
3	0	0	3

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 3^2Vs - 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.

22CSOE03 GAME PROGRAMMING

L	T	P	C
3	0	0	3

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

22CSOE04 STORAGE TECHNOLOGIES

L	T	P	C
3	0	0	3

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:

7. Brad Dayley, Brendan Dayley, Caleb Dayley, ‘Node.js, MongoDB and Angular Web Development’, Addison-Wesley, Second Edition, 2018

8. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node', Second Edition, Apress, 2019.
9. 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
10. Kirupa Chinnathambi, 'Learning React: A Hands-On Guide to Building Web Applications Using React and Redux', Addison-Wesley Professional, 2nd edition, 2018
11. https://www.tutorialspoint.com/the_full_stack_web_development/index.asp
12. 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

22CSOE05 RECOMMENDER SYSTEMS

L	T	P	C
3	0	0	3

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

22ECOE01 COMPUTATIONAL INTELLIGENCE

L	T	P	C
3	0	0	0

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.

22ECOE02 **WEARABLE DEVICES**

L	T	P	C
3	0	0	3

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 Bonfiglo and Danilo De Rossi, Wearable Monitoring Systems, Springer, 2011.
2. Zhang and Yuan-Ting, Wearable Medical Sensors and Systems, Springer, 2013.
3. 00Edward 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.

22ECOE03 VLSI TESTING AND DESIGN FOR TESTABILITY

L	T	P	C
3	0	0	3

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, Brever 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.

22ECOE04 IOT BASED SYSTEMS DESIGN

L	T	P	C
3	0	0	3

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 Madisetti 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

22ECOE05 **DESIGN THINKING**

L	T	P	C
3	0	0	0

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 Papadakos, (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.

22 EEOE01 POWER PLANT ENGINEERING

L	T	P	C
3	0	0	3

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 Plant Engineering", 2nd Edition,McGraw – Hill Professional, 2012.

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, das and combined cycle power plants.
CO3: Gain the basic knowledgeof construction and working of the components inside nuclear power plants.
CO4: Explore the construction and working of the components inside renewableenergy power plants.
CO5: Analysis and solve energy and economic related issues in power sector.

22 EEOE02 SENSORS AND TRANSDUCERS

L T P C

3 0 0 3

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.

22 EEOE03 HYBRID ENERGY TECHNOLOGY

L	T	P	C
3	0	0	3

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 Edison, 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

22 EEOE04 BIOMEDICAL INSTRUMENTATION

L	T	P	C
3	0	0	3

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", Merril 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.

22 EEOE05 ELECTRIC AND HYBRID VEHICLES

L	T	P	C
3	0	0	3

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”, CRCPress,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.

22ITOE01 MOBILE ADHOC NETWORKS

L	T	P	C
3	0	0	3

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:

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. C. Siva Ram Murthy and B. S. Manoj, Ad hoc Wireless Networks Architecture and Protocols, 2nd edition, Pearson Edition, 2007.
5. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000.
6. 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.

22ITOE02 BLOCKCHAIN TECHNOLOGIES

L	T	P	C
3	0	0	3

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: 0 Periods Total: 45 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

22ITOE03 OPEN SOURCE TECHNOLOGIES

L	T	P	C
3	0	0	3

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, My SQL 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.

22ITOE04 ANDROID APPLICATION DEVELOPMENT

L	T	P	C
3	0	0	3

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 you 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

22ITOE05 DIGITAL AND MOBILE FORENSICS

L	T	P	C
3	0	0	3

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.

22MEOE01	TESTING OF MATERIALS	L	T	P	C
		3	0	0	3

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.

22MEOE02	**WELDING TECHNOLOGY**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

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**.**

22MEOE03	INDUSTRIAL SAFETY ENGINEERING	L	T	P	C
		3	0	0	3

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 COPNCEPT **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 foroptimization of productivity.

CO5: Measure and evaluate occupational safety and health performance.

22MEOE04	**MARKETING MANAGEMENT**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

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 forremuneration and compensation methods.
CO4: Developed knowledge of sales planning techniques.
CO5: Understand the use of consumer behaviour concepts.

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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.