P. A. COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.E COMPUTER SCIENCE AND ENGINEERING

CURRICULA & SYLLABI

(I to VI Semester)

REGULATIONS 2022

Vision and Mission of the Institute and Department

Vision of the Institute

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

Mission of the Institute

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

Vision of the Department

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

Mission of the Department

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

Program Educational Objectives (PEO)

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

PEO 1: To make students as well-equipped computer professionals by providing comprehensive knowledge in Mathematics, Science and Engineering to find the solutions to the real-time computing problems.

PEO 2: To enhance students to be capable of transforming their gained knowledgeinto skills in order to work with modern tools and technologies to impart innovative research capabilities.

PEO 3: To provide all-round development thereby students are motivated to choose their career as entrepreneurs and technocrats with ethical values and to adapt themselves to rapidly changing work environment for benefit of the society.

Program Specific Outcomes (PSO):

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

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

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

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

Program Outcomes (POs):

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complexengineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/Development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural,societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a

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

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

SEMESTER I

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

SEMESTER II

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

SEMESTER III

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

SEMESTER IV

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

SEMESTER V

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

SEMESTER VI

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

HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT (HS)

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

BASIC SCIENCES (BS)

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

ENGINEERING SCIENCES (ES)

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

		Design				

PROFESSIONAL CORES (PC)

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

PROFESSIONAL ELECTIVE (PE) – I (SEMESTER V)

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

PROFESSIONAL ELECTIVE (PE) – II (SEMESTER VI)

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

PROFESSIONAL ELECTIVE (PE) – III (SEMESTER VI)

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

OPEN ELECTIVE (OE)

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	22ADOE01	Computer Vision	3	0	0	3
2.	22ADOE02	Ethics and AI	3	0	0	3
3.	22ADOE03	Network Security and Firewalls	3	0	0	3
4.	22ADOE04	R Programming	3	0	0	3
5.	22ADOE05	Programming with ASP.Net	3	0	0	3
6.	22CSOE01	Computer Graphics and Simulation	3	0	0	3
7.	22CSOE02	Data Integration & Big data	3	0	0	3
8.	22CSOE03	Game Programming	3	0	0	3
9.	22CSOE04	Storage Technologies	3	0	0	3
10.	22CSOE05	Recommender Systems	3	0	0	3
11.	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

MANDATORY COURSES (MC) (NO - CREDIT)

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

VALUE ADDED COURSES (VA)

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

SUMMARY OF CREDIT DISTRIBUTION

S.No.	Course Work Subject Area	CREDITS PER SEMESTER								Total Credits	% of Credits	Credit Range		
		I	II	III	IV	V	VI	VII	VIII			PA	AICTE	Anna University
1	**HS**	5	4					3		**12**	7.22	**12**	12	12
2	**BS**	11.5	7	4	4	4				**30.5**	18.37	**30.5**	25	25
3	**ES**	4.5	12	3						**19.5**	11.74	**19.5**	24	18
4	**PC**			12	19	12	12	7.5		**62.5**	37.65	**62.5**	48	61
5	**PE**					3	6	6	3	**18**	10.84	**18**	18	18
6	**OE**					3	3	3	3	**12**	7.22	**12**	18	12
7	**EE**							1.5	10	**11.5**	6.92	**11.5**	15	16
8	**MC**			0			0			**0**		**0**	-	
	Total	**21**	**23**	**19**	**23**	**22**	**21**	**21**	**16**	**166**	100%	**166**	160	162

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

22CAHS101 **SEMESTER I**

PROFESSIONAL ENGLISH - 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 ·ochures 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 – SCULPTU **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 – 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

UNIT-V: THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY **9**

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. [illegible] கே.கே. பிள்ளை வெளியீடு தமிழ்நாடு பாடநூல்
2.
3.
4.
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by:

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

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.

22CSES302 DIGITAL PRINCIPLES AND SYSTEM DESIGN SEMESTER III

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

UNIT-I: NUMBER SYSTEM AND BASIC LOGIC 9

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

UNIT-II: COMBINATIONAL CIRCUITS 9

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

UNIT-III: SYNCHRONOUS SEQUENTIAL CIRCUITS 9

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

UNIT-IV: ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

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

UNIT-V: MEMORY AND PROGRAMMABLE LOGIC 9

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

Contact Periods:

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

REFERENCES:

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

COURSE OUTCOMES:

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

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

22CSPC303 **DATA STRUCTURES** **SEMESTER III**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

UNIT-I: INTRODUCTION AND LINEAR DATA STRUCTURE 9

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

UNIT-II: STACK AND QUEUE 9

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

UNIT-III: TREES 9

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

UNIT-IV: GRAPH ALGORITHMS 9

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

UNIT-V: SORTING AND HASHING 9

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

Contact Periods:

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

REFERENCES:

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

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

COURSE OUTCOMES:

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

CO1: Analyze the time complexity of various algorithms.
CO2: Define and use list, stack and queue Abstract Data Types.
CO3: Define and use Tree ADT.
CO4: Explain Tree and Graph Traversals.
CO5: Use suitable sorting and hashing technique.

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 will be able to:

CO1: Develop Java programs using OOP principles.
CO2: Develop Java programs with the concepts of inheritance and interfaces.
CO3: Build Java applications using exceptions and multithreading.
CO4: Develop Java applications with I/O streams and collection frame work.
CO5: Develop GUI based Java programs using swings.

22CSPC305	COMPUTER ORGANIZATION AND ARCHITECTURE	SEMESTER III

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

UNIT-I: BASIC STRUCTURE OF COMPUTERS 9

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

UNIT-II: ARITHMETIC FOR COMPUTERS 9

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

UNIT-III: PROCESSOR AND CONTROL UNIT 9

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

UNIT-IV: PARALLELISIM 9

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

UNIT-V: MEMORY AND I/O SYSTEMS 9

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

Contact Periods:

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

REFERENCES:

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

Approach", 5th Edition, Morgan Kaufmann / Elsevier Publishers, 2012.
6. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020

COURSE OUTCOMES:

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

CO1: Design arithmetic and logic unit.
CO2: Design and analyze pipelined control units.
CO3: Understand parallel processing architectures.
CO4: Evaluate performance of memory systems.
CO5: Understand parallel processing architectures.

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: Organization, Structure and Functions.

UNIT-IV: LOCAL ADMINISTRATION **9**

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

UNIT-V: ELECTION COMMISSION **9**

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

Contact periods:

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

REFERENCES:

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

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

COURSE OUTCOMES:

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

CO1: Understand the concepts of constitution assembly.
CO2: Develop knowledge of union government and its administration.
CO3: Develop knowledge of state government and its administration.
CO4: Develop knowledge of local administration**.**
CO5: Learn to use the function of election commission.

22CSPC307 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 application of linear data structures.
- To implement the nonlinear data structures.
- To implement the sorting techniques.
- To implement the hashing techniques.

LIST OF EXPERIMENTS:

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

Contact Periods:

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

COURSE OUTCOMES:

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

CO1: Implement linear data structures using arrays and Linked Lists.
CO2: Implement applications of linked list.
CO3: Implement nonlinear data structures.
CO4: Implement various sorting techniques.
CO5 Implement hashing techniques.

LIST OF EQUIPMENT'S AND COMPONENTS

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

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.
- To understand and apply the concepts of interfaces, array list.
- To understand and apply the concepts of exception handling and file processing.
- To develop applications using generic programming and event handling.

LIST OF EXPERIMENTS:

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

Contact Periods:

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

COURSE OUTCOMES:

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

CO1: Implement Java programs for simple applications that make use of classes, packages.
CO2: Implement the concepts of interfaces and array list.
CO3: Implement the concepts of exception handling and file processing.
CO4: Implement Java programs with multithreading.
CO5: Design applications using file processing, generic programming and event handling.

LIST OF EQUIPMENT'S AND COMPONENTS

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

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.

22CAPC402 **OPERATING SYSTEMS** **SEMESTER IV**

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

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

UNIT-I: OPERATING SYSTEM OVERVIEW **7**

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

UNIT-II: PROCESS MANAGEMENT **11**

Processes – Process concept, Process scheduling, Operations on Processes, Inter process Communication; CPU Scheduling – Scheduling criteria, Scheduling algorithms, 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.

Practical

List of Experiments

1. Basics of UNIX commands

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

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

REFERENCES:

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

COURSE OUTCOMES:

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

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

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-NoSQL.

Contact Periods:

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

REFERENCES:

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

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

COURSE OUTCOMES:

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

CO1: Design Databases for applications.
CO2: Map ER model to Relational model to make database design.
CO3: Apply concurrency control and recovery mechanisms for real-world problems.
CO4: Compare the several indexing strategies in different database systems.
CO5: Learn advanced database concepts and assess how it differ from traditional databases.

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-SCRUM-Extreme programming-XP Process-Case Study.

UNIT-II: REQUIREMENTS ANALYSIS AND SPECIFICATION 9

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

UNIT-III: SOFTWARE DESIGN 9

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

UNIT-IV: SOFTWARE TESTING AND MAINTENANCE 9

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

UNIT-V: PROJECT MANAGEMENT 9

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

Contact Periods:

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

REFERENCES:

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

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

COURSE OUTCOMES:

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

CO1: Compare various Software Development Lifecycle Models
CO2: Evaluate project management approaches as well as cost and schedule estimation strategies.
CO3: Perform formal analysis on specifications.
CO4: Use UML diagrams for analysis and design.
CO5: Architect and design using architectural styles and design patterns, and test the system.

22CSPC405 DESIGN AND ANALYSIS OF ALGORITHMS SEMESTER IV

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

UNIT-I: INTRODUCTION 9

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

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

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

UNIT-III: DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 9

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

UNIT-IV: BACKTRACKING AND ITERATIVE IMPROVEMENT 9

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

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

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

Contact Periods:

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

REFERENCES:

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

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

COURSE OUTCOMES:

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

CO1: Explain the algorithms for different computing problem frameworks.
CO2: Analyze brute force and divide and conquer methods for various problems.
CO3: Utilize dynamic programming and greedy technique for problem solving.
CO4: Interpret the role of backtracking.
CO5: Critically analyze the P and NP problems with the help of branch and bound.

22CSPC406 **DATA SCIENCE** **SEMESTER IV**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

UNIT-I: INTRODUCTION **9**

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

UNIT-II: DESCRIBING DATA **9**

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

UNIT-III: DESCRIBING RELATIONSHIPS **9**

Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of 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.

Contact Periods:

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

REFERENCES:

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

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

COURSE OUTCOMES:

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

CO1: Define the Data Science process.
CO2: Understand different types of data description for data science process
CO3: Gain knowledge on relationships between data
CO4: Use the Python Libraries for Data Wrangling
CO5: Apply visualization Libraries in Python to interpret and explore data

22CSPC407 DATA SCIENCE LABORATORY SEMESTER IV

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

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

LIST OF EXPERIMENTS:

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

Contact Periods:

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

COURSE OUTCOMES:

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

CO1: Make use of the python libraries for data science.

CO2: Make use of the basic Statistical and Probability measures for data science.

CO3: Perform descriptive analytics on the benchmark data sets.

CO4: Perform correlation and regression analytics on standard data sets.

CO5: Present and interpret data using visualization packages in Python.

LIST OF EQUIPMENT'S AND COMPONENTS

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

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

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 frontend tool.
- To be exposed to implementation of database applications.

LIST OF EXPERIMENTS:

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

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

COURSE OUTCOMES:

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

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

LIST OF EQUIPMENT'S AND COMPONENTS

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

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

22CSBS501 PROBABILITY AND STATISTICS SEMESTER V

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

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

UNIT - I: PROBABILITY AND RANDOM VARIABLES 9+3

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

UNIT- II: STANDARD PROBABILITY DISTRIBUTIONS 9+3

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

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

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

UNIT-IV: TESTING OF HYPOTHESIS 9+3

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

UNIT -V: DESIGN OF EXPERIMENTS 9+3

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

Contact Periods:

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

REFERENCES:

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

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

COURSE OUTCOMES:

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

CO1: Acquire the fundamental knowledge of the concepts of probability and random variables.

CO2: Understand the basic knowledge of standard probability distributions which can describe real life phenomenon.

CO3: Understand the basic concepts of two-dimensional random variables and apply in Engineering applications.

CO4: Apply the concept of testing of hypothesis for small and large samples in real life problems.

CO5: Apply the basic concepts of classifications of design of experiments in the field of Engineering.

22CSPC502 **WEB PROGRAMMING** **SEMESTER V**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

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

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

UNIT-II: CLIENT-SIDE SCRIPTING **9**

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

UNIT-III: SERVER-SIDE PROGRAMMING **9**

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

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

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

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

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

Contact Periods:

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

REFERENCES:

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

COURSE OUTCOMES:

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

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

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

UNIT-I: INTRODUCTION AND PHYSICAL LAYER **9**

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

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

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

UNIT-III: NETWORK LAYER **9**

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

UNIT-IV: TRANSPORT LAYER **9**

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

UNIT-V: APPLICATION LAYER **9**

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

Contact Periods:

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

REFERENCES:

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

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

COURSE OUTCOMES:

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

CO1: Gain the knowledge of basic layers and its functions in computer networks.
CO2: Evaluate the performance of a network.
CO3: Discovered the basics of how data flows from one node to another.
CO4: Design protocols for various functions in the network.
CO5: Develop real world applications using various application layer protocols.

22CAPC504 THEORY OF COMPUTATION SEMESTER V

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.

22CSPC505 WEB PROGRAMMING LABORATORY SEMESTER V

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

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

LIST OF EXPERIMENTS:

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

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

COURSE OUTCOMES:

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

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

LIST OF EQUIPMENT'S AND COMPONENTS

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

22CAPC506 COMPUTER NETWORKS LABORATORY SEMESTER V

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

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

LIST OF EXPERIMENTS:

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

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

COURSE OUTCOMES:

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

CO1: Implement various protocols using TCP and UDP.
CO2: Compare the performance of different transport layer protocols.
CO3: Use simulation tools to analyze the performance of various network protocols.
CO4: Analyze various routing algorithms.
CO5: Implement error correction codes.

LIST OF EQUIPMENT'S AND COMPONENTS

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

22CSPC601 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

SEMESTER VI

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

UNIT-I: PROBLEM SOLVING **9**

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

UNIT-II: PROBABILISTIC REASONING **9**

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

UNIT-III: SUPERVISED LEARNING **9**

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

UNIT-IV: ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING **9**

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

UNIT-V: NEURAL NETWORKS **9**

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

Contact Periods:

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

REFERENCES:

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

Edition, Pearson Education, 2021.
2. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Fourth Edition, 2020.
3. Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, Pearson Education,2007
4. Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2008
5. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006
6. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016

COURSE OUTCOMES:

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

CO1: Use appropriate search algorithms for problem solving
CO2: Apply reasoning under uncertainty
CO3: Build supervised learning models
CO4: Develop ensembling and unsupervised models
CO5: Build deep learning neural network models

19CSPC602 **COMPILER DESIGN** **SEMESTER VI**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

UNIT-I: INTRODUCTION TO COMPILERS **9**

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

UNIT-II: LEXICAL ANALYSIS **9**

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

UNIT-III: SYNTAX ANALYSIS **9**

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

UNIT-IV: INTERMEDIATE CODE GENERATION **9**

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

UNIT-V: CODE GENERATION AND CODE OPTIMIZATION **9**

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

Contact Periods:

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

REFERENCES:

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

Publishers Elsevier Science, 2004.
5. Charles N. Fischer, Richard. J. LeBlanc, "Crafting a Compiler with C", Pearson Education, 2008.

COURSE OUTCOMES:

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

CO1: Analyze the different phases of compiler.
CO2: Design a lexical analyzer for a sample language.
CO3: Apply different parsing algorithms to develop the parsers for a given grammar.
CO4: Interprets syntax-directed translation and code generation.
CO5: Learn to implement code optimization techniques and a simple code generator.

22CSPC603 **INTERNET OF THINGS** **SEMESTER VI**

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.

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

22CSPC605 MACHINE LEARNING LABORATORY SEMESTER VI

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

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

LIST OF EXPERIMENTS:

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

Contact Periods:

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

COURSE OUTCOMES:

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

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

LIST OF EQUIPMENT'S AND COMPONENTS

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

22CSPC606 MOBILE APPLICATION DEVELOPMENT LABORATORY

SEMESTER VI

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

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

LIST OF EXPERIMENTS:

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

Contact Periods:

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

COURSE OUTCOMES:

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

CO1: Develop mobile applications using GUI and layouts.

CO2: Develop mobile applications using event listener.

CO3: Develop mobile applications using databases.

CO4: Develop mobile applications using RSS Feed, Internal/External storage, SMS, Multi-threading and GPS.

CO5: Analyze and discover own mobile app for simple needs.

LIST OF EQUIPMENT'S AND COMPONENTS

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

PROFESSIONAL ELECTIVE (PE) – I (SEMESTER V)

22CSPE501 DATA WAREHOUSING AND DATA MINING SEMESTER V

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

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

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

UNIT-II: INTRODUCTION TO DATA MINING 9

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

UNIT-III: DATA MINING – FREQUENT PATTERN ANALYSIS 9

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

UNIT-IV: CLASSIFICATION AND CLUSTERING 9

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

UNIT-V: WEKA TOOL AND R PROGRAMMING 9

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

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

REFERENCES:

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

COURSE OUTCOMES:

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

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

22CSPE502 SOFTWARE TESTING AND AUTOMATION SEMESTER V

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

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

UNIT-II: TEST PLANNING 9

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

UNIT-III: TEST DESIGN AND EXECUTION 9

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

UNIT-IV: ADVANCED TESTING CONCEPTS 9

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

UNIT-V: TEST AUTOMATION AND TOOLS 9

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

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

REFERENCES:

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

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

COURSE OUTCOMES:

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

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

22CSPE503 DIGITAL AND MOBILE FORENSICS SEMESTER V

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand basic digital forensics and techniques.
- To explain digital crime and investigation.
- To equip how to be prepared for digital forensic readiness.
- To learn and use forensics tools for iOS devices.
- To identify and use forensics tools for Android devices.

UNIT-I: INTRODUCTION TODIGITAL 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 CRIMEAND 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

REFERENCES:

1. Chuck Easttom, "An In-depth Guide to Mobile Device Forensics", First Edition, CRC Press, 2022.
2. Andre Arnes, "Digital Forensics", Wiley, 2018.
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: Analyze knowledge on digital forensics.
CO2: Discovered about digital crime and investigations.
CO3: Be forensic ready.
CO4: Investigate, identify and extract digital evidence from iOS devices.
CO5: Studey, identify and extract digital evidence from Android devices.

22CSPE504 **BIG DATA ANALYTICS** **SEMESTER V**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

UNIT-I: UNDERSTANDING BIG DATA **9**

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

UNIT-II: NOSQL DATA MANAGEMENT **9**

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

UNIT-III: MAP REDUCE APPLICATIONS **9**

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

UNIT-IV: BASICS OF HADOOP **9**

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

UNIT-V: HADOOP RELATED TOOLS **9**

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

Contact Periods:

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

REFERENCES:

1. Chandramouli Subramanian, Asha A George, C R Rene Robin, D Doreen Hephzibah Miriam, J Jasmine Christina Magdalene, “Big Data Analytics”, Universities Press (India) Pvt. Ltd., 2023.
2. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics:

Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
3. Sadalage, PramodJ, “No SQL distilled”, 2013.
4. EricSammer, "HadoopOperations", O'Reilley, 2012.
5. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
6. Alan Gates, "Programming Pig", O'Reilley, 2011.
7. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
8. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.

COURSE OUTCOMES:

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

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

22CSPE505 **DISTRIBUTED SYSTEMS** **SEMESTER V**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

UNIT-I: INTRODUCTION **9**

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

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

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

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

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

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

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

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

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

Contact Periods:

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

REFERENCES:

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

COURSE OUTCOMES:

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

CO1: Elucidate the foundations and issues of distributed systems.

CO2: Organize the various synchronization issues and global state for distributed systems.

CO3: Analyze the Mutual Exclusion and Deadlock detection algorithms in distributed systems.

CO4: Describe the agreement protocols and fault tolerance mechanisms in distributed systems.

CO5: Provide the features of peer-to-peer and distributed shared memory systems.

22CSPE506 **DIGITAL MARKETING** **SEMESTER V**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

UNIT-I: INTRODUCTION TO ONLINE MARKET **9**

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

UNIT-II: SEARCH ENGINE OPTIMISATION **9**

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

UNIT-III: E- MAIL MARKETING **9**

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

UNIT-IV: SOCIAL MEDIA MARKETING **9**

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

UNIT-V: DIGITAL TRANSFORMATION **9**

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

Contact Periods:

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

REFERENCES:

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

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

COURSE OUTCOMES:

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

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

CO2: Demonstrate how digital marketing can be utilized by organizations and describe its effectiveness can be measured.

CO3: Evaluate the key elements of a digital marketing strategy.

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

CO5: Demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs.

PROFESSIONAL ELECTIVE (PE) – II (SEMESTER VI)

22CSPE601 DIGITAL SIGNAL PROCESSING SEMESTER VI

L	T	P	C
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.

22CSPE602 **CLOUD COMPUTING** **SEMESTER VI**

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

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

UNIT-V: CLOUD SECURITY 9

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

Contact Periods:

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

REFERENCES:

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

COURSE OUTCOMES:

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

CO1: Analyze the cloud architecture and design challenges.

CO2: Apply the concept of virtualization and its types.

CO3: Experiment with virtualization of hardware resources and Docker.

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

CO5: Explain security challenges in the cloud environment.

22CSPE603 **APP DEVELOPMENT** **SEMESTER VI**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

UNIT I : FUNDAMENTALS OF MOBILE & WEB APPLICATION DEVELOPMENT **9**

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

UNIT II : NATIVE APP DEVELOPMENT USING JAVA **9**

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

UNIT III: HYBRID APP DEVELOPMENT **9**

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

UNIT IV: CROSS-PLATFORM APP DEVELOPMENT USING REACT-NATIVE **9**

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

UNIT V: NON-FUNCTIONAL CHARACTERISTICS OF APP FRAMEWORKS **9**

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

Contact Periods:

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

REFERENECS:

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

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

COURSE OUTCOMES:

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

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

22CSPE604 **SOFT COMPUTING** **SEMESTER VI**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

UNIT-I: INTRODUCTION TO SOFT COMPUTING **9**

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

UNIT-II: ARTIFICIAL NEURAL NETWORKS **9**

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

UNIT-III: FUZZY SYSTEMS **9**

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

UNIT-IV: GENETIC ALGORITHMS **9**

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

UNIT-V: HYBRID SYSTEMS **9**

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

Contact Periods:

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

REFERENCES:

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

2nd Edition, 2011.
2. Padhy N.P and Simon S.P., "Soft Computing with MATLAB Programming", Oxford University Press, 2015.
3. Rajasekaran S and Vijayalakshmi Pai G.A., "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt. Ltd., 2017.
4. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2002.
5. Kwang H. Lee, "First course on Fuzzy Theory and Applications", Springer, 2005.
6. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1996.
7. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Addison Wesley, 2003.

COURSE OUTCOMES:

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

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

22CSPE605 CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES

SEMESTER VI

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. 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.

22CSPE606 **EXPLORATORY DATA ANALYSIS** **SEMESTER VI**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

UNIT I : EXPLORATORY DATA ANALYSIS **9**

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

UNIT II : EDA USING PYTHON **9**

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

UNIT III: UNIVARIATE ANALYSIS **9**

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

UNIT IV: BIVARIATE ANALYSIS **9**

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

UNIT V: MULTIVARIATE AND TIME SERIES ANALYSIS **9**

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

Contact Periods:

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

REFERENECS:

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

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

COURSE OUTCOMES:

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

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

PROFESSIONAL ELECTIVE (PE) – III (SEMESTER VI)

22CSPE607	DEVOPS	SEMESTER VI

L	T	P	C
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** **Total: 45 Periods**

REFERENECS:

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

COURSE OUTCOMES:

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

CO1: Understand different actions performed through Version control tools like Git.

CO2: Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.

CO3: Ability to Perform Automated Continuous Deployment

CO4: Ability to do configuration management using Ansible

CO5: Understand to leverage Cloud-based DevOps tools using Azure DevOps

22CSPE608 MULTIMEDIA AND ANIMATION SEMESTER VI

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: Keyframe, Morphing, Inverse Kinematics, Hand Drawn, Character rigging, vector animation, stop motion, motion graphics, , Fluid Simulation, skeletal animation, skinning Virtual Reality, Augmented Reality.

UNIT-V: MULTIMEDIA APPLICATIONS 9

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

Contact Periods:

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

REFERENCES:

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

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

COURSE OUTCOMES:

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

CO1: Get the bigger picture of the context of Multimedia and its applications

CO2: Use the different types of media elements of different formats on content pages

CO3: Author 2D and 3D creative and interactive presentations for different target multimedia applications.

CO4: Use different standard animation techniques for 2D, 21/2 D, 3D applications

CO5: Understand the complexity of multimedia applications in the context of cloud, security, bigdata streaming, social networking and CBIR

22CSPE609 **DEEP LEARNING** **SEMESTER VI**

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

UNIT-I: DEEP LEARNING FUNDAMENTALS 9

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

UNIT-II: RECURRENT NEURAL NETWORKS 11

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

UNIT-III: CONVOLUTIONAL NEURAL NETWORKS 8

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

UNIT-IV: AUTOENCODER, RESTRICTED BOLTZMANN MACHINE 9

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

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

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

Contact Periods:

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

REFERENCES:

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

COURSE OUTCOMES:

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

CO1: Analyze the key computations underlying deep learning.

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

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

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

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

22CSPE610 MULTI-CORE ARCHITECTURE SEMESTER VI

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

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

UNIT-I: MULTI-CORE PROCESSORS 9

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

UNIT-II: PARALLEL PROGRAM CHALLENGES 9

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

UNIT-III: SHARED MEMORY PROGRAMMING WITH OpenMP 9

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

UNIT-IV: DISTRIBUTED MEMORY PROGRAMMING WITH MPI 9

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

UNIT-V: PARALLEL PROGRAM DEVELOPMENT 9

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

Contact Periods:

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

REFERENCES:

1. Peter S. Pacheco, “An Introduction to Parallel Programming”, Morgan-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.

22CSPE611 **ETHICAL HACKING** **SEMESTER VI**

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

22CSPE612 OPTIMIZATION TECHNIQUES SEMESTER VI

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.