

JERUSALEM COLLEGE OF ENGINEERING

(An Autonomous Institution)

**(Approved by AICTE, Affiliated to Anna University
Accredited by NBA and NAAC with 'A' Grade)**

Velachery Main Road, Pallikaranai, Chennai 600 100



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION OF THE INSTITUTION

Jerusalem College of Engineering is committed in emerging as an international institution of excellence in imparting the finest quality engineering, technology and management education rooted in ethical and societal values through various academic programmes, multi-disciplinary research, consultancy and entrepreneurship activities, and hence in contributing towards social transformation and nation building

MISSION OF THE INSTITUTION

- Generating abundant resources and making conducive policies, the management led by the Chief Executive Officer strives towards promoting globally competitive academic programmes augmented with value added courses, in-plant training, co-curricular activities and ambience that support intellectual growth and skill acquisition.
- Promoting collaborative trans-border research programmes, continuing education in synergy with academia, industries and research organizations leading to real time solutions and lifelong learning
- Transforming young men and women into competent professionals and entrepreneurs motivated by a passion for professional excellence, driven by human values and proactively engaging in the betterment of the society through innovative practices and academic excellence
- Facilitating effective interaction among faculty and students, and fostering network of alumni, industries, institutions and other stakeholders for successful career gain and placement.

VISION OF THE DEPARTMENT

The Department of Computer Science and Engineering is dedicated to be a center of excellence, in producing graduates as ethical engineers, innovative researchers, dynamic entrepreneurs and globally competitive technocrats.

MISSION OF THE DEPARTMENT

- To craft the students to be competent professionals with value based education, innovative teaching and practices
- To enhance student's soft skill, personality and ethical responsibilities by augmenting in-plant training, value added courses, co curricular and extracurricular activities
- To facilitate the students as researchers by widening their professional knowledge through continuous learning and innovative projects
- To produce dynamic entrepreneur through interaction with network of alumni, industry and academia

PROGRAM OUTCOMES(POs)

PO1:Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: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.

PO3: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.

PO4: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.

PO5: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.

PO6: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.

PO7: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.

PO8:Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9:Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: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.

PO11: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.

PO12:Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Graduates will apply engineering basics, laboratory and job oriented experiences to devise and unravel engineering problems in computer science engineering domain.

PEO2: Graduates will be multi faceted researchers and experts in fields like computing, networking, artificial intelligence, software engineering and data science.

PEO3: Graduates will be dynamic entrepreneurs and service oriented professionals with ethical and social responsibility.

PEO4: Graduates will ingress and endure in core and other prominent organization across the globe and will foster innovation.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO-I: The ability to understand, analyze and to develop the design, related to real-time system such as IOT, Secured Automated Systems, Machine Vision, Computer Vision And Cognitive Computing with various complexities , providing orientation towards green computing environment.

PSO-II: The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product

PSO-III: The ability to innovate, introduce and produce socially relevant products to facilitate transformation of society into a digitally empowered knowledge economy, thereby to chart a successful career with a new dimension to entrepreneurship.

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 (AN AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI)
B.E. COMPUTER SCIENCE AND ENGINEERING
REGULATION 2021
CHOICE BASED CREDIT SYSTEM
I TO VIII SEMESTERS CURRICULUM

COURSE SUMMARY SHEET

S.No	Category	Credits as per Semester								Total Credits
		1	2	3	4	5	6	7	8	
1	HS	3	3	-	-	1	-	-	-	7
2	BS	10	6	3	3	-	-	-	-	22
3	ES	10	13	5	-	-	-	-	-	28
4	PC	-	-	11	16	12	11	8	-	58
5	PE	-	-	-	-	3	6	6	-	15
6	OE	-	-	-	3	3	3	3	-	12
7	EEC	-	-	-	1	-	3	4	10	21
TOTAL (B.E)		23	22	19	23	19	23	21	10	160

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I TO VIII SEMESTERS CURRICULUM AND SYLLABI

SEMESTER 1

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JHS1121	Communicative English and Soft Skills I	HS	4	2	0	2	3
2	JMA1101	Matrices and Calculus	BS	4	2	2	0	3
3	JPH1101	Engineering Physics	BS	3	3	0	0	3
4	JCY1101	Engineering Chemistry	BS	3	3	0	0	3
5	JGE1101	Engineering Basics	ES	3	3	0	0	3
6	JGE1102	Programming in C	ES	3	3	0	0	3
PRACTICALS								
7	JPC1111	Physics and Chemistry Laboratory	BS	2	0	0	2	1
8	JGE1112	Programming in C Laboratory	ES	4	0	0	4	2
9	JGE1111	Design Appreciation Laboratory	ES	4	0	0	4	2
TOTAL				30	16	2	12	23

SEMESTER 2

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JHS1221	Technical English and Soft Skills II	HS	4	2	0	2	3
2	JMA1201	Vector Calculus and Complex Analysis	BS	4	2	2	0	3
3	JBE1223	Applied Science for Electronics and information Engineering	BS	4	2	0	2	3
4	JGE1201	Python Programming	ES	3	3	0	0	3
5	JEC1204	Digital Logic Fundamentals	ES	3	3	0	0	3
6	JGE1202	Engineering Graphics & Design	ES	5	1	0	4	3
7	JNC1261	Environmental Science	NCM	3	3	0	0	0
PRACTICALS								
8	JGE1211	Python Programming Laboratory	ES	4	0	0	4	2
9	JEC1214	Digital Logic Fundamentals Laboratory	ES	4	0	0	4	2
TOTAL				34	16	2	16	22

SEMESTER 3

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JMA1303	Discrete Mathematics and Number Theory	BS	4	2	2	0	3
2	JCS1301	Data Structures	ES	3	3	0	0	3
3	JCS1302	Database Management Systems	PC	3	3	0	0	3
4	JCS1303	Computer Architecture	PC	3	3	0	0	3
5	JCS1321 (Integrated)	Object Oriented Programming	PC	4	2	0	2	3
PRACTICALS								
6	JPT1001	Soft Skill and Aptitude- I	EEC	2	0	0	2	*
7	JCS1311	Data Structures Laboratory	ES	4	0	0	4	2
8	JCS1312	Database Management Systems Laboratory	PC	4	0	0	4	2
TOTAL				27	13	2	12	19

*Only Internal Assessment

SEMESTER 4

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JMA1403	Applied Probability and Queuing Theory	BS	4	2	2	0	3
2	JCS1401	Computer Networks	PC	3	3	0	0	3
3	JCS1402	Operating Systems	PC	3	3	0	0	3
4	JCS1403	Design and Analysis of Algorithms	PC	3	3	0	0	3
5	JCS1404	Software Engineering	PC	3	3	0	0	3
6		Open Elective-I	OE	3	3	0	0	3
PRACTICALS								
7	JPT1001	Soft Skills and Aptitude-II	EEC	2	0	0	2	1
8	JCS1411	Networks Laboratory	PC	4	0	0	4	2
9	JCS1412	Operating Systems Laboratory	PC	4	0	0	4	2
TOTAL				29	17	2	10	23

SEMESTER 5

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JCS1501	Internet Programming	PC	3	3	0	0	3
2	JCS1502 (Integrated)	Object Oriented Analysis and Design	PC	4	2	0	2	3
3	JCS1503	Theory of Computation	PC	5	3	2	0	4
4		Professional Elective - I	PE	3	3	0	0	3
5		Open Elective-II	OE	3	3	0	0	3
PRACTICALS								
6	JPT1002	Technical Skills and Aptitude-I	EEC	2	0	0	2	*
7	JHS1511	Professional Communication	HS	2	0	0	2	1
8	JCS1511	Internet Programming Laboratory	PC	4	0	0	4	2
TOTAL				26	14	2	10	19

*Only Internal Assessment

SEMESTER 6

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JCS1601	Compiler Design	PC	3	3	0	0	3
2	JIT1602	Artificial Intelligence	PC	3	3	0	0	3
3	JCS1603	Cryptography and Network Security	PC	3	2	1	0	3
4		Professional Elective - II	PE	3	3	0	0	3
5		Professional Elective - III	PE	3	3	0	0	3
6		Open Elective - III	OE	3	3	0	0	3
PRACTICALS								
6	JPT1002	Technical Skills and Aptitude-II	EEC	2	0	0	2	1
7	JCS1611	Compiler Design Laboratory	PC	4	0	0	4	2
8	JCS1621	Mini Project	EEC	2	0	0	2	1
9	JCS1641	Internship	EEC	-	-	-	2	1
TOTAL				26	18	0	10	23

**Internship of two weeks must be undertaken in Industry through semesters 3,4,5 leading to award of 1 credit in Semester VI

SEMESTER 7

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JCS1701	Big Data Analytics	PC	3	3	0	0	3
2	JCS1702 (Integrated)	Cloud Computing	PC	4	2	0	2	3
3		Professional Elective - IV	PE	3	3	0	0	3
4		Professional Elective - V	PE	3	3	0	0	3
5		Open Elective -IV	OE	3	3	0	0	3
6	JNC1361	Essence of Indian Traditional Knowledge	NCM	3	3	0	0	0
PRACTICALS								
7	JBA1711	Entrepreneurship for Engineers	EEC	2	0	0	2	1
8	JCS1711	Big Data Analytics Laboratory	PC	4	0	0	4	2
9	JCS1731	Project work – Phase I	EEC	6	0	0	6	3
TOTAL				31	17	0	14	21

SEMESTER 8

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JNC1861	Indian Constitution	NCM	3	3	0	0	0
PRACTICALS								
2	JCS1851	Comprehension and Technical Seminar	EEC	2	0	0	2	1
3	JCS1832	Project work – Phase II	EEC	18	0	0	18	9
TOTAL				23	3	0	20	10

PROFESSIONAL ELECTIVES

Vertical I DataScience	Vertical II Creative Media	Vertical III Cyber Security	Vertical IV IoT	Vertical V AI & ML
JAD1301- Foundation of Data science	JCS1025 - Principles of Multimedia	JCB1402 -Foundation of Cyber Security	JIT1036 -Internet of Things: Architecture Protocols and Applications	JAL1401- Principles of Artificial Intelligence
JCS1701- Big data analytics	JCS1026 -3D Modeling and Rendering	JCB1403 - Cryptography and Cryptanalysis	JIT1037 -Programming for IoT Boards	JAL1501-Machine Learning
JIT1033- Recommender systems	JCS1027 - Augmented reality and Virtual reality	JCB1501 -Cyber Forensics	JIT1038 - Industrial IoT 4.0	JAL1503 - Cognitive Science
JCS1020 - Web and Speech Analysis	JCS1028 - Digital Marketing and Commerce	JCB1502 -Intrusion Detection Systems	JIT1039 -IoT in Healthcare	JAL1601- Neural Networks and Deep Learning
JCS1021 -Social media analytics	JCS1029 - Computer Graphics and Animation	JCB1503 -Hardware Security	JIT1040 -Robotics in IoT	JAL1602 -Knowledge Representation and Reasoning
JCS1022- Data exploration and visualization	JCS1030 - Video processing and Analytics	JCB1601 -Cloud Security	JIT1041 - Mobile Application development for IoT	JAL1603 -Time Series Analysis and Forecasting
JCS1023 - Health care analytics	JAD1030 - Game Development	JCB1603 -Ethical Hacking	JIT1042 - Cognitive IOT	JAL1701 -Essence of Natural Language Processing
JCS1024 - Image and video Analytics	JCS1031 - Media Security	JCB1702 -Web Application Security	JIT1043 - Privacy and Security for IOT	JAL1702 -Robotic Process Automation

OPEN ELECTIVES

OPEN ELECTIVE 1 – SEMESTER 4

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	JCS9001	An Introduction to System Software	OE	3	3	0	0	3
2	JCS9002	Basics of Object Oriented Programming	OE	3	3	0	0	3
3	JCS9003	User Interface Design	OE	3	3	0	0	3

OPEN ELECTIVE 2 – SEMESTER 5

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	JCS9004	Introduction to Web Design	OE	3	3	0	0	3
2	JCS9005	Programming Tools and Techniques	OE	3	3	0	0	3
3	JCS9006	High Performance Networks for Beginners	OE	3	3	0	0	3

OPEN ELECTIVE 3 – SEMESTER 6

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	JCS9007	Essentials of Software Project Management	OE	3	3	0	0	3
2	JCS9008	Fundamentals of Big Data	OE	3	3	0	0	3
3	JCS9009	Security Practices	OE	3	3	0	0	3

OPEN ELECTIVE 4 – SEMESTER 7

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	JCS9010	Software Testing	OE	3	3	0	0	3
2	JCS9011	Introduction to Enterprises Resources Planning	OE	3	3	0	0	3
3	JCS9012	Basics of Machine Learning	OE	3	3	0	0	3

MANDATORY COURSES

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	JNC1261	Environmental Science	NCM	3	3	0	0	0
2	JNC1361	Essence of Indian Traditional Knowledge	NCM	3	3	0	0	0
3	JNC1861	Indian Constitution	NCM	2	2	0	0	0

HUMANITIES AND SOCIAL SCIENCES (HS)

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	JHS1121	Communicative English and Soft Skills I	HS	4	2	0	2	3
2	JHS1221	Technical English and Soft Skills II	HS	4	2	0	2	3
3	JHS1511	Professional Communication	HS	2	0	0	2	1

BASIC SCIENCES (BS)

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	JMA1101	Matrices and Calculus	BS	4	2	2	0	3
2	JPH1101	Engineering Physics	BS	3	3	0	0	3
3	JCY1101	Engineering Chemistry	BS	3	3	0	0	3
4	JPC1111	Physics and Chemistry Laboratory	BS	2	0	0	2	1
5	JMA1201	Vector Calculus and Complex Analysis	BS	4	2	2	0	3
6	JBE1223	Applied Science for Electronics and information Engineering	BS	4	2	0	2	3
7	JMA1303	Discrete Mathematics and Number Theory	BS	4	2	2	0	3
8	JMA1403	Applied Probability and Queuing Theory	BS	4	2	2	0	3

ENGINEERING SCIENCES (ES)

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	JGE1101	Engineering Basics	ES	3	3	0	0	3
2	JGE1102	Programming in C	ES	3	3	0	0	3
3	JGE1112	Programming in C Laboratory	ES	4	0	0	4	2
4	JGE1111	Design Appreciation Laboratory	ES	4	0	0	4	2

5	JGE1201	Python Programming	ES	3	3	0	0	3
6	JEC1204	Digital Logic Fundamentals	ES	3	3	0	0	3
7	JGE1202	Engineering Graphics & Design	ES	5	1	0	4	3
8	JGE1211	Python Programming Laboratory	ES	4	0	0	4	2
9	JEC1214	Digital Logic Fundamentals Laboratory	ES	4	0	0	4	2
10	JCS1301	Data Structures	ES	3	3	0	0	3
11	JCS1311	Data Structures Laboratory	ES	4	0	0	4	2

PROFESSIONAL CORE (PC)

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	JCS1302	Database Management Systems	PC	3	3	0	0	3
2	JCS1303	Computer Architecture	PC	3	3	0	0	3
3	JCS1321 (Integrated)	Object Oriented Programming	PC	4	2	0	2	3
4	JCS1312	Database Management Systems Laboratory	PC	4	0	0	4	2
5	JCS1401	Computer Networks	PC	3	3	0	0	3
6	JCS1402	Operating Systems	PC	3	3	0	0	3
7	JCS1403	Design and Analysis of Algorithms	PC	3	3	0	0	3
8	JCS1404	Software Engineering	PC	3	3	0	0	3
9	JCS1411	Networks Laboratory	PC	4	0	0	4	2
10	JCS1412	Operating Systems Laboratory	PC	4	0	0	4	2

10	JCS1501	Internet Programming	PC	3	3	0	0	3
11	JCS1502	Object Oriented Analysis and Design	PC	4	2	0	2	3
12	JCS1503	Theory of Computation	PC	5	3	2	0	4
13	JCS1511	Internet Programming Laboratory	PC	4	0	0	4	2
14	JCS1601	Compiler Design	PC	3	3	0	0	3
15	JIT1602	Artificial Intelligence	PC	3	3	0	0	3
16	JCS1603	Cryptography and Network Security	PC	3	3	0	0	3
17	JCS1611	Compiler Design Laboratory	PC	4	0	0	4	2
18	JCS1701	Big Data Analytics	PC	3	3	0	0	3
19	JCS1702	Cloud Computing	PC	4	2	0	2	3
20	JCS1711	Data Analytics Laboratory	PC	4	0	0	4	2

EMPLOYMENT ENHANCEMENT COURSES (EEC)

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	JCS1621	Mini Project	EEC	2	0	0	2	1
2	JCS1641	Internship	EEC	-	-	-	2	1
3	JBA1711	Entrepreneurship for Engineers	EEC	2	0	0	2	1
4	NMS0001	Professional Readiness for Innovation , Employability and Entrepreneurship	EEC	6	0	0	6	3
5	JCS1731	Project work – Phase I	EEC	6	0	0	6	3

6	JCS1851	Comprehension and Technical Seminar	EEC	2	0	0	2	1
7	JCS1832	Project work – Phase II	EEC	18	0	0	18	9
8	JPT1001	Soft Skill and Aptitude- I	EEC	2	0	0	2	*
9	JPT1001	Soft Skills and Aptitude-II	EEC	2	0	0	2	1
10	JPT1002	Technical Skills and Aptitude-I	EEC	2	0	0	2	*
11	JPT1002	Technical Skills and Aptitude-II	EEC	2	0	0	2	1

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SEMESTER I

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JHS1121	Communicative English and Soft Skills I	HS	4	2	0	2	3
2	JMA1101	Matrices and Calculus	BS	4	2	2	0	3
3	JPH1101	Engineering Physics	BS	3	3	0	0	3
4	JCY1101	Engineering Chemistry	BS	3	3	0	0	3
5	JGE1101	Engineering Basics	ES	3	3	0	0	3
6	JGE1102	Programming in C	ES	3	3	0	0	3
PRACTICALS								
7	JPC1111	Physics and Chemistry Laboratory	BS	2	0	0	2	1
8	JGE1112	Programming in C Laboratory	ES	4	0	0	4	2
9	JGE1111	Design Appreciation Laboratory	ES	4	0	0	4	2
TOTAL				30	16	2	12	23

JHS1121	COMMUNICATIVE ENGLISH & SOFT SKILLS I (Common to all B.E / B. Tech Programmes)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To enable the students of Engineering and Technology to develop their listening skill by learning the key techniques for comprehending information
- To facilitate the learners to speak effectively while exchanging ideas in academic and social domains
- To develop their skills in reading and understanding texts through practice
- To expose them to the correct usage of language to develop their writing skill
- To train the students to use appropriate vocabulary in academic and technical writings

UNIT I Basic Grammar I and Reading for information 9

Parts of speech - Sentence patterns – Tenses - Wh- questions - Yes/no questions - Countable and Uncountable nouns - Affixation – word formation; Reading short comprehension passages - practice in skimming and scanning for specific information and note-making, Critical reading - finding key information in a given text - shifting facts from opinions and paraphrasing

SOFT SKILLS LAB 3

Listening to documentaries, inspiring speeches of great leaders, news bulletins, Ted talks, telephonic conversations

UNIT II Basic Grammar I and Sharing Information 9

Pronouns - Adjectives - Adverbs - Imperatives - Direct and indirect questions - Compound words - Guessing meaning of words in contexts – one word substitutes; Autobiographical writing (writing about one's leisure time activities, hometown, favourite place and school life) – Biographical writing (place, people), Letter writing (informal letters)

SOFT SKILLS LAB 3

Self-introduction, peer introduction, picture description, JAM

UNIT III Basic Grammar III and Free Writing I 9

Conjunctions – Prepositions - Articles - Degrees of comparison – Discourse markers - Reference words; Process description, Coherence and cohesion in writing cause and effect / compare & contrast / narrative / analytical paragraphs

SOFT SKILLS LAB 9

Language functions: Giving reasons, talking about future plans, comparing and contrasting, making suggestions

UNIT IV Basic Grammar IV and Language Development 9

Subject-verb agreement - Modal verbs - Phrasal verbs - Single word substitutes - Use of abbreviations & acronyms - Cloze reading - Interpreting visual material, Jumbled sentences

SOFT SKILLS LAB 3

Interpersonal Skills: role play, group discussion, debate, conduct of meeting

UNIT V Basic Grammar V and Free Writing II **9**

Clause - Direct and indirect speech – Correction of errors - Word association (connotations) - Lexical items (fixed / semi fixed expressions) - Essay writing – different types of essays, dialogue writing

SOFT SKILLS LAB **3**

Creative writing and speaking skills: Poster making and description, project proposals

TOTAL: 60 PERIODS

Course Outcomes:

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

- Listen to different talks and lectures and understand them easily
- Communicate their thoughts confidently using communicative strategies
- Read and grasp different genres of texts effortlessly
- Write grammatically correct academic, business and technical texts
- Apply the language skills efficiently in all forms of communication

Text books:

1. Board of Editors, Department of English, Anna University, Chennai. Using English: A Course Book for Undergraduate Engineers and Technologists, Orient Black Swan: Chennai, 2017.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Black Swan Publications, Chennai, 2011.
3. Raman, Meenakshi & Sangeetha Sharma, Technical Communication: English Skills for Engineers. Oxford University Press, New Delhi. 2011.

Reference Books:

1. Regional Institute of English. English for Engineers. Cambridge University Press, New Delhi. 2006
2. Rizvi M, Ashraf. Effective Technical Communication. Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.
3. Rutherford, Andrea J. Basic Communication Skills for Technology. Pearson Edition (II Edition), New Delhi, 2001.
4. Mandel, Steve. *Effective Presentation Skills*. New Delhi: Viva Books Pvt. Ltd., 2004.
5. Writing Cover Letters-Kilmet, Stephen. "Cover Letter," and "Enclosures and Attachments." In *Writing for Design Professionals*. New York.

Web Links:

1. <https://www.perfect-english-grammar.com>
2. <https://edu.gcfglobal.org/en/grammar>
3. <https://www.talkenglish.com/grammar/grammar.aspx>
4. <https://learnenglish.britishcouncil.org/skills>
5. <https://www.myenglishlanguage.com>

Extensive Reading:

Kalam, Abdul. *The Wings of Fire*, Universities Press, Hyderabad. 1999

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	2	3	-	2
CO2	-	-	-	-	-	-	-	1	2	3	-	2
CO3	-	-	-	-	-	-	-	1	2	3	-	2
CO4	-	-	-	-	-	-	-	1	2	3	-	2
CO5	-	-	-	-	-	-	-	1	2	3	-	2
AVG	-	-	-	-	-	-	-	1	2	3	-	2

JMA1101	MATRICES AND CALCULUS (Common to all B.E /B.Tech Programmes)	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To equip students with the knowledge of matrices required for applications in engineering.
- To enable students to understand the concepts of multivariable functions and its calculus.
- To familiarize students on concepts of differential calculus and its applications.
- To introduce concepts of integral calculus as tools required for applications in engineering.
- To introduce ordinary differential equations which is widely used in problem solving and engineering applications.

UNIT I MATRICES

12

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices by similarity and orthogonal transformations – Reduction of a quadratic form to canonical form Nature of quadratic forms.

UNIT II FUNCTIONS OF SEVERAL VARIABLES

12

Partial differentiation – Total derivative – Jacobians – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT III APPLICATIONS OF DIFFERENTIAL CALCULUS

12

Curvature and radius of curvature – Circle of curvature – Evolutes – Envelopes – Evolute as envelope of normals.

UNIT IV APPLICATIONS OF INTEGRAL CALCULUS

12

Multiple integrals: Double integrals – Change of order of integration – Change of variables – Area enclosed by plane curves – Triple integrals – Volume of solids.
Improper integrals: Beta and Gamma Integrals – Definitions and properties – Simple problems.

UNIT V ORDINARY DIFFERENTIAL EQUATIONS

12

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

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able

- To understand applications of matrix theory in quadratic forms
- To use calculus for problems and applications dealing with functions of several variables
- To apply differential calculus in practical problem solving in the area of geometry
- To gain insight on the applications of multiple integrals in area and volume problems
- To solve ordinary differential equations that occur in many physical and engineering applications

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
3. P.Anuradha and V.Sudhakar, "Matrices and Calculus", Scitech Publications, 1st Edition, Chennai, 2019.

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1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
4. Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

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- 3.<https://nptel.ac.in/courses/111/104/111104144/>
- 4.<https://nptel.ac.in/courses/111/105/111105122/>
- 5.<https://nptel.ac.in/courses/111/107/111107111/>

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	2	-	-	2
CO2	3	3	2	2	-	-	-	-	2	-	-	2
CO3	3	3	2	2	-	-	-	-	2	-	-	2
CO4	3	3	2	2	-	-	-	-	2	-	-	2
CO5	3	3	2	2	-	-	-	-	2	-	-	2
AVG	3	3	2	2	-	-	-	-	2	-	-	2

JPH1101	ENGINEERING PHYSICS (Common to all B.E /B.Tech Programmes)	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To enable the students to understand the basics in crystals structure
- To enable the students to understand the basic concepts in properties of matter
- To impart knowledge in ultrasonic inspections
- To introduce the principles of quantum mechanics
- To impart knowledge of laser and fiber optic communication

UNIT I CRYSTAL PHYSICS 9

Single crystal, Polycrystalline and Amorphous materials – Single Crystals: Unit cell, Crystal systems, Bravais lattices, Directions and Planes in a crystal, Miller indices – Inter planar distances – Coordination number and Packing factor for SC, BCC, FCC, HCP and Diamond structures - Crystal imperfections: Point defects, Line defects – Burgers vector, Stacking faults

UNIT II PROPERTIES OF MATTER 9

Elasticity – Stress-strain diagram and its uses - factors affecting elastic moduli and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - stress due to bending in beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment

UNIT III ULTRASONICS 9

Production of ultrasound by Magnetostriction effect and Piezoelectric effect Detection of ultrasonic wave – Properties of ultrasonic wave – Acoustic grating - Industrial applications – Drilling, Welding, Soldering and Cleaning – SONAR - Non Destructive Testing – Pulse echo system through Transmission and Reflection modes- A, B and C–scan displays.

UNIT IV PHOTONICS AND FIBRE OPTICS 9

Spontaneous and stimulated emission-Population inversion -Einstein's A and B coefficients derivation – Laser Principle - Semiconductor lasers (homojunction & heterojunction)- Optical Fiber: types (material, refractive index, mode) - Propagation of light in optical fibers – Numerical aperture and Acceptance angle –attenuation, dispersion, bending -Fiber Optical Communication system (Block diagram) -Active and passive fiber sensors- Endoscope.

UNIT V QUANTUM PHYSICS 9

Black body radiation –Planck's theory (derivation) –Deduction of Wien's displacement law and Rayleigh –Jeans' Law from Planck's theory –Compton effect-theory –Properties of Matter waves –G.P Thomson experiment -Schrödinger's wave equation –Time independent and time dependent equations –Physical significance of wave function –Particle in a one dimensional box -Scanning electron microscope -Transmission electron microscope

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Students will be able

- To enhance knowledge on properties of matter
- To assess the properties of ultra sonics and imaging devices
- To understand and to compute problems in Quantum Physics.
- To learn the use of modern optical fiber communication systems and tools in real life applications.
- To gain more insight on the functioning of optical materials for optoelectronics.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. Dr.Beula Shanthi John , Dr.P.mani," Engineering Physics", Dhanam Publications, First Edition, 2019.

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1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning,2010.
3. Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics".W.H.Freeman, 2007
4. Rajendran V, "Engineering Physics", Tata McGraw Hill, 2009.
5. John D.Cutnell, "Cutnell and Johnson Physics", Willey Publications, 2018.

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- 5.<https://nptel.ac.in/courses/108/104/108104113/>

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	1	-	-	1	-	1	-
CO2	2	1	1	-	-	1	-	-	1	-	1	-
CO3	2	1	1	-	-	1	-	-	1	-	1	-
CO4	2	1	1	-	-	1	-	-	1	-	1	-
CO5	2	1	1	-	-	1	-	-	1	-	1	-
AVG	2	1	1	--	-	1	-	-	1	-	1	-

JCY1101	ENGINEERING CHEMISTRY	L	T	P	C
	(Common to all B.E /B.Tech Programmes)	3	0	0	3

COURSE OBJECTIVE

- To acquaint the student with concepts of photochemistry and analytical techniques.

- To make the students conversant with boiler feed water and water treatment techniques.
- To make the students acquire sound knowledge in corrosion of materials.
- To understand polymer chemistry and the principle of energy in batteries.
- To impart knowledge on the basics of nano materials and engineering materials.

UNIT I: PHOTOCHEMISTRY AND ANALYTICAL TECHNIQUES

9

Photochemistry- Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law (problems). Photo processes - Internal Conversion, Inter-system crossing, Fluorescence and its applications in medicine – Phosphorescence-Chemiluminescence and Photo-sensitization.

Analytical Techniques – UV-visible spectroscopy – principles – instrumentation (block diagram only) – Colorimetry- Principle-Instrumentation, estimation of iron by colorimetry – Flame photometry – principle – Instrumentation – estimation of sodium by Flame photometry.

UNIT II WATER TECHNOLOGY

9

Hardness-Units of Hardness- Temporary hardness-Permanent hardness- Estimation hardness by EDTA method- Alkalinity – Types- water quality parameters (pH, EC, TDS, DO, BOD, COD) – Boiler feed water-requirements- boiler troubles (scale and sludge-caustic embrittlement-boiler corrosion-priming and foaming) - softening of hard water - external treatment (zeolite and demineralization) - internal treatment (phosphate, calgon, carbonate, colloidal) -- desalination of brackish water –reverse osmosis.

UNIT III ELECTROCHEMISTRY AND CORROSION

9

Electrochemistry- Electrochemical cell - redox reaction, electrode potential- oxidation potential- reduction potential, measurement and applications - electrochemical series and its significance - Nernst equation (derivation and problems).

Corrosion- causes- types-chemical, electrochemical corrosion- galvanic corrosion-differential aeration corrosion (pitting, waterline, wire fence, pipeline, crevice, stress corrosion), Factors influencing the rate of corrosion- corrosion control - material selection and design aspects – cathodic protection methods (sacrificial anode and impressed current cathodic methods)- Electroplating of Copper and electroless plating of nickel-corrosion inhibitors (anodic and cathodic inhibitors).

UNIT IV POLYMER , COMPOSITES AND ENERGY STORAGE DEVICES

9

Introduction- Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerization.. Biodegradable polymer- Types-synthetic methods – applications of biodegradable polymers. Polymer composites and its application.

Energy Storage Devices - Batteries and fuel cells: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, nickel-cadmium battery, lithium-ion-battery). Fuel cell – H₂-O₂ fuel cell- solid oxide fuel cell - polymer electrolyte membrane fuel cell (PEMFC) applications.

UNIT V ENGINEERING MATERIALS AND NANOCHEMISTRY

9

Engineering Materials- Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) – manufacture of alumina, magnesite and zirconia bricks. cement-

manufacture and properties - setting and hardening of cement, special cement-waterproof and white cement-properties and uses.

Nanochemistry– Introduction – distinction between molecules, nanoparticles and bulk materials; Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Students will be able to

- Understand laws of photochemistry and principles of instrumentation and their applications in various fields.
- To understand the basic principle of water treatment and techniques involved in the purification process for future learning.
- Apply electrochemical reactions on the process of corrosion and its prevention methods.
- Gain knowledge on biodegradable polymers and understand the principle of batteries for development of new energy resources .
- Gain knowledge on engineering materials and understand the unique behavior of nanomaterials.

TEXT BOOKS:

1. Jain P.C. and Monica Jain, “Engineering Chemistry”, Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2010.
2. R.Gopalan, D.Venkayya, SulochnaNagarajan,Textbook of Engineering Chemistry, Vikas publishing pvt ltd, 4th edition, 2013.
3. Dr.N.JohnJebarathinamDr.R.VaidyanathanMs.A.U.AjishaDr.A.Ravikrishna n, Engineering Chemistry, Sri Krishna Publications,First edition 2019.

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1. O.G.Palanna, Engineering Chemistry, McGraw Hill, 2017
2. Dara S.S, Umare S.S, “Engineering Chemistry”, S. Chand & Company Ltd., New Delhi 2013.
3. Gowariker V.R. , Viswanathan N.V. and Jayadev Sreedhar, “Polymer Science”, New Age International P (Ltd.), Chennai, 2006.
4. Ozin G. A. and Arsenault A. C., “Nanochemistry: A Chemical Approach to Nanomaterials”, RSC Publishing, 2005.
5. B.R.Puri, L.R.Sharma, Madan S.Pathana, Principle of physical chemistry, 47th edition, Vishal publishing Co, 2017.

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2. <https://www.samcotech.com/what-is-a-boiler-feed-water-treatment-system-how-does-it-work/>
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CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	-	-	-	1	1
CO2	1	1	1	1	1	1	1	-	1	1	1	-
CO3	1	1	1	1	1	1	1	-	1	1	1	-
CO4	1	1	1	1	1	1	1	1	1	1	1	1
CO5	1	1	1	1	1	1	1	-	1	1	1	1
AVG	1	1	1	1	1	1	1	1	1	1	1	1

JGE1101	ENGINEERING BASICS (Common to all B.E /B.Tech Programmes)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To impart knowledge on the basics of Civil Engineering to the students.
- To impart knowledge on the basics of Mechanical Engineering to the students.
- To impart knowledge on the electric circuits and working principles of Electrical Machines.
- To impart knowledge on the Principles and characteristics of various electronic devices.
- To impart knowledge on the basics of various measuring instruments.

UNIT 1 BASICS OF CIVIL ENGINEERING

11

Introduction to Civil Engineering, Types of buildings, Components of a residential building, Building Materials, Types of slabs, beam, column, lintel, floor and foundation - Types of roofs.

Surveying and Levelling - Linear and Angular Measurements - Introduction to transport system, role of transportation in society - Green Highway. Sources of water, Hydrological cycle, Irrigation Engineering, Rain water harvesting, Environmental pollution, Greenhouse gas emission, Ozone depletion, Global warming - Green building concepts.

UNIT 2 BASICS OF MECHANICAL ENGINEERING

11

Introduction to the concepts of Mechanization and Automation, Robotics - Manufacturing methods - casting, machining, forming operations, Introduction to IC Engine - Working principles of four stroke petrol and diesel engines, Types of power plants - Hydel power plant and thermal power plant, Steam generators - Fire tube boiler and water tube boiler, Thermal systems - Heat exchangers, Radiator and oil cooler, Design of ingenious mechanisms - Parts feeding mechanism.

UNIT 3 ELECTRIC CIRCUITS AND ELECTRICAL MACHINES

7

Basic circuit components - Ohms Law - Kirchhoff's Law-Introduction to AC circuits-waveforms and RMS value - Power and power factor-Principles of operation and characteristics of DC

machines-Transformers-Three phase and single-Phase inductionmotors.

UNIT 4 ELECTRONIC DEVICES & CIRCUITS

7

Types of Materials - Silicon & Germanium - N type and P type materials - Construction and Characteristics: PN Junction diode - Zener Diode - Bipolar Junction Transistor - Field effect Transistors - IGBT - Introduction to operational amplifier - Inverting Amplifier - Non-inverting Amplifier.

UNIT 5 MEASUREMENTS & INSTRUMENTATION

9

Elements of generalized measurement system - Basic terminologies: Accuracy, precision, resolution, sensitivity, linearity, span and range - Errors in measurement - Standards of measurement - calibration - Operating forces: Deflection force, controlling force, damping force - Classification of instruments.

TOTAL 45 PERIODS

COURSE OUTCOMES

The students will be able to

- Gain knowledge on the various fields of Civil Engineering.
- Know the fundamentals of Mechanical Engineering.
- Understand the basic concepts of electric circuits and working principles of electrical machines.
- Gain knowledge on the basics of electronics and apply them in practical situations.
- Choose appropriate instruments for electrical measurement for a specific application.

TEXT BOOKS

1. Shanmugam G and Palanichamy MS, “ Basic Civil and Mechanical Engineering”, Tata McGraw Hill publishing Co., 2016
2. Venugopal K. and Prahu Raja V., Basic Mechanical Engineering, Anuradha Publishers, Kumbakonam,2000.
3. D P Kothari and I.J Nagarath, Electrical Machines - Basic Electrical and Electronics Engineering , McGraw Hill Education (India) Private Limited, Third Reprint, 2016.

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1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2010.
2. RamamruthamS.,Basic Civil Engineering, Dhanpat Rai Publishing Co.(P) Ltd.1999.
3. Thereja .B.L., Fundamentals of Electrical Engineering and Electronics , S. Chand & Co. Ltd., 2008.
4. A.K. Sawhney, A Course in Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai and Co, New Delhi, 2010.
5. H.S. Kalsi, Electronic Instrumentation, Tata McGraw-Hill, New Delhi, 2010.

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4. <https://nptel.ac.in/courses/117/103/117103063/>
5. <https://nptel.ac.in/courses/108/105/108105153/>

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	-	-	-	-	-	-	-
CO2	1	1	1	1	1	-	-	-	-	-	-	-
CO3	1	1	1	1	1	-	-	-	-	-	-	-
CO4	1	1	1	1	1	-	-	-	-	-	-	-
CO5	1	1	1	1	1	-	-	-	-	-	-	-
AVG	1	1	1	1	1	-	-	-	-	-	-	-

JGE1102	PROGRAMMING IN C	L	T	P	C
		3	0	0	3

Course Objectives

- To learn Fundamentals of computing
- To be able to use file operations in C
- To implement programs using basic features of C
- To learn to use C pointers and dynamically allocated memory techniques
- To learn advanced features of the C programming language

UNIT I INTRODUCTION TO PROBLEM SOLVING 9

Simple model of a Computer – Hardware – Software – Data Representation, Problem Solving Techniques – Bottom up design and top down design - applications, Introduction to Algorithms and Flow Chart - Notion of memory, addresses, variables, instructions, execution of instruction- Operating system commands, file editing, compiling, linking, executing a program.

UNIT II C PROGRAMMING 9

Introduction to ‘C’ programming – structure of a ‘C’ program – compilation and linking processes. Conversion of simple algorithm to program-Constants, Variables – Data Types – Expressions using operators in ‘C’ – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problem

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and two dimensional arrays - String- String operations –Arrays of strings.

UNIT IV FUNCTIONS AND USER DEFINED DATA TY 9

Function – definition of function – Declaration of function – Pass by value - Pass by reference–Command Line Argument in C-- Recursion - Enumerators – Structures - Unions.

UNIT V POINTERS AND FILES 9

Macros - storage classes - Pointers- Definition – Initialization – Pointers arithmetic – Double Pointers, Basic file operations-Example problems.

TOTAL: 45 Periods

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Design and represent solutions to problems as algorithm and flow chart
- Write simple C Programs using loops and conditional statements
- Write simple C Programs using arrays
- Write simple C Programs using functions
- Write simple C codes using pointers, structures and union

TEXT BOOKS:

1. PradiDey, ManasGhosh, "Programming in C", First Edition, Oxford University Press, 2018
2. Byron S Gottfried, "Programming with C", Schaum's Outlines, Third Edition, McGraw- Hill, 2010.

REFERENCES:

1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.
2. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.
3. Paul J Deitel,Dr.Harvey M.Deitel,"C How to Program", Seventh Edition, Pearson Education, 2016.
4. E. Balagurusamy, "Computing Fundamentals and C Programming", McGraw-Hill Publishing Company Limited, (2008).
5. Brian W. Kernighan and Rob Pike, "The Practice of Programming" (Chap 1), Pearson Education, 2008

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3. <https://www.studytonight.com/c/string-and-character-array.php>
4. https://www.tutorialspoint.com/cprogramming/c_functions.htm
5. <https://www.guru99.com/c-pointers.html>

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	3	3	3	-	3
CO2	3	3	3	-	-	-	-	3	3	3	-	3
CO3	3	3	3	-	-	-	-	3	3	3	-	3
CO4	3	3	3	-	-	-	-	3	3	3	-	3
CO5	3	3	3	-	-	-	-	3	3	3	-	3
AVG	3	3	3	-	-	-	-	3	3	3	-	3

JPC1111	Physics and Chemistry Laboratory (Common to all B.E /B.Tech Programmes)	L	T	P	C
		0	0	2	1

OBJECTIVES:

To provide students the first hand experience of verifying various concepts learnt in theory courses.

LIST OF EXPERIMENTS:

Physics

1. Determination of Young's modulus for the given uniform bar by uniform bending method
2. Determination of wavelength of the diode laser and hence determine the size of the coated powder particle
3. Determination of velocity of Ultrasound using Ultrasonic interferometer and also find the compressibility of the given liquid
4. Determination of moment of inertia of the given circular disc and rigidity modulus of the metal wire using torsional pendulum
5. Determination of Planck's constant using different color filters
6. Determination of Wavelength of spectral lines in mercury spectrum using spectrometer
7. Analysis of I-V Characterization of Solar cell

TOTAL:15 PERIODS

LIST OF EXPERIMENTS

Chemistry

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water samples.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper in brass by Iodometry.
6. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.

TOTAL:15 PERIODS

OUTCOMES:

Students will be able

1. Acquire experience in analyzing the elastic materials.
2. Understand the acoustic properties of various liquids.
3. Acquire knowledge in optical properties of solids.
4. Make the student acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
5. Acquaint the students with the determination of molecular weight of a polymer by viscometry

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1. Practical Fiber Optics, D. Bailey and E. Wright, 2003
2. Jerrad H.G. and Mc Neil D.B. -Theoretical and Experimental Physics
3. Fretter W.B. -Introduction to Experimental Physics, Blackie
4. J.Mendham, RC Denney, JD Barnes, MJK Thomas, Text book of quantitative chemical analysis, Vogel's, 2008

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3. <http://www.mgcub.ac.in/pdf/material/20200428101433e562a8b8e8.pdf>
4. <http://depthome.brooklyn.cuny.edu/physics/lab/phy2/newlabs/Diffraction-grating-ver-2.pdf>
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CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	1	1	-	-	1	-	1	1
CO2	2	1	1	-	1	1	-	-	1	-	1	1
CO3	2	1	1	-	1	1	-	-	1	-	1	1
CO4	2	1	1	-	1	1	-	-	1	-	1	1
CO5	2	1	1	-	1	1	-	-	1	-	1	1
AVG	2	1	1	--	1	1	-	-	1	-	1	1

JGE1112	Programming in C Laboratory	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

The students should be made to:

- To be exposed to the syntax of C
- To be familiar with programming in C
- To learn to use arrays, strings, functions, pointers, structures and unions in C.
- To Learn the fundamentals of File Programming in C
- To solve simple problems using C

LIST OF PROGRAMS

1. Usage of Basic Linux commands
2. C Programming using Simple statements and expressions
3. Scientific problem solving using decision making and looping.
4. Simple programming for one dimensional and two dimensional arrays.
5. Solving problems using Strings
6. C Programming using Pointers
7. C Programming using user defined functions (Pass by value and Pass by reference)
8. C Programming using Recursion
9. C Programming using structures and union
10. C Programming using enumerated data types
11. C Programming using macros and storage classes
12. C Programming using Files

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Write simple C Programs
- Able to solve scientific problems using C
- Gain knowledge on the use of functions and arrays

- Use structures, pointers and files in C Programs
- Develop modularized applications in C

TEXT BOOKS:

1. PradipDey, ManasGhosh, “Programming in C - As per the latest AICTE syllabus”, First Edition, Oxford University Press, 2018
2. Byron S Gottfried, “Programming with C”, Schaum’s Outlines, Third Edition, McGraw- Hill, 2010

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2. <https://www.w3resource.com/c-programming-exercises/>
3. <https://www.javatpoint.com/functions-in-c>
4. <https://www.programiz.com/c-programming/c-structures-pointers>
5. <https://www.sitesbay.com/cprogramming/c-applications>

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	-	-	-	2	2	2		2
CO2	3	3	3	3	-	-	-	3	3	3		3
CO3	3	3	3	3	-	-	-	3	3	3		3
CO4	3	3	3	3	-	-	-	3	3	3		3
CO5	3	3	3	3	-	-	-	3	3	3		3
AVG	3	3	3	3	-	-	-	3	3	3		3

JGE1111	DESIGN APPRECIATION LABORATORY (Common to all B.E /B.Tech Programmes)	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To provide exposure to the students with hands-on experience on various basic Engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
- To kindle your own creativity, ideation and realize the importance of team working.
- To gain knowledge through experience in handling of engineering aggregates.
- To appreciate the use of various mechanisms involved in engineering products.
- To understand the interactions between its subsystems and their functionality.

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE

13

Buildings:

- (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- (b) Study of pipe connections requirements for pumps and turbines.
- (c) Preparation of plumbing line sketches for water supply and sewage works.
- (d) Hands-on-exercise: Basic pipe connections - Mixed pipe material connection - Pipe connections with different joining components.
- (e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

- (a) Study of the joints in roofs, doors, windows and furniture.
- (b) Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

MECHANICAL ENGINEERING PRACTICE**18****Welding:**

- (a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
- (b) Gas welding practice

Basic Machining:

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

Sheet Metal Work:

- (a) Forming & Bending:
- (b) Model making - Trays and funnels.
- (c) Different type of joints.

Machine Assembly Practice:

- (a) Study of centrifugal pump
- (b) Study of air conditioner

Demonstration on:

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example - Exercise - Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.
- (c) Fitting - Exercises - Preparation of square fitting and V - fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)**I ELECTRICAL ENGINEERING PRACTICE****13**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities - voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

II ELECTRONICS ENGINEERING PRACTICE

16

1. Study of Electronic components and equipments - Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EX - OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice - Components Devices and Circuits - Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Fabricate carpentry components and pipe connections including plumbing works.
- Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings.
- Carry out basic home electrical works and appliances.
- Measure the electrical quantities.
- Elaborate on the components, gates, soldering practices.

EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets
2. Carpentry vice (fitted to work bench) 15 Nos
3. Standard woodworking tools 15 Sets
4. Models of industrial trusses, door joints, furniture joints 5 each
5. Power Tools:
 - (a) Rotary Hammer 2 Nos
 - (b) Demolition Hammer 2 Nos
 - (c) Circular Saw 2 Nos
 - (d) Planer 2 Nos
 - (e) Hand Drilling Machine 2 Nos
 - (f) Jigsaw 2 Nos

MECHANICAL

1. Arc welding transformer with cables and holders 5 Nos
2. Welding booth with exhaust facility 5 Nos
3. Welding accessories like welding shield, chipping hammer, wire brush etc. 5 Sets
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. 2 Nos
5. Centre lathe 2 Nos
6. Hearth furnace, anvil and smithy tools 2 Sets
7. Moulding table, foundry tools 2 Sets
8. Power Tool: Angle Grinder 2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner 1 each

ELECTRICAL

1. Assorted electrical components for house wiring 15 Sets
2. Electrical measuring instruments 10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp 1 each
4. Megger (250V/500V) 1 No
5. Power Tools:

- (a) Range Finder 2 Nos
- (b) Digital Live-wire detector 2 Nos

ELECTRONICS

- 1. Soldering guns 10 Nos
- 2. Assorted electronic components for making circuits 50 Nos
- 3. Small PCBs 10 Nos
- 4. Multimeters 10 Nos
- 5. Study purpose items: Telephone, FM radio, low-voltage power supply

WEB SITE REFERENCES:

- 1. www.vikaspublishing.com/engineering-practices-lab
- 2. <https://archieve.org/mechanicalengineeeringworkshoplaboratory>

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	-	-	-	1	1
CO2	1	1	1	1	1	1	1	-	1	1	1	-
CO3	1	1	1	1	1	1	1	-	1	1	1	-
CO4	1	1	1	1	1	1	1	1	1	1	1	1
CO5	1	1	1	1	1	1	1	-	1	1	1	1
AVG	1	1	1	1	1	1	1	-	1	1	1	1

SEMESTER II

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JHS1221	Technical English and Soft Skills II	HS	4	2	0	2	3
2	JMA1201	Vector Calculus and Complex Analysis	BS	4	2	2	0	3
3	JBE1223	Applied Science for Electronics and information Engineering	BS	4	2	0	2	3
4	JGE1201	Python Programming	ES	3	3	0	0	3
5	JEC1204	Digital Logic Fundamentals	ES	3	3	0	0	3
6	JGE1202	Engineering Graphics & Design	ES	5	1	0	4	3
7	JNC1261	Environmental Science	NCM	3	3	0	0	0
PRACTICALS								
8	JGE1211	Python Programming Laboratory	ES	4	0	0	4	2
9	JEC1214	Digital Logic Fundamentals Laboratory	ES	4	0	0	4	2
TOTAL				34	16	2	16	22

JHS1221	TECHNICAL ENGLISH & SOFT SKILLS II (Common to all B.E /B.Tech Programmes)	L	T	P	C
		2	0	2	3

Course Objectives:

- To make the students of engineering and technology enhance their ability to read and comprehend different texts
- To improve their creative and critical thinking so as to use in demanding contexts
- To equip the learners with the skills of writing convincing job applications and effective reports
- To develop their speaking skills to make technical presentations and participate in group discussions
- To facilitate them to hone their soft skills

UNIT I Technical Writing and Visual Conversion 9

Definitions, Purpose statements, Technical vocabulary, regular and irregular verbs - Process Description and Interpretation of Graphs and Charts

Soft Skills Lab 3

Skimming and scanning, understanding logic and sequencing in reading, inferring the exact meaning of text, making out meaning of pictorial and graphical representations

UNIT II Technical Writing and Guidelines Preparation 9

Conditional clauses, Numerical adjectives, Collocation, verbal analogies - Instructions, Recommendations, Checklist

Soft Skills Lab 3

Comprehensive listening: Listening to telephonic conversations, listening to native accents, short and long conversations from different domains, listening to various pre-recorded conversations and speeches

UNIT III 12

Soft Skills Lab

Listening and speaking practice based on BEC, IELTS and TOEFL

UNIT IV Technical Writing and Business letters 9

Cause and effect, impersonal passive voice, idioms and phrases, words used as nouns and verbs -- Letter writing – job application, business correspondence (letters) - calling for quotations, placing order, complaint letters, preparing a memo, notice and e-mail – itinerary

Soft Skills Lab 3

Group Discussions - Process, Skills, Guidelines, Evaluation, Oral Presentation – Planning, Preparing, Organizing, Presenting

UNIT V Technical Writing and Report Writing 9

Degrees of comparison, editing, Email etiquette, Misspelled words -- Report writing: survey, feasibility, industrial visit, reporting various incidents and accidents, Minutes of meeting

Soft Skills Lab 3

Starting a Career – vision statement, preparing logo and tagline, making short term and long term goals, setting plans

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Read and understand general and technical texts
- Apply creative and critical thinking and communicate their ideas efficiently
- Participate in group discussions and deliver short speeches effectively
- Write effectively and persuasively in academic and workplace contexts
- Face the future challenges confidently and successfully

TEXT BOOKS:

1. Department of English, Anna University, Chennai. Mindscapes: English for Technologists and Engineers. Orient Black Swan, Chennai, 2012.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Black Swan Publications, Chennai, 2011.
3. Rizvi, M. Ashraf, "Effective Technical Communication", Tata McGraw – Hill, 2006.

REFERENCE BOOKS:

1. Ibbotson, Mark, "Cambridge English for Engineering", Cambridge University Press, 2008.
2. English, Laura M & Sarah Lynn, "Business Across Cultures: Effective Communication Strategies", Addison Wesley, 1995.
3. Richard Johnson-Sheehan, "Technical Communication Today" 4th Edition Books Longman Publishing Group, 2011.
4. Porter, Patricia A., and Margaret Grant, "Communicating Effectively in English: Oral Communication for Non-Native Speakers", 2nd Edition, Wadsworth, 1992.
5. Gopalaswamy, Ramesh & Ramesh Mahadevan. ACE of Soft Skills: Attitude, Communication and Etiquette for Success, New Delhi: Pearson, 2010.

Web Links:

1. <https://learnenglish.britishcouncil.org/business-english>
2. <https://www.thebalancecareers.com>
3. <https://www.deakin.edu.au/students/studying/study-support/academic-skills/report-writing>
4. <https://www.englishclub.com>
5. <https://www.ielts.org>

Extensive Reading:

- Wells, H.G. The Time Machine, Peacock, India, 2008.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	2	3	-	2
CO2	-	-	-	-	-	-	-	1	2	3	-	2
CO3	-	-	-	-	-	-	-	1	2	3	-	2
CO4	-	-	-	-	-	-	-	1	2	3	-	2
CO5	-	-	-	-	-	-	-	1	2	3	-	2
AVG	-	-	-	-	-	-	-	1	2	3	-	2

JMA1201	VECTOR CALCULUS AND COMPLEX ANALYSIS (Common to all B.E /B.Tech Programmes)	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To familiarize students with concepts of vector calculus and complex analysis in problem solving.
- To build concepts of Laplace transforms leading up to its applications on solving differential equations

UNIT I VECTOR CALCULUS 12

Vector Differentiation: Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields
 Vector Integration: Line and surface integrals - Green’s theorem – Gauss and Stoke’s theorems – Verification and evaluation in simple problems.

UNIT II ANALYTIC FUNCTIONS 12

Analytic functions – Zeros and Singularities - Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates (without proof) - Properties – Harmonic conjugates – Construction of analytic functions - Conformal mappings $w = z, =c, \neq$ – Bilinear transformation.

UNIT III COMPLEX INTEGRATION 12

Cauchy’s integral theorem – Cauchy’s integral formula – Taylor’s and Laurent’s series - Types of Singularities and residues – Cauchy’s Residue theorem – Application of residue theorem for evaluation of real integrals (Circular contour and semi-circular contour only).

UNIT IV LAPLACE TRANSFORMS 12

Definition - Existence conditions – Transforms of elementary functions – Transforms of unit step function and unit impulse function – Properties with proof – Initial and final value theorems – Transform of periodic functions – Convolution theorem with proof – Problems.

UNIT V INVERSE LAPLACE TRANSFORMS 12

Definition - Evaluation of Inverse Laplace transforms by using properties, partial fractions, residues and convolution theorem - Applications to solution of linear second order ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able

- To understand concepts of vector calculus and evaluate line and surface integrals
- To understand analyticity of complex valued functions, bilinear transformation and conformal mappings
- To evaluate complex integrals using Cauchy’s integral and Cauchy’s residue theorems
- To find Laplace transforms of functions using definition and properties
- To apply Laplace transform method in solving differential equations

TEXT BOOKS:

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rd Edition, 2014.

- P.Anuradha and V.Sudhakar, "Vector Calculus and Complex Analysis", Scitech Publications, 1st Edition, Chennai, 2019.

REFERENCES:

- 1.Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
- 2.Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
- 3.O'Neil, P.V., "Advanced Engineering Mathematics", Cengage Learning India Pvt Ltd, New Delhi, 2007.
- 4.Sastry, S.S, "Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
- 5.Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

WEB REFERENCES

- <https://nptel.ac.in/courses/111/105/111105122/>
- <https://nptel.ac.in/courses/111/106/111106141/>
- <https://nptel.ac.in/courses/111/107/111107056/>
- <https://nptel.ac.in/courses/111/106/111106139/>

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	-	-	-	-	2	-	-	2
CO2	2	2	2	2	-	-	-	-	2	-	-	2
CO3	2	2	2	2	-	-	-	-	2	-	-	2
CO4	2	2	2	2	-	-	-	-	2	-	-	2
CO5	2	2	2	2	-	-	-	-	2	-	-	2
AVG	2	2	2	2	-	-	-	-	2	-	-	2

JBE1223	APPLIED SCIENCE FOR ELECTRONICS AND INFORMATION ENGINEERING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES

- To understand the essential principles of semiconductor device and Electron transport properties.
- To understand the essential principles of magnetic properties of materials.
- To understand the essential principles of optical properties of materials.
- To compare the basic concepts of hybridization with chemical bonding.
- To understand the principles in various analytical techniques.

UNIT I SEMICONDUCTING MATERIAL

7

Intrinsic semiconductor – Carrier concentration – Fermi level – Variation of Fermi level with temperature – Electrical conductivity – Band gap determination – Compound semiconductors - Direct and Indirect band gap- Carrier concentration in N-type and P-type semiconductor – Variation of Fermi level with temperature and Impurity concentration .

UNIT II MAGNETIC AND SUPERCONDUCTING MATERIALS 7

Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – Soft and Hard magnetic materials– Ferrites and its applications - Superconductivity: properties – Type I and Type II superconductors – BCS theory of superconductivity (Qualitative) – High Tc superconductors .

UNIT III OPTICAL PROPERTIES OF MATERIALS 7

Classification of Optical materials - metals, insulators and semiconductors) – Carrier generation and Recombination processes - Absorption emission and Scattering of light (concepts only) - Photo current in a P-N diode – Solar cell - LED – Organic LED.

UNIT IV CHEMICAL BONDING AND CONDUCTIVITY IN SOLIDS 10

Band theory - Salient feature-Application of band theory (conductor, semiconductor, insulator)- Semiconductor- Types (intrinsic and extrinsic) - Band energy levels for pure silicon crystal, band model of n-type and p-type semiconductance of silicon. Types -Nonelemental semiconductor, Defect semiconductor, Chalcogen semiconductor (definition, properties). Preparation of Germanium- Fractional distillation and crystal growth methods. Fullerenes-preparation, properties and applications. Conducting polymer-Types-mechanism of conduction (polyacetylene) - polyaniline - properties, applications.

UNIT V INSTRUMENTAL METHODS OF ANALYSIS 9

Thermal analysis techniques- Thermo gravimetric analysis and Differential thermal analysis- Principle, instrumentation and applications - Concept of chromatography – Principle, instrumentation and applications of Paper chromatography, Column chromatography, Thin layer chromatography and Gas chromatography. Principle and applications of Conductometric titrations, Potentiometric titrations and pH-metry.

PHYSICS LABORATORY

LIST OF EXPERIMENTS: (ANY 5)

1. Determination of dispersive power of the given solid prism using spectrometer
2. Determination of thickness of the given thin material by forming interference fringes using air- wedge setup
3. Analysis of I-V Characterization of Solar cell
4. Determination of energy gap of the given semiconductor by plotting the graph between current and temperature
5. Determination of acceptance angle of the given fiber cable.
6. Determination of Young's modulus for the given uniform bar by nonuniform bending method

CHEMISTRY LABORATORY

LIST OF EXPERIMENTS (ANY 5)

1. Determination of strength of hydrochloric acid using pH meter.
2. Determination of strength of acids in a mixture of acids using conductivity meters.
3. Conductometric titration of strong acid vs strong base.
4. Estimation of iron content using potentiometer.

6. Estimation of sodium and potassium present in water using a flame photometer.
7. Determination of SAP and FAV values of an oil.
8. Estimation of acetic acid adsorbed on charcoal

TOTAL: 60 PERIODS

COURSE OUTCOMES

At the end of the course, the students will able to

- Acquire knowledge on basics of conductivity of solids, semiconductor physics and its Applications in various devices,
- Get knowledge on magnetic properties of materials and their applications in data storage
- Have the necessary understanding on the functioning of optical materials for Optoelectronics
Acquainted with hands-on knowledge in the quantitative chemical analysis through instrumental analysis
- Acquire practical knowledge on interference pattern, semiconductor devices, solar cells and instrumental analysis of acids, bases and heavy metals.

TEXT BOOKS

1. Kasap, S.O.- Principles of Electronic Materials and Devices, McGraw, Education, 2007.
2. Jasprit Singh, Semiconductor Devices: Basic Principles, Wiley 2012.
3. Kittel, C. Introduction to Solid State Physics. Wiley, 2005.
4. Umesh K Mishra & Jasprit Singh, "Semiconductor Device Physics and Design", Springer, 2008.
5. Jain P.C. and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2010.

REFERENCES

1. Garcia, N. & Damask, A. "Physics for Computer Science Students". Springer-Verlag, 2012
2. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials". Narosa Publishing House, 2009.
3. Gurdeep R. Chatwal, Sham K. Anand, Instrumental methods of chemical analysis, Himalaya Publishing House, 2007.
4. Practical Fiber Optics, D. Bailey and E. Wright, 2003.
5. J. Mendham, R.C. Denney, J.D. Barnes, M.J.K. Thomas, Text book of quantitative chemical analysis, Vogel's, 2008.

WEBSITE LINK

1. <https://nptel.ac.in/courses/115/102/115102025/>
2. <https://www.youtube.com/watch?v=6QUFuZpCgGw>
3. <http://tiny.cc/0vhjuz>
4. <https://nptel.ac.in/content/storage2/courses/103108100/module7/module7.pdf>
5. <https://nptel.ac.in/courses/108/108/108108122/>

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	1	-	-	1	-	1	-
CO2	2	1	1	-	-	1	-	-	1	-	1	-
CO3	2	1	1	-	-	1	-	-	1	-	1	-
CO4	2	1	1	-	-	1	-	-	1	-	1	-
CO5	2	1	1	-	-	1	-	-	1	-	1	-
AVG	2	1	1	--	-	1	-	-	1	-	1	-

JGE1201	PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To provide an introduction to Python Programming Language.
- To understand the decision making and looping concepts.
- To understand functions, strings and list in Python.
- To understand tuples, dictionaries and files.
- To know the exception handling and 2D concepts.

UNIT 1 INTRODUCTION TO PYTHON

9

History of Python, Features, Installing Python, Running Python Program, Interactive mode programming, Script Mode Programming, Identifiers, Reserved Words, Indentation, Comments, Variables, Data Types, Data Type Conversion

UNIT 2 DECISION MAKING AND LOOPING

9

Python Operators, Operator Precedence, Decision Making: if Statement, if else Statement, if elif else Statement, nested if Statement, Loops: while loop, for loop, nested loops; Loop Control Statements: continue Statement, break Statement, pass Statement: Iterator and Generator

UNIT 3 FUNCTIONS, STRING, LIST

9

Functions: Pre defined Functions, User defined Functions, Recursion, Lambda Function; String: Functions, methods, modules; Lists: Operations, pre-defined functions, advanced list processing; Packages

UNIT 4 TUPLES, DICTIONARY, FILES

9

Tuples: Tuple Operations and methods, Dictionary: Dictionary Operations and methods; Files: Text Files, Reading and writing Files; Format Operator, Command line argument

UNIT 5 EXCEPTION HANDLING AND GRAPHICS

9

Date & Time Methods, Exception handling clauses, Raising an Exception, User Defined Exception; Simple graphics and image processing, simple 2d drawing - colors and shapes.

Total : 45 Periods

JEC1204	DIGITAL LOGIC FUNDAMENTALS (Common to B.E/B.Tech./ CSE & IT Programmes)	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To analyze and design synchronous sequential circuits
- To analyze and design asynchronous sequential circuits
- To understand Memory and Programmable Logic Devices

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9

Number Systems - Arithmetic Operations - Binary Codes- Boolean Algebra and Logic Gates - Theorems and Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Simplification of Boolean Functions using Karnaugh Map - Logic Gates – NAND and NOR Implementations.

UNIT II COMBINATIONAL LOGIC 9

Combinational Circuits – Analysis and Design Procedures - Binary Adder-Subtractor - Decimal Adder - Binary Multiplier - Magnitude Comparator - Decoders – Encoders – Multiplexers.

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 9

Sequential Circuits - Storage Elements: Latches, Flip-Flops - Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure - Registers and Counters.

UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC 9

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race- free State Assignment – Hazards.

UNIT V MEMORY AND PROGRAMMABLE LOGIC 9

RAM – Memory Decoding – Error Detection and Correction - ROM - Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices.

TOTAL : 45 PERIODS

OUT COMES:

On Completion of the course, the students should be able to:

- Simplify Boolean functions using KMap
- Design and Analyze Combinational and Sequential Circuits
- Design and Analyze synchronous sequential circuits
- Analyze and design asynchronous sequential circuits
- Implement designs using Programmable Logic Devices

TEXT BOOK:

1. M. Morris Mano and Michael D. Ciletti, “Digital Design”, 5th Edition, Pearson, 2014.

REFERENCES

1. G. K. Kharate, Digital Electronics, Oxford University Press, 2010
2. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition,

CENGAGE Learning, 2013

4. Donald D. Givone, Digital Principles and Design , Tata McGraw Hill, 2003.

WEBSITE REFERENCES:

1. <https://nptel.ac.in/courses/108/105/108105113/>
2. <http://www.nptelvideos.com/lecture.php?id=9330>
3. <https://nptel.ac.in/courses/117/106/117106086/>
4. <https://nptel.ac.in/courses/117/106/117106086/>
5. <http://www.nptelvideos.com/lecture.php?id=9616>

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	2	2	1	-	-	-	-	2	2
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CO3	3	3	1	2	2	1	-	-	-	-	2	2
CO4	3	3	1	2	2	1	-	-	-	-	2	2
CO5	2	2	1	2	2	1	-	-	-	-	2	2
AVG	3	3	1	2	2	1	-	-	-	-	2	2

JGE1202	ENGINEERING GRAPHICS & DESIGN (Common to all B.E /B.Tech Programmes)	L	T	P	C
		1	0	4	3

OBJECTIVES

- To understand the importance of graphics in engineering
- To develop skills in preparation of basic drawing
- To improve their technical communication skill in the form of communicative drawing
- To impart knowledge about standard principle of orthographic projection of objects.
- To improve their visualization skills for developing new products.

UNIT I PLANE CURVES AND ORTHOGRAPHIC PROJECTION 15

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.

Representation of Three Dimensional objects - General principles of orthographic projection - Need for importance of multiple views and their placement - First angle projection - layout views - Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 15

Projection of points and straight lines located in the first quadrant - Determination of true lengths and true inclinations - Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT III PROJECTION OF SOLIDS

15

Projection of simple solids like prisms, pyramids, cylinders and cones when the axis is inclined to one reference plane by change of position method.

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES

15

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other - Obtaining true shape of section.

Development of lateral surfaces of simple and truncated solids - Prisms, pyramids, cylinders and cones - Development of lateral surfaces of solids with cylindrical cut-outs and square cut-outs, perpendicular to the axis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

15

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Perspective projection of prisms, pyramids and cylinders by visual ray method.

TOTAL: 75 PERIODS

COURSE OUTCOMES:

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

- Familiarize with the fundamentals and standards of engineering graphics.
- Perform free hand sketching of basic geometrical constructions and multiple views of objects.
- Project orthographic projections of lines and plane surfaces.
- Draw projection of solids and development of surfaces.
- Interpret isometric and perspective view of objects.

TEXT BOOKS:

1. Natarajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.
3. Bhatt N.D. and Panchal V.M., —Engineering Drawing!, Charotar Publishing House, 50th Edition,2010

REFERENCES:

1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Gopalakrishna K.R., “Engineering Drawing” (Vol. I & II combined), Subhas Stores, Bangalore, 2007.
3. Luzzader, Warren.J and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production”, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. N S Parthasarathy and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
5. Shah M.B and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

1. IS 10711 - 2001: Technical products Documentation - Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) - 2001: Technical products Documentation - Lettering.
3. IS 10714 (Part 20) - 2001 & SP 46 - 2003: Lines for technical drawings.
4. IS 11669 - 1986 & SP 46 - 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) - 2001: Technical drawings - Projection Methods.

Web site References:

1. www.pdfdrive.com/engineering_drawing-books.html
2. <https://freevideolectures.com>
3. <https://nptel.ac.in/courses>
4. <https://nptel.ac.in/courses/105/104/105104148/>
5. <https://nptel.ac.in/courses/112/103/112103019/>

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	-	1	1	-	1	1	1	1	1
CO2	1	1	1	1	1	1	1	-	1	1	1	-
CO3	1	-	1	1	1	-	1	1	1	1	1	1
CO4	-	1	1	1	-	1	1	1	1	1	1	1
CO5	1	1	1	-	1	1	1	1	1	1	-	1
AVG	1	1	1	1	1	1	1	1	1	1	1	1

JNC1261	ENVIRONMENTAL SCIENCE	L	T	P	C
		3	0	0	0

COURSE OBJECTIVES:

- To study the interrelationship between living organisms and the environment.
- To find and implement scientific, technological and environmental problems due to pollution.
- To study the various natural resources and the responsibility of the individual to conserve it.
- To study the social issues over the environment.
- To get knowledge on population explosion, human rights and value education.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIO DIVERSITY 9

Definition, scope and importance of environment - need for public awareness - concept of an ecosystem - structure and function of an ecosystem - energy flow in the ecosystem - ecological succession - food chains, food webs and ecological pyramids - Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) - Introduction to biodiversity definition: genetic, species and ecosystem diversity - value of biodiversity - threats to biodiversity - conservation of biodiversity: In- situ and ex-situ conservation of biodiversity.

UNIT II ENVIRONMENTAL POLLUTION

9

Definition - causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards - Solid waste management: causes, effects and control measures of municipal solid wastes - Role of an individual in prevention of pollution.

UNIT III NATURAL RESOURCES

9

Forest resources: Use and over-exploitation, deforestation, case studies - timber extraction, mining, dams and their effects on forests and tribal people - Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams - benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources- effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: renewable and non renewable energy sources, Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - role of an individual in conservation of natural resources.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

9

Water conservation- watershed management - resettlement and rehabilitation of policy. - consumerism and waste products - environment production act - Air (Prevention and Control of Pollution) act - Water (Prevention and control of Pollution) act - Wildlife protection act - Forest conservation act - enforcement machinery involved in environmental legislation - central and state pollution control boards - Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

9

Human population growth, variation among nations population explosion - family welfare programme - environment and human health - human rights - value education - HIV / AIDS - women and child welfare - role of information technology in environment and human health.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of course completion, students will be able to

- Explain about ecosystems, their structure and function to conserve biodiversity.
- Recognize the level of environmental pollution and their control measures.
- Explain about the various types of natural resources and role of a human being in maintaining a clean sustainable environment for the future generations.
- Identify the social problems in the environment to reduce social issues.
- Understand environment and human health - human rights - value education, and the role of information technology in environment and human health.

TEXT BOOKS:

1. ErachBharucha, - Textbook of Environmental Studies, Universities Press (I) PVT, LTD, Hyderabad, 2015.
2. Benny Joseph, Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.

REFERENCES:

1. Dharmendra S. Sengar, Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
2. Rajagopalan, R, Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.

- Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
- G. Tyler Miller and Scott E. Spoolman, - Environmental Science, Cengage Learning India PVT, LTD, Delhi, 2014.

WEB SITE REFERENCES:

- <https://moef.gov.in/e-books/>
- <https://www.csindia.org/understanding-eia-383>
- <https://nptel.ac.in/courses/120108004>
- <https://nptel.ac.in/courses/107/103/107103081/>
- <https://nptel.ac.in/courses/109/104/109104045/>

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-	3	2	-	-	1	-
CO2	1	-	-	-	-	-	3	2	-	-	1	-
CO3	1	-	-	-	-	-	3	2	-	-	1	1
CO4	1	-	-	-	-	2	3	2	-	-	1	-
CO5	1	-	-	-	-	2	3	2	-	-	1	-
AVG	1	-	-	-	-	2	3	2	-	-	1	1

JGE1211	PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

Course Objectives

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- To implement basic 2D diagrams.

LIST OF PROGRAMS

- Compute the GCD of two numbers.
- Find the square root of a number (Newton's method)
- Exponentiation (power of a number)
- Find the maximum of a list of numbers
- Guess an integer number in a range
- Insert a card in a list of sorted cards.
- Multiply matrices
- Programs that take command line arguments (word count)
- Find the most frequent words in a text read from a file
- Create an User defined Exception
- Draw a 2d circle and square

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

TOTAL: 60 PERIODS

COURSE OUTCOMES :

At the end of the course, the student will be able to

Co1 : Write, test, and debug simple Python programs.

Co2 : Implement Python programs with conditionals and loops.

Co3 : Develop Python programs step-wise by defining functions and calling them.

Co4 : Use Python lists, tuples, dictionaries for representing compound data.

Co5 : Draw 2d graphic diagrams in Python.

WEBSITE REFERENCE:

1. <https://www.programiz.com/python-programming/examples>
2. <https://www.javatpoint.com/python-condition-and-loops-programs>
3. <https://realpython.com/python-lists-tuples/>
4. <https://www.tutorialsteacher.com/python/python-user-defined-function>
5. <https://www.cdslab.org/python/notes/visualization/2d/2d.html>

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	3	-	-	3	3	3	-	3
CO2	3	3	3	-	3	-	-	3	3	3	-	3
CO3	3	3	3	-	3	-	-	3	3	3	-	3
CO4	3	3	3	-	3	-	-	3	3	3	-	3
CO5	3	3	3	-	3	-	-	3	3	3	-	3
AVG	3	3	3	-	3	-	-	3	3	3	-	3

JEC1214	DIGITAL LOGIC FUNDAMENTALS LABORATORY (Common to B.E/B.Tech./ CSE & IT Programmes)	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To understand the various basic logic gates
- To design and implement the various combinational circuits
- To design and implement combinational circuits using MSI devices.
- To design and implement sequential circuits

LIST OF EXPERIMENTS

1. Verification of Boolean Theorems using basic gates.
2. Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters.
3. Design and implement Half/Full Adder and Subtractor.
4. Design and implement combinational circuits using MSI devices:
 - 4 – bit binary adder / subtractor
 - Parity generator / checker
 - Magnitude Comparator
5. Application using multiplexers.
6. Design and implement shift-registers.
7. Design and implement synchronous counters.

8. Design and implement asynchronous counters.
9. Design and implementation of a simple digital system (Mini Project).

TOTAL: 60 PERIODS

OUTCOMES:

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

- Implementation of basic logic gates
- Implement simplified combinational circuits using basic logic gates
- Implement combinational circuits using MSI devices
- Implement sequential circuits like registers and counters

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Digital trainer kits - 30
2. Digital ICs required for the experiments in sufficient numbers

WEBSITE REFERENCES:

- <http://vlabs.iitkgp.ac.in/dec/>
- www.electronicsfor/you.com

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	2	1	-	-	-	1	3
CO2	3	3	2	2	1	2	1	-	-	-	1	3
CO3	3	3	2	2	1	2	1	-	-	-	1	3
CO4	3	3	2	2	1	2	1	-	-	-	1	3
CO5	3	3	2	2	1	2	1	-	-	-	1	3
AVG	3	3	2	2	1	2	1	-	-	-	1	3

SEMESTER-III

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JMA1303	Discrete Mathematics and Number Theory	BS	4	2	2	0	3
2	JCS1301	Data Structures	ES	3	3	0	0	3
3	JCS1302	Database Management Systems	PC	3	3	0	0	3
4	JCS1303	Computer Architecture	PC	3	3	0	0	3
5	JCS1321 (Integrated)	Object Oriented Programming	PC	4	2	0	2	3
PRACTICALS								
6	JPT1001	Soft Skill and Aptitude- I	EEC	2	0	0	2	*
7	JCS1311	Data Structures Laboratory	ES	4	0	0	4	2
8	JCS1312	Database Management Systems Laboratory	PC	4	0	0	4	2
TOTAL				27	13	2	12	19

JMA1303	DISCRETE MATHEMATICS AND NUMBER THEORY	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To equip students with the ability to deal with abstraction by way of Propositional logic.
- To familiarize students in combinatorial problems and its applications.
- To enable students understand basics of graph theory and algorithms.
- To introduce fundamental concepts in number theory and its applications.
- To conceptualize congruence, its applications and standard theorems.

UNIT I LOGIC AND PROOFS 12

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

UNIT II COMBINATORICS 12

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

UNIT III GRAPHS 12

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 DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS 12

Division algorithm – Base-b representations – Number patterns – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM – Linear Diophantine equations.

UNIT V CONGRUENCES AND CLASSICAL THEOREMS 12

Congruences – Linear Congruences - Applications: Divisibility tests - Modular exponentiation - Chinese remainder theorem – 2 x 2 linear systems - Wilson's theorem – Fermat's little theorem – Euler's theorem – Euler's Phi functions – Tau and Sigma functions.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able

CO1:To understand propositional logic and various proof methods and strategy.

CO2:To use counting principles and mathematical induction in solving combinatorial problems.

CO3:To demonstrate efficient use of graph theoretic concepts in Solving connectivity and shortest path problems.

CO4:To understand divisibility theory and canonical decompositions of number theory.

CO5:To solve simple problems using classical theorems of number theory.

TEXT BOOKS:

1. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
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, 2011.
2. Koshy, T., —Elementary Number Theory with Applications, Elsevier Publications, New Delhi, 2002.

REFERENCES

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007.
2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum’s Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
3. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
4. Lidl, R. and Pitz, G, "Applied Abstract Algebra", Springer Verlag, New Delhi, 2nd Edition, 2006.
5. Niven, I, Zuckerman.H.S., and Montgomery, H.L., —An Introduction to Theory of Numbers, John Wiley and Sons , Singapore, 2004.
6. San Ling and Chaoping Xing, — Coding Theory – A first Course, Cambridge Publications, Cambridge, 2004.

WEB REFERENCES

1. <https://nptel.ac.in/courses/111/106/111106086/>
2. <https://nptel.ac.in/courses/111/106/111106155/>
3. <https://nptel.ac.in/courses/111/106/111106102/>
4. <https://nptel.ac.in/courses/111/101/111101137/>
5. <https://nptel.ac.in/courses/111/103/111103020/>

CO-PO MAPPINGS

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	2	-	-	2
CO2	3	3	2	2	-	-	-	-	2	-	-	2
CO3	3	3	2	2	-	-	-	-	2	-	-	2
CO4	3	3	2	2	-	-	-	-	2	-	-	2
CO5	3	3	2	2	-	-	-	-	2	-	-	2
AVG	3	3	2	2	-	-	-	-	2	-	-	2

JCS1301	DATA STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To be familiar with pointers and structures in C
- To understand the concepts of ADTs
- To understand linear data structures—lists, stacks, and queues
- To apply Tree and Graph structures
- To understand sorting, searching and hashing algorithms

UNIT I DATA STRUCTURES IN C –LISTS

9

Dynamic memory allocation using malloc(), free()-Pointers to Structure-Introduction to Data Structures- Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation – Singly linked lists- Circularly linked lists– Doubly-linked lists – Applications of lists–Polynomial Manipulation

UNIT II LINEAR DATA STRUCTURES-STACK AND QUEUE

9

Stack ADT – Array implementation of stack – Linked List implementation of stack– Applications of stack ADT–Infix to Postfix Notation, Evaluating arithmetic expressions– Queue ADT–Array implementation of Queue – Linked List implementation of Queue – Circular queue – Applications of queues

UNIT III NON-LINEAR DATA STRUCTURES- TREES

9

Tree ADT–Tree terminologies–Binary Tree ADT-Tree traversals–Expression trees–Binary search tree ADT-AVL Trees –Complete binary tree–Full binary tree-Heap–Priority queue using Heap–B-Tree-B+Tree

UNIT IV NON-LINEAR DATA STRUCTURES- GRAPHS

9

Graphs - Definition – Representation of Graph – Types of graph – Breadth-first traversal– Depth-first traversal – Topological Sort – Applications of graphs-Shortest path algorithm – Dijkstra’s algorithm-Minimum spanning trees-Prim’s Algorithm-Kruskal’s Algorithm

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES

9

Searching-Linear Search–Binary Search.Sorting–Bubblesort–Selection sort–Insertion sort Hashing-Hash Functions –Separate Chaining–Open Addressing–Rehashing

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Write programs using pointers and structures in C
- Implement abstract data types of linear data structures
- Apply the different linear data structures to problem solutions
- Apply the different non-linear data structures to problem solutions
- Implement the various sorting and hashing algorithms

TEXT BOOKS

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education, 2014.
2. Yashavant Kanetkar, “Understanding Pointers in C&C++”, 5th Revised & Updated Edition, BPB Publications, 2018.

REFERENCES

1. Reema Thareja, “Data Structures Using C”, Second Edition, Oxford University Press, 2014.
2. E. Balagurusamy, “Data Structures Using C”, McGraw Hill Education; First edition 2017.
3. Jeri R. Hanly, Elliot B. Koffman, “Problem Solving and Program Design in C”, 7th Edition, 2012, Prentice-Hall.
4. A. K Sharma, “Data Structures using C”, Second Edition, Pearson Education India 2013.
5. Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein, “Data Structures Using C”, Pearson Education; First edition 2019.
6. Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education, 2002.

WEBSITE REFERENCES

1. <https://nptel.ac.in/courses/106/102/106102064/>
2. <https://www.hackerearth.com/practice/data-structures/arrays/1-d/tutorial/>
3. <https://www.geeksforgeeks.org/data-structures>
4. https://www.tutorialspoint.com/data_structures_algorithms/index.htm

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	3	3	1	-	-	-	2	3	3	-	3	2	3	1
CO-2	3	3	3	-	-	-	-	3	3	3	-	3	3	3	3
CO-3	3	3	3	1	-	-	-	3	3	3	-	3	3	3	1
CO-4	3	3	3	1	-	-	-	3	3	3	-	3	3	3	2
CO-5	3	3	3	1	-	-	-	3	3	3	-	3	2	3	2

JCS1302	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To learn the working of various datamodels and get exposed to SQL querying
- To design data base with ERmodels and understand the significance of normalization
- To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures
- To have an introductory knowledge about the Storage and Query processing Techniques
- To familiarize the students with different types of advanced databases

UNIT I DATA MODELS AND QUERYING

9

Purpose of Data base System–Views of data–Data Models–Data base System Architecture
Introduction to relational databases–Relational Model–Keys–Relational Algebra–SQL fundamentals–
Advanced SQL features–Embedded SQL–Dynamic SQL.

UNIT II DESIGN AND NORMALIZATION

9

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping
Functional Dependencies–Non-loss Decomposition–First-Second-Third Normal Forms
Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and
Fourth Normal Form–Join Dependencies and Fifth Normal Form.

UNIT III TRANSACTION PROCESSING

9

Transaction Concepts–ACID Properties– Schedules–Serializability–ConcurrencyControl– Need for
Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery avePoints –
Isolation Levels–SQL Facilities for Concurrency and Recovery

UNIT IV IMPLEMENTATION TECHNIQUES 9

RAID – 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–Query optimization.

UNIT V ADVANCED DATABASE SYSTEMS 9

Distributed Databases Architecture – Data Storage – Transaction Processing – Object-based Data bases Object Database Concepts –Object-Relational Features– ODMG Object Model– ODL–OQLXML Databases –XML Hierarchical Model –DTD–XMLSchema– XQuery–DatabaseConnectivity–Fundamentals of Database security.

TOTAL 45 PERIODS

COURSE OUTCOMES

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

- Design efficient databases and extract information with SQL queries
- Develop preliminary design of normalized databases
- Analyze the various stransactions and provide smooth access of data
- Create organized databases and write optimized queries
- Learn the various advanced database concepts and security

TEXTBOOKS

1. Abraham Silberschatz, HenryF. Korth, S.Sudharshan, “Database System Concepts”, Seventh Edition, TataMcGraw Hill, 2020.
2. RamezElmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Sixth Edition, Pearson Education, 2015.

REFERENCES

1. Raghu Ramakrishnan, “Database Management Systems”, Fourth Edition, McGraw-Hill College Publications, 2015.
2. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2008.
3. G.K.Gupta, “Database Management Systems” ,Tata McGrawHill, 2011.

WEBSITE REFERENCES

1. <https://www.tutorialspoint.com/dbms/index.htm>
2. <https://www.studytonight.com/dbms/>
3. <https://www.w3schools.in/dbms/>
4. <https://sqlzoo.net/>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	3	3	2	2	3	3	2	3	3	1	2	2	3
CO-2	3	3	3	3	3	2	2	2	3	1	2	3	3	3	1
CO-3	3	2	3	1	3	3	3	2	3	3	3	3	3	2	2
CO-4	1	3	3	2	3	3	2	3	3	2	3	2	3	3	2
CO-5	3	3	3	2	2	2	3	3	2	3	2	3	2	3	2

JCS1303	COMPUTER ARCHITECTURE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the basic structure and operations of a computer
- To familiarize with arithmetic and logic unit and implementation of fixed-point and floating-point arithmetic operations
- To expose the concept of pipelining
- To understand parallelism and multi-core processors
- To learn cache memories and virtual memory

UNIT-I BASIC STRUCTURE OF A COMPUTER SYSTEM 9

Functional Units – Basic Operational Concepts – Performance – Instructions:Operations, Operands – Instruction Representation – Logical Operations – Decision Making – Addressing and Addressing Modes

UNIT-II ARITHMETIC FOR COMPUTERS 9

Fixed-point Representation–Addition,Subtraction,Multiplication,Division–Floating-point Representation–Floating-point Operations-Subword Parallelism

UNIT-III PROCESSOR AND CONTROL UNIT 9

Basic MIPS Implementation–Building a Datapath–Control Implementation Scheme–Pipelining–Pipelined Datapath and Control–Handling Data Hazards –Handling Control Hazards–Exceptions.

UNIT-IV PARALLELISIM 9

Parallel Processing Challenges – Flynn’s Classification – Hardware Multithreading – Multi-coreProcessors and other Shared Memory Multiprocessors – Introduction to Graphics Processing Units,Clusters, Warehouse Scale Computers.

UNIT-V MEMORY & I/OSYSTEMS 9

Memory Hierarchy–Memory Technologies–Cache Basics–Measuring and Improving CachePerformance–Virtual Memory, TLB’s –Accessing I/O Devices–DMA and Interrupts.

TOTAL:45 Periods

COURSE OUTCOMES

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

- Understand the basic structure of computers, operations and instructions
- Design arithmetic and logic unit
- Realize pipelined execution and design control unit
- Familiarize in the concepts of parallel processing architectures
- Acquire knowledge in various memory systems and I/O communication

TEXTBOOKS

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fifth Edition, Morgan Kaufmann/Elsevier, 2014.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata Mc Graw Hill, 2012.

REFERENCES

1. V. Carl Hamacher, Zvonko G. Vranesic and Safat G. Zaky, "Computer Organization", VI Edition, McGraw Hill Inc, 2012.
2. William Stallings "Computer Organization and Architecture", Seventh Edition, Pearson Education, 2006.
3. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition, Pearson Education, 2005.
4. Govindarajulu, "Computer Architecture and Organization, Design Principles and Applications", First Edition, Tata McGraw Hill, New Delhi, 2005.
5. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 1998.

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2. <https://people.inf.ethz.ch/omutlu/lecture-videos.html>
3. <https://freevideolectures.com/course/2274/computer-architecture>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	3	1	1	2	3	3	2	3	3	1	2	2	3
CO-2	3	3	3	1	1	2	2	2	3	1	2	3	3	3	2
CO-3	3	2	3	1	1	3	3	2	3	3	3	3	3	2	2
CO-4	1	3	3	1	1	3	2	3	3	2	3	2	3	3	2
CO-5	3	3	3	1	1	2	3	3	2	3	2	3	2	3	2

JCS1321	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		2	0	2	3

COURSE OBJECTS

- To understand the basic concepts of Object Oriented Programming in Java
- To know the principles of inheritance and interfaces
- To define exceptions and use of I/O streams
- To learn the concepts of threads and generics classes
- To design and build simple Graphical User Interfaces using swing components

UNIT-I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 12

Object Oriented Programming –objects and classes –features of OOP-OOP in Java – Characteristics of Java –The Java Environment –Java Source File –Compilation. Fundamental programming Structures in Java –constructors, methods – method overloading, access specifiers -static members - Comments, Data Types, Variables, Operators, Control Flow, Arrays, Packages, and Naming Conventions, Case study-simple program using objects, classes and constructors.

UNIT-II INHERITANCE AND INTERFACES 12

Inheritance –Super classes-sub classes –Protected members –constructors in sub classes-the Object class –abstract classes and methods-final methods and classes –Interfaces –defining an interface, implementing interface, differences between classes and interfaces and extending interfaces-Object cloning-inner classes, Reflection, Array Lists –Strings, Case study- program using inheritance strings and array List.

UNIT - III EXCEPTION HANDLING AND I/O 12

Exceptions -exception hierarchy -throwing and catching exceptions –built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics –Streams –Byte streams and Character streams–Reading and Writing Console–Reading and Writing Files, Case study-program using Exceptions and File Handling

UNIT- IV MULTI THREADING, GENERIC PROGRAMMING AND ADVANCED JAVA 12

Differences between multi-threading and multithreading, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, **Fibers**, daemon threads, thread groups. Generic Programming–Generic classes –generic methods –Bounded Types –Restrictions and Limitations, Case study-program using Multi threading and Generic Programming.

UNIT-V EVENT DRIVEN PROGRAMMING 12

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, TextAreas –Buttons-Check Boxes –Radio Buttons –Lists-choices-Scrollbars –Windows –Menus–Dialog Boxes, Case study-Program using AWT components and Swing Components.

TOTAL: 60 PERIODS

LIST OF EXPERIMENTS

1. Write a Java Program to capture the personal details of a person.
2. Develop an application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
3. Write a program to perform string operations using Array List.
4. Write a program to do the arithmetic operations with required exceptions.
5. Write a program to read a file and print on the console
6. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print a value of cube of the number.
7. Write a java program to find the maximum value from the given type of elements using a generic function.
8. Design a login screen using JAVA AWT components.

COURSE OUTCOMES

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

- Develop Java programs using OOP principles
- Develop Java programs using inheritance and interfaces concepts
- Build Java applications using exceptions, I/O streams and Java beans
- Develop Java applications with threads and generic classes
- Develop interactive applications using Swing

TEXTBOOKS

1. Herbert Schildt, "Java The complete reference", 11th Edition, McGraw Hill Education, 2017.
2. Cay S. Horstmann, Gary Cornell, "Core Java Volume-I Fundamentals", 9th Edition, Prentice Hall, 2013.

REFERENCES

1. Paul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015
2. Steven Holzner, "Java 2 Black book", Dream tech press, 2011.

WEB REFERENCES

1. https://www.w3schools.com/java/java_intro.asp
2. <https://www.tutorialspoint.com/java/index.html>
3. <https://www.javatpoint.com/java-tutorial>
4. <https://developer.ibm.com/tutorials/j-introtojava1/>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	3	1	2	2	3	3	2	3	3	1	2	2	3
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CO-3	3	2	3	-	-	3	3	2	3	3	3	3	3	2	2
CO-4	1	3	3	-	-	3	2	3	3	2	3	2	3	3	2
CO-5	3	3	3	-	-	2	3	3	2	3	2	3	2	3	2

JPT1001	SOFT SKILLS AND APTITUDE - I	L	T	P	C
		0	0	2	*

COURSE OBJECTIVES

- To help students groom their personality and develop their skill of building social relationships
- To improve the personality traits of students and their creativity
- To help students gain knowledge in rational thinking and aptitude
- To make students think logically and judiciously
- To help student acquire technical skills in C Programming language

UNIT-I SOFT SKILLS AND APTITUDE-I 6

Self-Realization – Self Motivation – Relationship Building – Personality Enrichment – Personality Traits–Intra Personal Communication–Inter Personal Communication–Behavioral Based Perception–Attitude & Behavior–SWOT Analysis

UNIT-II SOFT SKILLS AND APTITUDE-II 6

Dimensions of Personality – Self Confidence – Open Mindedness – Acceptance – Creativity – Strategies for developing creativity–Over coming myths of creativity–Presence of Mind– Staying Focused–Self Acceptance–Self Growth

UNIT-III QUANTITATIVE APTITUDE 6

Number system–Divisibility Rule–Simplification– Surds and Indices–Square root and Cuberoot –Averages– Percentage

UNIT-IV LOGICAL REASONING 6

Number series–Alphabet series–Alphabet test–Word test–Letter Arrangement–Word Arrangement–Coding and Decoding–Analogy

UNIT-V TECHNICAL APTITUDE IN C-I 6

Technical aptitude in C: Program Structure – Data types – Variables – Constants – Operators – Decision Making–Switch statement–Looping statements–Functions–Call by reference–Recursive Arrays, single dimensional, Multi-dimensional

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

- Build better relationship with all in their social settings
- Engage in creative activities focusing on their career
- Solve the real time and complex problems in aptitude
- Solve critical reasoning and real time application problems
- Apply their knowledge in the basics of C programming

TEXTBOOKS

1. Dr.R.S.Aggarwal,“Quantitative Aptitude”, S.Chand Publishing, 2020.
2. Dr.R.S.Aggarwal,“A Modern Approach to Verbal Reasoning”, S. Chand Publishing, 2017.
3. Dr.R.S.Aggarwal,“A Modern Approach to Non-Verbal Reasoning”, S.Chand Publishing, 2017.
4. Pradip Dey, ManasGhosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009.
5. Yashavant P.Kanetkar. “Let Us C”, BPB Publications, 2011.

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2. <https://m4maths.com/placement-puzzles.php>
3. <https://www.youtube.com> watch/average>
4. <https://www.youtube.com>watch/codinganddecoding>
5. <https://www.youtube.com>watch/cprograms>
6. <https://www.youtube.com>watch/selfconfidence>
7. <https://www.youtube.com> watch/motivation>

Mapping of CO with PO/PSO

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	3	2	-	-	1	3	2	1	-	-
CO2	-	2	3	2	-	-	1	3	2	1	-	-
CO3	-	2	3	2	-	-	1	3	2	1	-	-
CO4	-	2	3	2	-	-	1	3	2	1	-	-
CO5	-	2	3	2	-	-	1	3	2	1	-	-

JCS1311	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To implement linear and non-linear data structures
- To identify and implement appropriated at a structures for various applications
- To execute different operations of search trees
- To implement various sorting and searching algorithms
- To implement hashing techniques

LIST OF PROGRAMS

Implement the following programs

1. List ADT using Python with insert, delete, search and modify operations
2. Linked list
3. Polynomial Manipulation using list ADT
4. Stack using Python
5. a. Stack ADT using arrays
b. Stack ADT using linked list
6. a. Queue ADT using arrays
b. Queue ADT using linked list
7. Infix to Post fix conversion
8. Circular queue
9. Binary Search Trees and Tree traversals
10. AVL Trees
11. BFS and DFS of a graph
12. Bubblesort, Selection sort, Insertion sort using Python
13. Linear search and Binary search using Python
14. Hashing-Linear Probing and Quadratic Probing

TOTAL 60 PERIODS

COURSE OUTCOMES

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

1. Identify appropriate data structures for specified problem definition
2. Implement operations like searching, insertion, deletion, traversing mechanism etc. on various data structures
3. Apply appropriate linear /non-linear data structure operations for solving a given problem
4. Implement appropriate sorting/searching technique for given problem
5. Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.

TEXT BOOKS

1. Yashavant Kanetkar, "Understanding Pointers in C&C++", 5th Revised & Updated Edition, BPB Publications, 2018.
2. Rance D. Nicaise, "Data Structures and Algorithms Using Python", Wiley Publications, 2010.

WEBSITE REFERENCES

1. <https://www.geeksforgeeks.org/data-structures/>
2. www.nptel.ac.in/courses/106106130/
3. https://www.tutorialspoint.com/python_data_structure/

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

HARDWARE

Stand alone desktops 30 Nos. (or) Server supporting 30 terminals or more

SOFTWARE

Ubuntu C / Python 3

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	3	1	2	2	3	3	2	3	3	1	2	2	3
CO-2	3	3	3	-	-	2	2	2	3	1	2	3	3	3	1
CO-3	3	2	3	-	-	3	3	2	3	3	3	3	3	2	2
CO-4	1	3	3	-	-	3	2	3	3	2	3	2	3	3	2
CO-5	3	3	3	-	-	2	3	3	2	3	2	3	2	3	2

JCS1312	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To familiarize with DDL, DML and DCL Commands
- To learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of databases
- To be familiar with database triggers for specific application
- To develop applications using front-end tools and back-end DBMS

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, Subqueries and Joins
3. Creation of Views, Sequences, Indexes, Save point and commit constraints
4. Database Programming: Implicit and Explicit Cursors with PL/SQL block
5. Creation of PL/SQL Procedures and Functions
6. Creation of PL/SQL Triggers
7. Exception Handling
8. Database Design using ER modeling, Normalization and Implementation for any application
9. Database Connectivity with Front End Tools

11. Mini project (Application Development) in one or two of the following systems

- a) Student database system
- b) Inventory Control System
- c) Online Library Management
- d) Hospital Management System
- e) Railway Reservation System
- f) Personal Information System
- g) Online Course registration and maintenance System
- h) Attendance Management System
- i) Hotel Management System
- j) E-commerce portal
- k) Online auction system

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

- Execute typical data definitions, data control and data manipulation commands
- Familiarize with Nested and Join Queries for extracting combinatorial data
- Implement simple applications that use Views
- Develop PL/SQL procedures, functions and packages
- Develop applications using Front-end & Back-end Tool Isand also to handle report generation

TEXTBOOKS

1. Abraham Silberschatz, Henry F.Korth,S.Sudharshan, “Database System Concepts”, Seventh Edition, Tata McGrawHill, 2020.
2. Ramez Elmasri, ShamkantB. Navathe, “Fundamentals of Data base Systems”, Sixth Edition, Pearson Education, 2015.

WEBSITE REFERENCES

1. <https://www.w3schools.com/sql/default.asp>
2. https://www.tutorialspoint.com/dbms/er_diagram_representation.htm
3. https://www.tutorialspoint.com/python/python_database_access.htm
4. <https://sqlzoo.net>

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

HARDWARE:

Standal one desktops 30 Nos. (or) Server supporting 30 terminals or more.

SOFTWARE:

Frontend: Python/Visual Studio or Equivalent

Backend: Oracle/MS SQLServer /MySQL/DB2 or Equivalent

Mapping of CO with PO/PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	-	-		-	-	-	-	-	-	-	2	3	3	3
CO-2	-	3	2	2	-	-	-	-	-	-	-	2	3	3	3
CO-3	3	-	-	3	-	-	-	-	-	-	-	-	3	3	3
CO-4	-	3	2	3	-	-	-	-	-	-	-	2	3	3	3
CO-5	-	3	2	-	-	-	-	-	-	-	-	2	3	3	3

SEMESTER-IV

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JMA1403	Applied Probability and Queuing Theory	BS	4	2	2	0	3
2	JCS1401	Computer Networks	PC	3	3	0	0	3
3	JCS1402	Operating Systems	PC	3	3	0	0	3
4	JCS1403	Design and Analysis of Algorithms	PC	3	3	0	0	3
5	JCS1404	Software Engineering	PC	3	3	0	0	3
6		Open Elective-I	OE	3	3	0	0	3
PRACTICALS								
7	JPT1001	Soft Skills and Aptitude-II	EEC	2	0	0	2	1
8	JCS1411	Networks Laboratory	PC	4	0	0	4	2
9	JCS1412	Operating Systems Laboratory	PC	4	0	0	4	2
TOTAL				29	17	2	10	23

JMA1403	APPLIED PROBABILITY AND QUEUEING THEORY	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To provide basic concepts of discrete, continuous random variables and standard distributions.
- To introduce two dimensional random variables, correlation and regression.
- To acquaint students with statistical testing of hypothesis and its applications.
- To familiarize students in the concepts of random processes and its applications.
- To enable students to understand various Markovian and Non-Markovian queueing models.

UNIT I RANDOM VARIABLES 12

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Exponential and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 12

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

UNIT III TESTING OF HYPOTHESIS 12

Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means - Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table - Goodness of fit.

UNIT IV RANDOM PROCESSES 12

Classification – Stationary process – Markov process – Discrete parameter Markov chain – Chapman Kolmogorov theorem - Poisson process.

UNIT V QUEUEING MODELS 12

Markovian queues – Birth and death processes – Single and multiple server, Infinite and finite queueing models – Little's formula – Non-Markovian queues - M/G/1 queue – Pollaczek Khinchin formula - M/D/1 and M/E_K/1 as special cases.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able

- CO1: To understand random variables and use standard distributions in solving real time problems.
- CO2: To use joint density functions to perform correlation and regression analysis.
- CO3: To apply hypothesis testing for making statistical inferences in large and small sample real life problems.
- CO4: To demonstrate efficient use of random processes in modeling engineering problems.
- CO5: To understand and apply concepts of Markovian and Non-Markovian models in problems.

TEXT BOOKS:

1. Ibe, O.C., "Fundamentals of Applied Probability and Random Processes", 1st Indian Reprint, Elsevier, 2007.
2. Taha, H.A., "Operations Research", 9th Edition, Pearson India Education Services, Delhi, 2016.
3. Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., —"Fundamentals of Queueing Theory", Wiley Student 4th Edition, 2014.

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1. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2004.
2. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2002.
3. Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
4. Devore. J.L., "Probability and Statistics for Engineering and the Sciences, Cengage Learning, New Delhi, 8th Edition, 2014.
5. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.

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CO-PO MAPPINGS

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	2	-	-	2
CO2	3	3	2	2	-	-	-	-	2	-	-	2
CO3	3	3	2	2	-	-	-	-	2	-	-	2
CO4	3	3	2	2	-	-	-	-	2	-	-	2
CO5	3	3	2	2	-	-	-	-	2	-	-	2
AVG	3	3	2	2	-	-	-	-	2	-	-	2

JCS1401	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To learn the basic concepts of layered approach in Computer Networks
- To know functions of Data link layer and components to build different types of networks
- To learn the functions of network layer and the various routing protocols
- To familiarize the functions and protocol so the Transport layer
- To familiarize the application layer services

UNIT-I INTRODUCTION AND PHYSICAL LAYER

9

Building a network - Requirements Layering and protocols - Design issues for the layers- TCP/IP Protocol suite-OSI Model -Physical layer-Multiplexing and Spread Spectrum-Encoding Techniques-Transmission Media-Performance.

UNIT-II DATA-LINK LAYER & MEDIA ACCESS

9

Link layer Services - Framing - Error Detection - Flow control - Media access control - Ethernet(802.3) - Wireless LANs - 802.11 - Bluetooth - Switching and bridging - Basic Internetworking (IP,CIDR,ARP,DHCP,ICMP).

UNIT-III NETWORK LAYER

9

Network layer - Routing - Shortest Path Routing - Flooding - Routing (RIP, OSPF, metrics) -Switch basics - Global Internet (Areas, BGP, Ipv6) - Multicast - Addresses - Multicast routing(DVMRP,PIM).

UNIT-IV TRANSPORT LAYER

9

Overview of Transport layer-UDP-Reliable by testream (TCP)-Connection management-Flow control-Retransmission-TCP Congestion control-Congestion avoidance(DECbit,RED)-QoS.

UNIT-V APPLICATION LAYER

9

Electronic Mail (SMTP, POP3, IMAP, MIME)-HTTP-Web Services-DNS -SNMP.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Upon completion of the course, students will be able to

- Evaluate the functions and performance of a network
- Comprehend the data flow and control between nodes in the network
- Analyze and design routing algorithms
- Familiarize with the functionalities of various protocols and congestion mechanism in network
- Familiarize with different application layer protocols

TEXTBOOKS

1. Behrouz A. Forouzan, “Data Communications and Networking”, Fifth Edition TMH, 2017.
2. LarryL. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kauffmann Publishers Inc., 2012.

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1. James F.Kurose, Keith W.Ross, “Computer Networking: A Top-Down Approach”, Seventh Edition, Pearson Education, 2017.
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4. Ying-DarLin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.
5. AndrewS.Tanenbaum, David Wetherall, “Computer Networks”, Fifth Edition, Pearson Education, 2013.

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2. <https://www.cse.iitk.ac.in/users/dheeraj/cs425/lec12.html>
3. <https://www.engineersgarage.com/tutorials/transport-layer-protocols-iot-part-9/>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO-3	3	3	-	3	2	-	-	-	-	-	-	-	2	-	-
CO-4	3	3	-	3	3	1	-	-	-	-	-	-	3	-	-
CO-5	3	-	-	3	3	-	-	-	-	-	-	-	2	-	-

JCS1402	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To study the basic concepts, structure and functions of operating systems
- To learn process management concepts such as process scheduling, CPU scheduling, semaphores and dead locks etc.
- To learn various memory management concepts
- To understand the file storage handling management and I/O systems
- To learn the case study of operating system and services

UNIT-I OPERATING SYSTEMS OVERVIEW

9

Computer System Overview- Basic Elements – Interrupts - Memory Hierarchy - Cache Memory - Direct Memory Access - Operating System Overview - Objectives and Functions - Evolution of Operating System - Operating System Structure and Operations - System Calls - System Programs- OS Generation and System Boot.

UNIT-II PROCESS MANAGEMENT

9

Processes-Process Concept-Process Scheduling-Operations on Processes-Interprocess Communication – CPU Scheduling-Multiple-processor Scheduling-Real Time Scheduling-Threads-Overview – Multi threading Models - Threading Issues - Process Synchronization – Critical Section Problem - Mutex Locks - Semaphores - Monitors - Deadlocks - System Model – Deadlock Characterization-Methods for Handling Deadlocks-Deadlock Prevention-Deadlock Avoidance-Deadlock Detection-Recovery from Deadlock.

UNIT-III MEMORY MANAGEMENT

9

MainMemory-Background-Swapping-ContiguousMemoryAllocation-Paging-Segmentation - Segmentation with Paging, 32 and 64 Bit Architecture Examples - Virtual Memory -Background - Demand Paging - Page Replacement – Allocation – Thrashing - Allocating Kernel Memory.

UNIT-IV FILE SYSTEM AND I/O SYSTEM

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-File Sharing and Protection-File Allocation Methods-Free Space Management - Efficiency and Performance – Recovery - I/O Systems – I/O Hardware – Application I/O Interface-Kernel/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 Frame work-Media Layer-ServicesLayer-CoreOS Layer-File System.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Classify operating system components and system calls based on functionality
- Analyze and evaluate CPU scheduling algorithms and assess the solutions for synchronization problems and dead lock prevention
- Familiarize inmemory management and storage management techniques
- Analyze the File System Interface, Directory Structure and I/O systems
- Carryout case studies to generate and illustrate different aspects of various operating systems

TEXTBOOKS

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc.,2018.
2. William Stallings, “Operating Systems–Internals and Design Principles”, 7th Edition, Prentice Hall, 2018.

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1. AndrewS.Tanenbaum, “Modern Operating Systems”, Second Edition, Addison Wesley,2014.
2. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education”, 2018.
3. DMDhamdhere, “Operating Systems: A Concept-Based Approach”, Second Edition, Tata McGraw Hill Education.

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2. <https://www.geeksforgeeks.org/introduction-of-process-management/>
3. <https://technobyte.org/memory-management-os-simple-explanation/>
4. <https://inst.eecs.berkeley.edu/~eecsba1/sp97/reports/eecsba1a/index-os.html>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	-	2	-	-	-	-	-	-	2	2	2	3	3	3
CO-2	3	-	2	-	-	-	-	-	-	-	2	-	3	3	3
CO-3	1	-	2	-	-	-	-	-	-	1	2	-	3	3	3
CO-4	3	-	2	-	-	-	-	-	-	1	2	-	3	3	3
CO-5	2	-	2	-	-	-	-	-	-	1	2	-	3	3	3

JCS1403	DESIGN AD ANALYSIS OF ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To impart knowledge on runtime analysis of algorithms
- To study and understand various algorithm design techniques
- To analyze various searching and sorting algorithms
- To study the various graph algorithms
- To learn the limits of computation

UNIT - I INTRODUCTION 9

Introduction Fundamentals of Algorithmic Problem Solving- Important Problem types – Fundamental Data structures –Time complexity- Space complexity- Analysis Framework – A symptotic notations- Basic Efficiency classes.

UNIT - II FUNDAMENTALS OF THE ANALYSIS OF ALGORITHM EFFICIENCY 9

Best, Average and Worst Case Analysis-Linear search-Amortized efficiency- Mathematical Analysis of Non- recursive Algorithm - Mathematical Analysis of Recursive Algorithm -Example: Fibonacci Numbers.

UNIT - III ANALYSIS OF SORTING AND SEARCHING ALGORITHMS 9

Brute Force Strategy: Selection Sort and Bubble Sort, Brute-force string matching ,Exhaustive search- Knapsack problem, Assignment problem, Travelling Salesman Problem-Divide and conquer: general method-Masters theorem-Mergesort, QuickSort, BinarySearch.

UNIT - IV ANALYSIS OF GRAPH ALGORITHMS 9

Dynamic Programming: Warshalls and Floyd Algorithm, Optimal Binary Search trees-Greedy Technique: Container Loading Problem, Huffman trees, knapsack problem.

UNIT - V NP COMPLETE AND NP HARD PROBLEMS 9

NP Complete and NP Hard-NP Complete problems, backtracking: n-Queens Problem, Hamiltonian Circuit problem, Subset-Sum problem- Branch and bound: Assignment problem, Knapsack problem, Traveling sales man problem.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Gain knowledge on fundamentals of algorithmic problem solving
- Analyze the algorithm efficiency
- Compare different types of sorting and searching algorithms
- Familiarize in different design techniques of Graph Algorithms
- Analyze NP complete, NP hard problems, back tracking and branch & bound techniques

TEXTBOOKS

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education Asia, 2012
2. Horowitz, Sahni, and Rajasekaran, "Computer Algorithms", Silicon Press, 2007.

REFERENCES

1. Sara Baase and Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", Pearson Education Asia, 2010
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, "Introduction to Algorithms", PHI Pvt.Ltd. ,2009.
3. V.Aho, J.E.Hopcroft and J.D.Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education Asia, 2003.

WEBSITE REFERENCES

1. <https://www.geeksforgeeks.org/algorithms-gq/analysis-of-algorithms-gq>
2. <https://www.javatpoint.com/daa-tutorial>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	3	2	2	1	1	1	1	1	1	1	2	3	3	3
CO-2	3	3	3	3	1	2	1	1	2	2	1	2	3	3	3
CO-3	3	3	3	3	2	2	2	2	1	1	1	2	3	3	3
CO-4	3	3	3	2	2	1	1	1	2	2	2	3	3	3	3
CO-5	3	3	3	3	3	2	2	2	2	1	1	3	3	3	3

JCS1404	SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To study the different software process models and developments
- To learn the fundamental concepts of requirements engineering and Analysis Modeling
- To analyze and apply the various software design methodologies
- To acquire knowledge in various testing methodologies and tools
- To attain the knowledge in Project Management process

UNIT-I SOFTWARE PROCESS AND AGILE DEVELOPMENT

9

Introduction to Software Engineering –The Software Process–Perspective and Specialized Models–Agile Development–Introduction to Agility-Agile Process-Extreme programming-XP Values–XP Process.

UNIT-II REQUIREMENTS ANALYSIS AND SPECIFICATION 9

Software Requirement – Functional and Non-Functional –User requirements –System requirements
Software Requirements Document–Requirement Engineering Process–Feasibility Studies
Requirements elicitation and Analysis–Requirement Negotiation–Requirements Validation
Requirements Management-Classical analysis–Structured system Analysis– Data Dictionary.

UNIT-III SOFTWARE DESIGN 9

Design process–Design Concepts–Design Model–Design Heuristic–Architectural Design
Architectural Styles–Architectural Mapping using Data Flow- User Interface Design – Interface
analysis–Interface Design–Component level Design–Designing Class based components,
Traditional Components.

UNIT-IV TESTING AND MAINTENANCE 9

Software Testing Fundamentals -White box Testing – Basis Path Testing–Control Structure Testing
Black Box Testing – Regression Testing – Unit Testing – Integration Testing – Validation Testing
System Testing–Testing tools– Reengineering Process Model-Reverse and Forward Engineering.

UNIT-V PROJECT MANAGEMENT 9

Software Project Management –Estimation – LOC –FP Based Estimation – Make/Buy Decision
COCOMO I & II Model – Project Scheduling – Earned Value Analysis Planning – Project Plan
Planning Process– RFP Risk Management–Identification–Projection–Risk Mitigation-RMMM Plan-
CASE Tools

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

1. Identify the key activities in managing a software project and compare different process models
2. Apply concepts of Requirements Engineering and Analysis Modeling
3. Apply systematic procedures in software design and systems
4. Compare the various testing strategies
5. Handle project management system and qualities

TEXT BOOKS

1. Roger S.Pressman,“Software Engineering–A Practitioner’s Approach”, Eighth Edition, McGraw-Hill International Edition, 2014.
2. Ian Sommerville, “Software Engineering”, 9th Edition, Pearson Education Asia, 2011.

REFERENCES

1. Rajib Mall, Fundamentals of Software Engineering, Third Edition, HI Learning Private Limited, 2009.
2. Pankaj Jalote, Software Engineering, A Precise Approach,Wiley India, 2010.
3. Kelkar S.A.,“Software Engineering”, Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R.Schach, “Software Engineering” ,Tata McGraw-Hill Publishing Company Limited, 2007.

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	-	2	-	-	-	-	-	-	2	2	2	3	3	3
CO-2	3	-	2	-	-	-	-	-	-	-	2	-	3	3	3
CO-3	1	-	2	-	-	-	-	-	-	1	2	-	3	3	3
CO-4	3	-	2	-	-	-	-	-	-	1	2	-	3	3	3
CO-5	2	-	2	-	-	-	-	-	-	1	2	-	3	3	3

JPT1001	SOFT SKILLS AND APTITUDE – II	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

- To help students learn various forms of writing and develop content
- To help students acquire time and stress management skills
- To facilitate students to gain required knowledge to understand practical concepts in aptitude
- To develop the thinking and analytical skills of students
- To gain knowledge in concepts of C programming language

UNIT-I SOFTS KILLS AND APTITUDE - III 6

Communication – on Specific topics – both oral and written – Content development – various forms of writing and specific writing – Brainstorming – Individual – Concept focusing – Public Speaking –Analytical writing.

UNIT-II SOFT SKILLS AND APTITUDE - IV 6

Importance of Time–Time Management techniques–Theart of prioritizing and scheduling–Stress –Positive and Negative Stress – Stress Management techniques–Concept of Goal setting–Importance of Goals–Dreamvs Goal–Reasons for failure of Goals–SMART.

UNIT - III QUANTITATIVE APTITUDE 6

Ratio and Proportions–Allegations and Mixtures–Problemon Ages–Profit and Loss and Discount

UNIT-IV LOGICAL REASONING 6

Oddman out series–Blood Relation–Seating Arrangement–Number Ranking

UNIT-V TECHNICAL APTITUDE IN C-II 6

Strings - Storage Classes – Pointers – Pre processor directives - Structures – Union. Type def – Input/Output – File I/O - Header Files – Type casting – Error handling – Command Line Arguments –Variable Arguments–Memory Management-Bitwise operators.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

- Develop different types of content using the skills learnt
- Manage time and stress competently
- Find answers to real time application problems
- Use logical reasoning skills to solve problems differently
- Apply C programming concepts for coding

TEXT BOOKS

1. Dr.R.S.Aggarwal, “Quantitative Aptitude”, S.Chand Publishing, 2020.
2. Dr.R.S.Aggarwal, “A Modern Approach to Verbal Reasoning”, S. Chand Publishing, 2017.
3. Dr.R.S.Aggarwal, “A Modern Approach to Non-Verbal Reasoning”, S. Chand Publishing, 2017.
4. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009.
5. Yashavant P.Kanetkar. “Let Us C”, BPB Publications, 2011.

WEB SITE REFERENCES

1. <https://www.indiabix.com/aptitude/questions-and-answers/>
2. <https://m4maths.com/placement-puzzles.php>
3. www.freshersworld.com/

Mapping of CO with PO/PSO

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	3	2	-	-	1	3	2	1	-	-
CO2	-	2	3	2	-	-	1	3	2	1	-	-
CO3	-	2	3	2	-	-	1	3	2	1	-	-
CO4	-	2	3	2	-	-	1	3	2	1	-	-
CO5	-	2	3	2	-	-	1	3	2	1	-	-
AVG	-	2	3	2	-	-	1	3	2	1	-	-

JCS1411	NETWORKS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To learn Socket programming
- To study various networking commands
- To implement and analyze various network protocols
- To learn and implement various socket programming concepts
- To simulate and analyze the performance of various network protocols

LIST OF EXPERIMENTS

1. Learn to use commands like tcpdump, netstat, if config, ns look up and trace route. Captureping and trace route PDUs using a network protocol analyzer and examine
2. Write a code simulating ARP/RARP protocols.
3. Write a socket program for HTTP web page upload and download.

4. Applications using TCP Sockets like
 - a. Echoclient and echo server
 - b. Chat
 - c. File Transfer
5. Applications of DNS using UDP Sockets
6. Study of Network simulator and Simulation of Congestion Control Algorithms
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 error correction code (like CRC).

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

- Implement various protocols using TCP and UDP
- Implement various network commands
- Simulate the performance of various network protocols
- Implement error correction codes
- Analyze the various routing algorithms

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS:

HARDWARE

1. Stand alone desktops **30 Nos**

SOFTWARE

1. C/ C++/Java/Python/Equivalent Compiler **30 Nos**
2. Network simulator like NS2/Glomosim/OPNET/PacketTracer/Equivalent

WEBSITE REFERENCES

1. <https://www.javatpoint.com/socket-programming>
2. https://www.tutorialspoint.com/java/java_networking.htm
3. <https://www.nstools.org/techprog.shtml>
4. <https://ipwithease.com/top-5-network-simulation-tools-in-2020/>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	3	3	-	-	-	-	3	2	3	-	3	3	3	3
CO-2	3	3	3	-	-	-	-	3	2	3	-	3	3	3	3
CO-3	3	3	3	-	-	-	-	2	2	3	-	3	3	3	3
CO-4	2	2	3	-	-	-	-	3	3	3	-	2	3	3	3
CO-5	3	3	3	-	-	-	-	3	2	2	-	3	3	3	3

JCS1412	OPERATING SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To learn Unix commands and shell programming
- To execute various CPU Scheduling Algorithms
- To implement and familiarize in Process Creation and Inter Process Communication
- To implement Dead lock Avoidance and Dead lock Detection Algorithms
- To implement Page Replacement Algorithms, File Organization and File Allocation Strategies

LIST OF EXPERIMENTS

1. Basics of UNIX commands
2. Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, open dir, read dir
3. Write C programs to simulate UNIX commands like cp, ls, grep, etc.
4. Shell Programming
5. Write C programs to implement the various CPU Scheduling Algorithms
6. Implementation of Semaphores
7. Implementation of Shared memory and IPC
8. Bankers Algorithm for Dead lock Avoidance
9. Implementation of Dead lock Detection Algorithm
10. Write C program to implement Threading & Synchronization Applications
11. Implementation of the following Memory Allocation Methods for fixed partition
 - a) FirstFit
 - b)WorstFit
 - c)BestFit
12. Implementation of Paging Technique of Memory Management
13. Implementation of the following Page Replacement Algorithms
 - a) FIFO
 - b)LRU
 - c)LFU
14. Implementation of the various File Organization Techniques
15. Implementation of the following File Allocation Strategies
 - a) Sequential
 - b)Indexed
 - c)Linked
16. Install, upgrade and configure Linux operating systems.

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

- Compare the performance of various CPU Scheduling Algorithms
- Implement Dead lock avoidance, Detection Algorithms and Semaphores
- Create processes and implement IPC
- Analyze the performance of the various Page Replacement Algorithms
- Implement File Organization and File Allocation Strategies

TEXTBOOKS

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2018.

REFERENCES

1. William Stallings, “Operating Systems–Internals and Design Principles”, 7th Edition, Prentice Hall, 2018.
2. Andrew S. Tanenbaum, “Modern Operating Systems” Second Edition, Addison Wesley, 2014.
3. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education”, 2018.
4. DMDhamdhere, “Operating Systems: A Concept-Based Approach”, Second Edition, Tata McGraw Hill Education.

WEBSITE REFERENCE

1. https://www.tutorialspoint.com/operating_system/os_overview.htm
2. <https://www.geeksforgeeks.org/introduction-of-process-management>
3. <https://technobyte.org/memory-management-os-simple-explanation>
4. https://www.cse.iitb.ac.in/~mythili/teaching/cs347_autumn2016/notes/09-file-system-io.pdf
5. https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/13_IOSystems.html
6. <https://inst.eecs.berkeley.edu/~eecsba1/sp97/reports/eecsba1a/index-os.html>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	-	-		-	-	-	-	-	-	-	2	3	3	3
CO-2	-	3	2	2	-	-	-	-	-	-	-	2	3	3	3
CO-3	3	-	-	3	-	-	-	-	-	-	-	-	3	3	3
CO-4	-	3	2	3	-	-	-	-	-	-	-	2	3	3	3
CO-5	-	3	2	-	-	-	-	-	-	-	-	2	3	3	3

OPEN ELECTIVE - I

SEMESTER - IV

JCS9001	AN INTRODUCTION TO SYSTEM SOFTWARE	L	T	P	C
		3	0	0	3

OBJECTIVES

- To understand the relation ship between system software and machine architecture.
- To know the design and implementation of assemblers
- To know the design and implementation of linkers and loaders.
- To have an understanding of micro processors.
- To have an understanding of systems software tools.

UNIT-I INTRODUCTION

8

System software and machine architecture – The Simplified Instructional Computer (SIC) - Machine architecture- Data and instruction formats-addressing modes-instruction sets-I/O and programming.

UNIT-II ASSEMBLERS

10

Basic assembler functions - A simple SIC assembler – Assembler algorithm and data structures –Machine dependent assembler features-Instruction formats and addressing modes– Program relocation - Machine independent assembler features - Literals –Symbol- defining statements –Expressions - One pass assemblers and Multi pass assemblers - Implementation example – MASM assembler.

UNIT-III LOADERS AND LINKERS

9

Basic loader functions - Design of an Absolute Loader – A Simple Bootstrap Loader – Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader-Machine-independent loader features–Automatic Library Search–Loader Options-Loader design options-Linkage Editors–Dynamic Linking–Boots trap Loaders-Implementation example-MSDOS linker.

UNIT-IV MACRO PROCESSORS

9

Basic macro process or functions-Macro Definition and Expansion–Macro Processor Algorithm and data structures-Machine-independent macro process or features-Concatenation of Macro Parameters–Generation of Unique Labels–Conditional Macro Expansion –Keyword Macro Parameters-Macro with in Macro-Implementation example-MASM Macro Processor–ANSIC Macro language.

UNIT-V SYSTEM SOFTWARE TOOLS

9

Text editors - Overview of the Editing Process - User Interface – Editor Structure. – Interactive debugging systems - Debugging functions and capabilities – Relationship with other parts of the system–User-Interface Criteria.

TOTAL: 45 PERIODS

TEXT BOOK

1. Leland L. Beck, "System Software – An Introduction to Systems Programming", 3rd Edition, Pearson Education Asia, 2006.

REFERENCES

1. D.M.Dhamdhere, "Systems Programming and Operating Systems", Second Revised Edition, Tata McGraw-Hill, 2000.
2. John J.Donovan "Systems Programming", Tata McGraw-Hill Edition, 2000.
3. John R. Levine, Linkers & Loaders–Harcourt India Pvt. Ltd.,Morgan Kaufmann Publishers,2000.

Mapping of CO with PO/PSO

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	-	-	-	2
CO2	3	3	-	-	-	-	-	-	-	-	-	2
CO3	2	2	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	2
CO5	3	2	-	-	-	-	-	-	-	-	-	2
AVG	3	1	-	-	-	-	-	-	-	-	-	2

JCS9002	BASICS OF OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic concepts of Object Oriented Programming.
- Execute the Object oriented concepts to solve problems using C++.
- Develop programs using files and templates

UNIT-I CLASSES AND OBJECTS 9

Need for object oriented programming - Characteristics of object oriented programming -Classes and Objects: Simple Class-Nesting of Member functions - Static Data Members and Member Functions –Constructors and Destructors-Returning Objects from Functions.

UNIT-II ARRAYS, STRINGS AND OVER LOADING 9

Array Fundamentals - Arrays as Class Member Data - Arrays of Objects - String Manipulations - Operator overloading: Unary Operators - Binary Operators - Special Operators - Pitfalls of Operator Over loading and Data Conversion.

UNIT-III INHERITANCE 9

Derived Class and Base Class - Derived Class Constructors - Overriding Member Functions – Public and Private Inheritance-Types of Inheritance: Single, Multi Level, Multiple, Hierarchical and Hybrid-Virtual Base Classes-Abstract Classes

UNIT-IV FUNCTIONS AND STREAMS

9

Pointers - this Pointer - Pointers to Objects and Derived Classes - Function Overloading – Virtual Function - Friend Function-Static Function. Streams: Stream Classes-Unformatted I/O Operations Formatted Console I/O Operations.

UNIT-V FILES, TEMPLATES AND EXCEPTION HANDLING

9

File Stream Operations-File Pointers Manipulation-Templates: Class Templates-Function Templates –Exception Handling Mechanism: Try Throw and Catch.

COURSE OUTCOMES:

On Completion of the course, the students should be able to:

- Design problem solutions using Object Oriented Techniques..
- Apply the concepts of data abstraction, encapsulation and inheritance for problem solutions.
- Use the controls structures of C++ appropriately
- Critically analyse the various algorithms.
- Apply the different data structures to problem solutions

TEXTBOOK:

1. Bjarne Stroustrup,—The C++ Programming Language, 4thEdition, Addison-Wesley Professional, 2013.
2. Robert Lafore, - Object oriented programming in C++, 4th Edition, Pearson Education India

REFERENCES

1. Stephen Prata, -C++ Primer Plus, 6th Edition, Pearson Education, 2015
2. E Balagurusamy, -Object oriented programming in C++, 6th Edition, Mcgraw Hill publishing

Mapping of CO with PO/PSO

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3	-	-	-	-	-	-	3
CO2	3	-	3	2	3	-	-	-	1	-	-	3
CO3	3	1	3	2	3	-	-	-	-	-	-	3
CO4	3	1	3	2	3	-	-	-	2	-	-	3
CO5	3	2	3	2	3	-	-	-	2	-	-	3
AVG	3	2	3	2	3	-	-	-	2	-	-	3

JCS9003	USER INTERFACE DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES

- To learn and understand the Characteristics and principles of Graphical Interface
- To know the design of Graphical Interface
- To learn and understand the design of windows and controls
- To learn the design of webpages and multimedia.
- To have an understanding of the techniques and tools for testing the graphical interface

UNIT-I INTRODUCTION 8

Human-Computer Interface-Characteristics of Graphics Interface-Direct Manipulation
Graphical System-Web User Interface-Popularity-Characteristic & Principles-Usability
heuristics.

UNIT-II HUMAN COMPUTER INTERACTION 10

User Interface Design Process – Obstacles –Usability –Human Characteristics In Design –
Human Interaction Speed –Business Functions –Requirement Analysis – Direct – Indirect
Methods – Basic Business Functions–Design Standards–System Timings–Human Consideration.
In Screen Design-Structures Of Menu- Functions Of Menu-Contents Of Menu-Formatting–
Phrasing. The Menu-Selecting Menu Choice–Navigating Menus–Graphical Menus.

UNIT-III WINDOWS 9

Characteristics-Components-Presentation Styles-Types-Managements-Organizations–
Operations- Web Systems- Device- Based Controls Characteristics- Screen – Based Controls –
Operate Control-Text Boxes-Selection Control-Combination Control-Custom Control–
Presentation Control.

UNIT-IV MULTIMEDIA 9

Text For Web Pages-Effective Feed back-Guidance & Assistance-Internationalization–
Accessibility-Icons-Image-Multimedia-Coloring.

UNIT-V WINDOWS LAYOUT-TEST 9

Prototypes-Kinds of Tests-Retest-Information Search-Visualization-Hypermedia
-WWW-Software Tools.

TOTAL: 45 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Define the characteristics and principles of different graphical user interface.
- Apply the concepts and principles of designing graphical interface
- Use various controls and styles in designing a window
- Describe the design of multi media and web pages
- Test and compare various graphical interfaces

TEXTBOOKS:

1. Wilbent.O.Galitz,“The Essential Guide To User Interface Design”, John Wiley & Sons, 2001.
2. BenSheiderman, “Design the User Interface”, Pearson Education, 1998.

REFERENCE:

1. Alan Cooper, “The Essential of User Interface Design”, Wiley – Dream Tech Ltd.,2002.

Mapping of CO with PO/PSO

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	-	3	-	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	2	2	3	-	3	-	-	-	-	-	-	-
CO4	2	2	3	-	3	2	-	-	-	-	-	-
CO5	2	2	3	-	3	2	-	-	-	-	-	-
AVG	2	2	3	-	3	2	-	-	-	-	-	-

SEMESTER V

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JCS1501	Internet Programming	PC	3	3	0	0	3
2	JCS1502 (Integrated)	Object Oriented Analysis and Design	PC	4	2	0	2	3
3	JCS1503	Theory of Computation	PC	5	3	2	0	4
4		Professional Elective – I	PE	3	3	0	0	3
5		Open Elective-II	OE	3	3	0	0	3
PRACTICALS								
6	JPT1002	Technical Skills and Aptitude-1	EEC	2	0	0	2	*
7	JHS1511	Professional Communication	HS	2	0	0	2	1
8	JCS1511	Internet Programming Laboratory	PC	4	0	0	4	2
TOTAL				26	14	2	10	19

***Only Internal Assessment**

JCS1501	INTERNET PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand different Internet Technologies
- To design interactive web pages using Scripting languages
- To learn java-specific webservices architecture
- To understand the essential client side technologies for internet programming
- To develop applications using database connectivity and server side programming in Java environment

UNIT I WEBSITE BASICS, HTML5, CSS3, WEB 2.0 9

Web Essentials: Clients, Servers and Communication – The Internet-Basic Internet protocols - World wide web- HTTP Request Message - HTTP Response Message - Web Clients – Web Servers - HTML5 - Tables - Lists - Image - HTML5 control elements - Semantic elements - Drag and Drop - Audio - Video controls - CSS3 - Inline, embedded and external style sheets - Rule cascading - Inheritance - Backgrounds - Border Images - Colors - Shadows - Text - Transformations - Transitions - Animations - Web Servers - Microsoft Internet Information Services –Apache HTTP Server

UNIT II CLIENT SIDE PROGRAMMING 9

Java Script: An introduction to Java Script–Java Script DOM Model-Date and Objects-Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling - DHTML with JavaScript-JSON introduction–Syntax–Function Files–Http Request–SQL

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 - ASP. NET Overview

UNIT IV PHP and XML 9

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions - Form Validation- Regular Expressions - File handling – Cookies - Connecting to Database.XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

UNIT V INTRODUCTION TO AJAX and WEB SERVICES 9

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; WebServices: Introduction-Javaweb services Basics–Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a webservice, Database Driven webservice from an application –SOAP-Session Tracking-UDT to a Webservice

TOTAL 45 PERIODS

COURSE OUTCOMES:

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

- Construct a basic website using HTML and Cascading Style Sheets.
- Build dynamic webpage with validation using Java Script objects and by applying different event and link mechanisms.
- Develop server side programs using Servlets and JSP.
- Construct simple webpages in PHP and to represent data in XML format.
- Use AJAX and web services to develop interactive web applications

TEXT BOOK:

1. Deitel and Deitel and Nieto, "Internet and World Wide Web- How to Program", Prentice Hall, 5th Edition, 2011.

REFERENCES:

1. Stephen Wynnkoop and John Burke "Running a Perfect Website", QUE, 2nd Edition, 1999.
2. Chris Bates, Web Programming—Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
3. Jeffrey C and Jackson, "Web Technologies A Computer Science Perspective", Pearson Education, 2011.
4. Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India, 2014.
5. UttamK. Roy, "Web Technologies", Oxford University Press, 2011.

WEBSITE REFERENCES:

1. <https://www.htmldog.com/guides/>
2. <https://www.codecademy.com/catalog>
3. <https://www.w3schools.com/>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	3	3	-	-	-	-	2	3	3	-	3	2	2	3
CO-2	3	3	3	-	-	-	-	3	3	3	-	3	3	3	1
CO-3	3	3	3	-	-	-	-	3	3	3	-	3	3	2	2
CO-4	3	3	3	-	-	-	-	3	3	3	-	3	3	3	2
CO-5	3	3	3	-	-	-	-	3	3	3	-	3	2	3	2

JCS1502	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the fundamentals of object modeling and Use cases
- To design with static UML diagrams
- To design with the UML dynamic and implementation diagrams
- To improve the software design with design patterns
- To test the software against its requirements specification

UNIT I UNIFIED PROCESS AND USE CASE DIAGRAMS 9

Introduction to OOAD with OO Basics-Iterative, Evolutionary, and Agile–Unified Process
 – UML diagrams-Casestudy–the Next Gen POS system-Inception-Evolutionary Requirements-Use cases Modelling–Relating Use cases–include, extend and generalization
 – When to use Use-cases

UNIT II STATIC UML DIAGRAMS 9

Class Diagram— Elaboration – Domain Model – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition - Relationship between sequence diagrams and use cases–When to use Class Diagrams

UNIT III DYNAMIC AND IMPLEMENTATION UML DIAGRAMS 9

Dynamic Diagrams – UML interaction diagrams - System sequence diagram – Collaboration diagram – When to use Communication Diagrams - State machine diagram and Modelling – When to use State Diagrams-Activity diagram–When to use activity diagrams-Implementation Diagrams-UML package diagram -When to use package diagrams–Component and Deployment Diagrams–When to use Component and Deployment diagrams

UNIT IV DESIGN PATTERNS 9

GRASP: Designing objects with responsibilities–Creator–Information expert–Low Coupling – High Cohesion – Controller Design Patterns – creational – factory method – structural – Bridge – Adapter – behavioural – Strategy – observer –Applying GoF design patterns – Mapping design to code.

UNIT V TESTING 9

Object Oriented Methodologies – Software Quality Assurance – Impact of object orientation on Testing–Develop Test Cases and Test Plans.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Design software applications using OO concepts.
- Express software design with UML diagrams
- Identify various scenarios based on software requirements
- Transform UML based software design into pattern-based design using design patterns
- Understand the various testing methodologies for OO software

TEXT BOOKS:

1. Craig Larman, “Applying UML and Patterns : An Introduction to Object-Oriented Analysis and Design and Iterative Development”, Third Edition , Pearson Education, 2005.
2. AliBahrami, “Object Oriented Systems Development”, McGraw Hill International Edition, 1999

REFERENCES:

1. Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, “Design patterns: Elements of Reusable Object-Oriented Software”, Addison-Wesley, 1995.
2. Martin Fowler, “UML Distilled: A Brief Guide to the Standard Object Modeling Language”, Third edition, Addison Wesley, 2003.
3. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Addison Wesley Longman, 1999.
4. Bemd Bruegge, Allen H.Dutoit, “Object Oriented Software Engineering using UML, Patterns and Java”, Pearson, 2004.

WEBSITE REFERENCES:

1. https://www.tutorialspoint.com/object_oriented_analysis_design/index.htm
2. <https://nptel.ac.in/courses/106/105/106105153/>
3. <http://www.digimat.in/nptel/courses/video/106105153/L31.html>
4. <https://www.youtube.com/watch?v=qiyMyyYqZVY>
5. <http://www.infocobuild.com/education/audio-video-courses/computer-science/ObjectOrientedAnalysis -IIT-Kharagpur/lecture-38.html>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	3	3	2	2	3	3	2	3	3	1	2	2	3
CO-2	3	3	3	3	3	2	2	2	3	1	2	3	3	3	2
CO-3	3	2	3	1	3	3	3	2	3	3	3	3	3	2	2
CO-4	1	3	3	2	3	3	2	3	3	2	3	2	3	3	2
CO-5	3	3	3	2	2	2	3	3	2	3	2	3	2	3	2

JCS1503	THEORY OF COMPUTATION	L	T	P	C
		3	2	0	4

COURSE OBJECTIVES:

- To understand formal languages and finite Automata
- To construct automata for any given pattern and find its equivalent regular expressions
- To design a context free grammar for any given language
- To understand Turing machines and their capability
- To understand undecidable problems and NP class problems

UNIT I AUTOMATA FUNDAMENTALS 9

Introduction to formal proof–Additional forms of Proof–Inductive Proofs–Introduction to Formal language, Alphabets and languages, Finite Automata–Deterministic Finite Automata – Non-deterministic Finite Automata –Finite Automata with Epsilon Transitions

UNIT II REGULAR EXPRESSIONS AND LANGUAGES 9

Regular Expressions–Operators of RE-FA and Regular Expressions–Proving Languages not to be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata.

UNIT III CONTEXT FREE GRAMMAR AND LANGUAGES 9

CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Push down Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata. - Normal Forms for CFG – Pumping Lemma for CFL–Closure Properties of CFL

UNIT IV TURING MACHINES 9

Turing Machine Model, Representation of Turing Machines, Language Acceptability by Turing Machines, Design of TM, Description of TM, Programming Techniques for TM Construction, Working with JFLAP (Java Formal Languages & Automata package)

UNIT V UNDECIDABILITY 9

Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM–Post’s Correspondence Problem, The Class P and NP.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Construct automata, regular expression for any pattern.
- Write Context free grammar for any construct.
- Design Turing machines for any language.
- Propose computation solutions using Turing machines.
- Derive whether a problem is decidable or not.

TEXT BOOKS:

1. J.E.Hopcroft, R.Motwani and J.DULLman,—Introduction to Automata Theory, Languages and Computations, Second Edition, Pearson Education, 2003.
2. PeterLinz- An Introduction to Formal Languages and Automata, Sixth Edition, Jones & Bartlett, 2016

REFERENCES:

1. H.R.Lewis and C.H.Papadimitriou, —Elements of the theory of Computation, Second Edition, PHI, 2003
2. J.Martin,—Introduction to Languages and the Theory of Computation, Third Edition, TMH, 2003
3. Micheal Sipser, —Introduction of the Theory and Computation, Thomson Brokecole, 1997.

WEBSITE REFERENCES:

1. [AutomataTutorial/TheoryofComputation-Javatpoint](#)
2. [TheoryOfComputationandAutomataTutorials-GeeksforGeeks](#)
3. [AutomataTheoryTutorial-Tutorialspoint](#)
4. [NPTEL::ComputerScienceand Engineering-TheoryofComputation](#)
5. [Theoryofcomputation\(TOC\)Articles, Tutorials\(includehelp.com\)](#)
6. <https://users.cs.duke.edu/~rodger/tools/jflap/indexold.html>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	3	2	-	3	-	-	1	2	1	-	1	2	2	3
CO-2	3	3	2	-	3	-	-	1	2	1	-	1	3	3	2
CO-3	3	3	2	-	-	-	-	-	2	1	-	1	3	2	2
CO-4	3	2	1	-	-	-	-	-	-	-	-	1	3	3	2
CO-5	2	2	1	-	-	-	-	-	-	-	-	1	2	3	2

JPT1002	TECHNICAL SKILLS AND APTITUDE - I	L	T	P	C
		0	0	2	*

COURSE OBJECTIVES:

- To make students analyze and solve problems in technical as well as Quantitative aptitude.
- To enhance the Technical skills and basics of programming language
- To make students understand how to apply the practical knowledge with real time applications.
- To make students think and draw a conclusion from different scenarios.
- To help students understand python programming concepts

UNIT I OOPS CONCEPTS **6**

What is object oriented programming?. Constand classes. Arrays and string arrays fundamentals. Arrays of object, string, The standard C++ String class. Operator overloading: Overloading unary operations. Concept of inheritance. Derived class and based class. Derived class constructors, member function, Virtual Function

UNIT II PYTHON I **6**

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tupleb assignment, modules and functions.

UNIT III PYTHON II **6**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, list parameters; Tuples: tuple assignment, Dictionaries: operations and methods; advanced list processing–list comprehension

UNIT IV QUANTITATIVE APTITUDE **6**

Boats and streams – Time and work – Pipes and Cistern – Time and Distance – Problems onTrains

UNIT V LOGICAL REASONING **6**

Syllogism – Statement and Conclusion – Inequalities – Non Verbal Reasoning – Figure Analogy – Mirror and Water images – Paper cutting and Folding – Cubes and Dices – attern completion.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

- Apply OOPS concepts in applications
- To enhance knowledge in python programming.
- Gain knowledge in coding using the python programming.
- Solve complex arithmetic problems practically with realtime applications.
- Think logically in solving problems, enhance decision making, for difficult situations.

TEXTBOOKS:

1. Dr.E. Balagurusamy, "Programming in C++" complete reference 8th Edition.
2. "THE COMPLETE REFERENCE PYTHON", Herbert schildt., McGraw Hill Education, 2011.
3. Python: The Complete Reference by Martin Brown and Martin C. Brown Published in 2014.
4. Python in anut shell by Alex Martelli Revised in March 2013.
5. Dr.R.SAgrawal, "Quantitative Aptitude "and Non Verbal Reasoning published in 2000.

WEBSITE REFERENCES:

1. <https://www.indiabix.com/aptitude/questions-and-answers/>
2. <https://m4maths.com/placement-puzzles.php>
3. www.freshersworld.com
4. www.careerride.com
5. www.youtube.com/watch/python
6. www.youtube.com/watch/conceptsofpython

7. <https://stackoverflow.com/>
8. <https://www.w3schools.com/>
9. <https://www.geeksforgeeks.org/>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	-	2	3	2	-	-	1	3	2	1	-	-	2	2	3
CO-2	-	2	3	2	-	-	1	3	2	1	-	-	2	2	2
CO-3	-	2	3	2	-	-	1	3	2	1	-	-	2	2	2
CO-4	-	2	3	2	-	-	1	3	2	1	-	-	2	2	2
CO-5	-	2	3	2	-	-	1	3	2	1	-	-	2	2	2

JHS1511	PROFESSIONAL COMMUNICATION	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To enable students to acquire aspecialized knowledge of the essential professional skills
- To train them to make effective presentations on a variety of topics
- To help them participate in group discussions displaying team work skills
- To build their confidence and help the mattend interviews winningly
- To groom them to become successful professionals

UNIT I EXPOSURE TO PROFESSIONAL SKILLS

6

Introduction to Skills: hardskills and softskills–communication skills–inter personal skills employ ability and career skills–planning and prioritizing work–time management–stress management–emotional intelligence–SWOT analysis

UNIT II PREPARING AND PRESENTING IN SPIRING TALKS

6

Key elements of effective presentation–nonverbal communication–impressive self-introduction and short individual presentation – preparing outline – structuring and organizing content–presenting–introducing topic–developing points–concluding–answering questions

UNIT III MEASURES TO CRACK GROUP DISCUSSION

6

Group discussion skills–team building–using key strategies–etiquette–content preparation brain storming–out of box thinking–mind mapping–turn taking and turn giving–speaking persuasively–questioning and clarifying

UNIT IV INTERVIEW SKILLS TO GET HIRED

6

Interview skills–etiquette–body language–confidence–preparedness–types of interview
– Frequently Asked Questions (FAQs) –mock interview–job application and resume writing

UNIT V LANGUAGE SKILLS AND CAREER MAPPING

6

Listening skills – understanding different accents – reading skills – verbal ability –
email writing – professional grooming – leadership qualities – fundamentals of
entrepreneurship –career planning–goal setting–future challenges

TOTAL : 30 PERIODS

COURSE OUTCOMES:

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

- Have sufficient knowledge of the skills required for professional development
- Give formal and effective presentations
- Participate active lyng roup discussions
- Attend job interviews and answer questions confidently and effortlessly
- Emerge as professionals ready for placement.

RECOMMENDED SOFTWARE:

1. **Globearena**
2. **WinEnglish**

TEXTBOOKS:

- Interact English Lab Manual for Under graduate Students, 2016, Hyderabad: Orient Black Swan.

REFERENCES:

1. Alex,K, 2019, Soft Skills: Know Yourself and Know the World, NewDelhi :S.Chand & Company Limited.
2. Butter field, Jeff, 2015, Soft Skills for Everyone. NewDelhi: Cengage Learning.
3. Kumar,Suresh Eetal, 2015, Communication for Professional Success, Hyderabad: Orient Black Swan.
4. Mitra, BarunK, 2016, Personality Development and SoftSkills, NewDelhi:Oxford University Press.
5. Raman, Meenakshi and Sangeeta Sharma, 2014, Professional Communication, Oxford: Oxford University Press.
6. Rizvi, Ashraf, M, 2018, Effective Technical Communication, Chennai: McGraw-Hill Education.

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1. <https://www.britishcouncil.in/english/online/resources-websites/moocs>
2. <https://alison.com/courses/communications>
3. <https://in.topresume.com/career-advice/15-free-resources-to-improve-your-presentation-andspeaking-skills>
4. http://www.washington.edu/doi/TeamN/present_tips.html
5. <https://www.softwaretestinghelp.com/how-to-crack-the-gd/>
6. <http://www.oxforddictionaries.com/words/writing-job-applications>
7. http://www.mindtools.com/pages/article/newCDV_34.htm
8. <https://myinterviewpractice.com/>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO-3	-	-	-	-	1		1	-	-	1	-	1	2	2	2
CO-4	-	-	-	-	1		1	-	-	1	-	1	2	2	2
CO-5	-	-	-	-	1		1	-	-	1	-	1	2	2	2

JCS1511	INTERNET PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To be familiar with Web page design using HTML/XML and style sheets
- To be exposed to creation of user interfaces using Java frames and applets.
- To learn to create dynamic web pages using server-side scripting.
- To learn to write Client Server applications.
- To be familiar with the PHP programming.
- To be exposed to creating applications with AJAX

LIST OF EXPERIMENTS

1. Create a web page with the following using HTML
 - a. To embed a map in a web page
 - b. To fix the hot spot sin that map
 - c. Show all the related information when the hot spot sare clicked.
2. Create a web page with the following.
 - a. Cascading style sheets.
 - b. Embedded style sheets.
 - c. In line style sheets. Use our college information for the web pages.
3. Validate the Registration, user login, user profile and payment by credit card pages using Java Script.
4. Write programs in Java using Servlets:
 - a. To invoke servlets from HTML forms
 - b. Session tracking using hidden form fields and Session tracking for a hit count
5. Write programs in Java to create three-tier applications using servlets for conducting on line examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
6. Install TOMCAT web server. Convert the static web pages of programs into dynamic webpages using servlets (or JSP) and cookies. Hint: User's information (user id, password, creditcard number) would be stored in web.xml. Each user should have a separate Shopping Cart.
7. Redo the previous task using JSP by converting the static web pages into dynamic web

pages. Create a database with user information and books information. The book catalogue should be dynamically loaded from the database.

8. Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information n from the XML document
9. i. Validate the form using PHP Regular expression. ii. PHP stores a form data into database.
10. Write a web service for finding what people think by asking 500 people's opinion for any consumer product.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Construct Web pages using HTML/XML and style sheets
- Build dynamic web pages with validation using JavaScript objects and by applying different events and link mechanisms
- Develop dynamic web pages using server-side scripting
- Use PHP programming to develop web applications
- Construct web applications using AJAX and web services

WEBSITE REFERENCES:

1. <https://www.w3schools.com/html/>
2. <https://www.javatpoint.com/php-tutorial>
3. <https://www.javatpoint.com/servlet-tutorial>
4. <https://www.tutorialspoint.com/xml/index.htm>

SOFTWARE REQUIRED:

- Dream Weaver or Equivalent, My SQL or Equivalent, Apache Server, WAMP/XAMPP

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	3	3	-	-	-	-	2	3	3	-	3	3	3	3
CO-2	3	3	3	-	-	-	-	3	3	3	-	3	3	3	3
CO-3	3	3	3	-	-	-	-	3	3	3	-	3	3	3	3
CO-4	3	3	3	-	-	-	-	3	3	3	-	3	3	3	3
CO-5	3	3	3	-	-	-	-	3	3	3	-	3	3	3	3

OPEN ELECTIVE II

SEMESTER V

JCS9004	INTRODUCTION TO WEB DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To define the principle of Web page design.
- To visualize the basic concept of HTML.
- To recognize the elements of HTML.
- To learn about different layouts and styles in CSS.
- To develop the concept of web publishing.

UNIT I WEB DESIGN PRINCIPLES 9

Basic principles involved in developing a web site – Planning process – Five Golden rules of web designing – Designing navigation bar – Page design – Home Page Layout – Design Concept, Basics in Web Design - Brief History of Internet – What is World Wide Web – Why create a website–Web Standards–Audience requirement.

UNIT II INTRODUCTION TO HTML 9

What is HTML – HTML Documents – Basic structure of an HTML document – Creating an HTML document– Mark upTags, Heading– Paragraphs– Line Breaks– HTML Tags.

UNIT III ELEMENTS OF HTML 9

Introduction to elements of HTML – Working with Text – Working with Lists, – Tables and Frames – Working with Hyperlinks – Images and Multimedia – Working with Forms and controls.

UNIT IV INTRODUCTION TO CASCADING STYLE SHEETS 9

Concept of CSS – Creating Style Sheet – CSS Properties – CSS Styling (Back ground, Text Format, Controlling Fonts) – Working with block elements and objects – Working with Lists and Tables – CSS Id and Class – Box Model (Introduction, Border properties, Padding Properties, Margin properties) – CSS Advanced (Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector) – CSS Colour Creating page Layout and Site Designs.

UNIT V INTRODUCTION TO WEB PUBLISHING OR HOSTING 9

Creating the WebSite–Saving the site–Working on the website–Creating website structure – Creating Titles for webpages–Themes–Publishing websites.

COURSE OUTCOMES:

On successful completion of the course, Students will be able to

- Gain fundamental knowledge on the principles of Web design
- Create dynamic website/web based applications using HTML.
- Debug the programs by applying concepts and error handling techniques of HTML.
- Design websites using basic elements to control layout and style.
- Design an original and functional website that communicates and publish on the interne.

TEXT BOOKS:

1. Basic of Web Design: HTML5 & CSS, 5th Edition, Terry Felke-Morris, Pearson, 2019.
2. Learning Web Design–A Beginner’s Guide to HTML, CSS, Java Script and Web Graphics, O’Reilly Media, Jennifer Niederst Robbins, 2018.

REFERENCES:

1. Beginning HTML, XHTML, CSS and Java Script, John Wiley & Sons, Inc Dockett Jon, 2011.
2. Beginning CSS: Cascading Style Sheets for Web Design, 3rd Edition, Wrox, Ian Pouncey, Richard York, 2011.
3. HTML & CSS: The Complete Reference, Thomas Powell, Fifth Edition, 2017.
4. HTML, XHTML, and CSS Bible, 5th Edition, Steven M. Schafer, 2010.
5. HTML 5 in simple Steps, Kogent Learning Soutlion Inc, Dream tech Press, 2010.

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1. <https://www.w3schools.com/html/default.asp>
2. <https://www.tutorialspoint.com/html5/index.htm>
3. <https://www.youtube.com/watch?v=mU6anWqZJcc>
4. <https://www.edx.org/course/html5-and-css-fundamentals>
5. <https://www.coursera.org/learn/html-css-javascript-for-web-developers>

Mapping of CO with PO/PSO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	1	2	1	3	1	3
CO2	3	2	3	3	1	2	2	1	1	2	3	3
CO3	3	3	3	3	2	2	2	3	2	3	3	3
CO4	3	2	3	2	3	3	2	2	2	2	3	3
AVG	3	3	3	2	2	3	3	2	1	2	2	3

JCS9005	PROGRAMMING TOOLS AND TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn fundamentals of software project management
- To provide an understanding of Scripting languages
- To learn GUI programming
- To learn high level programming language processing.
- To understand windows programming

UNIT I SOFTWARE PROJECT MANAGEMENT TOOLS 6

Introduction-Project Plan-Mile stone checklist-Gantt chart-PERT chart-Resource Histogram

UNIT II INTRODUCTION TO PERL AND SCRIPTING 12

Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, sub routines

UNIT III GUI PROGRAMMING USING PYTHON 9

Simple GUIs- Creating Simple “static“ GUIs with labels and buttons only. Repetition and Conditional commands- Binding events to widgets-Advanced GUIs-Check Boxes, radio buttons, list boxes.

UNIT IV LANGUAGE PROCESSING TOOLS 9

Basic Functions of Assembler, Assembler Design, Single pass and 2 Pass Assemblers and their Design, Linkers and Loaders, Absolute Loader and Relocating loader, Design of Linking Loader, Macro Processor c and its design, Fundamentals of Text Editor Design,

UNIT V WINDOWS PROGRAMMING 9

Windows environment – a simple windows program – windows and messages – creating the window–displaying the window–message loop–the window procedure–message processing – text output – painting and repainting – introduction to GDI – device context –basic drawing–child window controls

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Use and apply tools to facilitate the software project management process
- Acquire programming skills inscripting language.
- Create, run and manipulate Python based GUI programs
- Ability to understand the tools involved inprocessing of programming languages
- Explain concepts in windows programming.

TEXTBOOKS:

1. Nicholas Ayden,— Python Programming, 2019
2. Charles Petzold, “Windows Programming”, Microsoft press,1996
3. David Barron,—The world of Scripting Languages,Wiley, 2000

REFERENCES:

1. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O’Reilly, SPD, 2000.
2. Beck.—System Software - An Introduction to system programming, 2002.

WEBSITE REFERENCES:

1. [WhatIsaScriptingLanguage?:ACompleteGuide |CareerKarma](#)
2. [OverviewofWindowsProgramminginC++|MicrosoftDocs](#)

Mapping of CO with PO/PSO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	1	2	1	3	1	3
CO2	3	2	3	3	1	2	2	1	1	2	3	3
CO3	3	3	3	3	2	2	2	3	2	3	3	3
CO4	3	2	3	2	3	3	2	2	2	2	3	3
AVG	3	3	3	2	2	3	3	2	1	2	2	3

JCS9006	HIGH PERFORMANCE NETWORKS FOR BEGINNERS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Describe the role of high performance network and where it is used
- Explain the techniques involved to support real-time traffic and congestion control
- Define the architecture of Integrated Services in high performance network
- Implement principles of high performance wireless network operations
- Applications of Network management over IP

UNIT I HIGH PERFORMANCE NETWORKS 9

Introduction-frame relay networks – ATM protocol architecture-ATM logical connection – ATM cells-ATM service categories–AAL–highspeed LANS: the emergence of high speed LANS-Ethernets-fiber channel-wireless LANS

UNIT II CONGESTION AND TRAFFIC MANAGEMENT 9

Congestion control in data networks and internets – link level flow and error control- TCP traffic-congestion control in ATM networks–Interior routing protocols.

UNIT III QOS IN IP NETWORKS 9

Integrated service architecture-queuing discipline– random early detection differentiated services protocol for QOS support – RSVP – multiprotocol Label switching – real time transport protocol-IP version six.

UNIT IV PRINCIPLES OF WIRELESS NETWORK OPERATION 9

Local broad band and Adhoc networks. Introduction to wireless LANS-IEEE802. 11 WLAN-WATM–HIPERLAN- Adhoc networking and WPAN.

UNIT V NETWORK MANAGEMENT AND APPLICATION 9

Network management-choosing a configuration method–MIB–SNMP–XML CORBA – COPS–VPNS-mobile IP-voice over IP.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Learn the various high-speed networking technologies and their design issues.
- Apply techniques involved to support real-time traffic and congestion control.
- Design high speed networks with quality of service (QoS).
- Understand the performance of high-speed wireless networking technologies.
- Apply the concept learnt in Network management in voice over IP.

TEXTBOOKS:

1. William Stallings, "HIGH SPEED NETWORKS AND INTERNET" ,Pearson Education, Second Edition, 2002.
2. Kaven Pahlavan And Prashant Krishnamoorthy, "Principles Of Wireless Network", Prentice Hall Of India, 2010.
3. Adrian Farrel, "The Internet And Its Protocols" Elsevier Publications, 2011.

REFERENCES

1. Behrouz A.Forouzan, "Data Communication And Computer Networking" ,4th, 2011.
2. Larry L. Peterson and Bruce S.Davie," Computer Networks", Third edition, Elsevier Publications, 2003

WEBSITE REFERENCES:

1. https://www.cse.wustl.edu/~jain/cis788-95/ftp/frame_relay/index.html
2. <https://www.cse.wustl.edu/~jain/papers/ftp/cnis/index.html>
3. https://www.cse.wustl.edu/~jain/cis788-95/ftp/atm_cong/index.html
4. https://www.cse.wustl.edu/~jain/cis788-99/ftp/qos_protocols/index.html
5. <https://www.slideshare.net/ayyakathir/unit1-29753217>

Mapping of CO with PO/PSO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	1	2	1	3	1	3
CO2	3	2	3	3	1	2	2	1	1	2	3	3
CO3	3	3	3	3	2	2	2	3	2	3	3	3
CO4	3	2	3	2	3	3	2	2	2	2	3	3
AVG	3	3	3	2	2	3	3	2	1	2	2	3

SEMESTER VI

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JCS1601	Compiler Design	PC	3	3	0	0	3
2	JIT1602	Artificial Intelligence	PC	3	3	0	0	3
3	JCS1603	Cryptography and Network Security	PC	3	2	1	0	3
4		Professional Elective - II	PE	3	3	0	0	3
5		Professional Elective - III	PE	3	3	0	0	3
		Open Elective - III	OE	3	3	0	0	3
PRACTICALS								
6	JPT1002	Technical Skills and Aptitude-II	EEC	2	0	0	2	1
7	JCS1611	Compiler Design Laboratory	PC	4	0	0	4	2
8	JCS1621	Mini Project	EEC	2	0	0	2	1
9	JCS1641	Internship	EEC	-	-	-	2	1
TOTAL				26	18	0	10	23

SEMESTER VI

JCS1601	COMPILER DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To know about various phases of the compiler and to kenization
- To learn about the techniques for parsing
- To understand the way sof in termed iater e presentation
- To have an idea about generating assembly code
- To have a brief understanding of code optimization techniques

UNIT I INTRODUCTION AND LEXICAL ANALYSIS 9

Language Processors – Structure of a Compiler – Role of Lexical Analyser – Specification of Tokens–Recognition of Tokens–Lex–Finite Automata–Construction of NFA from Regular Expression–NFA to DFA–Direct Conversion of Regular Expression to DFA–Minimization of DFA.

UNIT II SYNTAX ANALYSIS 9

Role of Parser – Error Handling – Error-Recovery Strategies – Context-Free Grammars – Recursive-Descent Parser – Predictive Parser – Shift-Reduce Parser – Simple LR Parser – CanonicalLR parser–LALR Parser–Yacc.

UNIT III INTERMEDIATE-CODE GENERATION 9

Syntax-Directed Definitions – Evaluation Orders for SDDs – Applications of Syntax-Directed Translation–DAG–Three-Address Code–Types and Declarations–Translation of Expressions –Type Checking–Backpatching.

UNIT IV RUN-TIME ENVIRONMENT AND CODE GENERATION 9

Storage Organization– Stack Allocation of Space– Accessto Nonlocal Data on Stack–Heap Management – Issues in the Design of Code Generator – The Target Machine – Addresses in the Target Code–Basic Blocks and Flow Graphs–A Simple Code Generator.

UNIT V CODE OPTIMIZATION 9

Principal Sources of Optimization – Optimization of Basic Blocks – Peephole Optimization –Register Allocation – Loops in Flow Graphs – Introduction to Global Data-flow Analysis –Code Improving Transformations.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Develop a lexical analyser for recognizing tokens.
- Construct parsers with an understanding of context-free grammar.
- Translate the source program into intermediate code.
- Understand accessing of variables and data and the algorithm that generate code.
- Analyze and understand code optimization.

TEXT BOOKS:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D. Ullman, Compilers: Principles, Techniques, & Tools, Second Edition, Pearson Education, 2007.
2. Torben Ægidius Mogensen, Introduction to Compiler Design, Second Edition, Springer, 2017.

REFERENCES:

1. Alfred V. Aho, Ravi Sethi and Jeffrey D. Ullman, Compilers: Principles, Techniques, and Tools, Pearson Education, 2001.
2. J.E. Hopcroft, R. Motwani and J.D. Ullman, Introduction to Automata Theory, Languages and Computations, Second Edition, Pearson Education, 2003.
3. Keith Cooper and Linda Torczon, Engineering a Compiler, Second Edition, Elsevier, 2011.
4. Santanu Chattopadhyay, Compiler Design, PHI, 2005.

WEBSITE REFERENCES:

1. <https://holub.com/compiler/>
2. <https://nptel.ac.in/courses/106/108/106108113/>
3. <https://www.javatpoint.com/compiler-tutorial>
4. https://www.tutorialspoint.com/compiler_design/index.htm
5. <https://www3.nd.edu/~dthain/compilerbook/>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	3	3	-	-	-	-	2	3	3	-	3	3	3	3
CO-2	3	3	3	-	-	-	-	3	3	3	-	3	3	3	3
CO-3	3	3	3	-	-	-	-	3	3	3	-	3	3	3	3
CO-4	3	3	3	-	-	-	-	3	3	3	-	3	3	3	3
CO-5	3	3	3	-	-	-	-	3	3	3	-	3	3	3	3

JIT1602	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To know the underlying structure behind intelligence mathematically
- To know the logical implications in computational intelligence
- To know the automated learning techniques
- To study the techniques of knowledge representation
- To explore the adaption of artificial intelligence techniques in real-time scenarios

UNIT I INTELLIGENT AGENTS AND SEARCH TECHNIQUES 9

Agents and Environments – Good Behaviour: The Concepts of Rationality – The Nature of Environments–The Structure of Agents–Problem Solving by Search–Uninformed Search–Searching with Costs–Informed State Space Search–Heuristic Search: Greedy–A* Search Problem Reduction Search–Game Search–Constraint Satisfaction Problems

UNIT II REASONING WITH LOWER ORDER LOGICS 9

Logical Agent – Proposition Logic – Syntax and Semantics – Theorem Proving – Model Checking–Inference in First Order Logic:Forward Chaining–Backward Chaining–Resolution

UNIT III KNOWLEDGE REPRESENTATION 9

Knowledge Representation Issues–Approaches for Knowledge Representation: Simple Relational Knowledge – Inherited Knowledge – Semantic Nets – Frames – Semantic Web – Ontology

UNIT IV AI PLANNING AND NATURAL LANGUAGE PROCESSING 9

Classical Planning – Types – Partial Order Planning – Graph Plan and SAT Plan – Natural Language Processing Basics: Syntax –Semantics – Introduction to Statistical NLP

UNIT V LEARNING AND APPLICATIONS 9

Logical Formulation of Learning – Knowledge in Learning – Explanation-based Learning – Learning using Relevance Information – Natural Language Tool kit (NLTK) –Application with NLP: Developing a Simple Chatbot–Types of Chatbot

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Apply the search technique storeal-time problems
- Apply the reasoning techniques to real world problems
- Understand the representation of knowledge
- Understand the learning techniques
- Apply AI techniques in developing real world applications

TEXT BOOKS:

1. Stuart J.Russell, Peter Norvig, “Artificial Intelligence-A Modern Approach”, Third Edition, Pearson Publishers, 2015.
2. Elaine Rich, Kevin Knight, Shivashankar B.Nair, “Artificial Intelligence”, Third Edition, Tata McGraw-Hill Education, 2008.

REFERENCES:

1. Dheepak Khemani, “ A first course in Artificial Intelligence”, McGraw Hill Education Pvt Ltd., NewDelhi, 2013.
2. Steven Bird, Ewan Klein and Edward Loper, “Natural Language Processing with Python”, O’ Reilly, 2009, <https://www.nltk.org/book/>.
3. Nils J.Nilsson, “Artificial Intelligence: A New Synthesis”, Morgan Kaufmaan Publishers Inc; Second Edition, 2003.

WEBSITE REFERENCES:

1. <http://nptel.ac.in/courses/106105079/2>
2. <https://in.udacity.com/course/intro-toartificial-intelligence--cs271>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	3	3	3	-	-	-	-	2	-	-	3	3	3	3
CO-2	3	3	3	3	-	-	-	-	2	-	-	3	3	3	3
CO-3	3	3	3	3	-	-	-	-	2	-	-	3	3	3	3
CO-4	3	3	3	3	-	-	-	-	2	-	-	3	3	3	3
CO-5	3	3	3	3	3	-	-	-	2	-	-	3	3	3	3

JCS1603	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
		2	1	0	3

COURSE OBJECTIVES:

- To understand Cryptography Theories, Algorithms and Systems
- To learn the mathematics concepts in symmetric key cryptography and algorithms
- To acquire knowledge and fundamental ideas of public-key cryptography
- To understand the principles of Message Authentication, Integrity and related algorithms
- To understand necessary Approaches and Techniques to build protection
- Mechanisms in order to secure computer networks

UNIT I INTRODUCTION

9

Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security – Security attacks, services and mechanisms–OSI security architecture–Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security–information theory–product cryptosystem–cryptanalysis.

UNIT II SYMMETRIC KEY CRYPTOGRAPHY

9

MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures–Modular arithmetic–Euclid’s algorithm- Congruence and matrices - Groups, Rings, Fields–Finite fields- SYMMETRIC KEY CIPHERS: SDES – Block cipher Principles of DES – Strength of DES–Differential and linear crypt analysis–Block cipher design principles–Blockcipher mode of operation–Evaluation criteria for AES–Advanced Encryption Standard–RC4 Key distribution.

UNIT III PUBLIC KEY CRYPTOGRAPHY

9

MATHEMATICS OF A SYMMETRIC KEY CRYPTO GRAPHY: Primes–Primality Testing –Factorization – Euler’s totient function, Fermat’s and Euler’s Theorem - Chinese Remainder

Theorem–Exponentiation and logarithm-ASYMMETRIC KEYCIPHERS: RSA cryptosystem–Key distribution–Key management–Diffie Hellman key exchange-ElGamal cryptosystem–Elliptic curve arithmetic-Elliptic curve cryptography– Learning honey pot and monitor the honeypot on network using KF Sensor

UNIT IV MESSAGE AUTHENTICATION AND INTEGRITY 9

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA –Digital signature and authentication protocols – DSS-Entity Authentication: Biometrics, Passwords, Challenge Response protocols-Authentication applications - Kerberos, X.509- Learning secure data storage, secure data transmission and for creating digital signatures using GnuPG.

UNIT V SECURITY PRACTICE AND SYSTEM SECURITY 9

Electronic Mail security–PGP, S/MIME-IP Security-Cutting Edge Web Application Security : Click jacking - DNS rebinding - Flash security - Java applet security - Single-sign- on solution and security - IPv6 impact on web security .System Security: Intruders–Malicious software – viruses – Firewalls - IoT attack, types of IoT attacks, Threats and Security Solutions.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Understand the fundamental also of networks security, security architecture, threats and vulnerabilities
- Apply the different cryptographic cooperation so of symmetric cryptographic algorithms
- Apply the different cryptographic operation so of public key cryptography
- Apply the various Authentication schemes to simulate different applications.
- Understand various Security practices and System security standards.

TEXT BOOKS:

1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 8th Edition, 2019
2. Stuttard, Dafydd, and Marcus Pinto. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws. John WileySons, 2011

REFERENCES:

1. C K Shyamala, N Harini and Dr.TR Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd.
2. Behrouz A.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.
3. Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall, ISBN 0-13-046019-2.
4. Sullivan, Bryan, and Vincent Liu.Web Application Security, A Beginner's Guide. McGraw Hill Professional, 2011.

WEBSITE REFERENCES:

1. <https://www.tutorialspoint.com/cryptography/index.htm>
2. <https://www.geeksforgeeks.org/cryptography-introduction/>
3. <https://mindmajix.com/cryptography-tutorial>
4. https://www.academia.edu/35766751/Cryptography_tutorial
5. https://www.vssut.ac.in/lecture_notes/lecture1428550736.pdf

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	3	3	3	3	3	1	3	1	1	3	2	3	2	2
CO-2	3	3	3	2	3	2	1	3	2	1	3	2	3	2	2
CO-3	3	3	3	2	3	2	1	3	2	1	3	2	3	2	2
CO-4	3	2	3	2	3	3	1	3	2	1	3	2	3	2	2
CO-5	3	3	3	2	3	3	1	3	2	1	3	2	3	2	2

JPT1002	TECHNICAL SKILLS AND APTITUDE - II	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To make students analyze and solve problems in technical as well as quantitative aptitude. Enhance the technical skills and basics of programming language
- To make the students understand
- How to apply the practical knowledge in realtime applications.
- To make the students think and draw conclusions from different scenarios.
- To help the students understand JAVA programming concepts
- To help the students understand concepts and develop new applications in JAVA

UNIT I JAVA FUNDAMENTALS 6

OO Pin Java–Characteristics of Java–Java Source-File-Structure–Compilation.
Fundamental Programming Structures in Java

UNIT II ADVANCED JAVA PROGRAMMING 6

Defining classes in Java–constructors, methods-access specifiers–static members-Data Types, Variables, Operators, Control Flow, Arrays, Inheritance–Super classes-sub classes –Protected members–constructors in sub classes-Interfaces–Strings.

UNIT III MATHEMATICAL AND ARITHMETIC PROBLEM SOLVING 6

Crpto arithmetic Problem Solving, Logarithms, Trigonometry, Mensuration, Probability, Permutations and Combinations.

UNIT IV LOGICAL REASONING - COGNITIVE THINKING 6

Numerical Ability, English Ability, Gaming, Arrangements, Visual Reasoning, Flowcharts –Visual Reasoning–DI.

UNIT V LOGICAL REASONING-CRITICAL THINKING 6

Logical Sequence, I nferred Meaning, Agree Disagree Psychometric, Statement & On clusions, Cubes and Cuboids

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

- Enhance their knowledge in JAVA concepts and Java Programming.
- Gain knowledge in coding using JAVA programming.
- Solve complex arithmetic problems practically with real time applications.
- Think logically in solving problems, enhance decision making, for difficult situations

TEXTBOOKS:

1. Herbert Schildt, “Java The complete reference”, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Garycornell, “Core JavaVolume–I Fundamentals”, 9th Edition, Prentice Hall, 2013.
3. Dr. R .S Agrawal, “Quantitative Aptitude” and Non Verbal Reasoning published in 2000.
4. S.Chand – A Modern Approach to Logical Reasoning Published in 2000.

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2. <https://m4maths.com/placement-puzzles.php>
3. www.freshers_world.com
4. www.careerride.com
5. www.youtube.com/watch/python
6. www.youtube.com/watch/conceptsofpython
7. <https://stackoverflow.com/>
8. <https://www.w3schools.com/>
9. <https://www.geeksforgeeks.org/>

Mapping of CO with PO/PSO

CO\ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	1		1	-	-	1	-	1
CO2	-	-	-	-	1		1	-	-	1	-	1
CO3	-	-	-	-	1		1	-	-	1	-	1
CO4	-	-	-	-	1		1	-	-	1	-	1
AVG	-	-	-	-	1		1	-	-	1	-	1

JCS1611	COMPILER DESIGN LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To expose the students to compiler writing tools.
- To learn the implementation of the different Phases of compiler
- To familiarize with control flow and data flow analysis
- To implement the efficient storage allocation strategies
- To learn simple optimization techniques

LIST OF EXPERIMENTS

1. Implementation of Symbol Table using C
2. Develop lexical analyzer to recognize patterns using Lex Tool. Simulate the same using C. (eg:. identifiers, constants, comments, operators etc.)
3. Identify whether a given line is a comment or not using a C program.
4. Generate YACC specification for few syntactic categories.
5. Convert the BNF rules into YACC form and write code to generate Abstract Syn tax Tree.
6. Implement LL (1) parser.
7. Implement LALR parser.
8. Implement control flow analysis and Data flow Analysis
9. Implement Heap storage allocation strategy
10. Constructa DAG for any given three address code.
11. Implement the back end of the compiler that generates machine code from abstract syntax tree generated by the parser.
12. Implementation of Simple Code Optimization Techniques.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Describe the functionality of each phase involved in Compilation process
- Implement the parsing techniques including Bottom-up and Top-down parsing for the given programming construct described in Context Free Grammar.
- Understand the different representations of intermediate code
- Describe the concepts of storage administration for different programming environments
- Generate the machine code by considering all the functionalities of the different phases of the compiler and develop an optimized compiler.

TEXT BOOKS:

1. Alfred VAho ,Monica S.Lam, Ravi Sethi and Jeffrey DULLman,“Compilers– Principles,Techniques and Tools”, 2nd Edition, Pearson Education, 2007
2. Randy Allen, Ken Kennedy,“Optimizing Compilers for Modern Architectures: A Dependence-based Approach”, Morgan Kaufmann Publishers, 2002
3. Charles N.Fischer, Richard. J.LeBlanc, “Craftinga Compiler with C”, Pearson Education, 2008.

WEBSITE REFERENCES

1. <https://github.com/JacobSamro/Compiler-Design-Lab>
2. <https://www.javatpoint.com/lex>
3. <https://www.javatpoint.com/YACC>
4. <https://www.guru99.com/compiler-design-tutorial.html>
5. <https://www.codeproject.com/Articles/30353/Designing-a-Compiler>

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

HARDWARE:

Stand alone desktops 30Nos. (or) Server supporting 30 terminals or more.

SOFTWARE:

- C/C++ compiler and Compiler writing tools
- LEX and YACC compilers

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	3	3	3	1	3	2	2	1	1	2	3	3	2	2
CO-2	3	3	3	3	3	3	2	2	2	1	1	3	3	2	2
CO-3	3	3	3	3	2	2	2	2	2	1	1	3	3	2	2
CO-4	3	3	3	3	3	2	2	2	2	2	1	3	3	2	2
CO-5	3	3	3	3	3	2	2	2	3	2	1	3	3	2	2

JCS1621	MINI PROJECT	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To understand real time software development environment.
- To develop research skills with new product design ideas.
- To develop leadership and ownership capability
- To implement quality programming strategies
- To learn simple software development tools

GUIDELINES**1. Selection of project Title**

Project work can be of three types:

- Developing solutions for real time problems
- System software project
- Research level project

2. Project Team

- To achieve the stated objectives, it is imperative that the miniproject is done through a team effort with are striction on minimum 2 and maximum 4 students per team.
- A team leader shall be selected
- Even if students are doing projectas teams, each one must independently assigned different modules of the work and must maintain and submit there porton progress on assigned activities.

3. Selection ofTools

Students can choose platform /tools /languages to be utilized to develop their projects.

4. Project Management

- Students should submit fortnightly a progress report, which highlights the indication of percentage of completion of project work.
- Each team should submit 3 copies of project report which should contain of

**OPEN ELECTIVE 3
SEMESTER VI**

JCS9007	ESSENTIALS OF SOFTWARE PROJECT	L	T	P	C
	MANAGEMENT	3	0	0	3

COURSE OBJECTIVES:

- To understand the Software Project Planning and Evaluation techniques.
- To plan and manage projects a teach stage of the software development lifecycle (SDLC).
- To learn about the activity planning and risk management principles.
- To manage software projects and control software deliverables.
- To develop skills to manage the various phases involved in project management and people management.
- To deliver successful software projects that support organization’s strategic goals.

UNIT I PROJECT EVALUATION AND PROJECT PLANNING 9

Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control –Project portfolio Management– Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

UNIT II PROJECT LIFE CYCLE AND EFFORT ESTIMATION 9

Software process and Process Models – Choice of Process models – Rapid Application development– Agile methods – SCRUM-KANBAN – Dynamic System Development Method - Extreme Programming – Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II – a Parametric Productivity Model

UNIT III ACTIVITY PLANNING AND RISK MANAGEMENT 9

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – PERT technique – Monte Carlo simulation – Resource Allocation –Creation of critical paths – Cost schedules.

UNIT IV PROJECT MANAGEMENT AND CONTROL 9

Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management-Project Recovery.

UNIT V STAFFING IN SOFTWARE PROJECTS 9

Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures –Dispersed and Virtual teams –Communications genres–Communicationplans –Leadership.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Understand Project Management principles while developing software.
- Gain extensive knowledge about the basic project management concepts, frame work and the process models.
- Obtain adequate knowledge about software process models and software effort estimation techniques.
- Estimate the risks involved in various project activities.
- Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.
- Learn staff selection process and the issues related to people management

TEXT BOOK:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

REFERENCES:

1. Robert K. Wysocki —Effective Software Project Management – Wiley Publication, 2011.
2. Walker Royce:—Software Project Management—Addison-Wesley, 1998.
3. Gopalaswamy Ramesh,—Managing Global Software Projects—McGraw Hill Education (India), Fourteenth Reprint 2013.
4. David J. Anderson and Eli Schragenheim,—Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results—, Prentice Hall, 2003.
5. Hazza and Dubinsky, —Agile Software Engineering, Series: Undergraduate Topics in Computer Science—, Springer, 2009.

WEBSITE REFERENCES:

1. https://www.tutorialspoint.com/software_engineering/software_project_management.htm
2. <https://www.geeksforgeeks.org/software-engineering-software-project-management-spm/>
3. <https://www.cprime.com/resources/what-is-agile-what-is-scrum/>
4. <https://www.atlassian.com/agile>
5. <https://www.tutorialspoint.com/agile/index.htm>

Mapping of CO with PO

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	1	2	1	3	1	3
CO2	3	2	3	3	1	2	2	1	1	2	3	3
CO3	3	3	3	3	2	2	2	3	2	3	3	3
CO4	3	2	3	2	3	3	2	2	2	2	3	3
CO5	3	3	3	2	2	3	3	2	1	2	2	3
AVG	3	3	3	3	2	3	2	2	2	2	3	3

JCS9008	FUNDAMENTALS OF BIG DATA	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn big data concepts, architecture, business analysis and tools
- Define big data for business intelligence
- Analyze business case studies for big data analytics
- Explain managing of Big data Without SQL
- Develop map-reduce analytics using Hadoop and related tools

UNIT I UNDERSTANDING BIG DATA 9

What is big data – why big data – Data!, Data Storage and Analysis, Comparison with Other Systems, Rational Database Management System, Grid Computing, Volunteer Computing, convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and health care – big data in medicine – advertising and big data – 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 – aggregates – key-value and document data models – relationships – graph databases – schema less databases – materialized views – distribution models – sharding – version – map reduce – partitioning and combining – composing map-reduce calculations.

UNIT III 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 – dataflow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures.

UNIT IV MAP REDUCE APPLICATIONS 9

MapReduce workflows – unit tests with MRUnit – 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 V HADOOP RELATED TOOLS 9

Hbase – data model and implementations – Hbase clients – Hbase examples – praxis. Cassandra – Cassandra data model – Cassandra examples – Cassandra clients – Hadoop integration. 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.

TOTAL 45 PERIODS

COURSE OUTCOMES:

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

- Describe big data and use cases from selected business domains
- Explain No SQL big data
- Install, configure, and run Hadoop and HDFS
- Perform map-reduce analytics using Hadoop
- Familiar with Hadoop tools

TEXT BOOKS:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilly, 2012.
2. Eric Sammer, "Hadoop Operations", O'Reilly, 2012.

REFERENCES:

1. Vignesh Prajapati, Big data analytics with R and Hadoop, SPD2013.
2. E.Capriolo, D.Wampler, and J.Rutherglen, " Programming Hive", O'Reilly,2012.
3. Lars George, "HBase: The Definitive Guide", O'Reilly, 2011.

WEBSITE REFERENCES:

1. https://www.tutorialspoint.com/big_data_analytics/index.htm
2. <https://www.javatpoint.com/what-is-big-data>
3. <https://www.guru99.com/bigdata-tutorials.html>

Mapping of CO with PO/PSO

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	1	2	1	3	1	3
CO2	3	2	3	3	1	2	2	1	1	2	3	3
CO3	3	3	3	3	2	2	2	3	2	3	3	3
CO4	3	2	3	2	3	3	2	2	2	2	3	3
CO5	3	3	3	2	2	3	3	2	1	2	2	3
AVG	3	3	3	3	2	3	2	3	2	2	3	3

JCS9009	SECURITY PRACTICES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the fundamentals of practices followed in system and web security
- To have an understanding of the basic security concepts in networks
- To deploy the security essentials in IT Sector
- To be exposed to the concepts of Cyber Security and encryption Concepts
- To perform a detailed study of Privacy and Storage security and related Issues.

UNIT I SYSTEM SECURITY

9

Building a secure organization – A Cryptography primer – detecting system Intrusion - Preventing system Intrusion - Fault tolerance and Resilience in cloud computing environments

UNIT II NETWORK SECURITY

9

Firewalls -. IP Security-. VPN - Intrusion Detection - Web Security- SSL – TLS- Local Area Network Security - Wireless Network Security - Cellular Network Security - Optical Network Security – Overview of web security – Secured Web Programming.

UNIT III SECURITY MANAGEMENT

9

Information security essentials for IT Managers – Security Management System – Policy Driven System Management - IT Security – Identity Management System - Intrusion and Detection and Prevention System.

UNIT IV CYBER SECURITY

9

Introduction – Computer Security – Threats – Harm – Vulnerabilities – Controls – Authentication - Access Control and Cryptography – Web - User Side - Browser Attacks - Web Attacks Targeting Users – Obtaining User or Website Data – Email Attacks

UNIT V PRIVACY AND STORAGE SECURITY

9

Privacy on the Internet - Privacy Enhancing Technologies - Personal privacy Policies - Detection of Conflicts in security policies - privacy and security in environment monitoring systems. Storage Area Network Security - Storage Area Network Security Devices – Risk management - Physical Security Essentials.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Understand the core fundamentals of system security and web security
- Apply the security concepts related to networks in wired and wireless scenario
- Implement and Manage the security essentials in IT Sector
- Explain the concepts of Cyber Security and encryption Concepts
- Attain a through knowledge in the area of Privacy and Storage security and related issues.

TEXT BOOKS:

1. JohnR.Vacca, Computer and Information Security Handbook, Third Edition, Elsevier2017.
2. Michael E.Whitman, Herbert J.Mattord, Principal of Information Security, Fifth Edition, Cengage Learning, 2015.

REFERENCES:

1. Richard E.Smith, Elementary Information Security, Second Edition, Jones and Bartlett Learning, 2016
2. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition, Pearson Education, 2015
3. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 5th Edition, 2010.

WEBSITE REFERENCES:

1. https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm
2. <https://www.synopsys.com/glossary/what-is-cyber-security.html>
3. <https://www.sciencedirect.com/science/article/pii/S1877050916315812>
4. <https://www.sciencedirect.com/topics/computer-science/security-management>
5. <https://www.oreilly.com/library/view/web-security-privacy/0596000456/ch04.html>

Mapping of CO with PO / PSO

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	1	2	1	3	1	3
CO2	3	2	3	3	1	2	2	1	1	2	3	3
CO3	3	3	3	3	2	2	2	3	2	3	3	3
CO4	3	2	3	2	3	3	2	2	2	2	3	3
CO5	3	3	3	2	2	3	3	2	1	2	2	3
AVG	3	3	3	3	2	3	2	3	2	2	3	3

SEMESTER 7

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JCS1701	Big Data Analytics	PC	3	3	0	0	3
2	JCS1702 (Integrated)	Cloud Computing	PC	4	2	0	2	3
3		Professional Elective - IV	PE	3	3	0	0	3
4		Open Elective –IV	OE	3	3	0	0	3
5	JNC1361	Essence of Indian Traditional Knowledge	NCM	3	3	0	0	0
PRACTICALS								
6	JBA1711	Entrepreneurship for Engineers	EEC	2	0	0	2	1
7	NMS0001	Professional Readiness for Innovation ,Employability and Entrepreneurship	EEC	6	0	0	6	3
8	JCS1711	Big Data Analytics Laboratory	PC	4	0	0	4	2
9	JCS1731	Project work – Phase I	EEC	6	0	0	6	3
TOTAL				34	14	0	20	21

JCS1701	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To know the fundamental concepts of bigdata and analytics.
- To explore tools and practices for working with bigdata.
- To analyse about association and recommendation rules.
- To learn about stream computing.
- To know about the research that requires the integration of large amounts of data.

UNIT-I INTRODUCTIONTOBIGDATA 9

Evolution of Bigdata-Best Practices for Bigdata Analytics-Bigdata characteristics– Validating the Promotion of the Value of Big Data - Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value-Understanding BigData Storage.

UNIT-II CLUSTERING AND CLASSIFICATION 9

Overview of Clustering - K-means - Use Cases -Overview of the Method- Determining the Number of Clusters - Classification: Decision Trees - Overview - Algorithms-Evaluation-NaïveBayes-Bayes'Theorem-NaïveBayesClassifier.

UNIT-III ASSOCIATION AND RECOMMENDATION SYSTEM 9

Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Finding Association & finding similarity - Recommendation System: Collaborative Recommendation- Content Based Recommendation - Knowledge Based Recommendation- Hybrid Recommendation.

UNIT-IV HADOOP FILE SYSTEM AND MAP-REDUCE 9

Hadoop Architecture, Internals of Hadoop File Systems. Map-Reduce Programming: Developing Distributed Programs and issues, Developing Map-Reduce programs in Java, Reduce works on HDFS, Examples: Running simple word count Map-Reduce program on the cluster, analyze call data records.

UNIT-V NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION 9

NoSQL Databases: Schema-less Models”: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases Hive - Sharding – Hbase – Analyzing big data with twitter - Big data for E-Commerce Big data for blogs Review of Basic Data Analytic Methods using R.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Work withbigdatatools anditsanalysis techniques.
- Analyzedatabyutilizingclusteringandclassificationalgorithms.
- Apply different mining algorithms and recommendation systems for largevolumesofdata.
- Performon Hadoop and Map reduce programming.
- Explore NoSQLdatabasesandmanagement.

TEXT BOOKS

1. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/Elsevier Publishers, 2013.
2. Sridhar Alla, "Big Data Analytics with Hadoop 3", Packt Publications, May 2018.
3. Adam Shook, Donald Miner, "Map Reduce Design Patterns", O'Reilly Media, Inc., 2012.
4. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
5. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publisher, 2015.

REFERENCES

1. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
2. Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010.
3. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers "CRC Press, 2015.
4. Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with MapReduce", Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers, 2010.

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1. <https://www.techtargget.com/searchbusinessanalytics/definition/big-data-analytics>
2. <https://www.studocu.com/in/document/tata-institute-of-social-sciences/big-data-analysis/unit-4-unit-4-notes/11465883>
3. <https://www.analyticssteps.com/blogs/what-big-data-analytics-definition-advantages-and-types>
4. <https://www.softwaretestinghelp.com/hadoop-mapreduce-tutorial/>
5. <https://www.techopedia.com/definition/28988/big-data-visualization>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	3	3	3	3	1	-	1	-	-	-	1	3	-	-
CO-2	3	3	3-	3	3	-	1	-	-	-	-	-	3	-	-
CO-3	3	3	-	3	2	-	-	-	-	-	-	-	2	-	-
CO-4	3	3	-	3	3	1	-	-	-	-	-	-	3	-	-
CO-5	3	-	-	3	3	-	-	-	-	-	-	-	2	-	-

JCS1702	Cloud Computing	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES

- To understand the concept of cloud computing.
- To learn the evolution of cloud from the existing technologies.
- To apply the knowledge on the various issues in cloud computing.
- Analyse storage architectures, processes, components and how they relate to virtualization.
- To identify the key aspects of developing applications using a framework.

UNIT-I INTRODUCTION TO CLOUD COMPUTING

9

Introduction to Cloud – Definition and Evolution of Cloud – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – Features of Today's Cloud, On-demand Provisioning.

UNIT-II CLOUD ENABLING TECHNOLOGIES

9

Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish Subscribe Model – Virtualization Platforms & Techniques - Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.

UNIT-III CLOUD ARCHITECTURE, SERVICES AND STORAGE

9

Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – Google Cloud, Amazon S3, Windows Azure, IBM Cloud.

UNIT-IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD

9

Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Technical and Legal Issues in Cloud Computing - Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

UNIT-V CLOUD TECHNOLOGIES AND ADVANCEMENTS

9

Hadoop – MapReduce in Google Cloud Platform– Virtual Box -- Google App Engine – Programming Environment for Google App Engine – Cloud Computing Development Tools.– Open Stack, SaltStack , AWS Cloud Development Kit (AWS CDK) , Windows Azure SDK – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Describe the main concepts, key technologies, strengths and limitations of cloud computing.

- Classify the key and enabling technologies that help in the development of cloud.
- Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
- Explain the core issues of cloud computing such as resource management and security.
- Recognize various Cloud Technologies and Advancements

TEXT BOOKS

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. SunilkumarManvi, Gopal K. Shyam,"Cloud Computing: Concepts and Technologies", CRC Press, Taylor & Francis Publishers, 2021.

REFERENCES

1. Rajiv Misra, Yashwant Singh Patel ,"Cloud and Distributed Computing: Algorithms and Systems", WILEY Publishers, 2020.
2. Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
3. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, —Mastering Cloud Computingl, Tata Mcgraw Hill, 2013.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approachl, Tata Mcgraw Hill, 2009.
5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly, 2009.

WEBSITE REFERENCES

1. <https://nptel.ac.in/courses/101/104/106105167>
2. <https://www.coursera.org/learn/introduction-to-cloud>
3. <https://www.ibm.com/in-en/cloud/learn/soa>
4. <https://www.geeksforgeeks.org/rest-api-architectural-constraints/>
5. <https://aws.amazon.com/pub-sub-messaging/>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	3	2	-	2	3	-	-	-	-	-	2	3	2	-
CO-2	3	3	2	-	2	3	-	-	-	-	-	2	3	2	-
CO-3	3	3	3	-	3	3	-	-	-	-	-	3	3	2	-
CO-4	3	3	3	-	3	3	-	-	-	-	-	3	3	1	-
CO-5	2	2	3	3	3	2	-	-	-	-	-	3	3	1	-

JNC1361	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L	T	P	C
		3	0	0	0

COURSE OBJECTIVES:

- To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

UNIT I INTRODUCTION TO TRADITIONAL KNOWLEDGE 6

Define traditional knowledge (TK), nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

UNIT II PROTECTION OF TRADITIONAL KNOWLEDGE 6

The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT III LEGAL FRAME WORK AND TK 6

A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act);

B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

UNIT IV TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY 6

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT V TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS 6

Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able:

- To understand the concept of Traditional knowledge and its importance
- To know the need and importance of protecting traditional knowledge.
- To know the various enactments related to the protection of traditional knowledge.
- To understand the concepts of Intellectual property to protect the traditional knowledge.
- To know the applications of traditional knowledge in various fields.

REFERENCE BOOKS:

- Amit Jha, "Traditional Knowledge System in India", 2009.
- Basanta Kumar Mohanta and Vipin Kumar Singh, "Traditional Knowledge System and

- Technology in India”, Pratibha Prakashan, 2012.
- Amit Jha, “Traditional Knowledge System in India”, Atlantic publishers,2002
 - Kapil Kapoor, MichelDanino, “Knowledge Traditions and Practices of India”

WEBSITE REFERENCES:

- <https://www.youtube.com/watch?v=LZP1StpYEPM>
- <http://nptel.ac.in/courses/121106003/>

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	-	-	1	1	1	1	1	-	-	-	-	-	1	1	1
CO-2	-	-	1	1	1	1	1	-	-	-	-	-	1	1	1
CO-3	-	-	1	1	1	1	1	-	-	-	-	-	1	1	1
CO-4	-	-	1	1	1	1	1	-	-	-	-	-	1	1	1
CO-5	-	-	1	1	1	1	1	-	-	-	-	-	1	1	1

JBA 1711	ENTREPRENEURSHIP FOR ENGINEERS	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To provide exposure on insight of entrepreneurship
- To investigate the feasibility study for the new venture.
- To identify the right process for successful business plan

Sl.No	LIST OF ACTIVITIES	No.of Periods
1	Insight of Entrepreneurship	1
2	Business Idea	1
3	Business sources	1
4	Business Plan	1
5	Financial Plan	1
6	Market Survey	2
7	Feasibility report	2
8	Case study	3
9	Entrepreneurship Que Card	2
10	Prevention of Sickness & Measures	1

TOTAL: 20 PERIODS

COURSE OUTCOMES:

Students will be able,

- To procure knowledge on setting up of new venture
- To draft and approval of financial plan and appraisal of new project
- To impart the knowledge of effectiveness of innovation in entrepreneurship

REFERENCES

1. Hisrich, Robert D., Michael Peters and Dean Shepherded, Entrepreneurship, Tata Mc Graw Hill, 2014.
2. SS. Khanka, Entrepreneurial Development, Third Edition, S. Chand & company, New Delhi 2001.
3. Srinivasan, Case Studies in marketing Indian context, sixth edition PHI learning private Limited 2014.
4. Lall, Madhurima, and Shikha Sahai, Entrepreneurship, Excel Book, New Delhi. 2008.

WEBSITES:

- <https://ideadrop.co/innovation-management/top-five-favourite-idea-generation-techniques/>
- <https://www.bajajfinserv.in/what-are-the-sources-of-finance-for-entrepreneurs>
- <https://www.babson.edu/academics/undergraduate-school/core-experiences/foundations-of-management-and-entrepreneurship/>
- <https://www.businessgig.com/business-plan-preparation>
- <https://www.financierworldwide.com/the-impact-of-social-entrepreneurship-on-economic-growth>.

NMS0001	PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP	L	T	P	C
		0	0	6	3

COURSE OBJECTIVES:

- To empower students with overall Professional and Technical skills required to solve a real world problem.
- To mentor the students to approach a solution through various stages of Ideation, Research, Design Thinking, Workflows, Architecture and building a prototype in keeping with the end-user and client needs.
- To provide experiential learning to enhance the Entrepreneurship and employability skills of the students.

This course is a four months immersive program to keep up with the industry demand and to have critical thinking, team based project experience and timely delivery of modules in a project that solves world problems using emerging technologies.

To prepare the students with digital skills for the future, the Experiential Project Based Learning is introduced to give them hands-on experience using digital technologies on open-source platforms with an end-to-end journey to solve a problem. By the end of this course, the student understands the approach to solve a problem with team collaboration with mentoring from Industry and faculties. This is an EEC category course offered as an elective, under the type, “Experiential Project Based Learning”.

Highlights of this course:

- Students undergo training on emerging technologies
- Students develop solutions for real-world use cases
- Students work with mentors to learn and use industry best practices
- Students access and use Self-Learning courses on various technologies, approaches and methodologies
- Collaborate in teams with other students working on the same topic
- Have a dedicated mentor to guide

COURSE OUTCOMES:

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

- Upskill in emerging technologies and apply to real industry-level use cases
- Understand agile development process
- Develop career readiness competencies, Team Skills / Leadership qualities
- Develop Time management, Project management skills and Communication Skills
- Use Critical Thinking for innovative Problem Solving
- Develop entrepreneurship skills to independently work on products

The course will involve 40-50 hours of technical training, and 40-50 hours of project development

JCS1711	Big Data Analytics Laboratory	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To implement Map Reduce programs for processing big data
- To realize storage of big data using H base, Mongo DB.
- To analyse big data using linearmodels.
- To analyze big data using machine learning techniques such as SVM / Decision tree classifications.
- To implement clustering algorithms.

LIST OF EXPERIMENTS**Hadoop Framework**

1. Install, configure and run Hadoop and HDFS
2. Implement word count / frequency programs using MapReduce
3. Implement a Map Reduce program that processes a weather dataset

R Language

4. Implement Linear and logistic Regression
5. Implement SVM / Decision tree classification techniques
6. Implement clustering techniques
7. Visualize data using any plotting framework
8. Implement an application that stores big data in Hbase / MongoDB / Pig using Hadoop / R.

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

- Process big data using Hadoop framework
- Build and apply linear and logistic regression models
- Perform data analysis with machine learning methods
- Perform graphical data analysis
- Implementing Hadoop and R frameworks

LIST OF SOFTWARE (OPEN SOURCE)

- Hadoop
- YARN
- R Package
- Hbase
- MongoDB

TEXT BOOKS

1. Big Data Analytics Paperback – 1 March 2020 by [G. Sudha Sadasivam](#) (Author), [R. Thirumahal](#) (Author).
2. Big Data, Black Book: Covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization Paperback – 1 January 2016.
3. Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani, —An Introduction to Statistical Learning with Applications in R, Springer Publications, 2015(Corrected 6 th Printing)
4. Alan Gates and Daniel Dai, "Programming Pig – Dataflow scripting with Hadoop", O'Reilley, 2nd Edition, 2016.

REFERENCES

1. Hadley Wickham,ggplot2 – Elegant Graphics for Data Analysis, Springer Publications,2nd Edition, 2016
2. Kristina Chodorow, "MongoDB: The Definitive Guide – Powerful and Scalable Data Storage", O'Reilley, 2nd Edition, 2013
3. Lars George, "HBase: The Definitive Guide", O'Reilley, 2015.
4. Tom White, —Hadoop: The Definitive Guide – Storage and Analysis at Internet Scale, O'Reilley, 4th Edition, 2015.

WEBSITE REFERENCES

1. <https://www.geeksforgeeks.org/integration-of-hadoop-and-r-programming-language/>
2. [https://www.researchgate.net/publication/262378989 Integrating R and Hadoop for Big Data Analysis](https://www.researchgate.net/publication/262378989_Integrating_R_and_Hadoop_for_Big_Data_Analysis)
3. <https://www.youtube.com/watch?v=IWjwtegs2och><https://www.cs.carleton.edu/faculty/dmusician/cs348w16/hadoop/hadoopLab.html>

Mapping of CO with PO/PSO

	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	-	3	2	-	-	-	1	2	-	-	2	1	-
CO-2	3	3	-	2	2	-	-	-	1	3	-	-	1	1	-
CO-3	2	3	2	2	2	-	-	-	-	3	-	-	2	1	-
CO-4	2	2	1	2	1	-	-	-	1	3	-	-	1	1	-
CO-5	1	2	1	1	1	-	-	-	3	3	-	-	1	1	-

OPEN ELECTIVE 4 – SEMESTER 7

JCS9010	SOFTWARE TESTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To interpret the principle of developing test cases and identifying defects.
- To design test cases for software development on various domains.
- To describe different types of testing.
- To Illustrate test management and test automation techniques.
- To apply test metrics and measurements.

UNIT I INTRODUCTION 9

Testing as an Engineering Activity – Testing as a Process – Testing axioms – Basic definitions – Software Testing Principles – The Tester’s Role in a Software Development Organization – Origins of Defects – Cost of defects – Defect Classes – The Defect Repository and Test Design – Defect Examples

UNIT-II TEST CASE DESIGN STRATEGIES 9

Test case Design Strategies – Using Black Box Approach to Test Case Design — Random Testing – Requirements based testing –Using White Box Approach to Test design– Test Adequacy Criteria – static testing vs. structural testing

UNIT-III LEVELS OF TESTING 9

The need for Levels of Testing – Unit Test – Unit Test Planning –Integration tests — Scenario testing –System Testing – Acceptance testing – Performance testing— Regression Testing – Ad-hoc testing – Alpha, Beta Tests.

UNIT-IV TEST MANAGEMENT 9

People and organizational issues in testing – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process –Test Reporting.

UNIT-V TEST AUTOMATION 9

Software test automation – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool–challenges in automation

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Describe the process of testing
- Design test cases suitable for software development for different domains
- Compare and use various levels of testing
- Create and document a Test plan based on the given requirement.
- Choose and use automatic testing tools.

TEXT BOOKS

1. Srinivasan Desikan and Gopalaswamy Ramesh, “Software Testing – Principles and Practices”, Pearson Education, 2009.
2. Ron Patton, “Software Testing”, Second Edition, Sams Publishing, Pearson Education, 2007.

REFERENCES

1. Ilene Burnstein, "Practical Software Testing", Springer International Edition, 2003.
2. Ali Mili, FairouzTchier "Software Testing Concepts and Operations", Wiley Publication · 2015
3. Rajiv Chopra "Software Testing: Principles and Practices" Mercury Learning & Information 2018
4. Aditya P. Mathur, "Foundations of Software Testing _ Fundamental Algorithms and Techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008
5. Paul Ammann, Jeff Offutt "Introduction to Software Testing", Second Edition Cambridge University Press 2018

WEBSITE REFERENCES

1. <https://nptel.ac.in/courses/106105150>
2. <https://www.javatpoint.com/software-testing-tutorial>
3. <https://www.guru99.com/software-testing.html>
4. <https://artoftesting.com/software-testing-tutorial>
5. <https://www.softwaretestinghelp.com/manual-testing-tutorial-1/>

Mapping of CO with PO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3										
CO-2	3		3	3						3	2	2
CO-3	3	3									2	2
CO-4	3	3	3					3		3	3	2
CO-5	3				3							2

JCS9011	INTRODUCTION TO ENTERPRISES RESOURCE PLANNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To learn the concept of ERP and the ERP model
- To understand how ERP is used to integrate business processes; define and analyse a process
- To learn the elements of a value chain, and explain how core processes relate
- To identify how the organizational infrastructure supports core business processes;
- To learn effect of a new product launch on the three core business processes.

UNIT-I INTRODUCTION TO ERP

9

ERP Introduction- Benefits, Origin- Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP- the Structure of ERP.

UNIT-II BUSINESS PROCESS REENGINEERING

9

Business Process Reengineering- Data warehousing- Data Mining- Online Analytic Processing (OLAP)- Product Life Cycle Management (PLM)- LAP, Supply chain Management.

UNIT-III ERP DYNAMICS

9

ERP Marketplace and Marketplace Dynamics: Market Overview- Marketplace Dynamics- the Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software- Integration of ERP- Supply chain and Customer Relationship Applications.

UNIT-IV ERP IMPLEMENTATION

9

ERP Implementation Basics- ERP Implementation Life Cycle- Role of SDLC/SSAD, Object Oriented Architecture- Consultants, Vendors and Employees.

UNIT-V ERP AND E-COMMERCE

9

ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Describe the concept of ERP and its models.
- Illustrate Business Process and Re-Engineering Methods.
- Apply ERP solutions and functional modules.
- Implement ERP lifecycles and frameworks
- Explore emerging trends on ERP

TEXT BOOKS

1. Rajesh Ray, “Enterprise Resource Planning”, Tata McGraw Hill, 2017.
2. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning Concepts and Practice”, PHI,2007
3. Ellen F Monk and Bret Wagner, “Concepts in Enterprise Resource Planning”, Cengage Learning, 2012.

REFERENCES

1. Alexis Leon, “Enterprise Resource Planning”, 4th Edition, Tata McGraw Hill, 2020.
2. Klaus-Dieter Gronwald, “Integrated Business Information Systems A Holistic View of the Linked Business Process Chain ERP-SCM-CRM-BI-Big Data”, Springer Berlin Heidelberg, 2021.
3. Alexis Leon, “Erp Demystified”, 3rd Edition, Tata McGraw Hill, 2014.
4. Rahul V. Altekar “Enterprise Wide Resource Planning : Theory And Practice”, PHI,
5. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning – A Concepts and Practice”, PHI, 2007.
6. Veena Bansal, “Enterprise Resource Planning”- Pearson Education, ISBN 9788131787038, 2013.

WEBSITE REFERENCES

1. <https://www.oracle.com>
2. <https://www.geeksforgeeks.org>

3. <https://www.tutorialspoint.com>
4. <https://www.sap.com>
5. <https://www.techtarget.com>
6. <https://www.javatpoint.com>

Mapping of CO with PO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	1	1	1	3	-	-	-	-	-	3	1
CO-2	2	2	3	1	3	-	-	-	-	-	3	1
CO-3	2	1	-	1	-	-	-	-	-	-	3	-
CO-4	2	1	1	1	3	-	-	-	-	-	3	-
CO-5	2	2	3	1	3	-	-	-	-	-	3	1

JCS9012	BASICS OF MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study about the basics of machine learning and parameter estimation methods.
- To know the basics of supervised learning models and linear and non-linear models.
- To learn dimensionality deduction approaches and various unsupervised algorithms.
- To study various graphical models and design and analysis of machine learning experiments.

UNIT I INTRODUCTION

9

Machine Learning: Types and uses of Machine Learning; Parametric Methods: Maximum Likelihood Estimation - Bias and Variance - Bayes' Estimator and Classification – Regression - Model Selection Procedures;

UNIT II SUPERVISED LEARNING I

9

Supervised Learning: Learning a Class – Probably Approximately Correct (PAC) Learning – Learning Multiple Classes – Regression – Model Selection and Generalization - Dimensions of Supervised Machine Learning Algorithm; Bayesian Decision Theory: Classification - Discriminant Functions - Association Rules.

UNIT III SUPERVISED LEARNING II

9

Decision Trees: Univariate Trees – Pruning - Rule Extraction and Learning Rules - Multivariate Trees; Multilayer Perceptron (MLP): The Perceptron - Training a Perceptron - MLP as a Universal Approximator - Back propagation Algorithm - Training Procedures - Deep Learning.

UNIT IV DIMENSIONALITY REDUCTION AND UNSUPERVISED LEARNING 9

Subset Selection - Principal Component Analysis – Feature Embedding - Factor Analysis – Singular Value Decomposition and Matrix Factorization - Multidimensional Scaling; Clustering: K-means – Expectation-Maximization - Spectral and Hierarchical - Choosing Number of Clusters.

UNIT V GRAPHICAL MODELS AND PERFORMANCE ANALYSIS 9

Example Graphical Models – Belief Propagation – Markov Random Fields – Learning the Structure of a Graphical Model – Influence Diagram; Factors, Response and Strategy – Guidelines – Cross Validation and Resampling Methods – Measuring Classifier Performance.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Estimate the parameter for each model.
- Develop a classifier for an application using Bayes theory and Support Vector Machine.
- Implement a neural network and decision tree model for an application of your choice using an available tool.
- Use a tool to implement typical clustering algorithms for different types of applications.
- Design and implement any graphical model.

TEXT BOOKS

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Prentice Hall of India, 3rd Edition, 2014.
2. Stephen Marsland, "MACHINE LEARNING -An Algorithmic Perspective", Second Edition, 2015.

REFERENCES

1. MehryarMohri, Afshin Rostamizadeh, AmeetTalwalkar " Foundations of Machine Learning", MIT Press, 2012.
2. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.
3. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", First Edition, Cambridge University Press, 2012.
4. CharuC.Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014.
5. Charu C. Aggarwal, "DATA CLUSTERING Algorithms and Applications", CRC Press, 2014.

WEBSITE REFERENCES

1. https://onlinecourses.nptel.ac.in/noc22_cs29/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs85/preview
3. <https://www.simplilearn.com/tutorials/machine-learning-tutorial>
4. <https://www.javatpoint.com/machine-learning>
5. <https://machinelearningmastery.com/start-here/>

SEMESTER 8

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JNC1861	Indian Constitution	NCM	3	3	0	0	0
PRACTICALS								
2	JCS1851	Comprehension and Technical Seminar	EEC	2	0	0	2	1
3	JCS1832	Project work – Phase II	EEC	18	0	0	18	9
TOTAL				23	3	0	20	10

JNC1861	INDIAN CONSTITUTION	L	T	P	C
		3	0	0	0

COURSE OBJECTIVES:

- To understand the importance of Indian constitution, Administration, Concept and Development of Human Rights, election commission.

UNIT I INTRODUCTION TO INDIAN CONSTITUTION 9

Constitution' meaning of the term, 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, The Supreme Court and High Court: Powers and Functions; **State Government and its Administration** Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions

UNIT III 9

A: Local Administration District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation,

B: Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT IV CONCEPT AND DEVELOPMENT OF HUMAN RIGHTS 9

Meaning Scope and Development of Human Rights, United Nations and Human Rights – UNHCR, UDHR 1948, ICCPR 1996 and ICESCR 1966, Human Rights in India: Protection of Human Rights Act, 1993 (NHRC and SHRC), First, Second and Third Generation Human Rights, Judicial Activism and Human Rights.

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.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Know the sources, features and principles of Indian Constitution.
- Learn about Union Government, State government and its administration.
- Get acquainted with Local administration and Pachayati Raj.
- Be aware of basic concepts and developments of Human Rights.
- Gain knowledge on roles and functioning of Election Commission.

REFERENCES:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd. New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-RESOURCES:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution.

JCS1851	COMPREHENSION & TECHNICAL SEMINAR	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To revamp the knowledge gained in the semester and prepare the students to face interview both at the academic and the Industrial Sector
- To encourage the students to study about the recent developments in the field
- To prepare and present technical reports
- To encourage the students to use various teaching aids such as Power point presentation and Demonstrative models

METHOD OF EVALUATION:

COMPREHENSION:

One period is allotted for comprehension. During this period, a test with objective type questions from competitive exams is conducted in identified technical courses. The evaluation is purely internal. Average of all the test marks shall be calculated , a weightage of 50 marks is awarded to the comprehension component.

TECHNICAL SEMINAR:

Three periods are allotted for the technical seminar. During the seminar session each student is expected to prepare and present a technical topic for duration of 10 minutes. Each student is expected to make presentation at least twice during the semester and the student is evaluated based on various parameters such as topic chosen, content delivery, communication skills and presentation. A faculty guide is allotted who shall guide and

monitor the progress and attendance of all the students. Equal weightage is considered for the two seminar sessions for a total weightage of 50 marks.

The total mark awarded for the course shall be the sum of marks scored out of 50 each for the two components. Evaluation is purely internal.

TOTAL : 30 PERIODS

COURSE OUTCOMES:

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

- Consolidate all the engineering concepts acquired in the course of study.
- Enrich their technical knowledge.
- Prepare and present technological developments.
- Communicate effectively the concepts related to the various topics.
- Face the interviews with confidence during the placement drives.

JCS1832	PROJECT WORK - PHASE - 2	L	T	P	C
		0	0	18	9

COURSE OBJECTIVES:

- To develop the ability to solve a specific problem related to their subject expertise.
- To develop the methodology to solve the identified problem.
- To design, analyze and implement the chosen problem using the hardware components.
- To validate the simulation, hardware results with the theoretical results.
- To train the students in preparing project reports and to face reviews and viva-voce examination.

METHOD OF EVALUATION:

The students in a group of 3 to 4 work on a topic approved by the Head of the Department under the guidance of a faculty member, prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee is constituted by the Head of the Department. The project work is evaluated based on oral presentation and the project report, jointly by external and internal examiners.

TOTAL: 270 PERIODS

COURSE OUTCOMES:

On Completion of the project work, the student will be able to

- Apply the technical knowledge acquired for solving real world problems.
- Develop skills such as self learning, critical thinking, problem solving, project management and finance.
- Apply modern tools and techniques.
- Work with team mates and collectively work towards the success of the project.
- Communicate effectively to present the outcomes of the project both in written and oral forms.

JERUSALEM COLLEGE OF ENGINEERING

(AN AUTONOMOUS INSTITUTION AFFILIATED TO ANNAUNIVERSITY,CHENNAI)

B.E. COMPUTER SCIENCE AND ENGINEERING

REGULATION 2021

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I DataScience	Vertical II CreativeMedia	VerticalIII Cyber Security	VerticalIV IoT	VerticalV AI & ML
JAD1301- Foundation of Data science	JCS1025 - Principles of Multimedia	JCB1402 -Foundation of Cyber Security	JIT1036 -Internet of Things: Architecture Protocols and Applications	JAL1401- Principles of Artificial Intelligence
JCS1701- Big data analytics	JCS1026 -3D Modeling and Rendering	JCB1403 - Cryptography and Cryptanalysis	JIT1037 -Programming for IoT Boards	JAL1501-Machine Learning
JIT1033- Recommender systems	JCS1027 - Augmented reality and Virtual reality	JCB1501 -Cyber Forensics	JIT1038 - Industrial IoT 4.0	JAL1503 - Cognitive Science
JCS1020 - Web and Speech Analysis	JCS1028 - Digital Marketing and Commerce	JCB1502 -Intrusion Detection Systems	JIT1039 -IoT in Healthcare	JAL1601- Neural Networks and Deep Learning
JCS1021 -Social media analytics	JCS1029 - Computer Graphics and Animation	JCB1503 -Hardware Security	JIT1040 -Robotics in IoT	JAL1602 -Knowledge Representation and Reasoning
JCS1022- Data exploration and visualization	JCS1030 - Video processing and Analytics	JCB1601 -Cloud Security	JIT1041 - Mobile Application development for IoT	JAL1603 -Time Series Analysis and Forecasting
JCS1023 - Health care analytics	JAD1030 - Game Development	JCB1603 -Ethical Hacking	JIT1042 - Cognitive IOT	JAL1701 -Essence of Natural Language Processing
JCS1024 - Image and video Analytics-	JCS1031 - Media Security	JCB1702 -Web Application Security	JIT1043 - Privacy and Security for IOT	JAL1702 -Robotic Process Automation

VERTICAL I - DATA SCIENCE

JAD1301	FOUNDATION OF DATA SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the data science process and the different roles involved in data science.
- To understand the concept of correlation and regression.
- To develop skills in creating line plots, scatter plots, density plots, contour plots, and histograms.
- To learn data manipulation techniques using Numpy and Pandas.
- To learn techniques for visualizing segmentations and representing trees as sets of rules.

PREREQUISITE: Database Management System

UNIT-I INTRODUCTION TO DATA SCIENCE PROCESS AND R PROGRAMMING

9

Data science process, roles, stages in data science project, working with data from files, working with relational databases, exploring data, managing data, cleaning and sampling for modeling
Introduction to R: Introduction to various data types, numeric, character, date, data frame, array, matrix etc., reading and writing datasets, working with different file types .txt, .csv, outliers, R functions and loops

UNIT-II DESCRIBING RELATIONSHIPS

9

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

UNIT-III DATA VISUALIZATIONS

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

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

Models, Induction, and Prediction-Visualizing Segmentations-Trees as Sets of Rules-Probability Estimation-Fitting a Model to Data: Classification via Mathematical Functions-Regression via Mathematical Functions-Class Probability Estimation and Logistic Regression

TOTAL: 45 PERIODS

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

- Gain a comprehensive understanding of the data science process, including its stages and key roles.
- Develop a clear understanding of correlation and regression and its significance in analyzing relationships between variables.
- Learn how to create line plots, scatter plots, density plots, contour plots, and histograms using appropriate tools and libraries.
- Learn how to perform data indexing, selection, and operations on datasets
- Understand how to visualize segmentations in data using appropriate techniques.

TEXT BOOKS:

1. Foster Provost & Tom Fawcett, “Data Science for Business”, Published by O’Reilly Media, 2013.
2. David Cielien, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2018
3. Robert Kabacoff, "R in Action: Data Analysis and Graphics with R", Manning Publications, 2015

REFERENCES:

1. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016
2. Matt Harrison, “Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization”, O’Reilly, 2016.
3. Joel Grus, “Data Science from Scratch: First Principles with Python”, O’Reilly Media, 2015.
4. Tania Moulik, “Applied Data Visualization with R and ggplot2”, September 2018.
5. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017.

WEBSITE REFERENCES:

1. <https://rdrr.io/cran/IPSUR/f/inst/doc/IPSUR.pdf>
2. <https://www.oreilly.com/library/view/applied-data-visualization>
3. <https://www.oreilly.com/library/view/doing-data-science/9781449363871/>
4. <https://pg-p.ctme.caltech.edu/data-science-course-certification>
5. <https://www.mygreatlearning.com/srm-mtech-data-science>

MAPPING WITH CO-PO

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	3	3	-	-	-	-	-	-	3	-	2	3
CO2	3	3	2	3	-	-	-	-	3	-	2	3
CO3	3	-	3	3	-	-	-	-	-	-	-	3
CO4	3	3	-	3	-	-	-	-	3	-	2	-
CO5	3	2	-	-	2	-	-	-	3	-	3	-
AVG	3	2.7	2.5	3	2	-	-	--	3	-	2.2	3

JIT1033	RECOMMENDER SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the foundations of the recommender system.
- To learn the significance of content-based Recommender systems.
- To learn about collaborative filtering.
- To make students learn about attacks in recommender system.
- To learn on Evaluation techniques for Recommender systems.

PREREQUISITE: Database Management System

UNIT-I INTRODUCTION TO RECOMMENDER SYSTEMS 9

Introduction and basic taxonomy of recommender systems - Traditional and non-personalized Recommender Systems - Overview of data mining methods for recommender systems- similarity measures- Dimensionality reduction – Singular Value Decomposition (SVD)

UNIT-II CONTENT-BASED RECOMMENDATION SYSTEMS 9

High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.

UNIT-III COLLABORATIVE FILTERING 9

A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection)

UNIT-IV ATTACK-RESISTANT RECOMMENDER SYSTEMS 9

Introduction – Types of Attacks – Detecting attacks on recommender systems – Individual attack – Group attack – Strategies for robust recommender design - Robust recommendation algorithms

UNIT-V EVALUATING RECOMMENDER SYSTEMS 9

Evaluating Paradigms – User Studies – Online and Offline evaluation – Goals of evaluation design – Design Issues – Accuracy metrics – Limitations of Evaluation measures

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At end of the course students will be able to:

- Understand the basic concepts of recommender systems.
- Implement content-based recommender systems for various data sets.
- Implementation of Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics.
- Design and implement attack-resistant simple recommender system.
- Learn about evaluation of recommender system

TEXT BOOKS:

1. Charu C. Aggarwal, “Recommender Systems: The Textbook”, Springer, 2016.
2. Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich , “Recommender Systems: An Introduction”, Cambridge University Press, 2011.

REFERENCES:

1. Francesco Ricci , Lior Rokach , Bracha Shapira , “Recommender Systems Handbook”, Springer , 2011.
2. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, “Mining of massive datasets”, 3rd edition, Cambridge University Press, 2020.

WEBSITE REFERENCES:

1. <https://www.coursera.org/specializations/recommender-systems>
2. <https://towardsdatascience.com/introduction-to-recommender-systems-c66cf15ada?gi=4c414b90d766>
3. <https://builtin.com/data-science/recommender-systems>

MAPPING WITH CO-PO

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	1
CO2	2	2	2	1	1	-	-	-	-	-	-	1
CO3	2	2	2	1	1	-	-	-	-	-	-	1
CO4	2	2	2	1	1	-	-	-	-	-	-	1
CO5	2	2	2	1	1	-	-	-	-	-	-	1
AVG	5	2	2	1	1	-	-	-	-	-	-	1

JCS1020	WEB AND SPEECH ANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To recall the basics of www and textual data in web.
- To familiarize the processing of textual data such as tokenization, phrase recognition, Document matching
- To apply relevant models for contextual information retrieval
- To understand speech recognition process
- To explain the processes involved in information extraction using sentimental analysis.

PREREQUISITE: Python Programming, Web Technology

UNIT- I INTRODUCTION TO WEB

9

History of Web and Internet, Web analysis, Text analysis, Types of problems solved using text analysis, Document classification and information retrieval, Clustering and organizing documents, Information extraction, Prediction and Evaluation

UNIT- II NLP BASED PREDICTION

9

A Document Tokenization- Lemmatization, Vector Generation and Prediction, Boundary determination, Phrase Recognition, Parsing, Feature generation -Term-Document Matrices (TDMs) from the Corpus, Problem specific novel patterns finding CO2 C Keyword search, Nearest Neighbor Methods, Similarity measures, Web based document search, Document matching,

UNIT-III TEXT INFORMATION RETRIEVAL

9

Introduction to Text information retrieval -A Clustering methods for similarity Cluster Label Mean-Patterns and Entities-Co-reference and relationship extraction- Template Filling - Applications: Information retrieval- commercial extraction systems-criminal justice- Intelligence

UNIT- IV SPEECH RECOGNITION

Introduction to speech recognition -Speech representation and feature extraction -Hidden Markov Models (HMM) for speech recognition-Building a basic speech recognition system-Introduction to speech sentiment analysis -Pre-processing speech data for sentiment analysis-Feature extraction for

speech sentiment analysis-Developing a basic speech sentiment analysis system.

Speech Analysis: Rhetorical Devices and Persuasive Strategies-Introduction to speech analysis and its relevance- Identifying and analyzing rhetorical devices- Understanding persuasive strategies -Speech Analysis: Delivery Techniques and Nonverbal Communication-Analyzing delivery styles -Assessing nonverbal communication cues and their impact-Case studies of speeches with effective delivery techniques.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At end of the course students will be able to:

- To discuss the basics of www and textual data in web.
- To analyse tokenization, phrase recognition, Document matching in text data processing
- To build relevant models for contextual information retrieval
- To explain speech recognition process
- To discuss the basic concepts involved in information extraction using sentimental analysis.

TEXT BOOKS

1. Gregory C. Burdea & Philippe Coiffet, John, "Virtual Reality Technology" 2nd Edition, Wiley & Sons, 2013
2. D. Yu and L. Deng , "Automatic Speech Recognition: A Deep Learning Approach", Springer, 2015

REFERENCES:

1. Bing Liu , "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data", Springer, 2011

WEBSITE REFERENCES

1. <https://www.futurelearn.com/info/blog/virtual-reality-education-immersive-learning>
2. <https://immersionvr.co.uk/about-360vr/vr-for-education/>
3. <https://online.lsu.edu/newsroom/articles/how-virtual-reality-changing-education/>
4. <https://www.analyticssteps.com/blogs/5-applications-virtual-reality-education>

MAPPING WITH CO-PO

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	1
CO2	2	2	2	1	1	-	-	-	-	-	-	1
CO3	2	2	2	1	1	-	-	-	-	-	-	1
CO4	2	2	2	1	1	-	-	-	-	-	-	1
CO5	2	2	2	1	1	-	-	-	-	-	-	1
AVG	5	2	2	1	1	-	-	-	-	-	-	1

JCS1021	SOCIAL MEDIA ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand basics of social media related simple applications.
- To understand data structures in social media analysis
- To recall the basics of social networks
- To explain the data extraction and mining of social networks
- To describe the processing and visualization in web analytics

PREREQUISITE: Computer Networks

UNIT 1 INTRODUCTION TO SOCIAL MEDIA ANALYTICS 9

Introduction, History of Social media Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Types of social networks: friend, user-generated, content, affiliation, etc., Sociograms, Sociometric studies Basics of Social Media and Business Models, Basics of Web Search Engines and Digital Advertising., Application of SMA in different areas

UNIT 2 GRAPH AND MATRICES 9

The Adjacency Matrix, Paths and Connectivity, Distance and Breadth-First Search, Network Datasets: An Overview Nodes, ties and influencers, Making connections: Link analysis. Paths Random graphs and network evolution. telephone call graph, Weighted Networks, Hypergraph

UNIT 3 NETWORK FUNDAMENTALS 9

Network structures: equivalence, homophile, clustering, Snowball Sampling, Contact Tracing, And Random Walks, Ego-centered network, dominance hierarchies, Third-Party Records, affiliation network, Citation Networks, Peer-To- Peer Networks, Recommender Networks, Biological Networks, Genetic Regulatory Networks, Neural Networks

UNIT 4 SOCIAL NETWORK AND MODELING 9

Social contexts: Affiliation and identity. social capital, structural holes, Structural balance, Predictive modeling, Descriptive modeling: community/anomaly detection Diffusion in Networks

: information cascades, social ,influence, market experiments, Geospatial social data mining, Privacy in a Networked World, Predicting the future with social media Facebook Analytics: Introduction, parameters, demographics. Analysing page audience. Reach and Engagement analysis. Google analytics.

Processing and Visualizing Data, Influence Maximization, Link Prediction, Collective Classification, Applications in Advertising and Game Analytics, Collecting and analysing social media data; visualization and exploration, Social network and web data and methods, Clickstream analysis, A/B testing, online surveys, Web crawling and Indexing. Natural Language Processing Techniques for Micro-text Analysis, Trend: social influences on judgments, opinion spread, sentiment.

TOTAL:45 PERIODS

COURSE OUTCOMES:

At end of the course students will be able to:

- Develop simple social media related simple applications
- Explain the data structures in Social Networking
- Discuss the basics of networking.
- Explain the data extraction and mining of social networks
- Discuss the processing and visualization in web analytics

TEXT BOOK:

1. Peter Mika, “Social Networks and the Semantic Web, First Edition, Springer 2007.
2. Borko Furht, “Handbook of Social Network Technologies and Application, Springer, 2010.
3. David Easley, Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning about a Highly Connected World, First Edition, Cambridge University Press, 2010.

REFERENCE BOOKS:

1. Easley D. Kleinberg J., “Networks, Crowds, and Markets – Reasoning about a Highly Connected World, Cambridge University Press, 2010.
2. Jackson, Matthew O., “Social and Economic Networks”, Princeton University Press, 2008.
3. Guandong Xu, Yanchun Zhang and Lin Li, “Web Mining and Social Networking Techniques and applications”, First Edition, Springer, 2011.
4. Dion Goh and Schubert Foo, “Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively”, IGI Global Snippet, 2008.

WEBSITE REFERENCE:

1. <https://www.coursera.org/learn/social-media-analytics-introduction>
2. https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fcarey.jhu.edu%2Fuploads%2Fdocuments%2F450.765_AY19-20.docx&wdOrigin=BROWSELINK
3. <https://blog.hootsuite.com/what-is-social-media-analytic/>

MAPPING WITH CO-PO

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	2	1	-	1	-	1	-	2	-	-	1	3
CO2	3	1	3	2	1	1	-	-	2	3	2	3
CO3	2	3	2	3	3	2	3	-	2	-	2	1
CO4	1	3	3	3	3	3	3	3	3	2	3	2
CO5	2	3	2	3	3	3	3	2	-	2	3	1
AVG	2.0	2.2	2.5	2.4	2.5	2.0	3.0	2.3	2.3	2.3	2.2	2

JCS1022	DATA EXPLORATION AND VISUALIZATION	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.

PREREQUISITE: Probability and Statistics

UNIT I EXPLORATORY DATA ANALYSIS

9

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

UNIT II VISUALIZING USING MATPLOTLIB

9

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

UNIT III UNIVARIATE ANALYSIS

9

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

UNIT IV BIVARIATE ANALYSIS

9

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

UNIT V MULTIVARIATE AND TIME SERIES ANALYSIS

9

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

TOTAL:45 PERIODS

COURSE OUTCOMES:

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

- Understand the fundamentals of exploratory data analysis.
- Implement the data visualization using Matplotlib.
- Perform univariate data exploration and analysis.
- Apply bivariate data exploration and analysis.
- Use Data exploration and visualization techniques for multivariate and time series data.

TEXT BOOKS:

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

REFERENCES:

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

WEBSITE REFERENCES:

1. [Data Analysis and Visualization Foundations | Coursera](#)
2. [Data Analysis and Visualization Foundations Specialization \(IBM\) | Coursera](#)
3. [Data Analysis and Visualization – Shaheed Sukhdev College of Business Studies \(du.ac.in\)](#)
4. [Data Analysis and Visualization Syllabus - BCA Tribhuvan University\(TU\) - Bench Partner](#)

MAPPING WITH CO-PO

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	3	-	-	-	-	2	3	3	3
CO2	2	2	2	1	1	-	-	-	3	2	3	1
CO3	2	1	2	1	1	-	-	-	-	1	2	1
CO4	2	2	2	1	-	-	-	-	1	2	1	3
CO5	3	1	1	2	1	-	-	-	3	2	1	2
AVG	2.4	1.4	2	1.6	1				2.25	2	2	2

JCS1023	HEALTH CARE ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Understand the health data formats, health care policy and standards
- Learn the significance and need of data analysis and data visualization
- Understand the health data management frameworks
- Learn the use of machine learning and deep learning algorithms in healthcare
- Apply healthcare analytics for critical care applications

PREREQUISITE: Database Management System and Artificial Intelligence

UNIT I: INTRODUCTION TO HEALTHCARE ANALYSIS 9

Overview - History of Healthcare Analysis Parameters on medical care systems- Health care policy- Standardized code sets – Data Formats – Machine Learning Foundations: Tree Like reasoning , Probabilistic reasoning and Bayes Theorem, Weighted sum approach.

UNIT II : ANALYTICS ON MACHINE LEARNING 9

Machine Learning Pipeline – Pre-processing –Visualization – Feature Selection – Training model parameter – Evaluation model: Sensitivity , Specificity , PPV,NPV, FPR ,Accuracy, ROC, Precision, Recall Curves , Valued target variables – Python: Variables and types, Data Structures and containers , Pandas Data Frame:Operations – Scikit –Learn : Pre-processing , Feature Selection.

UNIT III HEALTH CARE MANAGEMENT 9

IOT- Smart Sensors – Migration of Healthcare Relational database to NoSQL Cloud Database – Decision Support System – Matrix block Cipher System – Semantic Framework Analysis – Histogram bin Shifting and Rc6 Encryption – Clinical Prediction Models – Visual Analytics for Healthcare.

UNIT IV HEALTHCARE AND DEEP LEARNING 9

Introduction on Deep Learning – DFF network CNN- RNN for Sequences – Biomedical Image and Signal Analysis – Natural Language Processing and Data Mining for Clinical Data – Mobile Imaging and Analytics – Clinical Decision Support System.

UNIT V CASE STUDIES

9

Predicting Mortality for cardiology Practice –Smart Ambulance System using IoT Hospital Acquired Conditions (HAC) program- Healthcare and Emerging Technologies – ECG Data Analysis.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

- Use machine learning and deep learning algorithms for health data analysis
- Apply the data management techniques for healthcare data
- Evaluate the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications
- Design health data analytics for real time applications
- Design emergency care system using health data analysis

TEXT BOOKS:

1. Chandan K.Reddy, Charu C. Aggarwal, “Health Care data Analysis”, First edition, CRC, 2015.
2. Vikas Kumar, “Health Care Analysis Made Simple”, Packt Publishing, 2018.

REFERENCES:

1. Nilanjan Dey, Amira Ashour , Simon James Fong, Chintan Bhatl, “Health Care Data Analysis and Management, First Edition, Academic Press, 2018.
2. Hui Jang, Eva K.Lee, “HealthCare Analysis : From Data to Knowledge to Healthcare Improvement”, First Edition, Wiley, 2016.
3. Kulkarni , Siarry, Singh ,Abraham, Zhang, Zomaya , Baki, “Big Data Analyticsin HealthCare”, Springer, 2020.

WEBSITE REFERENCES:

1. <https://cpe.ucdavis.edu/sites/g/files/dgvnsk4886/files/2021-04/Intro%20to%20Healthcare%20Analytics%20Syllabus%20-%20HCA200>
2. <https://www.coursera.org/learn/healthcare-analytics-essentials>
3. <https://www.coursera.org/lecture/hi-five-clinical/introduction-to-healthcare-data-analytics-overview-NAv03>
4. <https://www.business.rutgers.edu/masters-healthcare-analytics-intelligence/curriculum>

MAPPING WITH CO-PO

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO1 2
CO1	3	3	3	1	3	-	-	-	3	2	1	1
CO2	3	1	1	3	1	-	-	-	3	2	3	1
CO3	2	1	2	1	2	-	-	-	2	2	1	3
CO4	2	2	3	3	1	-	-	-	2	3	1	2
CO5	1	2	2	1	1	-	-	-	1	3	3	2
AVG	2.2	1.8	2.2	1.8	1.6				2.2	2.4	1.8	1.8

JCS1024	IMAGE AND VIDEO ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the basics of image processing techniques for computer vision.
- To learn the techniques used for image pre-processing.
- To discuss the various object detection techniques.
- To understand the various Object recognition mechanisms.
- To elaborate on the video analytics techniques.

PREREQUISITE: Python Programming and Computer Graphics

UNIT I INTRODUCTION 9

Computer Vision – Image representation and image analysis tasks - Image representations – digitization – properties – color images – Data structures for Image Analysis - Levels of image data representation - Traditional and Hierarchical image data structures.

UNIT II IMAGE PRE-PROCESSING 9

Local pre-processing - Image smoothing - Edge detectors - Zero-crossings of the second derivative- Scale in image processing - Canny edge detection -Parametric edge models - Local pre- processing in the frequency domain - Line detection by local pre- processing operators - Image restoration.

UNIT III OBJECT DETECTION USING MACHINE LEARNING 9

Object detection– Object detection methods – Deep Learning framework for Object detection– bounding box approach-Intersection over Union (IoU) –Deep Learning Architectures-R-CNN-Faster-R-CNN-You Only Look Once (YOLO)-Salient features-Loss Functions-YOLO architectures

UNIT IV FACE RECOGNITION AND GESTURE RECOGNITION 9

Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition-Deep Face solution by Facebook-FaceNet for Face Recognition- Implementation using FaceNet-Gesture Recognition.

Video Processing – use cases of video analytics-Vanishing Gradient and exploding gradient problem-ResNet architecture-ResNet and skip connections-Inception Network-GoogleNet architecture-Improvement in Inception v2-Video analytics-ResNet and Inception v3.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Discuss the basics of image processing techniques for computer vision and video analysis.
- Analyse the techniques used for image pre-processing.
- Develop various object detection techniques.
- Make use of various face recognition mechanisms for multiple applications.
- Elaborate on deep learning-based video analytics.

TEXT BOOKS

1. Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing, Analysis, and Machine Vision”, 4th edition, Thomson Learning, 2013.
2. Vaibhav Verdhani, (2021), Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras, Apress 2021 (UNIT-III, IV and V)

REFERENCES

1. Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer Verlag London Limited, 2011.
2. Caifeng Shan, Fatih Porikli, Tao Xiang, Shaogang Gong, “Video Analytics for Business Intelligence”, Springer, 2012.
3. D. A. Forsyth, J. Ponce, “Computer Vision: A Modern Approach”, Pearson Education, 2003.
4. E. R. Davies, (2012), “Computer & Machine Vision”, Fourth Edition, Academic Press.

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1. <https://www.analyticsvidhya.com/blog/2018/09/deep-learning-video-classification-python/>
2. <https://www.toptal.com/machine-learning/machine-learning-video-analysis>
3. <https://tryolabs.com/guides/video-analytics-guide>
4. <https://www.simplilearn.com/image-processing-article>
5. <https://www.v7labs.com/blog/video-recognition-overview-and-tutorial>

MAPPING WITH CO-PO

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	2	-	-	-	3	3	2	1
CO2	2	2	3	3	3	-	-	-	3	2	1	1
CO3	1	2	2	2	3	-	-	-	1	2	1	1
CO4	1	2	3	2	3	-	-	-	2	2	2	1
CO5	3	2	1	3	2	-	-	-	2	1	1	1
AVG	2	1.8	2.2	2.4	2.6	-	-	-	2.2	2	1.4	1

VERTICALS II – CREATIVE MEDIA

JCS1025	PRINCIPLES OF MULTIMEDIA	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To understand different forms of media in systems.
- To acquire knowledge in multimedia components.
- To acquire knowledge about multimedia tools and authoring.
- To acquire knowledge in the development of multimedia applications.
- To learn about the latest trends and technologies in multimedia.

COURSE PRE-REQUISITES: Basics of photoshop & Animation

UNIT I INTRODUCTION 9

Introduction to Multimedia – Characteristics of Multimedia Presentation – Multimedia Components – Promotion of Multimedia Based Components – Digital Representation – Media and Data Streams – Multimedia Architecture – Multimedia Documents – Visual Display System.

UNIT II ELEMENTS OF MULTIMEDIA 9

Text: Types, Font, Unicode Standard, Text Compression, File Formats , Image Processing, Standards, Specification, Device Independent Color Models, Gamma Correction, File Formats – Video: Video Signal Transmission, Signal Formats, Broadcasting Standards, Digital Video Standards, PC Video, Video File Formats – Audio: Acoustics, Characteristics of Sound Graphics: Components of Graphics System, Plotter – Introduction to 2D and 3D Graphics

UNIT III MULTIMEDIA SYSTEMS 9

Compression Types and Techniques: CODEC, GIF Coding Standards, JPEG, MPEG –Multimedia Database System – User Interfaces – OS Multimedia Support – Hardware Support – Real Time Protocols – Play Back Architectures – Synchronization – Document Architecture – Hypermedia Concepts: Hypermedia Design – Digital Copyrights.

UNIT IV MULTIMEDIA TOOLS 9

Authoring 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 – Sound Editing Tools – Digital Movie Tools.

UNIT V MULTIMEDIA APPLICATION DEVELOPMENT 9

Software Life Cycle – ADDIE Model – Conceptualization – Content Collection – Story Board –Script –Authoring Metaphors – Testing – Report Writing – Documentation.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES:

15 PERIODS

1. Install tools like Flash, Photoshop, Blender.
2. Design a simple web page with animated web advertisement.
3. Creating visual effects by editing and mixing various media elements using tools like adobe premier pro.
4. Use Adobe after effects for creating lighting effects and shades.
5. Use Adobe audition for sound mixing.
6. Use Adobe media encoder for coding an audio.
7. Use Photoshop to create a button, banner and texture.
8. Use Photoshop to create morphing and animation.
9. Develop a full-fledge multimedia application.
10. Develop a digital story boarding and 3D animation as mini project.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Handle the multimedia elements effectively.
- Articulate the concepts and techniques used in multimedia applications.
- Develop effective strategies to deliver Quality of Experience in multimedia applications.
- Design and implement algorithms and techniques applied to multimedia objects.
- Design and develop multimedia applications following software engineering models.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE REQUIREMENTS

- Adobe Photoshop

HARDWARE REQUIREMENTS

- Standalone desktops (or) Server supporting 30 terminals or more

REFERENCES:

1. Ranjan Parekh, "Principles of Multimedia", Second Edition, McGraw-Hill Education, 2017.
2. Tay Vaughan, "Multimedia: Making It Work", Ninth Edition, McGraw-Hill, 2014.
3. Ralf Steinmetz, Klara Nahrstedt, "Multimedia: Computing, Communications and Applications", Prentice Hall, 1995.

4. Paul Dietel, Harvey Dietel, Abbey Dietel, "Internet & World Wide Web How to Program", Fourth Edition, Prentice Hall, 2008.
5. Fred Halsall, "Multimedia Communications: Applications, Networks, Protocols and Standards", Pearson Education, 2002.

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- <https://www.geeksforgeeks.org/what-is-multimedia/>
- <https://www.britannica.com/technology/interactive-media>
- <https://visme.co/blog/multimedia-presentation/>
- <https://www.makeuseof.com/photoshop-3d-elements-alternatives/>

Mapping with CO / PO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	2	-	-	2	1	2	-	1	2	-	2
CO-2	3	2	-	-	2	1	2	-	1	2	-	2
CO-3	3	2	-	-	2	3	3	-	3	3	-	2
CO-4	3	2	-	-	2	3	2	-	3	3	-	2
CO-5	3	2	-	-	2	3	2	-	2	2	-	2
Avg	3	2	-	-	2	3	2	-	2	2	-	2

JCS1026	3D MODELING AND RENDERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the fundamentals of modeling and rendering.
- To know the working principles of objects in three-dimensional space.
- To acquire knowledge about the issues in Scene modelling.
- To learn rendering algorithms and application of special effects to the modelled objects.
- To gain skill in designing real time movie and games.

COURSE PRE-REQUISITES: Computer Graphics

UNIT I MATHEMATICS FOR MODELING 9

Overview of Graphics System: Video Display Devices, Raster System, Input Devices – Interactive Input Methods and Graphical User Interfaces –Vector Tools for Graphics: Dot Product, Cross Product, Representation of Key Geometric Objects, Intersection of lines and planes, Polygon Intersection.

UNIT II GEOMETRIC PRIMITIVES MODELING 9

Transformation of Objects: 3D Affine Transformation, Geometric Transformation –2D and 3D Viewing –Modeling Shapes with Polygons Meshes–Curves and Surface Design –Color Models and Color Application.

UNIT III OBJECT MODELING 9

Visual Surface Detection Methods –Illumination Models –Computer Animation –Hierarchical Modeling –Human Character Modeling –Applying Emotion for the Characters –Vehicle Modeling –Landscape Modeling.

UNIT IV SCRIPTING 9

Physics: Collision Detection, Particles Systems, Rigid Bodies Motion, Deformable Bodies – Artificial Intelligent: Path Finding, Controlled Based Animation, Animation and Modeling: Key frame, Kinematics, Inverse Kinematics –Rigging –Bones –Adding Speech Movements to Characters –Skinning –Spatial Sorting –Level of Details.

UNIT V RENDERING AND SPECIAL EFFECTS 9

Developing 2D and 3D Interactive Scene using OpenGL, Unity and Similar Tools –Advanced Tools in Rendering –Global Illumination –Shade Effects –Sound –Lighting –Video Post Interface –Atmospheric Effects: Fire, Water, Fog –Impact of Graphics and Animation on Film and Gaming Industry.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Apply the knowledge related to concepts and techniques used in 3D Modeling.
- Understand the physics and basic movements of character.
- Conduct various experiments for effective modern interactive 3D Scene design.
- Design and implement algorithms and techniques applied to 3D Modeling and Rendering.
- Apply various tools and software related to three-dimensional modelling efficiently to uphold the professional and social obligation.

TEXT BOOKS:

1. Donald Hearn, M.Pauline Baker, “Computer Graphics with OpenGL”, Third Edition, Pearson Education, 2012.
2. Micheal E.Mortenson, ‘ 3D Modeling, Animation and Rendering’,2010.

REFERENCES:

1. F.S. Hill, Jr., Stephen Kelly, “Computer Graphics Using OpenGL”, Third Edition, Persons Education/PHI Learning, 2007.
2. AndyBeane, “3D Animation Essentials”, John Wiley & Sons, 2012.
3. R.Stuart Ferguson, “Practical Algorithms for 3D Computer Graphics”, Second Edition, CRC Press, 2013.
4. Kelly L.Murdock, “Auto Desk Maya 2016 Basic Guide”, Auto Desk Maya,2016.

WEBSITE REFERENCES:

1. <https://www.makeuseof.com/primitives-in-3d-modeling/>
2. <https://www.techopedia.com/definition/8635/object-model>
3. <https://www.turito.com/learn/math/mathematical-modeling>
4. <https://www.quora.com/3d-modeling-software>
5. <https://www.geeksforgeeks.org/opengl-rendering-pipeline-overview/>

Mapping with CO / PO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	2	2	2	2	2	-	-	-	-	-	-
CO-2	2	1	2	2	2	2	-	-	-	-	-	-
CO-3	2	1	2	2	2	2	-	-	-	-	-	-
CO-4	2	1	2	2	2	2	-	-	-	-	-	-
CO-5	3	2	3	3	3	3	-	-	-	-	-	-
Avg	2.2	1.4	2.2	2.2	2.2	2.2	-	-	-	-	-	-

JCS1027	AUGMENTED REALITY AND VIRTUAL REALITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Learn the fundamental Computer Vision, Computer Graphics and Human-Computer interaction Techniques related to VR.
- Review the Geometric Modeling Techniques.
- Review the Virtual Environment.
- Discuss and Examine VR/AR Technologies.
- Use of various types of Hardware and Software in Virtual Reality systems and it's applications.

COURSE PRE-REQUISITES: Computer Graphics

UNIT-I INTRODUCTION TO VIRTUAL REALITY 9

Virtual Reality and Virtual Environment, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark.

UNIT-II COMPUTER GRAPHICS AND GEOMETRIC MODELLING 9

The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, Color theory, Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modelling, 3D clipping, Illumination models, Reflection models, Shading algorithms, Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection.

UNIT-III VIRTUAL ENVIRONMENT 9

Input/Output Devices: Input ,Output , Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems, Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system.

Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft

UNIT-IV AUGMENTED REALITY

9

Taxonomy, Technology and Features of Augmented Reality, AR Vs VR, Challenges with AR, AR systems and functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, Enhancing interactivity in AR Environments, Evaluating ARsystems.

UNIT-V DEVELOPMENT TOOLS, FRAMEWORKS & APPLICATIONS

9

Human factors: Introduction, the eye, the ear, the somatic senses Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems

Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML.

AR / VR Applications: Introduction, Engineering, Entertainment, Science, Training, Game Development.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Understand fundamental Computer Vision, Computer Graphics and Human Computer Interaction Techniques related to VR.
- Understand Geometric Modeling Techniques
- Understand the Virtual Environment
- Analyze and evaluate VR/AR Technologies
- Apply various types of Hardware, Software in Virtual Reality systems and Virtual/Augmented Reality Applications.

TEXT BOOKS

1. Coiffet, P., Burdea, G. C., (2003), "Virtual Reality Technology," Wiley-IEEE Press
2. Schmalstieg, D., Höllerer, T., (2016), "Augmented Reality: Principles & Practice," Pearson

REFERENCES

1. Craig, A. B., "Understanding Augmented Reality, Concepts and Applications," Morgan Kaufmann, 2013
2. Craig, A. B., Sherman, W. R., Will, J. D., "Developing Virtual Reality Applications, Foundations of Effective Design," Morgan Kaufmann, 2009
3. Kim, G. J., "Designing Virtual Systems: The Structured Approach", 2005
4. Bimber, O., Raskar, "Spatial Augmented Reality: Merging Real and Virtual Worlds," CRC Press, 2005

5. O'Connell, K., "Designing for Mixed Reality: Blending Data, AR, and the Physical World," O'Reilly, 2019
6. Sanni Siltanen, S, "Theory and applications of marker-based augmented reality," Julkaisija –Utgivare Publisher, 2012

WEBSITE REFERENCES

1. Manivannan, M., (2018), "Virtual Reality Engineering," IIT Madras, <https://nptel.ac.in/courses/121106013>
2. Misra, S., (2019), "Industry 4.0: Augmented Reality and Virtual Reality," IIT Kharagpur, <https://www.youtube.com/watch?v=zLMgdYI82IE>
3. Dube, A., (2020), "Augmented Reality - Fundamentals and Development," NPTEL Special Lecture Series, <https://www.youtube.com/watch?v=MGuSTAqlZ9Q>
4. <http://cambum.net/course-2.htm>

MAPPING WITH CO / PO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	2	1	1	-	1	-	-	3	1	1	1
CO-2	2	2	1	1	-	1	-	-	3	2	2	2
CO-3	2	3	2	2	-	1	-	-	3	2	2	2
CO-4	2	1	3	2	3	1	1	2	3	2	2	2
CO-5	2	2	3	3	1	1		1	2	2	1	2
Avg	2	2	2	1.8	2	1	1	1.5	2.8	1.8	1.6	1.8

JCS1028	DIGITAL MARKETING AND COMMERCE	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To learn the concept of digital marketing and strategy
- To explore on various search engine optimization strategies and marketing
- To know marketing through E-mail and Mobile
- To learn marketing through social media
- To know about the various digital transformation techniques

COURSE PRE-REQUISITES: Nil

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 maximising email campaign effectiveness.

Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns.

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.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES:

1. Subscribe to a weekly/quarterly newsletter and analyze how it's content and structure aid with the branding of the company and how it aids its potential customer segments.
2. Perform keyword search for a skincare hospital website based on search volume and competition using Google keyword planner tool.
3. Demonstrate how to use the Google WebMasters Indexing API
4. Discuss an interesting case study regarding how an insurance company manages leads.
5. Discuss negative and positive impacts and ethical implications of using social media for political advertising.
6. Discuss how Predictive analytics is impacting marketing automation

COURSE OUTCOMES:

- To examine and explore the role and importance of digital marketing in today's rapidly changing business environment..
- To focusses on how digital marketing can be utilised by organisations and how its effectiveness can measured.
- To know the key elements of a digital marketing strategy.
- To study how the effectiveness of a digital marketing campaign can be measured
- To demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs.

TOTAL:60 PERIODS

TEXT BOOKS:

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: Pearson Education; First edition (July 2017);ISBN-10: 933258737X;ISBN-13: 978-9332587373.
2. Digital Marketing by Vandana Ahuja ;Publisher: Oxford University Press (April 2015). ISBN-10: 0199455449
3. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler;Publisher: Wiley; 1st edition (April 2017); ISBN10: 9788126566938;ISBN13: 9788126566938;
4. Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited..
5. Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South-Western ,Cengage Learning.

CO-PO MAPPING:

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	2	1	-	1	1	1	2	-	-	-	-
CO-2	3	3	1	-	2	1	1	2	-	-	-	-
CO-3	3	3	1	-	2	1	1	2	-	-	-	-
CO-4	3	3	1	-	1	1	1	2	-	-	-	-
CO-5	2	2	2	-	3	1	1	2	-	-	-	-
Avg	2.8	2.4	1.2	-	1.8	1	1	2	-	-	-	-

JCS1029	COMPUTER GRAPHICS AND ANIMATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the fundamentals of graphics.
- To gain and understand the acquired knowledge pertaining to 2D and 3D concepts in graphics.
- To familiarize the fundamental concepts of graphical color models.
- To understand the basic 3D modeling and rendering techniques.
- To know the working principles of animation tools.

COURSE PRE-REQUISITES: Data Structures and algorithm

UNIT-I FUNDAMENTALS OF COMPUTER GRAPHICS 9

Attributes of Graphics Primitives, Implementation Algorithms for Graphics primitives and attributes-Line drawing: DDA, Bresenham's, Circle generation, Ellipse generation, Implementation style for fill styles: Scan line polygon filling algorithm, Boundary fill and Flood fill

UNIT-II 2D AND 3D TRANSFORMATION VIEWING 9

2D transformation: Translation, Scaling, Rotation, Composite transformation, Reflection, Shearing, Raster Transformation - 2D Viewing: Pipeline, Normalization.

3D Transformation: Translation, Scaling, Rotation, Reflection, Shearing, 3D Viewing: Projection, Three-Dimensional Viewing concepts, 3D Viewing pipe line, Three-Dimensional viewing coordinate parameters, Projection transformation: Parallel projection, Orthogonal projection: oblique, Perspective projection, View volume.

UNIT-III COLOR MODELS AND ILLUMINATION 9

Color Models: Chromaticity Diagram, RGB model, YIQ model, CMY model, CMYK model, HSV model, HLS model, Transformation between color models. Illumination models: Lighting Models, Basic Illumination models: Ambient Light, Diffusion Light, Specular reflection.

UNIT-IV VISIBLE SURFACE DETECTION AND SURFACE RENDERING 9

Visible Surface Detection Methods: Back face detection, Depth buffer method, A-Buffer method, Scan-line method, Depth-sorting method, BSP-Tree method, Area-subdivision method, Octree method, Ray-casting method, Curve and Line frame detection, Polygon rendering method – Constant intensity, Gouraud surface rendering, Phong surface rendering and Fast Phong surface rendering.

Raster methods of Animation, Design of Animation sequence, traditional Animation sequence, Key frame animation sequence, Key frame system, Motion Specification: Direct motion specification, Goal-Directed systems, Kinematics and Dynamics. Introduction to the flash interface, Setting stage dimensions, working with panels, panel layouts, Layers & Views, Shaping Objects – Overview of shapes, Drawing & Modifying Shapes, Bitmap Images & Sounds, Animation -Principles, Frame by frame animation, tweening, masks

TOTAL:45 PERIODS

COURSE OUTCOMES

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

- Understand the concepts of computer graphics primitives and various graphics algorithms.
- Design and demonstrate the 2D and 3D object transformation and viewing through graphics principles.
- Understand the various color models and comprehend the complexities of illumination in virtual scenes.
- Express their ability to model the hidden surface and render the respective 3D objects to project on the screen.
- Comprehend and apply animation techniques towards the formation of motion pictures.

TEXT BOOKS

1. Donald D. Hearn, Pauline Baker, Warren Carithers - Computer graphics with Open GL.- Pearson New International Edition, 4th Edition, Pearson Education Ltd., 2014.
2. Sumanta Guha, Computer Graphics Through OpenGL - From Theory to Experiments, 3rd Edition, CRC Press, 2019.
3. Robert R, Snow D, Flash CS4 Professional Bible, Wiley Publishing, 2011

REFERENCES

1. JungHyun Han, Introduction to Computer Graphics with OpenGL-ES, CRC Press, 2018.
2. Steve Marschner, Peter Shirley, Fundamentals of Computer Graphics, Fourth Edition, CRC Press, 2016.
3. Edward Angel, Dave Shreiner, Interactive Computer Graphics - A Top-Down Approach with Shader-Based OPENGL, 6th Edition, Addison-Wesley, 2012.

WEBSITE LINKS

1. <https://www.javatpoint.com/computer-graphics-tutorial>

2. <https://www.udemy.com/course/blender-basics-a-quick-intro-to-3d-modeling-and-rendering/>
3. <https://www.tutorialboneyard.com/simple-flash-animation/>

CO-PO MAPPING:

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	1	1	-	1	-	2	-	-	2	-	-
CO-2	2	1	1	-	2	-	1	-	-	1	-	-
CO-3	2	1	-	1	1	-	2	-	-	2	-	-
CO-4	2	2	1	-	2	-	1	-	-	1	-	-
CO-5	2	1	1	2	3	2	2	-	-	2	-	2
Avg	2	1.2	1	1.5	1.8	2	1.6	-	-	1.6	-	2

JCS1030	VIDEO PROCESSING AND ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To have a better knowledge about videos representation and its formats
- To know the fundamental concepts of data science and analytics
- To enrich students with video processing for analytics
- To understand the data analytics for processing video content
- To expose the student to emerging trends in video analytics

COURSE PRE-REQUISITES: Big data Analytics

UNIT I VIDEO FUNDAMENTALS 9

Basic Concepts and Terminology – Analog Video Standards – Digital Video Basics – Analog-to-Digital Conversion – Color Representation and Chroma Sub Sampling – Video Sampling Rate and Standards Conversion – Digital Video Formats – Video Features – Colour, Shape and Textural Features.

UNIT II MOTION ESTIMATION AND VIDEO SEGMENTATION 9

Fundamentals of Motion Estimation – Optical Flow – 2D and 3D Motion Estimation – Block Based Point Correspondences – Gradient Based Intensity Matching – Feature Matching – Frequency Domain Motion Estimation – Video Segmentation.

UNIT III FUNDAMENTAL DATA ANALYSIS 9

Exploratory Data Analysis – Collection of Data – Graphical Presentation of Data – Classification of Data – Storage and Retrieval of Data – Big Data – Challenges of Conventional Systems – Web Data – Evolution of Analytic Scalability – Analytic Processes and Tools – Analysis vs. Reporting.

UNIT IV MINING DATA STREAMS AND VIDEO ANALYTICS 9

Introduction To Streams Concepts – Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Analytic Processes and Tools – Video shot boundary detection – Model Based Annotation and Video Mining – Video Database – Video Categorization – Video Query Categorization

UNIT V EMERGING TRENDS 9

Affective Video Content Analysis – Parsing a Video Into Semantic Segments – Video Indexing and Abstraction for Retrievals – Automatic Video Trailer Generation – Video In painting – Forensic Video Analysis.

TOTAL:45 PERIODS

PRACTICAL EXERCISES:**15 PERIODS**

1. Choose appropriate features for video segmentation for given sample video.
2. Compute two dimension motion estimation using block based match technique.
3. Calculate the motion estimation based on Frequency domain.
4. Compare the video features extracted from a given video dataset using graphical representation.
5. Compute the number of distinct elements found in the given sample data stream.
6. Detect shot boundary for given sample video.
7. Parse the given sample video for indexing and faster retrieval.
8. Generate an automatic video trailer for given sample video.
9. Design simple application using video in painting technique.
10. Mini project for video categorization based on content analysis.

TOTAL: 60 PERIODS**COURSE OUTCOMES:**

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

- Discuss video processing fundamentals
- Analyze video features for segmentation purpose
- Derive numeric problems related to motion estimation
- Process video streams for analytics purpose
- Parse and index video segments
- Design applications for video analytics in current trend

REFERENCES:

1. Roy, A., Dixit, R., Naskar, R., Chakraborty, R.S., “Digital Image Forensics: Theory and Implementation”, Springer, 2018.
2. Paul Kinley, “Data Analytics for Beginners: Basic Guide to Master Data Analytics”, CreateSpace Independent Publishing Platform, 2016.
3. Henrique C. M. Andrade, Bugra Gedik, Deepak S. Turaga, “Fundamentals of Stream Processing: Application Design, Systems, and Analytics”, Cambridge University Press, 2014.
4. Murat Tekalp, “Digital Video Processing” Second Edition, Prentice Hall, 2015.
5. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications“, Wiley, 2014.
6. Oges Marques, “Practical Image and Video Processing Using MATLAB”, Wiley-IEEE Press, 2011.

MAPPING WITH PO /CO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	2	2	2	2	2	-	-	-	-	-	-
CO-2	2	1	2	2	2	2	-	-	-	-	-	-
CO-3	2	1	2	2	2	2	-	-	-	-	-	-
CO-4	2	1	2	2	2	2	-	-	-	-	-	-
CO-5	3	2	3	3	3	3	-	-	-	-	-	-
Avg	2.2	1.4	2.2	2.2	2.2	2.2	-	-	-	-	-	-

JAD1030	GAME DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Understand the fundamentals of game development processes and workflows.
- Gain practical skills in game design, prototyping, and documentation.
- Develop proficiency in game programming and implementation of gameplay mechanics.
- Learn game art principles and techniques for asset creation.
- Gain experience in game testing, optimization, and deployment.

COURSE PRE-REQUISITES: Programing knowlege in C/c++/Java

UNIT-I INTRODUCTION TO GAME DEVELOPMENT 9

Overview of Game Development Process - History and Evolution of Game Development - Roles and Responsibilities in Game Development Teams - Introduction to Game Engines and Tools.

UNIT-II GAME DESIGN AND PROTOTYPING 9

Fundamentals of Game Design - Conceptualizing and Documenting Game Ideas - Paper Prototyping and Iterative Design - Game Design Documentation and Communication.

UNIT-III GAME PROGRAMMING AND DEVELOPMENT 9

Introduction to Game Programming Languages (e.g., C++, C#, Java) - Basics of Game Development Frameworks and APIs - Gameplay Programming and Mechanics Implementation - Asset Integration and Game Polishing.

UNIT-IV GAME ART AND ASSET CREATION 9

Principles of Game Art and Visual Design - 2D and 3D Asset Creation Techniques - Character Design and Animation - Environmental and Level Design.

UNIT-V GAME TESTING, DEPLOYMENT, AND POST-PRODUCTION 9

Quality Assurance and Testing in Game Development - Playtesting and Gathering User Feedback -Game Optimization and Performance Tuning - Game Publishing and Distribution.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Demonstrate a comprehensive understanding of the game development process.
- Design and prototype game ideas effectively.

- Implement gameplay mechanics using programming languages and frameworks.
- Create visually appealing game assets and environments.
- Test, optimize, and deploy games for different platforms.

TEXT BOOKS

1. Jesse Schell, "The Art of Game Design: A Book of Lenses", CRC Press, 2008.
2. Joe Hocking , "Unity in Action: Multiplatform Game Development in C#", Manning Publications, 2018.

REFERENCES

1. Alan Thorn, "Game Development Principles", Wiley, 2018.
2. Mike McShaffry , "Game Coding Complete", Cengage Learning, 2018.
3. Jeremy Gibson Bond , "Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C#" , Addison-Wesley Professional, 2017.

WEBSITE REFERENCES

1. <https://www.youtube.com/watch?v=7C92ZCnlmQo>
2. <https://www.youtube.com/watch?v=U9vqzH65Zzw>
3. <https://developer.android.com/games/agde>
4. <https://www.youtube.com/watch?v=rJ1iA-33fss>

Mapping of CO with PO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	2	1	2	3	1					2	2
CO-2	3	2	1	2	2	1					2	1
CO-3	3	2	2	2	2	1					2	2
CO-4	3	2	1	2	1	1					2	3
CO-5	2	2	1	2	2	1					2	1
Avg	2.8	2	1.2	2	2	1					2	1.8

JCS1031	MEDIA SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the cryptanalysis on standard algorithms meant for confidentiality, integrity and authenticity.
- To know about the Digital rights management.
- To know about the concepts of Digital Watermarking techniques.
- To understand the concept of Steganography
- To learn the privacy preserving techniques on Multimedia data.

COURSE PRE-REQUISITES: Cryptography and Network Security

UNIT I CRYPTANALYSIS AND DIGITAL RIGHTS MANAGEMENT 9

Cryptanalysis Techniques – Encryption Evaluation metrics – Histogram Deviation – orthogonal Frequency Division Multiplexing – OFDM Model – OFDM Limitations – Introduction to DRM – DRM Products – DRM Laws

UNIT II DIGITAL WATERMARKING BASICS 9

Introduction – Basics Models of Watermarking – Basic Message Coding – Error Correction coding – Mutual Information and Channel Capacity – Designing a Good Digital Watermark – Information Theoretical Analysis of Digital Watermarking.

UNIT III DIGITAL WATERMARKING SCHEMES AND PROTOCOLS 9

Spread Spectrum Watermarking – Block DCT-domain Watermarking – Watermarking with Side Information – Dirty-paper Coding – Quantization Watermarking – buyer Seller Watermarking Protocol – Media Specific Digital Watermarking : Image WM , Video WM , Audio WM – Watermarking for CG-Models: Watermarking for Binary Images and 3D Contents – Data Hiding Through Watermarking Techniques.

UNIT IV STEGANOGRAPHY AND STEGANALYSIS 9

Steganographic Communication – Notation and Terminology – Information –Theoretic Foundations of Steganography – Cachin’s Definition of Steganographic Security – Statistics Preserving Steganography – Model-Based Steganography – Masking Embedding as Natural Processing – Minimizing the Embedding Impact – Matrix Embedding – Nonshared Selection Rule – Steganalysis Algorithms: LSB Embedding and the Histogram Attack – Sample Pairs Analysis.

UNIT V MULTIMEDIA ENCRYPTION

9

Multimedia Processing in the Encryption Domain – Information Processing – Data Sanitization – Finger Printing – Digital Forensics: Intrusive and Non- Intrusive –Forgeries Detection– Privacy Preserving – Surveillance.

COURSE OUTCOMES:

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

- Analyze the security algorithms required by any computing system.
- Identify the security challenges and issues that may arise in any system.
- Implement the concepts of steganography, digital watermarking techniques, etc.
- Design secure applications using steganography and water marking schemes
- Apply concepts on digital rights management while developing secure systems
- Design any secure system by preserving the privacy.

REFERENCES

1. Frank Shih, “Digital Watermarking and Steganography: Fundamentals and Techniques”, CRC Press, 2014.
2. Fathi E. Abd El-Samie, HossamEldin H. Ahmed, Ibrahim F. Elashry, Mai H. Shahieen, Osama S. Faragallah, El-Sayed M. El-Rabaie, Saleh A. Alshebeili , “Image Encryption: A Communication Perspective”, CRC Press, 2013.
3. Douglas R. Stinson, “Cryptography Theory And Practice”, Third Edition, Chapman & Hall/CRC, 2006
4. Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, 2006.
5. Ingemar Cox, Matthew Miller, Jeffrey Bloom, Jessica Fridrich and TonKalker, “Digital Watermarking and Steganography”, Second Edition, Elsevier, 2007.

WEBSITE REFERENCES

- <https://www.geeksforgeeks.org/cryptanalysis-and-types-of-attacks/>
- <https://www.techopedia.com/definition/24927/digital-watermarking>
- <https://www.simplilearn.com/what-is-steganography-article>

Mapping with CO / PO

	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	2	-	-	2	1	2	-	1	2	-	2
CO-2	3	2	-	-	2	1	2	-	1	2	-	2
CO-3	3	2	-	-	2	3	3	-	3	3	-	2
CO-4	3	2	-	-	2	3	2	-	3	3	-	2
CO-5	3	2	-	-	2	3	2	-	2	2	-	2
Avg	3	2	-	-	2	3	2	-	2	2	-	2

VERTICAL III -CYBER SECURITY

JCB1402	FOUNDATION OF CYBER SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the difference between threat, risk, attack, and vulnerability.
- To learn about security in operating system and networks.
- To analyze the different security available in databases.
- To understand the concept of privacy and security in emerging technologies.
- To learn about management and risks in different technologies.

PREREQUISITE:

- Computer Programming
- Computer Networks

UNIT-I INTRODUCTION TO CYBER SECURITY 9

Introduction -Computer Security - Threats -Harm - Vulnerabilities - Controls - Authentication - Access Control and Cryptography –Web-User Side - Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data - Email Attacks

UNIT-II SECURITY IN OPERATING SYSTEM & NETWORKS 9

Security in Operating Systems - Security in the Design of Operating Systems – Root kit - Network security attack- Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.

UNIT-III DEFENCES SECURITY COUNTER MEASURES 9

Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity
- Database Disclosure - Data Mining and Big Data.

UNIT-IV PRIVACY IN CYBERSPACE 9

Privacy concepts –privacy principles and policies -authentication and privacy-Data mining – privacy on the Web - email Security - privacy Impacts of Emerging Technologies - where the Field Is Headed.

UNIT-V MANAGEMENT AND INCIDENTS 9

Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing with Disaster - Emerging Technologies - The Internet of Things - Economics - Electronic Voting - Cyber Warfare- Cyberspace and the Law - International Laws - Cyber crime - Cyber Warfare and Home Land Security.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

Classify various types of attacks and learn the tools to launch the attacks

Apply various tools to perform information gathering

Analyze intrusion techniques to detect intrusion

Apply intrusion prevention techniques to prevent intrusion

Explain the basics of cyber security, cyber crime and cyber law

TEXT BOOKS:

1. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition, Pearson Education, 2015.
2. David Kim & Michael G. Solomon, “FOUNDATIONS” and Custom Edition 1 Jan 1, 2014.

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1. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.
2. MarttiLehto, PekkaNeittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015
3. Nelson Phillips and EnfingerSteuart, —Computer Forensics and Investigationsll, Cengage Learning, New Delhi, 2009.

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<https://www.edureka.co/blog/cybersecurity-fundamentals-introduction-to-cybersecurity/>

https://cnitarot.github.io/courses/fc_Fall_2022/2550_intro_history_pub_cnr.pdf

CO-PO MAPPINGS:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	-	-	-	-	-	-	-	2	-
CO2	-	2	2	1	2	-	-	-	-	-	-	2
CO3	-	2	2	2	-	-	-	-	-	-	-	2
CO4	2	-	-	2	-	-	1	-	-	1	2	-
CO5	3	-	2	2	2	-	-	-	-	1	-	-

JCB1403	CRYPTOGRAPHY AND CRYPTANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

To study about the fundamentals of Cryptography

To analyze Key Management techniques and importance of number Theory

To understand the concept of Message Authentication Codes and Hash Functions

To design a security solution for a given application

To understand about cyber crimes and the different security practice.

PREREQUISITE:

Fundamentals of Mathematics

UNIT-I INTRODUCTION TO CRYPTOGRAPHY

9

Number theory – Algebraic Structures – Modular Arithmetic - Euclid’s algorithm – Congruence and matrices – Group, Rings, Fields, Finite Fields-Symmetric Key Ciphers- DES – Block Ciphers – DES – Strength of DES – Differential and linear cryptanalysis – Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Pseudorandom Number Generators – RC4 – Key distribution.

UNIT-II ASYMMETRIC CRYPTOGRAPHY

9

Primes – Primality Testing – Factorization – Euler’s totient function, Fermat’s and Euler’s Theorem – Chinese Remainder Theorem – Exponentiation and logarithm-Asymmetric Key Ciphers - RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange – Elliptic curve arithmetic – Elliptic curve cryptography.

UNIT-III MESSAGE AUTHENTICATION AND HASH FUNCTION

9

Authentication Requirements - Authentication Function- Message Authentication Codes - Hash Functions - Security of Hash Functions and MACs- Secure Hash Algorithm - Whirlpool, HMAC, CMAC -Digital Signatures - Authentication Protocol - Digital Signature Standard- Authentication Applications- Kerberos -X.509 Authentication Service - Public-key infrastructure

UNIT-IV FIREWALLS AND CRYPTANALYSIS

9

Intruder – Intrusion detection system -Password Management-Virus and related threats-Countermeasures- Firewall design principles- Trusted systems -Practical implementation of cryptography and security

UNIT-V CYBER CRIMES AND SECURITY

9

Cyber Crime and Information Security – classifications of Cyber Crimes – Tools and Methods – Password

Cracking, Keyloggers, Spywares, SQL Injection – Network Access Control – Cloud Security – Web Security – Wireless Security

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Understand the fundamentals of networks security
- Demonstrate the different cryptographic operations of symmetric cryptographic algorithms
- Develop the different cryptographic operations of public key cryptography.
- Explain the various Authentication schemes to simulate different applications.
- Understand various cyber-crimes and cyber security.

TEXT BOOKS:

1. Forouzan Mukhopadhyay “Cryptography and Network Security” McGraw Hill, 2nd Edition
2. William Stallings, "Cryptography and Network Security - Principles and Practice", Seventh Edition, Pearson Education, 2017.
3. Nina Godbole, Sunit Belapure, “Cyber Security: Understanding Cyber-crimes, Computer Forensics and Legal Perspectives”, First Edition, Wiley India, 2011.

REFERENCES:

1. Behrouz A. Forouzan, DebdeepMukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata McGraw Hill, 2015.
2. Charles Pfleeger, Shari Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, New Delhi, 2015.

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- <https://ukdiss.com/examples/web-based-crypto-analysis-learning-application.php>
- https://developer.mozilla.org/en-US/docs/Web/API/Web_Crypto_API
- <https://www.garykessler.net/library/crypto.html>
- <https://www.cryptomathic.com/news-events/blog/summary-of-cryptographic-algorithms-according-to-nist>

CO-PO MAPPINGS:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	-	-	-	-	-	-	2	2
CO2	1	2	2	1	2	-	-	-	-	-	2	2

CO3	2	2	2	2	-	-	-	-	-	-	-	2
CO4	2	2	1	2	-	-	1	-	-	1	2	1
CO5	3	1	2	2	2	-	-	-	-	1	2	2

JCB1501	CYBER FORENSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the process of Digital Cyber Forensics.
- To be aware of the Cyber forensics Environments and standards.
- To study the data and evidence collection activities.
- To understand how to investigate digital evidence.
- To Explore advanced techniques in Cyber Forensics.

PREREQUISITE:

Cryptography and Cryptanalysis

UNIT-I DIGITAL FORENSICS PROCESS 9

Computer forensic fundamentals - Applying forensic science to computers - Computer forensic services - Benefits of professional forensic methodology -Steps taken by computer forensic specialists, Forensic science, Digital forensics, Digital evidence, Digital forensics process – Identification, Collection, Examination, Analysis, Presentation Phases, Cyber Crime Law.

UNIT-II FORENSICS ENVIRONMENTS & STANDARDS 9

Hardware and software environments – Storage devices - Operating system - File Systems – Metadata - Locating evidence in file systems - Password security – Encryption - Hidden files - Digital evidence.

UNIT-III DATA AND EVIDENCE COLLECTION 9

Identification of Data: timekeeping - Forensic identification - Analysis of technical surveillance devices - Reconstructing past events - Useable file formats - Unusable file formats - Converting files - Investigating network intrusions - Cyber crime - Network forensics - Investigating logs - Network.

UNIT-IV INVESTIGATING DIGITAL EVIDENCE 9

Applying forensic Science to computers – Preparation – Survey – Documentation – Preservation – examination – Reconstruction - Analyzing digital evidence - Locating digital evidence, Categorizing files - Eliminating superfluous files - Event analysis tool - Cloud analysis tool - Lead analysis tool - Volume shadow copy analysis tools.

UNIT-V ADVANCED CYBER FORENSICS 9

Windows forensics evidence collection in linux - Network forensics packet capture using wire shark, t shark and tcp dump - Memory forensics virtual machine- Forensics use - Implementation

-Virtual machines in forensic analysis- Cloud forensics analysis -Cloud storage - Data remnants.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

Identify the need for cybercrime forensics.

Examine the hardware, software components and standards responsible for seeking evidence.

Apply techniques for collecting data and evidences.

Analyze the methods for investigating digital evidences

Examine advanced techniques for Cyber Forensics.

TEXT BOOKS:

1. Richard Boddingtons, Practical Digital Forensics, PACKT publishing, First Edition, 2016
ANDRÉ ÅRNES.
2. Marjie T.Britz, Computer Forensics and Cyber Crime: An Introduction, Third Edition, Prentice Hall, 2013

REFERENCES:

1. Richard E.Smith, “Internet Cryptography”, Third Edition, Pearson Education, 2008
2. Angus M.Marshall, “Digital forensics: Digital evidence in criminal investigation”, John – Wiley and Sons, 2008.
3. John R.Vacca, “Computer Forensic”s, Second Edition, Cengage Learning, 2005.
4. John R. Vacca, Charles River Media “Computer Forensics: Computer Crime Scene Investigation”, 2nd Edition, , 2005

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<https://www.stannescet.ac.in/cms/staff/qbank/CSE/Notes/CS6004-CYBER%20FORENSICS-1800235714-CS6004%20UNIT%203.pdf>

<https://www.geeksforgeeks.org/cyber-forensics/>

<https://www.studocu.com/in/document/dr-babasaheb-ambedkar-marathwada-university/cyber-forensic/cyber-forensics-lecture-notes/34989994>

<https://www.studocu.com/in/document/kannur-university/network-forensics/cyber-forensics-unit1/17233533>

CO-PO MAPPINGS:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	-	1	3	-	2	1	3	-	3	1	3
CO-2	1	1	1	-	2	-	2	-	2	-	2	-
CO-3	-	2	1	1	3	-	1	2	3	2	-	2
CO-4	2	1	2	2	2	-	1	2	1	-	3	-
CO-5	2	1	2	2	3	3	1	3	1	-	2	-

JCB1502	INTRUSION DETECTION SYSTEM	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

To understand basic concepts of intrusion detection system.

To learn about Intrusion Prevention Systems, Network IDs protocol and model for intrusion analysis.

To analyze intrusion detection alerts and logs to distinguish attack types from false alarms

To understand Intrusion Prevention Systems, Network IDs protocol and model for intrusion analysis.

To learn agent development for intrusion detection and architectural models of IDs and IPs.

PREREQUISITE:

Foundations of Cyber Security

UNIT-I INTRODUCTION TO INTRUSION DETECTION 9

History of intrusion detection, Audit, Concept and definition , Internal and external threats to data, Attacks, Need and types of IDS, Information sources, Host based information sources, Network based information sources.

UNIT-II THEORITICAL FOUNDATION OF DETECTION 9

Intrusion prevention systems, Network Ids protocol based Ids, Hybrid Ids, Analysis schemes, Thinking about intrusion, Model for intrusion analysis, Techniques responses ,Requirement of responses, Types of responses, Mapping responses to policy vulnerability analysis, Credential analysis ,Non credential analysis

UNIT-III ARCHITECTURE AND IMPLEMENTATION 9

Introduction to snort, Snort installation scenarios, Installing snort , Running snort on multiple network interfaces, Snort command line options, Step-by-step procedure to compile ,Install snort location of snort files, Snort modes snort alert modes

UNIT-IV SNORT CONCEPTS 9

Working with snort rules, Rule headers, Rule options, Snort configuration file, Plugins, Preprocessors and output modules, Using snort with mysql

UNIT-V CASE STUDY 9

Using ACID and snort snarf with snort, Agent development for intrusion detection, Architecture models of Ids and Ips

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

Understand the basic concepts of intrusion detection system.

Explain about Intrusion Prevention Systems, Network IDs protocol and model for intrusion analysis.

Analyze when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise.

Understand the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creation and evaluation of new Intrusion Detection Systems.

Explain about agent development for intrusion detection and architectural models of IDs and IPs.

TEXT BOOK:

1. T. Fahringer, R. Prodan, “A Text book on Grid Application Development and Computing Environment”. 6th Edition, Khanna Publishers, 2012
2. Rafeeq Rehman : “ Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID,” 1st Edition, Prentice Hall , 2003

REFERENCES:

1. Christopher Kruegel, Fredrik Valeur, Giovanni Vigna: “Intrusion Detection and Correlation Challenges and Solutions”, 1st Edition, Springer, 2005.
2. Carl Endorf, Eugene Schultz and Jim Mellander “Intrusion Detection & Prevention”, 1st Edition, Tata McGraw-Hill, 2004.
3. Stephen Northcutt, Judy Novak: “Network Intrusion Detection”, 3rd Edition, New Riders Publishing, 2002.

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<https://www.knowledgehut.com/blog/security/intrusion-detection-system>

<https://www.helixstorm.com/blog/types-of-intrusion-detection-systems/>

<https://usemynotes.com/what-is-intrusion-detection-system/>

<https://www.cs.colostate.edu/~massey/Teaching/cs356/RestrictedAccess/Slides/356lecture18.pdf>

CO-PO MAPPINGS:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	1	2	-	3	-	1	-	1	-	-	-	1
CO-2	3	2	-	2	3	2	-	-	1	2	-	2
CO-3	3	1	-	1	2	1	-	-	2	1	-	1

CO-4	2	2	3	2	3	-	-	-	-	2	2	-
CO-5	1	2	2	2	2	2	1	1	2	1	2	1

JCB1503	HARDWARE SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To know basic components and fundamentals of hardware security.
- To develop an application using various services in security.
- To understand about different attacks and testing.
- To learn the basic and important concepts of hardware design.
- To understand the issues and solutions for hardware security and monitoring.

PREREQUISITE:

Cryptography and Cryptanalysis

UNIT-I INTRODUCTION

9

Hardware security-Key threats-Security practices-Types-Fault attacks and countermeasures-Hardware design cycle-Measuring hardware security-Secure platforms-Ciphers: historical; block (AES/DES), Stream, (Trivium) Public Key Ciphers (RSA, ECC), Hash Functions (SHA-1)

UNIT-II PRINCIPLES AND APPLICATIONS

9

Physical unclonable functions:-Design-Principles and applications- Hardware random- Number generators: design-Principles and applications-Design and evaluate pufs - Random number generators on an FPGA

UNIT-III ATTACKS AND TESTING

9

Side channels – Overview - Fault attacks and countermeasures Power attacks and countermeasures - Designing Fault attack - Evaluate a counter measure - VLSI testing: attacks and countermeasures, Scan attack on FPGA implementation of DES.

UNIT-IV HARDWARE ARCHITECTURE

9

Hardware trojans-Overview-Attacks and defenses-Malicious 8051 Processor design-IP piracy-Logic encryption-FPGA logic encryption of combinational logic-Reverse engineering: ic layout camouflaging, Gate level reversing, ESL reversing.

UNIT-V CASE STUDY

9

Analysis of notable hardware security breaches - Study of hardware security vulnerabilities in commercial systems-Emerging hardware security technologies – Approaches - Ethical considerations - Hardware security research - Practice- Internet of Things (IoT) Security challenges- Hardware security - Autonomous systems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Demonstrate the main concepts of security, its characteristics, advantages, key technologies.
- Develop and design an application using various tools in hardware environment.
- Understand the basic and important design concepts and issues of attacks and testing.
- Explain about the concept, characteristics and the architecture of hardware.
- Analyze the issue of security and understand the applications of hardware security in various feild.

TEXT BOOK:

1. S. Bhunia and M. Tehranipoor, “Hardware Security: A Hand-on Training Approach, Morgan Kauffman”, 2018
2. M. Tehranipoor and C. Wang (Eds.), Introduction to Hardware Security and Trust, Springer, 2011

REFERENCES:

1. Debdeep Mukhopadhyay, “Hardware Security: Design, Threats, and Safeguards”, 1st edition, 2015.
2. Mohammad Tehranipoor and Cliff Wang, “Introduction to Hardware Security and Trust, by”, kindle edition, 2012.

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- https://books.google.com/books/about/Introduction_to_Hardware_Security_and_Tr.html?id=bNiw9448FeIC
- <https://tehranipoor.ece.ufl.edu/wp-content/uploads/2021/07/01-Intro-to-HW-Security.pdf>
- https://catalog.library.vanderbilt.edu/discovery/fulldisplay/alma991043664639603276/01VAN_INST:vanui

CO-PO MAPPINGS:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	-	2	1	2	-	-	-	-	-	1	1
CO-2	1	2	1	-	1	-	-	-	-	1	1	1
CO-3	1	2	1	1	1	1	-	-	-	1	2	-
CO-4	3	2	3	3	3	2	-	-	-	-	-	2
CO-5	2	3	-	1	3	1	-	-	-	2	1	-

JCB1601	CLOUD SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To know basic components and fundamentals of cloud computing.
- To develop an application using various services in cloud.
- To understand how to design the web application development in cloud.
- To understand the issues and solutions for cloud security and cloud monitoring.
- To learn the basic and important concepts of python to implement in an application.

PREREQUISITE:

- Data Communication and Networking
- Foundations of Cyber Security

UNIT-I INTRODUCTION

9

Cloud fundamentals - Cloud service components - Cloud service, Deployment models - Cloud components - Guiding principle - Utilization, Security, Pricing - Application of cloud computing. Case Study: Open stack and AWS.

UNIT-II CLOUD BASED APPLICATIONS DEVELOPMENT

9

Application architectures - Monolithic-Distributed, Micro Service fundamental - Cloud native applications - 12 factors app - Application integration process - APIfication process- API fundamental-Micro service - API management- Spring boot fundamental - Design of micro service
- API tools.

UNIT-III WEB DEVELOPMENT TECHNIQUES

9

Devops fundamentals - Devops role – responsibility - Tools - Containerization process and application-Evolution of app deployment- Docker fundamentals – architecture – Commands – Orchestration – Kubernetes - Docker container.

UNIT-IV CLOUD SECURITY AND MONITORING TOOL

9

Cloud security - Shared responsibility architecture - Security by design principles-Identity - Access management - Cloud security layers illustration - Cloud network - Host - Data security concepts - Security operations - Major cloud service provider tools - Security compliance and regulations - Cloud monitoring - Benefits of cloud monitoring.

UNIT-V BUILDING AN APPLICATION USING PYTHON

9

Developing - Deploying an application in the cloud- Building a python project based on design - Development testing - Deployment of an application using a development framework - Deployment Platform - Case study: python use case and python framework.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Demonstrate the main concepts of cloud, its characteristics, advantages, key technologies and its various delivery and deployment models.
- Develop and design an application using various tools in cloud environment.
- Acquire the basic and important design concepts and issues of web application development techniques in cloud.
- Structure simple python program for developing an application in cloud.
- Analyze the issue of cloud such as security, energy efficiency and interoperability, and provide an insight into future prospects of computing in the cloud monitoring.

TEXT BOOK:

1. Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, “Cloud Computing Concepts, Technology & Architecture”, Prentice Hall, 2013.
2. Guo Ning Liu, Qiang Guo Tong, Harm Sluiman, Alex Amies, "Developing and Hosting Applications on the Cloud", IBM Press, 2012.

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1. Michael J. Kavis “Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)”, 1st Edition, Wiley, 2014.
2. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, “Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet”, First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.
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- <https://www.box.com/resources/what-is-cloud-security>
- <https://cloud.google.com/learn/what-is-cloud-security>

CO-PO MAPPINGS:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3	-	2	3	1	-	1	-	-	1	1
CO-2	2	1	2	-	-	-	-	-	-	1	1	1
CO-3	-	1	3	2	1	-	-	-	1	-	-	-
CO-4	3	3	3	3	1	2	1	1	1	2	1	-
CO-5	1	2	2	3	-	-	1	1	2	1	-	1

JCB1603	ETHICAL HACKING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To study about the fundamentals of hacking.
- To learn different types of hacking in web.
- To understand attacks in networking.
- To learn about wireless hacking, attacks and various agents in hacking.
- To understand about automation and authentication.

PREREQUISITE:

- Cryptography and Cryptanalysis

UNIT-I INTRODUCTION TO HACKING 9

Introduction to hacking – Terminologies – Penetration test – Vulnerability assessments versus penetration test – Pre-engagement – Rules of engagement -Penetration testing methodologies – OSSTMM – Categories of penetration test – Types of penetration tests – Vulnerability assessment summary -Reports.

UNIT-II ETHICAL HACKING IN WEB 9

Introduction to ethical hacking – Foot printing - Reconnaissance - Scanning networks - Enumeration - System hacking - Malware Threats – Sniffing- Social engineering - Denial of service - Session hijacking - Hacking web servers - Web applications – SQL Injection - Hacking wireless networks - Mobile platforms.

UNIT-III NETWORK ATTACKS 9

Vulnerability data resources – Exploit databases –Promiscuous versus non promiscuous mode – MITM attacks – ARP attacks –SSL strip: stripping https traffic -DNS spoofing – ARP spoofing– DHCP Spoofing -Remote exploitation – Attacking network remote services – Overview of brute force attacks.

UNIT-IV WIRELESS HACKING 9

Wireless hacking – Air crack- Cracking WEP – WPA/WPA2 wireless network using air crack – Evil twin attack –Log-in protection mechanisms – Captcha validation flaw – Captcha RESET flaw
– Manipulating user-Agents to bypass captcha.

UNIT-V CASE STUDY

9

Authentication bypass attacks – Testing for vulnerability – Automating with burp suite – Session attacks – SQL injection attacks – XSS (Cross-Site Scripting) - Types of cross-Site scripting – Cross-site request forgery (CSRF) – SSRF attacks.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Understand the fundamentals of hacking and different methodologies in testing.
- Demonstrate the different types of hacking and various applications in web.
- Explain about different attacks, testing, and authentication in networking.
- Understand about wireless hacking, cracking and protection mechanisms.
- Explain the various Authentication schemes to simulate different applications.

TEXT BOOKS:

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, “Computer Forensics and Investigations”, Cengage Learning, India Edition, 2016.
2. CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2015.

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1. Marjie T.Britz, “Computer Forensics and Cyber Crime: An Introduction”, 3rd Edition, Prentice Hall, 2013.
2. Kenneth C.Brancik, “Insider Computer Fraudl ”,Auerbach Publications Taylor & Francis Group–2008.
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- <https://www.knowledgehut.com/blog/security/introduction-to-ethical-hacking>

CO-PO MAPPINGS:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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CO-2	1	1	2	1	-	1	1	-	-	1	-	1
CO-3	-	2	1	-	1	-	-	2	2	-	1	2
CO-4	2	2	-	2	1	1	-	1	2	-	-	-
CO-5	1	1	1	2	1	-	3	1	-	2	-	-

JCB1702	WEB APPLICATION SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To reveal the underlying in web application.
- To identify and aid in fixing any security vulnerabilities during the web development process.
- To understand the security principles in developing a reliable web application.
- To learn about different industry tools in web security.
- To understand about various testing and security.

PREREQUISITE:

- Web Technology

UNIT-I INTRODUCTION TO WEB APPLICATIONS 9

History of web applications interface -Web application Vs Cloud application -Security fundamentals- Input validation - Attack surface reduction rules of thumb- Classifying and prioritizing threats

UNIT-II WEB APPLICATION SECURITY FUNDAMENTALS 9

Origin policy - Exceptions to the same- Cross-site scripting and cross-site request forgery – Reflected XSS - HTML injection

UNIT-III WEB APPLICATION VULNERABILITIES 9

Vulnerabilities in traditional client server application and web applications- Client state manipulation-Cookie based attacks,-SQL injection, Cross domain attack (XSS/XSRF/XSSI)- Http header injection - SSL vulnerabilities and testing - Proper encryption use in web application- Session vulnerabilities and testing - Cross-site request forgery.

UNIT-IV WEB APPLICATION MITIGATIONS 9

Http request - Http response, rendering and events - Html image tags - Image tag security - Issue - Java script on error – Java script timing - Port scanning - Remote scripting - Running remote code - frame and iframe - Browser sandbox - policy goals, same origin policy - Library import - Domain relaxation

UNIT-V SECURE WEBSITE DESIGN 9

Introduction- Architecture and Design Issues for Web Applications - Deployment Considerations Input Validation – Authentication – Authorization - Configuration Management - Sensitive Data - Session Management – Cryptography - Parameter Manipulation - Exception Management.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

Identify the vulnerabilities in the web applications.

Identify the various types of threats and mitigation measures of web applications.

Apply the security principles in developing a reliable web application.

Use industry standard tools for web application security.

Apply Penetration testing to improve the security of web application

TEXT BOOKS:

Sullivan, Bryan, and Vincent Liu. Web Application Security, A Beginner's Guide. McGraw Hill Professional, 2011.

Stuttard, Dafydd, and Marcus Pinto. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws. John Wiley Sons, 2011

REFERENCES:

- Behrouz A. Ferouzan, DebdeepMukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata McGraw Hill, 2015.
- Charles Pfleeger, Shari Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, New Delhi, 2015.

WEB REFERENCES:

[Web Application Security \[Book\] \(oreilly.com\)](#)

[Web Application Security: Exploitation and Countermeasures for Modern Web ... - Andrew Hoffman -](#)

[Google Books amazon.com/Web-Application-Security-Beginners-Guide/dp/0071776168](#)

<https://www.garykessler.net/library/crypto.html>

<https://www.cryptomathic.com/news-events/blog/summary-of-cryptographic-algorithms-according-to-nist>

CO-PO MAPPINGS:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	2	-	2	2	-	-	1	-	-	1	2	1
CO-2	2	2	2	2	2	-	-	-	-	2	1	1
CO-3	2	2	2	2	1	-	2	-	-	-	-	2
CO-4	2	-	-	2	-	-	1	-	-	1	2	1
CO-5	2	1	2	2	2	-	2	-	-	1	1	2

IoT:Internet Of Things

PREREQUISITE: Python Programming, Computer Networks,MobileComputing,Internet Of Things

JIT1036	INTERNET OF THINGS: ARCHITECTURE PROTOCOLS AND APPLICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Understand the Architectural Overview of IoT
- To Understand the IoT Reference Architecture and RealWorld Design Constraints
- To Understand the various IoT Protocols.
- To Understandvarious IoT transport & session layer protocols.
- To Understand various IoT service layer protocols and security

UNIT-I : OVERVIEW 9

IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

UNIT-II: REFERENCE ARCHITECTURE 9

IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT-III :IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS 9

PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN,6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP.

UNIT-IV : TRANSPORT & SESSION LAYER PROTOCOLS 9

Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer HTTP,CoAP, XMPP, AMQP, MQTT

UNIT-V : SERVICE LAYER PROTOCOLS & SECURITY 9

Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4, 6LoWPAN, RPL, Application Layer

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- Describe the basic concept and architecture of IOT systems
- Understand key skills employed in the IIoT &IoRT space building applications.
- Analyze various IoT Comprehend IOT protocols
- Analyze various IoT Comprehend IOT protocols
- Analyze various IoTservice layer protocols and security

TEXT BOOKS:

1. JanHoller, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos,David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a NewAge of Intelligence”, 1st Edition, Academic Press, 2014.
2. Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI
3. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer

REFERENCES:

1. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications
2. Vijay Madiseti and ArshdeepBahga, “Internet of Things (A Hands-on Approach)”, 1stEdition, VPT, 2014

WEBSITE REFERENCES:

1. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html
2. <https://www.hindawi.com/journals/jece/2017/9324035>
3. <https://www.sciencedirect.com/science/article/pii/B9780128205815000134>

CO-PO AND CO-PSO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3		1	1							
CO2	3	2	3	3		1	1							
CO3	3	3	2	3		2	2							
CO4	3	3	3	2		2	2							
CO5	3	2	2	2		2	2							
AVG	3	3	3	3		2	2							

JIT1037	PROGRAMMING FOR IOT BOARDS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce Internet of Things (IoT) environment and its technologies for designing smart systems
- To explore open-source computer hardware/software platform, development and debugging environment, programming constructs and necessary libraries
- To learn embedded programming constructs and real time systems
- To understand various options in programming languages
- To test, debug, and deploy and to solve real world problems.

UNIT-I : INTRODUCTION TO IOT BOARDS 9

IoT- Introduction and Characteristics, Things, Architecture, Enabling Technologies, Challenges, Levels - Environment -board, IDE, shields; Programming - syntax, variables, types, operators, constructs and functions; sketch - skeleton, compile and upload, accessing pins; debugging - UART communication protocol and serial library

UNIT-II : INTERFACING WITH IOT BOARDS 9

Circuits - design, wiring, passive components; sensors and actuators, interfacing, read and write; software libraries to handle complicated hardware; shields, interfacing and libraries

UNIT-III :Single Board Computers and Python Interfacing 9

Board schematic, setup, configure and use, OS implications; linux - basics, file system and processes, shell CLI, GUI; python - basics, API's RPi.GPIO, PWM library to access pins, Tkinter Networking - Internet Connectivity, Standard Internet Protocols, MQTT, CoAP, Networking Socket Interface; Cloud - Public APIs and SDK's for accessing cloud services, Twitter API using Twython package; Interfacing - sensors and actuators, Pi Camera, Servo, A/D, D/A

UNIT-IV :Embedded Programming and RTOS 9

MCU - GPIO, WDT, timers/counters, IO, A/D, D/A, PWM, Interrupts, Memory, serial communication UART, I2C, SPI, Peripheral Interfacing OS - basics, types, tasks, process, threads (POSIX Threads), thread preemption, Preemptive Task Scheduling Policies, Priority Inversion, Task communication, Task Synchronization issues - racing and deadlock, binary and counting

semaphores(Mutexexample),choosingRTOS

UNIT-V :Real World Projects

9

IoT Integrated Primary Health Care, Large Scale Face Detection by AI Powered Street Lights, Cloud IoT Systems for Smart Agriculture, Smart Home Gadgets, Autonomous Car Features – speed and horn intensity control.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- Understand basic circuits, sensors and interfacing, data conversion process and shield libraries to interface with the real world
- Program SBC for practical IoT devices using Python
- Explore protocols, data conversion process, Api and expansion boards for real world interaction
- Learn embedded programming constructs and constraints real time systems
- Illustrate IoT prototyping for real world socio-economic problems

TEXT BOOKS:

1. Yamanoor, Sai, and Srihari Yamanoor. Python Programming with Raspberry Pi, 1st edition, Packt Publishing Ltd, 2017.
2. Donald Norris, The Internet of Things: Do-It-Yourself Projects with Arduino, Raspberry Pi, and BeagleBone Black, 1st edition,McGraw Hill Education, 2015

REFERENCES:

1. Marco Schwartz, Home Automation with Arduino, 3rd edition, Open Home Automation 2014.
2. Schwartz, Marco. Internet of things with arduino cookbook, 1st edition, Packt Publishing Ltd,2016.
3. Kooijman, Matthijs. Building Wireless Sensor Networks Using Arduino, 1st edition, Packt Publishing Ltd, 2015.

WEBSITE REFERENCES :

1. <https://elearn.nptel.ac.in/shop/iit-workshops/completed/lab-workshop-on-internet-of-things-iot/>
2. <https://ict.iitk.ac.in/courses/learn-iot-through-arduino-and-raspberry-pi/>
3. https://onlinecourses.swayam2.ac.in/arp20_ap03/preview

CO-PO AND CO-PSO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2				3									
CO2	3													
CO3	3		3	3										
CO4	3													
CO5		3												
AVG	3	3	3	3	3									

JIT1038	INDUSTRIAL IoT 4.0	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To develop knowledge in Industrial Internet of Things (IIoT) fundamentals.
- To understand the architecture, IOT and its protocols
- To Understand the various data analytics techniques
- To Understand the CPS for Industry 4.0
- To provide students with a good depth of knowledge of Designing Industrial IOT Systems for various applications

UNIT-I : Industrial IOT Introduction 9

Introduction to IOT, IOT Vs. IIOT, History of IIOT, Components of IIOT - Sensors and Actuators for Industrial Processes, Role of IIOT in Manufacturing Processes.Challenges & Benefits in implementing IIOT.

UNIT-II:IIoT Architecture 9

Industrial IoT: Business Model and Reference Architecture: IIoT-Business Models, Industrial IoT-Layers: IIoT Sensing, IIoT Processing, IIoT Communication, IIoT Networking

UNIT-III :IIOT ANALYTICS 9

Big Data Analytics and Software Defined Networks, Machine Learning and Data Science, Julia Programming, Data Management with Hadoop.

UNIT-IV : Industrial IoT:CYBER PHYSICAL SYSTEM 9

Introduction to Cyber Physical Systems (CPS), Architecture of CPS- Components, Datascience and technology for CPS, Emerging applications in CPS in different fields. Casestudy: Application of CPS in health care domain.

JIT1039	IoT in HealthCare	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To design products related to IoT based Health care applications
- To Understand and design multidisciplinary approach for design, development,
- To simulate, and implement IoT health care systems.
- To Apply the monitored health parameter sensor output data for further computing, analyzation and visualization.
- To Identify and summarize remote health monitoring and Tele-health.

UNIT-I : INTRODUCTION TO IOT BASED HEALTH CARE 9

Introduction to IoT applications in smart healthcare& their distinctive advantages - Patient Health Monitoring System (PHMS), Tele-Health, TeleMedicine, Tele-Monitoring, Mobile Health Things (m-health).

UNIT-II: IOT SMART SENSING HEATH CARE AND POWER CHALLENGE 9

Concept of Generic Biomedical sensors, Smart Sensors: Monitor health parameters, Wearable ECG sensors, IoT Data Acquisition System, Energy harvesting, Battery based systems, Power management.

UNIT-III : INTERNET OF MEDICAL THINGS 9

Data Confidentially, Data Integrity, Data Protection, Security awareness, Emergent threats: Autonomous, IoT heterogeneity and ubiquity, Physicalenvironment.

UNIT-IVSECURITY AND PRIVACY 9

Security, Privacy and Ethical Issues Smart Health and well-being Applications Risk Analysis Cyber-Physical-Social Systems, Machine Ethics, Physical Safety Software Quality, IT Security, Privacy, Risk of Technology Misuse

UNIT-V :WEARABLE TECHNOLOGIES – CASE STUDIES 9

Soft Skin simulation for Wearable Haptic Rendering, Design Challenges for real wearable computers, Collaboration with wearable computers. IoT Based Contactless Body Temperature Monitor.

JIT1040	Robotics in IOT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn basics of Internet of Things (IoT), and its execution using multiple robotic sensors
- To understand Internet of Robotic Things (IoRT) and its various implementations in industry and automation
- To implement IoT and Robotics application in autonomous driving and health care
- To Learn the design and analysis of Industry 4.0 systems for Energy and smart vehicular applications.
- To understand the Cloud Robotics and Industrial Automation

UNIT-I : Introduction to IoT and Vision systems 9

History and evolution of IoT, AI, ML, Machine Vision, optoelectronic sensors, 3D & 2D machine vision technologies, robot navigation, control schemes, motion controllers, intelligent algorithms and vision systems.

UNIT-II: Robotic Sensors 9

Optical sensors and actuators; Mechanical sensors and actuators; Acoustic sensors and actuators; Performance characteristics of sensors and actuators.

UNIT-III :Internet of Robotic Things 9

Communication architecture for IoRT; Decentralized and automated IoT infrastructure using Blockchain; IoRT Platforms Architecture, IoRT applications

UNIT-IV :Autonomous Vehicle Systems 9

Introduction to Autonomous Driving; Perception in Autonomous Driving; Robot Operating System (ROS) Overview - Client Systems for Autonomous Driving - Decision planning and control in autonomous vehicle systems - Cloud Platform for Autonomous Driving.

UNIT-V :Cloud Robotics and Industrial Automation 9

IoMT and Robotics in Healthcare IoMT Driven connected healthcare, Efficient design for IoMT based healthcare design, Robotics in healthcare, Components of Cloud Robotics; Limitations and challenges of Cloud Robotics; Applications: Autonomous mobile robots, Cloud medical robots, Industrial robots.

TOTAL: 45 HOURS

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

- Understand IoT ecosystem in robotic paradigm
- Analyze IoT infrastructure and develop IoRT applications
- Apply IoT in robotics over different platforms
- Implement Cloud robotics in automations
- Implement automated applications using multiple robotic sensors

TEXT BOOKS:

1. Vermesan, Ovidiu, and Joël Bacquet, eds., Cognitive Hyperconnected Digital Transformation: Internet of Things Intelligence Evolution, 1st edition, River Publishers, 2017.
2. A.K.Gupta, S.K.Arora, and J.Riescher, Industrial Automation and Robotics, 1st edition, Mercury Learning and Information LLC, 2017

REFERENCES:

1. A.K Dubey, A.Kumar, and S.R Kumar., AI and IoT-based Intelligent Automation in Robotics, 1st edition. Wiley, 2020
2. A.E.Hassanien, N.Dey, and S.Borra, Medical Big Data and Internet of Medical Things: Advances, Challenges and Applications, 1st edition, Taylor & Francis Group, 2019
3. S.Liu, L.Li and J.Tang, Creating Autonomous Vehicle Systems, Synthesis Lectures on Computer Science, 1st edition, Morgan & Claypool, 2018
4. Nathan Ida, Sensors, Actuators, and Their Interfaces: A multidisciplinary introduction, 2nd edition The Institution of Engineering and Technology, 2017

WEBSITE REFERENCES :

1. <https://www.udemy.com/course/iot-robotics-hacking-nodemcu/>

CO-PO AND CO-PSO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3		2	2	2						
CO2	3	3	3	3										
CO3	3	3	3	3		1	1	1						
CO4	3	3	3	3		1	1	1						
CO5	3	3	3	3										
AVG	3	3	3	3		2	2	2						

JIT1041	MOBILE APPLICATION DEVELOPMENT FOR IOT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the mobile application development for Internet of Things (IoT) devices
- To deploy various components of mobile devices and essential sensors for various application
- To understand architectures and models used in Mobile
- To understand analytics and security aspects of mobile applications in IoT platforms
- To apply the technologies for low power wireless devices.

UNIT-I : INTRODUCTION TO IOT ECOSYSTEM 9

IoT ecosystem; Industry 4.0; Application development platforms for IoT; IoT Data sources

UNIT-II: SENSOR FOR MOBILE AND HANDHELD DEVICES 9

Temperature sensors, Proximity sensor, IR sensors, Image sensors, Motion detection sensors, Accelerometer sensors, Gyroscope sensors, Optical sensors

UNIT-III: SENSOR DATA PROCESSING 9

Sensor Data-Gathering and Data-Dissemination Mechanisms; Sensor Database system architecture; Sensor data-fusion mechanisms; Data-fusion Architectures and models

UNIT-IV: PROGRAMMING FRAMEWORKS FOR INTERNET OF THINGS 9

IoT Programming Approaches: Node-Centric Programming - Database approach - ModelDriven Development - IoT Programming Frameworks: Android Things - ThingSpeak - IoTivity - Node-RED - DeviceHive - Contiki and Cooja – Zetta

UNIT-V: COMMUNICATION TECHNOLOGIES FOR LOW POWER WIRELESS INTERACTIONS 9

Wireless communications in product development – Bluetooth LE - Near Field Communications (NFC) – WiFi; Prototyping Bluetooth LE with Arduino Nano; Power management strategies and practices Case Study

TOTAL: 45 HOURS

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

- Outlines a fundamental full stack architecture for IoT
- Describes various development technologies in each IoT layer
- Develops IoT applications using standardized hardware and software platforms.
- Creates prototype using low power communication technologies.
- Explains IoT solution development from Product management perspective

TEXT BOOKS:

1. Kale, Vivek. Parallel Computing Architectures and APIs: IoT Big Data Stream Processing 1st edition, CRC Press, 2019.
2. Lea, Perry. Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security, 1st edition, Packt Publishing Ltd, 2018.

REFERENCES:

1. Fadi Al-Turjman, Intelligence in IoT-enabled Smart Cities, 1st edition, CRC Press, 2019
2. Giacomo Veneri, and Antonio Capasso, Hands-on Industrial Internet of Things: Create a powerful industrial IoT infrastructure using Industry 4.0, 1st edition, Packt Publishing, 2018

WEBSITE REFERENCES :

1. <https://www.silabs.com/support/training/app-103-mobile-app-development-for-iot>
2. <https://www.classcentral.com/course/mobile-development-in-iot-73972>

CO-PO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3		2	2	2	3	3	3	3
CO2	3	3	3	3					3	3	3	3
CO3	3	3	3	3		1	1	1	3	3	3	3
CO4	3	3	3	3		1	1	1	3	3	3	3
CO5	3	3	3	3					3	3	3	3
AVG	3	3	3	3		2	2	2	3	3	3	3

JIT1042	COGNITIVE IOT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Introduce cloud computing and enabling technologies
- To Explore the need for fog and edge computation
- To Impart the knowledge to log the sensor data and to perform further data analytics
- Impart the knowledge to log the sensor data and to perform further data analytics
- Make the students to apply Internet of Things (IoT) data for business solution in various domain in secured manner

UNIT-I : Cognitive IoT – Introduction 9

Cognitive IoT, Need for Cognitive IoT, Current and Future trends of IoT, Cognitive computing and applications. Data Analytics for IoT Regression, Data Analytics for IoT ANN Classification, Data Analytics for IoT Modern DNN's

UNIT-II: Secure Fog-Cloud of Things 9

Secure Fog-Cloud of Things: Architectures, Opportunities & Challenges IoT Architecture and Core IoT, Collaborative and Integrated Edge Security Architecture, A connected ecosystem, Threat and security in IoT.

UNIT-III :GPUArchitecture 9

Introduction to GPU's Parallel programming for GPU, Parallel programming in CUDA, CNN

Inference in GPU, CNN Training in GPU. FPGA for Internet of Things Benefits of FPGA, Interfacing FPGAs with IoT-based edge devices, IoT-FPGA based applications, Microsemi's SmartFusion2 SoC FPGA.

UNIT-IV : IoT Enabling Technologies and Devices 9

Big data, Digital twin, Cloud Computing, Sensors, Communications, Analytical software, Edge Devices.

UNIT-V : Security in Cognitive IoT 9

Security in Cognitive IoT, Security Issues in IoT, A hardware assisted approach for security, Architectural level overview for providing security, Security threats. IoT and Edge Security, Physical and hardware security, Shell security, Cryptography, Software-Defined Perimeter, Blockchains and cryptocurrencies in IoT, Government regulations and intervention.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- Integrate the aspects of human cognitive processes in the system design
- Comprehend the underlying cognitive process can have many abstractions of a cognitive cycle such as ‘Sense’, ‘Understand’, ‘Decide’ and ‘Act’.
- Detect any failures of system components and re-configure itself which provides a graceful degradation through self-healing.
- Accomplish knowledge about the application, system architecture, resources, system state and behavior.
- Analyze security issues in IoT applications

TEXT BOOKS:

1. Matin, Mohammad Abdul, ed. Towards Cognitive IoT Networks, 1st edition ,Springer International Publishing, 2020.
2. “IoT and Edge Computing for Architects” Perry Lea,”-second edition, Packt, March,2020. “Secure Edge Computing: Applications, Techniques and Challenges”,
3. Mohiuddin Ahmed (Editor), Paul Haskell-Dowland (Editor), CRC press, first edition, August 2021.

REFERENCES:

1. Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg, Sebastian Lange and Stefan Meissner, Enabling things to talk –Designing IoT solutions with the IoT Architecture Reference Model, 1st edition ,Springer Open, 2016
2. John Mutumba Bilay, Peter Gutsche, Mandy Krimmel and Volker Stiehl, SAP Cloud Platform Integration: The Comprehensive Guide, 2nd edition, Rheinweg publishing.2019.
3. Mahalle, Parikshit Narendra, and Poonam N. Railkar, Identity management for internet of things, 1st edition , River Publishers, 2015.

WEBSITE REFERENCES :

1. <https://learn.microsoft.com/en-us/training/modules/run-cognitive-services-iot-edge/>

CO-PO AND CO-PSO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PO12	PSO1	PSO2
CO1	3	3	3	3		2	2	2						
CO2	3	3	3	3										
CO3	3	3	3	3		1	1	1						
CO4	3	3	3	3		1	1	1						
CO5	3	3	3	3										
AVG	3	3	3	3		2	2	2						

JIT1043	PRIVACY SECURITY FOR IoT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Realize IoT security requirements and management tools
- To know the state-of-the-art methodologies in Cyber Physical system.
- To impart knowledge on Model threats and countermeasures.
- To explore the Privacy Preservation and Trust Models in Internet of Things (IoT)
- To apply the concept of Internet of Things Security in the real world scenarios

UNIT-I : INTRODUCTION: SECURING THE INTERNET OF THINGS 9

Introduction – Security Requirements in IoT architectures – Security in Enabling Technologies – IoT Security Life Cycle – Cryptographic Fundamentals for IoT Security Engineering - Security Concerns in IoT Applications – Basic Security Practices.

UNIT-II: SECURITY ARCHITECTURE IN THE INTERNET OF THINGS 9

Introduction – Security Requirements in IoT – Insufficient Authentication/Authorization – Insecure Access Control – Threads to Access Control, Privacy, and Availability – Attacks Specific to IoT – Malware Propagation and Control in Internet of Things.

UNIT-III : PRIVACY PRESERVATION 9

Privacy Preservation Data Dissemination - Privacy Preservation for IoT used in SmartBuilding – Exploiting Mobility Social Features for Location Privacy Enhancement in Internet of Vehicles – Lightweight and Robust Schemes for Privacy Protection in Key personal IOT Applications: Mobile WBSN and Participatory Sensing.

UNIT-IV :TRUST, AUTHENTICATION AND DATA SECURITY 9

Trust and Trust Models for IoT – Emerging Architecture Model for IoT Security and Privacy – preventing Unauthorized Access to Sensor Data – Authentication in IoT – Computational Security for the IoT – Secure Path Generation Scheme for real-Time Green IoT – Security Protocols for IoT Access Networks

UNIT-V:SOCIAL AWARENESS AND CASE STUDIES 9

User Centric Decentralized Governance Framework for Privacy and Trust in IoT – Policy Based Approach for Informed Consent in IoT - Security and Impact of the IoT on Mobile Networks – Security Concerns in Social IoT – Security for IoT Based Healthcare – Smart cities.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

- Describe the basics of securing Internet of Things.
- Explain architecture and threats in IoT.
- Analyze various privacy schemes related to IoT
- Describe the authentication mechanisms for IoT security and privacy.
- Explain security issues for various applications using case studies

TEXT BOOKS:

1. Shancang Li, Li Da Xu, “Securing the Internet of Things,” Syngress (Elsevier) publication, 2017, ISBN: 978-0-12-804458-2.
2. Fei Hu, “Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations,” CRC Press (Taylor & Francis Group), 2016, ISBN:978-1-4987- 23190.
3. ArshdeepBahga, Vijay Madiseti, “Internet of Things – A Hands-on approach,” VPT Publishers, 2014, ISBN: 978-0996025515.

REFERENCES:

1. Alasdair Gilchris, “Iot Security Issues,” Walter de Gruyter GmbH & Co, 2017.
2. SridiptaMisra, MuthucumarMaheswaran, Salman Hashmi, “Security Challenges and Approaches in Internet of Things,” Springer, 2016. 6. Brian Russell, Drew Van Duren,
3. “Practical Internet of Things Security,” Packet Publishing Ltd, 2016.

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1. https://onlinecourses.nptel.ac.in/noc22_cs23/preview
2. <https://www.coursera.org/lecture/m2m-iot-interface-design-embedded-systems/iot-ecurity/>

CO-PO AND CO-PSO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	-	3	1	-	-	2	2
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CO3	3	3	2	3	1	-	-	1	-	1	2	2
CO4	3	3	3	2	2	-	-	1	1	2	3	2
CO5	3	3	3	3	2	1	1	2	-	2	2	2
AVG	3	3	3	2.0	2	-	2	1	1	2	2	2

VERTICAL V – AI & ML

JAL1401	PRINCIPLES OF ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the various characteristics of a problem solving agent
- To study about the different strategies involved in problem solving
- To learn about solving problems with various constraints.
- To know about knowledge representation in solving AI problems.
- To understand about expert systems.

PREREQUISITES: Data structures

UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND PROBLEM-SOLVING AGENT 9

Problems of AI, AI technique, Tic – Tac – Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal-based agents, utility-based agents, learning agents. Defining the problem as state space search - production system - problem characteristics - issues in the design of search programs.

UNIT II SEARCH TECHNIQUES 9

Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best-first search, A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search.

UNIT III CONSTRAINT SATISFACTION PROBLEMS AND GAME THEORY 9

Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.

UNIT IV KNOWLEDGE & REASONING 9

Statistical Reasoning: Probability and Bayes' Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic. AI for knowledge representation, rule-based knowledge representation, procedural and declarative knowledge, Logic programming, Forward and backward reasoning.

UNIT V EXPERT SYSTEMS 9

Expert systems – Architecture of expert systems, Roles of expert systems – Knowledge Acquisition – Meta knowledge, Heuristics. Typical expert systems – MYCIN, DART, XOON, Expert systems shells.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Acquire knowledge in basics of artificial intelligence

- Use appropriate search algorithms to solve AI based problems
- Design applications with constraints games.
- Understand the representation of knowledge and apply the reasoning techniques to solve real world problems
- Apply AI techniques to real-world problems to develop expert systems.

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, 4th Edition, 2021.
2. Dan W. Patterson – “Introduction to Artificial Intelligence and Expert Systems”, PHI, New Delhi, 2006.
3. Nils J. Nilsson, “Artificial Intelligence: A New Synthesis “(1 ed.), Morgan-Kaufmann, 1998. ISBN 978-1558605350.

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1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, “Artificial Intelligence”, McGraw Hill, 3rd ed.,2017.
2. Patterson,,: Introduction to Artificial Intelligence & Expert Systems”, Pearson, 1st ed. 2015
3. Dheepak Khemani, “A first course in Artificial Intelligence”, McGraw Hill Education Pvt. Ltd., NewDelhi, 2013.
4. Steven Bird, Ewan Klein and Edward Loper, “Natural Language Processing with Python”, O’Reilly, 2009.
5. Peter Jackson, “Introduction to Expert Systems”, 3rd Edition, Pearson Education, 2007.

WEB LINKS:

1. <http://nptel.ac.in/courses/106105079/2>
2. <https://cloudsek.com/blog/intelligent-searching-techniques-in-artificial-intelligence>
3. <https://www.javatpoint.com/constraint-satisfaction-problems-in-artificial-intelligence>
4. <https://ai.plainenglish.io/knowledge-and-reasoning-in-artificial-intelligence-4755d0f5d161>
5. <https://www.guru99.com/expert-systems-with-applications.html>

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	3	-	-	-	2	2	2
CO2	2	3	1	1	1	-	-	-	-	2	2	2
CO3	2	3	2	2	1	-	-	-	-	2	-	-
CO4	2	3	3	3	2	-	-	-	-	2	2	2
CO5	2	2	2	2	2	3	-	-	-	2	1	-
AVG	2	2	2	2	2	3	-	-	-	2	2	2

JAL1501	MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the basic concepts of machine learning.
- To understand and build supervised learning models.
- To understand and build unsupervised learning models.
- To inculcate knowledge on neural networks.
- To evaluate the machine learning algorithms.

PREREQUISITES: Linear Algebra, Data structure

UNIT I INTRODUCTION TO MACHINE LEARNING

9

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

UNIT II SUPERVISED LEARNING

9

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

UNIT III ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING

9

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

UNIT IV NEURAL NETWORKS

9

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

UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS

9

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

TOTAL 45 PERIODS

COURSE OUTCOMES

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

- Explain the basic concepts of machine learning.
- Construct supervised learning models.
- Construct unsupervised learning algorithms.
- Apply neural networks to make intelligent decisions
- Evaluate and analyse machine learning algorithms.

TEXT BOOKS

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

REFERENCES

1. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, “Foundations of Machine Learning”, Second Edition, MIT Press, 2018.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.
3. Sebastain Raschka, Vahid Mirjalili , “Python Machine Learning”, Packt publishing 3rd Edition, 2019.

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1. <https://mitsloan.mit.edu/ideas-made-to-matter/machine-learning-explained>
2. <https://www.simplilearn.com/tutorials/machine-learning-tutorial/supervised-and-unsupervised-learning>
3. <https://www.investopedia.com/terms/n/neuralnetwork.asp>
4. <https://towardsdatascience.com/a-quick-guide-to-managing-machine-learning-experiments-af84da6b060b>

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1	1	2	-	-	-	-	-	-	1
CO2	3	2	3	2	3	-	-	-	-	-	-	1
CO3	3	3	3	3	3	-	-	-	1	-	1	2
CO4	3	3	3	2	3	-	-	-	1	-	1	2
CO5	3	3	3	3	3	-	-	-	3	3	1	1
AVG	2.6	2	2.6	2	2.7	-	-	-	1	1	1	1.4

JAL1601	NEURAL NETWORKS AND DEEP LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce major deep neural network frameworks and issues in basic neural networks.
- To solve real world applications using Deep learning.
- To understand Data augmentation and Optimization.
- To understand Deep-nets and apply for human intuitive applications.
- To understand Transfer Learning strategy

PREREQUISITES: Machine Learning, Python programming

UNIT I NEURAL NETWORKS 9

Introduction of Artificial Neural Networks (ANN) - Functions in ANN – Activation function, Loss function - L1, L2 - Function approximation, classification / clustering problems – Applications.

UNIT II LEARNING IN DEEP NETWORKS 9

Back propagation training, Learning the weights, Chain rule, Stochastic gradient descent, Sigmoid units and vanishing gradient, Rectified Linear Unit (ReLU) and its variants - Cross entropy for classification and activation, Batch learning

UNIT III IMPROVING DEEP NEURAL NETWORKS 9

Hyper-parameter tuning, Regularization - Dropouts, Minibatch gradient descent, Data Augmentation, Stratification, Generalization Gap – Under-fitting Vs Over-fitting - Optimization – Momentum, Learning rate schedules, AdaGrad, RMSProp and Adam optimization, Internal Co-variant and Batch Normalization, Initialization – weights, Bias.

UNIT IV CONVOLUTION NEURAL NETWORKS AND RECURRENT NETWORKS 9

CNN Operations, Pooling, Basic architecture, Variants of the Basic Convolution Model – Advanced architectures: AlexNet, ResNet and others. Recurrent Neural Networks - Bidirectional RNNs, Encoder, Decoder, Sequence-to-Sequence Architectures, Deep Recurrent Networks, Auto encoders

UNIT V RECURSIVE NEURAL NETWORKS AND TRANSFER LEARNING 9

The Challenge of Long-Term Dependencies, Echo State Networks, Long Short-Term Memory and Other Gated RNNs, Optimization for Long-Term Dependencies, Explicit Memory, Transfer Learning strategy, GAN and their variants, R-CNN , YOLO and SSD

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Understand the methods and terminologies involved in deep neural network, differentiate the learning methods used in Deep-nets.
- Identify and apply suitable deep learning approaches for given application.
- Apply the optimization and normalization techniques.
- Design and develop custom Deep-nets for human intuitive applications.
- Design of test procedures to assess the efficiency of the developed model.

TEXT BOOK(S)

1. Ian Goodfellow Yoshua Bengio Aaron Courville, “Deep Learning”, MIT Press, 2017
2. Michael Nielsen “Neural Networks and Deep Learning” Determination Press

REFERENCE BOOKS

1. N D Lewis, “Deep Learning Step by Step with Python”, 2016
2. Deep Learning: A Practitioner's Approach, Josh Patterson, , O'Reilly Media, 2017
3. Adam Gibson “Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks”, Umberto Michelucci, Apress, 2018.
4. Giancarlo Zaccane, Md. RezaulKarim, Ahmed Menshawy,”Deep Learning with TensorFlow: Explore neural networks with Python” Packt Publisher, 2017.
5. Antonio Gulli, Sujit Pal ,”Deep Learning with Keras”, Packt Publishers, 2017.
6. Francois Chollet,”Deep Learning with Python”, Manning Publications, 2017.

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1. <https://www.techtarget.com/searchenterpriseai/definition/neural-network>
2. <https://www.kibin.com/essay-examples/the-objectives-of-deep-learning-KCApMkQ5>
3. <https://www.telusinternational.com/insights/ai-data/article/difference-between-cnn-and-rnn>
4. <https://datascience.stackexchange.com/questions/70333/recursive-transfer-learning>

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	2	2	-	-	-	-	-	-	1
CO2	2	3	2	2	2	-	-	-	-	-	-	1
CO3	3	3	3	3	3	-	-	-	-	-	-	1
CO4	2	2	2	3	3	-	-	-	-	-	2	1
CO5	2	1	3	3	3	3	-	-	3	-	2	-
AVG	2	2.2	2.4	2.6	2.6	.6	-	-	0.6	-	0.8	0.8

JAL1701	ESSENCE OF NATURAL LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To tag a given text with basic language processing features, design an innovative application using NLP components.
- Implement a rule based system to tackle morphology/syntax of a Language.
- Design a tag set to be used for statistical processing keeping an application in mind.
- Design a Statistical technique for a new application.
- Compare and contrast use of different statistical approaches for different types of applications.

PREREQUISITES: Artificial Intelligence

UNIT I BASICS OF LANGUAGE PROCESSING 9

Regular Expressions - Finite State Automata - Morphology – Finite state transducers - Probabilistic models - N-grams models.

UNIT II SYNTAX ANALYSIS 9

Word classes and Part-of-Speech - Context Free Grammars for English – parsing with context free grammar- Syntax-Features and Unification- Lexicalized and Probabilistic Parsing- Language and Complexity.

UNIT III SEMANTIC ANALYSIS 9

Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus - Representing Linguistically Relevant Concepts -Syntax-Driven Semantic Analysis -Semantic Attachments - Syntax-Driven Analyzer - Robust Analysis - Lexemes and their Senses - Internal Structure - Word Sense Disambiguation -Information Retrieval.

UNIT IV – PRAGMATICS 9

Discourse- Reference Resolution - Text Coherence -Discourse Structure - Dialog and Conversational Agents - Natural Language Generation- Machine Translation - Transfer Metaphor – Interlingua – Statistical Approaches.

UNIT V – INFORMATION EXTRACTION 9

Entity recognition - relation detection - temporal expression analysis and template - filling. Question Answering and Summarization: Information retrieval - factoid question answering, single document summarization - generic multiple document summarization - query - focused summarization.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Acquainted with natural language processing and learn how to apply basic algorithms in this field
- Understand the algorithmic description of the main language levels: morphology, syntax
- Understand semantics, and pragmatics of natural language data - corpora
- Understand basics of knowledge representation, inference
- Elations to the artificial intelligence.

TEXT BOOK(S)

1. Daniel Jurafsky and James, H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing Computational Linguistics, and Speech Recognition”, 2nd Edition Prentice-Hall, 2009.
2. Tanveer Siddiqui and U. S. Tiwary, “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008.
3. James Allen, “Natural Language Understanding”, Benjamin / Cummings Publishing Co., 1995.

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1. Gros, Jones and Webber, “Readings in Natural Language Processing”, Morgan Konfmann Publishers,1986.
2. Popov, “Talking with computers in Natural Language”- Springer – Verlag – 1986.
3. E. Reiter and Robert Date, “Building Natural Language Generation Systems, Cambridge University Press, 2000.

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2. https://www.tutorialspoint.com/natural_language_processing/natural_language_processing_syntactic_analysis.htm
3. <https://www.scaler.com/topics/nlp/elements-of-semantic-analysis/>
4. <https://www.codingninjas.com/codestudio/library/pragmatics-in-nlp>
5. <https://nanonets.com/blog/information-extraction/>

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	-	-	-	-	-	-	-
CO2	2	2	2	2	2	-	-	-	-	-	-	-
CO3	2	3	3	3	3	-	-	-	1		1	1
CO4	3	3	3	3	3	-	-	-	2	2	1	1
CO5	1	1	2	3	3	-	-	-	2	3	3	1
AVG	1.6	2	2.2	2.6	2.6	-	-	-	1	1	1	1

JAL1603	TIME SERIES ANALYSIS AND FORECASTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basic concepts of time series analysis.
- To familiarize the basic statistical methods to modeling, analyzing, and forecasting time series data.
- To learn the application of regression models for forecasting.
- To explore Autoregressive Integrated Moving Average (ARIMA) Models.
- To introduce multivariate time series and forecasting models.

PREREQUISITES: Artificial Intelligence, Python tools

UNIT I INTRODUCTION TO TIMESERIES ANALYSIS 9

Time Series and Forecasting -Different types of data-Internal structures of time series-Models for time series analysis - Autocorrelation and Partial Autocorrelation-Examples of Time series- Nature and uses of forecasting-Forecasting Process-Data for forecasting –Resources for forecasting.

UNIT II STATISTICS BACKGROUND FOR FORECASTING 9

Graphical Displays-Time Series Plots - Plotting Smoothed Data - Numerical Description of Time Series Data - Use of Data Transformations and Adjustments- General Approach to Time Series Modelling and Forecasting- Evaluating and Monitoring Forecasting Model Performance.

UNIT III REGRESSION ANALYSIS AND FORECASTING 9

Introduction - Least Squares Estimation in Linear Regression Models - Statistical Inference in Linear Regression - Prediction of New Observations - Model Adequacy Checking -Variable Selection Methods in Regression - Generalized and Weighted Least Squares- Regression Models for General Time Series Data.

UNIT IV AUTOREGRESSIVE INTEGRATED MOVING AVERAGE (ARIMA) MODELS 9

Linear models for stationary time series - Finite order moving average processes - Finite order autoregressive processes - Mixed autoregressive–moving average Processes – Non stationary processes - Time series model building forecasting ARIMA processes - Seasonal processes.

UNIT V MULTIVARIATE TIME SERIES MODELS AND FORECASTING METHODS 9

Multivariate Time Series Models and Forecasting - Multivariate Stationary Process - Vector ARIMA Models - VectorAR (VAR) Models - Neural Networks and Forecasting - Spectral Analysis – Bayesian Methods in Forecasting.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Explain the basic concepts in time series analysis and forecasting.
- Apply various time series models for forecasting.
- Analyze various time series regression models.
- Distinguish the ARIMA modelling of stationary and non-stationary time series.
- Compare with multivariate times series and other methods of applications.

TEXT BOOKS

1. Douglas C. Montgomery, Cheryl L. Jen – “Introduction To Time Series Analysis and Forecasting”, 2nd Edition, Wiley Series in Probability and Statistics (2015).
2. Dr. Avishek Pal, Dr. Pks Prakash – “Master Time Series Data Processing, Visualization and Modeling Using Python” (2017).

REFERENCE BOOKS

1. Soren Bisgaard Murat Kulahci – “Time Series Analysis and Forecasting by Example, Technical University of Denmark”, Copyright c2011 By John Wiley & Sons, Inc.
2. Peter J. Brockwell Richard A. “Davis Introduction to Time Series and Forecasting” Third Edition. (2016).
3. William W.S. – “Multivariate Time Series Analysis and Applications Wei Department of Statistical Science” Temple University, Philadelphia, PA, SA 2019 John Wiley & Sons Ltd 2019.

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2. <https://b-ok.cc/book/2542456/2fa941>
3. <https://b-ok.cc/book/1183901/9be7ed>
4. <https://www.coursera.org/learn/practical-time-series-analysis>

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	-	-	-	-	-	-	-
CO2	2	3	3	3	3	-	-	-	-	-	-	-
CO3	2	2	3	3	3	-	-		1	-	2	1
CO4	2	3	3	2	3	-	-	2	1	-	2	1
CO5	2	2	3	3	3	-	-	2	1	-	2	1
AVG	2.2	2.6	2.7	2.6	2.7	-	-	1.2	1	-	1.2	1

JAL1602	KNOWLEDGE REPRESENTATION AND REASONING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To learn the concepts of First Order Logics.
- To understand the concepts of Knowledge Engineering and Resolution.
- To acquire the knowledge of Rules, Frames and Structured Description.
- To familiarize the fundamentals of uncertainty and degrees of belief.
- To understand the fundamental concepts of Planning.

PREREQUISITES: Machine Learning

UNIT I INTRODUCTION

9

Introduction: The Key Concepts, Need for Knowledge Representation and Reasoning - The Role of Logic. The Language of First-Order Logic: Introduction-The Syntax- The Semantics-The Semantics-Explicit and Implicit.

UNIT II EXPRESSING KNOWLEDGE AND RESOLUTION

9

Expressing Knowledge: Knowledge Engineering – Vocabulary - Basic Facts -Complex Facts - Terminological Facts Entailments- Other Sorts of Facts. Resolution : The Propositional Case-Handling Variables and Quantifiers – Dealing with Computational Intractability - Backward Chaining - Forward Chaining.

UNIT III RULES, FRAMES AND STRUCTURED DESCRIPTION

9

Rules in Production System: Basic Operation, Working Memory, Production Rules and examples-Conflict Resolution- Applications and Advantages. Frames: objects and frames - Basic frame formalism- Frame examples.Structured Description: Descriptions- A Description Language-Meaning and Entailment- Computing Entailments- Taxonomies and Classification.

UNIT IV UNCERTAINTY AND DEGREES OF BELIEF

9

Non-categorical Reasoning- Objective Probability- Subjective Probability- Vagueness. Explanation and Diagnosis: Diagnosis- Explanation- A Circuit Example.

UNIT V PLANNING

9

Planning in the Situation Calculus - The STRIPS Representation- Planning as a Reasoning Task- Hierarchical Planning - Conditional Planning.

TOTAL 45 PERIODS

COURSE OUTCOMES:

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

- Apply the concept of First Order Logic for knowledge representation.
- Apply the concepts of unification and resolution to solve real time facts.
- Integrate the concepts of rules and frames for real world phenomena.
- Analyze the concept of uncertainty and degrees of belief to find the varying levels of knowledge and confidence level of real time facts.
- Explain the concepts of planning to find the difference between plan space and state space.

TEXT BOOKS

1. Deepak Khemani. "A First Course in Artificial Intelligence," McGraw Hill Education (India), 2013.
2. Ronald J. Brachman Hector J. Levesque ,Morgan Kaufmann,: "Knowledge Representation and Reasoning," 2004.

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1. Murray Shanahan: A Circumscriptive Calculus of Events. Artificial Intelligence 77(2) , pp. 249-284, 1995.
2. John F. Sowa: Knowledge Representation: Logical Philosophical, and Computational Foundations, Brooks/Cole, Thomson Learning, 2000.

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2. <https://www.section.io/engineering-education/forward-and-backward-chaining-in-ai/>
3. https://onlinecourses.nptel.ac.in/noc20_cs30/
4. https://edurev.in/studytube/Uncertainty-Knowledge-Representation/650044ce-8778-4ba2-b440-f37d21c821e6_p
5. <https://www.javatpoint.com/what-is-the-role-of-planning-in-artificial-intelligence>

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	2	2	-	-	-	-	-	-	-
CO2	3	3	3	3	2	-	-	-	-	-	1	-
CO3	2	3	3	3	3	-	-	-	-	-	1	1
CO4	3	3	3	3	2	-	-	2	2	-	1	1
CO5	2	2	2	2	2	-	-	2	2	-	1	1
AVG	2.2	2.6	2.6	2.6	2.2	-	-	1.2	1.2	-	1.2	1

JAL1503	COGNITIVE SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand about the basics of cognitive system.
- To develop algorithms that use AI and machine learning along with human interaction and feedback to help humans make choices/decisions.
- To demonstrate and apply the principal aspects of cognitive science, methods and paradigms
- To get the detailed about appealing new cognitive model for application development.
- To understand how cognitive computing supports human reasoning by evaluating data in context and presenting relevant findings along with the evidence that justifies the answers.

PREREQUISITES: Machine Learning, Artificial Intelligence

UNIT I INTRODUCTION TO COGNITIVE SYSTEMS 9

The Nature of Cognition, Overview, Four Aspects of modeling cognitive systems. Levels of abstraction in modeling cognitive systems - Marr's hierarchy of abstraction, Kelso's hierarchy of abstraction. Paradigms of Cognitive Science- cognitivist paradigm, emergent paradigm.

UNIT II COGNITIVE ARCHITECTURE 9

The cognitivist perspective, The emergent perspective- Desirable characteristics: Realism, Behavioural characteristics, Cognitive characteristics, Functional capabilities, Development, Dynamics - Anatomy – Types of Anatomy - Embodiment and Its Implications, Cognitive architectures such as ACT-R, SOAR, OpenCog, CopyCat, Memory Networks, DeepQA Architecture, Unstructured Information Management Architecture (UIMA), Structured Knowledge.

UNIT III MODELING PARADIGMS 9

Declarative/ logic-based computational cognitive modeling, connectionist models of cognition, Bayesian models of cognition, a dynamical systems approach to cognition. Classical models of rationality, symbolic reasoning and decision making; Formal models of inductive generalization, causality, categorization and similarity; the role of analogy in problem solving

UNIT IV COGNITIVE MODELS OF MEMORY AND LANGUAGE 9

Memory – Types of memory, Computational models: episodic and semantic memory, modeling psycholinguistics (with emphasis on lexical semantics), modeling the interaction of language, memory and learning.

UNIT V COGNITIVE DEVELOPMENT AND SOCIAL COGNITION 9

Piaget- Vygotsky theory of cognitive development - Child concept acquisition, child language learning, acquisition of arithmetic skills. Social interaction. Reading intentions and theory of mind, Business Implications, Building Cognitive Applications, Application of Cognitive Computing and Systems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Apply the paradigm of cognitive computing.
- Use the primary techniques and tools associated with cognitive computing
- Apply cognitive modeling in decision making and problem solving.
- Develop interactive frameworks for modeling the memory and language
- Design simulation models of cognition using different cognitive architectures/models for real world applications.

TEXT BOOKS

1. Vernon, David, “Artificial Cognitive Systems: A Primer”, (The MIT Press) 1st Edition, 2015.
2. The Cambridge Handbook of Computational Psychology, Ron Sun (ed.), Cambridge University Press (2008)

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1. Dawson, M.R.W. (2013) Mind, Body, “World: Foundations of Cognitive Science.” Athabasca University Press: Edmonton
2. Peter Finger, ‘Cognitive Computing: A Brief Guide for Game Changers’, Meghan Kiffler Press, 1st Edition, 2015, ISBN: 973-0-92965251-1
3. Kai Hwang, “Cloud Computing for Machine Learning and Cognitive Applications”, MIT Press Publishers, June 2017 | ISBN: 9780262341110
4. Jay Friedenbergr , Gordon Silverman ,Cognitive Science,An “Introduction to the Study of Mind”, SAGE Publications, Inc, 3rd edition.

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3. <https://www.frontiersin.org/research-topics/9151/language-and-memory-understanding-their-interactions-interdependencies-and-shared-mechanisms>
4. <https://study.com/academy/lesson/cognitive-social-and-emotional-development.html>
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CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	2	-	-	-	-	-	-	-	-
CO2	2	3	2	2	3	-	-	-	-	-	-	1
CO3	3	3	3	3	3	-	-	-	-	-	-	1
CO4	2	2	3	3	3	-	-	2	-	1	-	1
CO5	2	2	3	3	3	3	-	1	-	2	-	
AVG	2.2	2.4	2.6	2.6	2.6	1	-	1	-	1	-	1.2

JAL1702	ROBOTIC PROCESS AUTOMATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Prepare to become Junior RPA Developers.
- Learn the basic concepts of Robotic Process Automation.
- Develop familiarity and deep understanding of UiPath tools.
- Develop the ability to design and create robots for business processes independently.
- Develop skills required to pass UiPath RPA Associate v1.0 Exam.

PREREQUISITES: Artificial Intelligence

UNIT I ROBOTIC PROCESS AUTOMATION (RPA) BASICS 9

History of Automation - Story of Work - Introduction to RPA - RPA vs Automation - RPA and AI - RPA and emerging ecosystem - Industries best-suited for RPA - Processes best-suited for automation.

UNIT II INTRODUCTION TO UIPATH, VARIABLES AND ARGUMENTS 9

UiPath and its Products, Robots and their Types - Studio Overview – Orchestrator - UiPath Studio Installation & Updating - The User Interface - Features of Studio - Building 'Hello World' Automation Project. Variables and their Types - Variables Panel - Scope of a Variable – Arguments - Arguments Panel - Argument Directions - Arguments vs. Variables.

UNIT III SELECTORS AND CONTROL FLOW 9

UI interactions - Input Actions and Input Methods – Containers - Recording and its types - Selectors and their types – Anchors - Fine-tuning Selectors – Sequences - Control Flow and its Types - Decision Control – Loops - Other Control Flow Activities – Flowcharts - Error Handling.

UNIT IV DATA MANIPULATION AND AUTOMATION 9

Data Manipulation and Its importance, String Manipulations - DataTable Manipulations – Collection - Its Types and Manipulations - Extraction and Its Techniques - Automation Techniques.

UNIT V UIPATH ORCHESTRATOR 9

Orchestrator Overview - Publishing a Project to Orchestrator - Orchestrator Functionalities.

TOTAL 45 PERIODS

COURSE OUTCOMES

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

- Become Junior RPA Developers.
- Understand the basic concepts of Robotic Process Automation.
- Understand the UiPath tools.
- Design and create robots for business processes independently.
- Develop projects using UiPath.

TEXT BOOKS

1. Learning Robotic Process Automation: Create Software Robots and Automate Business Processes with the Leading RPA Tool – UiPath, Alok Mani Tripathi, Packt Publishing Ltd., 2018.
2. Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant Paperback, 2018.

REFERENCES

1. Robotic Process Automation Projects: Build real-world RPA solutions using UiPath and Automation Anywhere, Nandan Mullakara, Arun Kumar Asokan, Packt Publishing Ltd., 2020.
2. Tom Tauli, “The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems” 1st Edition,

WEBSITE REFERENCES

1. <https://www.bterrell.com/robotic-process-automation-rpa/basics-rpa>
2. <https://www.soais.com/variables-and-arguments/>
3. <https://docs.uipath.com/studio/docs/control-flow-activities>
4. <https://www.uipath.com/learning/video-tutorials/data-manipulation-with-studio>
5. <https://www.simplilearn.com/tutorials/rpa-tutorial/uipath-orchestrator>

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2	-	-	-	-	-	2	-
CO2	2	2	2	2	2	-	-	-	-	-	-	1
CO3	3	3	3	3	3	-	1	-	-	1	-	1
CO4	2	3	3	3	3	-	1	-	-	1	-	2
CO5	3	3	3	3	3	-	1	-	-	1	-	1
AVG	2.6	2.6	2.6	2.6	2.6	-	0.6	-	-	0.6	0.4	1