Sri

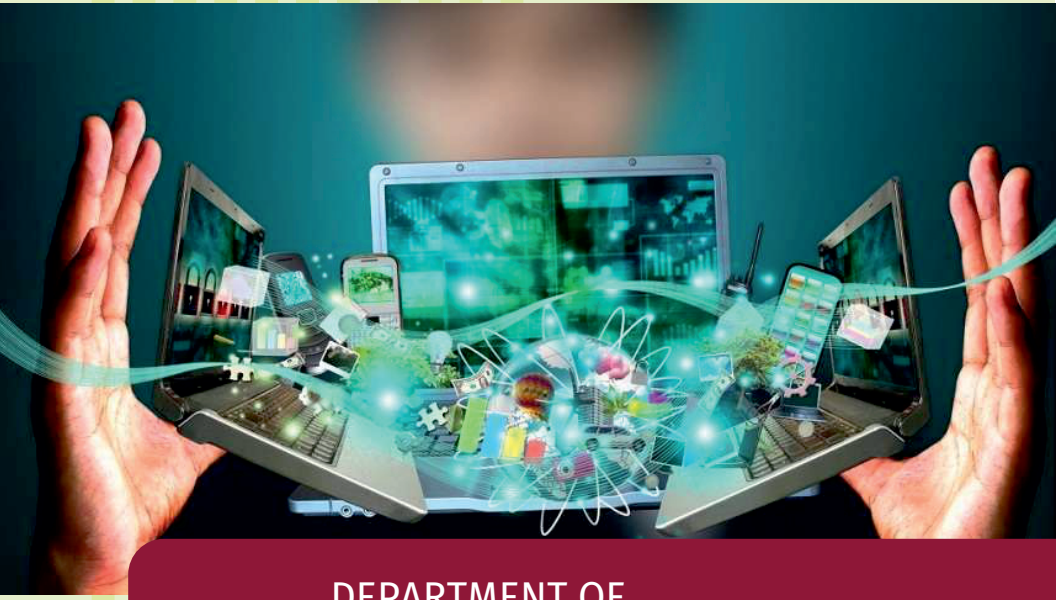
SAI RAM ENGINEERING COLLEGE

An Autonomous Institution

West Tambaram, Chennai - 44

www.sairam.edu.in

Approved by AICTE, New Delhi
Affiliated to Anna University



DEPARTMENT OF
COMPUTER SCIENCE & ENGINEERING
M.TECH. - 5 years Integrated Programme

AUTONOMOUS

CURRICULUM AND

SYLLABUS
I - X
SEMESTERS

REGULATIONS
2020

Academic Year 2021-22 onwards

SRI SAIRAM ENGINEERING COLLEGE

VISION

To emerge as a "Centre of excellence " offering Technical Education and Research opportunities of very high standards to students, develop the total personality of the individual and instil high levels of discipline and strive to set global standards, making our students technologically superior and ethically stronger, who in turn shall contribute to the advancement of society and humankind.

MISSION

We dedicate and commit ourselves to achieve, sustain and foster unmatched excellence in Technical Education. To this end, we will pursue continuous development of infra-structure and enhance state-of-the-art equipment to provide our students a technologically up-to date and intellectually inspiring environment of learning, research, creativity, innovation and professional activity and inculcate in them ethical and moral values.

QUALITY POLICY

We at Sri Sai Ram Engineering College are committed to build a better Nation through Quality Education with team spirit. Our students are enabled to excel in all values of Life and become Good Citizens. We continually improve the System, Infrastructure and Service to satisfy the Students, Parents, Industry and Society.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING - 5 YEARS INTEGRATED

VISION

To be a pioneer in providing industry and research focused integrated curriculum in computer science & engineering and to transform young minds to sustain technically and compete globally with enriched, ethical and moral values to serve the nation & beyond.

MISSION

Department of Computer Science & Engineering - 5 years Integrated Course, Sri Sairam Engineering College is committed to

M1 Accelerate the learning process by collaborating undergraduate fundamentals & postgraduate focused learning & research

M2 Tie-up with industries to facilitate advanced real time projects & internships to bridge gaps between industry & academics

M3 Impart research mindset to provoke innovative thoughts and be responsible for inventions benefitting society

M4 Inculcate moral and ethical values as a part of curriculum to enable interpersonal skills.

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2020

SEMESTER I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20BSMA101	Engineering Mathematics-I	3	1	0	4	4
2	20HSEN101	Technical English-I	3	0	0	3	3
3	20BSPH101	Engineering Physics	3	0	0	3	3
4	20BSCY101	Engineering Chemistry	3	0	0	3	3
5	20ESCS101	Problem Solving and Programming in C	3	0	0	3	3
6	20ESGE101	Engineering Graphics	1	2	0	3	3
PRACTICALS							
7	20BSPL101	Physics and Chemistry Laboratory	0	0	3	3	1.5
8	20ESPL101	Programming in C Laboratory	0	0	3	3	1.5
VALUE ADDITIONS - I							
9	20TPHS101	Skill Enhancement	0	0	2	2	1
10	20HSMG101	Personal Values	2	0	0	2	0
TOTAL						**29**	**23**

SEMESTER II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20BSMA204	Discrete Structures	3	1	0	4	4
2	20HSEN201	Technical English – II	2	0	2	4	3
3	20BSPH203	Physics for Information Science	3	0	0	3	3
4	20BSCY201	Environmental Science and Engineering	3	0	0	3	3
5	20ESIT202	Python Programming	3	0	0	3	3
6	20ESIT203	Digital Principles and System Design	2	1	0	3	3
PRACTICALS							
7	20ESPL201	Python Programming Laboratory	0	0	3	3	1.5
8	20ESPL202	Digital Laboratory	0	0	3	3	1.5
9	20ESGE201	Engineering Practices Laboratory	0	0	3	3	1.5
VALUE ADDITIONS - II							
10	20TPHS201	Skill Enhancement	0	0	2	2	1
11	20HSMG201	Interpersonal Values	2	0	0	2	0
TOTAL						**33**	**24.5**

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2020

SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20BSMA304	Statistics and Linear Algebra	3	1	0	4	4
2	20CJPC301	Object Oriented Programming Using Java and UML	2	1	0	3	3
3	20ITPC301	Data Structures	3	0	3	3	3
4	20ITPC303	Computer Organization & Architecture	3	0	0	3	3
5	20CBPC303	Software Engineering	3	0	0	3	3
PRACTICALS							
6	20ITPL301	Data Structures Laboratory	0	0	3	3	1.5
7	20CJPL301	Object Oriented Analysis and Design Laboratory	0	0	3	3	1.5
VALUE ADDITIONS - III							
8	20CJTE301	Live in Lab- I	0	0	2	2	1
9	20CJTP301	Skill Enhancement	0	0	2	2	1
10	20MGMC301	Constitution of India	2	0	0	2	0
		TOTAL				**28**	**21**

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20BSMA402	Probability and Queueing Theory	3	1	0	4	4
2	20CSPC401	Operating Systems	3	0	0	3	3
3	20CSPC402	Database Management Systems	3	0	0	3	3
4	20CJPC401	Core Java Programming	3	0	0	3	3
5	20ITPC401	Design and Analysis of Algorithms	2	1	0	3	3
PRACTICALS							
6	20CSPL401	Operating Systems Laboratory	0	0	3	3	1.5
7	20CSPL402	Database Management Systems Laboratory	0	0	3	3	1.5
8	20CJPL401	Java Programming Laboratory	0	0	3	3	1.5
VALUE ADDITIONS - IV							
9	20CJTE401	Live in Lab- II	0	0	2	2	1
10	20CJTP401	Skill Enhancement	0	0	2	2	1
		TOTAL				**29**	**22.5**

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2020

SEMESTER V

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20CJPC501	Data Warehousing and Data Mining	3	0	0	3	3
2	20CJPC502	Agile Methodologies	3	0	0	3	3
3	20CSPC502	Theory of Computation	3	0	0	3	3
4	20CJPW501	JEE Framework with laboratory	3	0	2	5	4
5	20CJPC503	Web Technology Foundation	3	0	0	3	3
6	20CSPW401	Computer Networks with Laboratory	3	0	2	5	4
PRACTICALS							
7	20CJPL501	Web Technology Laboratory	0	0	3	3	1.5
VALUE ADDITIONS - V							
8	20CJTE501	Live in Lab - III	0	0	2	2	1
9	20CJTP501	Skill Enhancement (DB)	0	0	2	2	1
		TOTAL				**29**	**23.5**

SEMESTER VI

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20CSPC601	Artificial Intelligence	3	0	0	3	3
2	20CJPC601	Cloud Computing Technologies	3	0	0	3	3
3	20CJPW601	Mobile Application Development (with laboratory)	3	0	2	5	4
4	20XXOLXXX	Open Elective-I	3	0	0	3	3
5	20XXELXXX	Professional Elective I	3	0	0	3	3
PRACTICALS							
6	20CSPL601	Artificial Intelligence Laboratory	0	0	3	3	1.5
7	20CSPL602	Cloud Computing Laboratory	0	0	3	3	1.5
8	20HSPL501	Communication and Soft skills Laboratory	0	0	2	2	1
VALUE ADDITIONS - VI							
9	20CJTP601	Skill Enhancement	0	0	2	2	1
10	20CJTE601	Live in Lab IV	0	0	2	2	1
		TOTAL				**29**	**22**

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2020

SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20CSPC702	Machine Learning Techniques	3	0	0	3	3
2	20ITPC701	Cryptography and Network Security	3	0	0	3	3
3	20XXELXXX	Professional Elective -II	3	0	0	3	3
4	20XXELXXX	Professional Elective -III	3	0	0	3	3
5	20XXOEXXX	Open Elective -II	3	0	0	3	3
PRACTICALS							
6	20CJPL701	Machine Learning Laboratory	0	0	3	3	1.5
7	20ITPL701	Cryptography & Network Security Laboratory	0	0	3	3	1.5
8	20CJPJ701	Innovative Design Project-I	0	0	4	4	1
VALUE ADDITIONS - VII							
9	20CJTP701	Skill Enhancement	0	0	2	2	1
		TOTAL				**27**	**20**

SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
THEORY							
1	20CJPC801	Computer Vision	3	0	0	3	3
2	20CSPC701	Big Data Analytics	3	0	0	3	3
3	20CJPW801	Front End Framework Engineering with Laboratory	3	0	2	5	4
4	20XXELXXX	Professional Elective -IV	3	0	0	3	3
5	20XXELXXX	Professional Elective -V	3	0	0	3	3
PRACTICALS							
6	20CSPL701	Big Data Analytics Laboratory	0	0	3	3	1.5
7	20CJPJ801	Innovative Design Project II	0	0	4	4	2
		TOTAL				**24**	**19.5**

AUTONOMOUS CURRICULA AND SYLLABI
Regulations 2020

SEMESTER IX

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
PRACTICAL							
1	20CJPJ901	Project Phase – I	0	0	24	24	9
		TOTAL				**24**	**9**

SEMESTER X

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
PRACTICAL							
1	20CJPJ1001	Project Phase – II	0	0	24	24	12
		TOTAL				**24**	**12**

PROFESSIONAL ELECTIVES - I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CREDIT	STREAM
			L	T	P		
1	20ESEC502	Microprocessors and Microcontrollers	3	0	0	3	Internet of Things
2	20CSEL503	Distributed Systems	3	0	0	3	Cloud Computing & Security
3	20CSEL505	NoSQL Database	3	0	0	3	Data Science
4	20ITEL706	Computer Graphics and Multimedia	3	0	0	3	Software Engg. & Computing
5	20MGEL501	Intellectual Property Rights	3	0	0	3	Management
6	20CJEL601	Foundation of Cyber Security	3	0	0	3	Cyber security
7	20CSPC602	Compiler Design	3	0	0	3	Software Engg. & Computing
8	20CSEL608	Soft Computing	3	0	0	3	Artificial Intelligence
9	20CSEL703	Information Retrieval Techniques	3	0	0	3	Artificial Intelligence

PROFESSIONAL ELECTIVES - II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CREDIT	STREAM
			L	T	P		
1	20ITEL607	Embedded Systems	3	0	0	3	Internet of Things
2	20CJEL701	Artificial Intelligence: Knowledge Representation and Reasoning	3	0	0	3	Cloud Computing & Security
3	20CSEL604	Bio Informatics	3	0	0	3	Data Science
4	20ITEL601	Software Testing	3	0	0	3	Software Engg. & Computing
5	20MGEL601	Total Quality Management	3	0	0	3	Management
6	20CSEL502	Cyber Forensics	3	0	0	3	Cyber security
7	20CJEL702	R Programming	3	0	0	3	Software Engg. & Computing
8	20CSEL805	Speech Processing	3	0	0	3	Artificial Intelligence
9	20CSEL806	Cognitive Science	3	0	0	3	Software Engg. & Computing
10	20CEJL703	Ethical Hacking	3	0	0	3	Cyber security
11	20CSEL707	Game Programming	3	0	0	3	Internet of Things
12	20CJEL704	Foundation of Cyber Physical Systems	3	0	0	3	Cyber security

PROFESSIONAL ELECTIVES - III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CREDIT	STREAM
			L	T	P		
1	20ITEL709	Internet of Things	3	0	0	3	Internet of Things
2	20ITEL702	Wireless AdHoc and Sensor Networks	3	0	0	3	Cloud Computing & Security
3	20CSEL605	Predictive Modeling	3	0	0	3	Data Science
4	20CSEL601	Software Project Management	3	0	0	3	Software Engg. & Computing
5	20MGEL701	Foundation Skills in Integrated Product Development	3	0	0	3	Management
6	20CJEL705	Cyber Security Principles	3	0	0	3	Cyber security
7	20ITEL701	C# and .Net Programming	2	1	0	3	Software Engg. & Computing
8	20CJEL707	Reinforcement Learning	3	0	0	3	
9	20ITEL802	Virtual & Augmented Reality	3	0	0	3	Data Science
10	20CJEL706	Human Computer Interaction	3	0	0	3	Internet of Things
11	20CJEL709	Artificial Intelligence Methods for Problem Solving	3	0	0	3	Artificial Intelligence
12	20CJEL708	Privacy and Security in Online Social Media	3	0	0	3	Artificial Intelligence Cyber security

PROFESSIONAL ELECTIVES - IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CREDIT	STREAM
			L	T	P		
1	20CSEL606	IoT Architecture, Network & Security	3	0	0	3	Internet of Things
2	20CJEL801	Fundamentals of Open Source Systems	3	0	0	3	Cloud Computing & Security
3	20CSEL701	Social Network Analysis	3	0	0	3	Data Science
4	20ITEL804	Digital Image Processing	3	0	0	3	Software Engg. & Computing
5	20HSMG801	Professional Ethics and Values	3	0	0	3	Management
6	20CSEL803	Block Chain and Crypto Currency Technologies	3	0	0	3	Cyber security
7	20CJEL802	Natural Language Processing	3	0	0	3	Artificial Intelligence
8	20CJEL803	Web Analytics	3	0	0	3	Software Engg. & Computing
9	20CJEL808	Scientific Visualization Techniques	3	0	0	3	Data Science
10	20CJEL804	Entrepreneurship Development	3	0	0	3	Data Science
11	20CJEL805	Data Analytics with Python	3	0	0	3	Data Science
12	20ITEL803	Intrusion Detection Systems	3	0	0	3	Software Engg. & Computing

PROFESSIONAL ELECTIVES - V

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CREDIT	STREAM
			L	T	P		
1	20CSEL706	Multi-core Architectures and Programming	3	0	0	3	Internet of Things
2	20PCNEL308	Information Storage Management	3	0	0	3	Cloud Computing & Security
3	20CSEL802	Deep Learning Principles & Practices	3	0	0	3	Data Science
4	20CJEL806	Advanced Computer Networks	3	0	0	3	Cyber security
5	20HSMG601	Principles of Engineering Management	3	0	0	3	Management
6	20CJEL807	Applied Cryptography	3	0	0	3	Cyber security
7	20CJEL808	Service Oriented Architecture	3	0	0	3	Cloud Computing & Security
8	20CJEL809	Reconfigurable Computing	3	0	0	3	Software Engg. & Computing
9	20CSEL801	Green Computing	3	0	0	3	Cloud Computing & Security
10	20CSEL804	Software Quality Assurance	3	0	0	3	Software Engg. & Computing
11	20CJEL810	Fuzzy Logic and Neural Networks	3	0	0	3	Artificial Intelligence
12	20CSEL702	Software Defined Networks	3	0	0	3	Cloud Computing & Security

HONOURS DATA SCIENCE

S. NO	COURSE CODE	COURSE TITLE
1	20CSEL505	NoSQL Database
2	20CSEL604	Bio Informatics
3	20CSEL605	Predictive Modeling
4	20CSEL701	Social Network Analysis
5	20CSEL802	Deep Learning Principles & Practices
6	20CJEL804	Entrepreurship development
7	20CSEL808	Scientific Visualization Techniques

HONOURS ARTIFICIAL INTELLIGENCE

S. NO	COURSE CODE	COURSE TITLE
1	20CSEL608	Soft Computing
2	20CSEL805	Speech Processing
3	20CJEL706	Human Computer Interaction
4	20CJEL802	Natural Language Processing
5	20CSEL808	Scientific Visualization Techniques
6	20CJEL903	Agent Based Intelligent System

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 Graduates will have solid and sound basics in Mathematics, Scientific and Engineering fundamentals necessary to understand and analyze any problems and design a computer based solution.

PEO 2 Graduates will have the capability to work effectively as Computer Science Engineers, including supportive and leadership roles in multi disciplinary domain and research.

PEO 3 Graduates will have the potential to participate in life-long learning through the successful completion of higher degrees, continuing education, certifications and/or other professional developments.

PEO 4 Graduates will have the ability to apply the gained knowledge to improve the society ensuring ethical and moral values.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1 The Computer Science and Engineering graduates are able to analyze, design, develop, test and apply management principles, mathematical foundations in the development of computational solutions, make them to expert in designing the computer software and hardware.

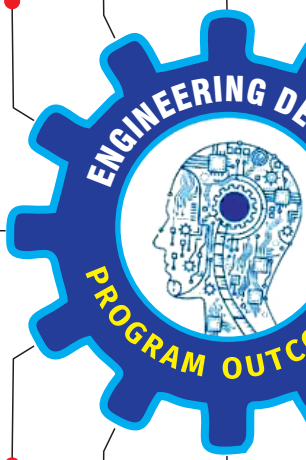
PSO 2 Develop their skills to solve problems in the broad area of programming concepts and appraise environmental and social issues with ethics and manage different projects in inter-disciplinary field.

COMPONENTS OF THE CURRICULUM (COC)

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total Number of credits
Basic Sciences(BS)	14.39	31	29.5
Engineering Sciences(ES)	8.78	24	18
Humanities and Social Sciences (HS)	3.41	11	07
Professional Electives(EL)	8.78	15	15
Program Core+Program Lab (PC+PL)	32.93	89	70.5
Program theory with Lab (PW)	9.76	20	16
Open Electives (OE)	2.93	06	06
Talent Enhancement (TE)	1.95	08	04
Project (PJ)	13.66	56	24
Training & Placement (TP)	3.41	14	07
Internships/Seminars (IS)	0.00	NA	03
Mandatory Courses (MC)	0.00	02	NA
Total number of Credits		276	200

PROGRAMME OUTCOMES(POs)

PROGRAM OUTCOME REPRESENTS THE KNOWLEDGE, SKILLS AND ATTITUDES THAT THE STUDENTS WOULD BE EXPECTED TO HAVE AT THE END OF THE 4 YEAR ENGINEERING DEGREE PROGRAM



01 Engineering knowledge
Apply the basic principle and knowledge of mathematics, science and engineering principles to solve technical problems.

02 Problem Analysis
Identify and analyze complex engineering problems reaching logical conclusions using the basic principles of mathematics, science and engineering.

03 Development of solutions
Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs.

04 Investigate complex problems
Perform investigations, use research based knowledge and conduct experiments, analyze and interpret the results to provide valid conclusions.

05 Modern tool usage
Create, select and apply the latest techniques, resources and modern engineering / IT tools to develop appropriate solutions with an understanding of the limitations.

06 The Engineer and Society
Apply reasoning based on contextual knowledge to assess societal, legal and cultural issues with competency in professional engineering practices.

07 Environment & Sustainability
Demonstrate professional skills, knowledge and contextual reasoning to assess / environmental / societal issues for sustainable development.

08 Apply ethical principles
Apply ethical principles and commit to professional ethics and responsibilities based on the norms of professional engineering pratices.

09 Individual & Teamwork
Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary professional settings.

10 Communicate effectively
Communicate effectively amongst the engineering community, being able to comprehend & write effective reports, make presentations & give/receive clear instructions.

11 Project management
Demonstrate knowledge and apply the principles of engineering & management in their own / team projects in multidisciplinary environments.

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

SEMESTER - I

20BSMA101 SDG NO. 4 & 9	ENGINEERING MATHEMATICS-I	L	T	P	C
		3	1	0	4

OBJECTIVES:

The intent of the course is

- To understand and gain the knowledge of matrix algebra.
- To introduce the concepts of limits, continuity, derivatives and maxima and Minima
- To acquaint the concept of improper integrals and the properties of definite integrals.
- To provide understanding of double integration, triple integration and their application.
- To introduce the concept of sequence and series and impart the knowledge of Fourier series.

UNIT I MATRICES **12**

Symmetric, skew symmetric and orthogonal matrices; Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem (excluding proof) – Diagonalization of a Quadratic form using orthogonal transformation - Nature of Quadratic forms.

UNIT II DIFFERENTIAL CALCULUS **12**

Limits, continuity, Differentiation rules - Maxima and Minima of functions of one variable, partial derivatives (first and second order – basic problems), Taylor's series for functions of two variables, Jacobian, Maxima & Minima of functions of several variables, saddle points; Method of Lagrange multipliers.

UNIT III INTEGRAL CALCULUS **12**

Evaluation of definite integrals - Techniques of Integration-Substitution rule - Integration by parts, Integration of rational functions by partial fraction, Integration of irrational functions. Applications of definite integrals to evaluate surface area of revolution and volume of revolution. Evaluation of improper integrals.

UNIT IV MULTIPLE INTEGRALS **12**

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

UNIT V SEQUENCES AND SERIES **12**

Introduction to sequences and series – power series – Taylor's series – series for exponential, trigonometric, logarithmic, hyperbolic functions – Fourier series – Half range Sine and Cosine series – Parseval's theorem.

TOTAL: 60 PERIODS

TEXTBOOKS:

1. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015.
2. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 11th Reprint, 2010.

REFERENCES:

1. G.B. Thomas and R.L. Finney, "Calculus and Analytic Geometry", 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
3. T. Veerarajan, "Engineering Mathematics for first year", Tata McGraw-Hill, New Delhi, 2008.
4. N.P. Bali and Manish Goyal, "A text-book of Engineering Mathematics", Laxmi Publications, Reprint, 2008.
5. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2014.

WEB REFERENCES:

1. https://math.mit.edu/~gs/linearalgebra/ila0601.pdf
2. http://ocw.mit.edu/ans7870/18/18.013a/textbook/HTML/chapter30/
3. https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/2.-partial-derivatives/
4. http://ocw.mit.edu/ans7870/18/18.013a/textbook/HTML/chapter31/

ONLINE RESOURCES:

1. https://www.khanacademy.org/math/linear-algebra/alternate-bases/eigen-everything/v/linear-algebra-introduction-to-eigenvalues-and-eigenvectors
2. https://www.khanacademy.org/math/differential-calculus

OUTCOMES:

Upon completion of the course, the student should be able to

1. Diagonalize the matrix using orthogonal transformation and apply Cayley Hamilton Theorem to find the inverse and integral powers of a square matrix. (K3)

2. Evaluate the limit, examine the continuity and use derivatives to find extreme values of a function. (K3)
3. Evaluate definite and improper integrals using techniques of integration. (K3)
4. Apply double and triple integrals to find the area of a region and the volume of a surface. (K3)
5. Compute infinite series expansion of a function. (K3)

CO - PO MAPPING :

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

SEMESTER - I

20HSEN101 SDG NO. 4	TECHNICAL ENGLISH - I	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To develop the basic LSRW skills of the students
- To encourage the learners to adapt to listening techniques
- To help learners develop their communication skills and converse fluently in real contexts
- To help learners develop general and technical vocabulary through reading and writing tasks
- To improve the language proficiency for better understanding of core subjects

UNIT I INTRODUCTION 9

Listening – short texts – formal and informal conversations - **Speaking** – basics in speaking – speaking on given topics & situations – recording speeches and strategies to improve - **Reading –** critical reading – finding key information in a given text – shifting facts from opinions - **Writing –** free writing on any given topic – autobiographical writing - **Language Development** – tenses – voices- word formation: prefixes and suffixes – parts of speech – developing hints

UNIT II READING AND LANGUAGE DEVELOPMENT 9

Listening - long texts - TED talks - extensive speech on current affairs and discussions -Speaking – describing a simple process – asking and answering questions - **Reading** comprehension – skimming / scanning / predicting & analytical reading – question & answers – objective and descriptive answers –identifying synonyms and antonyms - process description - **Writing** instructions – **Language Development** – writing definitions – compound words.

UNIT III SPEAKING AND INTERPRETATION SKILLS 9

Listening - dialogues & conversations - **Speaking** – role plays – asking about routine actions and expressing opinions - **Reading** longer texts & making a critical analysis of the given text - **Writing** – types of paragraph and writing essays – rearrangement of jumbled sentences - writing recommendations - **Language Development** – use of sequence words - cause & effect expressions - sentences expressing purpose - picture based and newspaper based activities – single word substitutes

UNIT IV VOCABULARY BUILDING AND WRITING SKILLS 9

Listening - debates and discussions – practicing multiple tasks – self introduction – **Speaking** about friends/places/hobbies - **Reading** -Making inference from the reading passage – Predicting the content of the reading passage - **Writing** – informal letters/e-mails - **Language Development** - synonyms & antonyms - conditionals – if, unless, in case, when and others – framing questions.

UNIT V LANGUAGE DEVELOPMENT AND TECHNICAL WRITING 9

Listening - popular speeches and presentations - **Speaking** - impromptu speeches & debates - **Reading** - articles – magazines/newspapers **Writing** – essay writing on technical topics - channel conversion – bar diagram/ graph – picture interpretation - process description - **Language Development** – modal verbs - fixed / semi-fixed expressions – collocations

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Board of Editors. Using English: A Coursebook for Undergraduate Engineers and Technologists. Orient Blackswan Limited, Hyderabad: 2015.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai, 2011.

REFERENCES:

1. Anderson, Paul V. Technical Communication: A Reader – Centered Approach. Cengage, New Delhi, 2008.
2. Smith-Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason, USA, 2007.
3. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford, 2007.
4. Chauhan, Gajendra Singh and et.al.Technical Communication (Latest Revised Edition). Cengage Learning India Pvt. Limited, 2018.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_hs31/preview
2. http://engineeringvideolectures.com/course/696

ONLINE RESOURCES:

1. https://www.pearson.com/english/catalogue/business-english/technical-english.html
2. https://www.cambridgeenglish.org/learning-english/free-resources/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Express and explain short texts on different topics with key information applying suitable vocabulary (K2)
2 Interpret and dramatize fluently in informal and formal contexts(K2)
3 Choose and apply the right syntax in comprehending diversified general and technical articles (K3)
4 Analyze and write technical concepts in simple and lucid style (K3)
5 Construct informal letters and e-mails thoughtfully (K2)
6 Demonstrate technical concepts and summaries in correct grammar and vocabulary (K2)

CO - PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	1	-	2	3	1	1
CO2	-	-	-	-	-	-	-	1	2	3	2	1
CO3	-	-	-	-	-	-	-	-	1	3	3	2
CO4	-	2	-	-	-	-	-	1	2	3	1	1
CO5	-	-	-	-	-	-	-	2	-	3	2	1
CO6	-	-	-	-	-	-	3	-	-	3	2	1

SEMESTER - I

20BSPH101 SDG NO. 4	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To educate and enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology

UNIT I CRYSTAL PHYSICS 9

Single crystalline, Polycrystalline and Amorphous materials - single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal - Miller indices - Interplanar distance - Powder diffraction method - Debye Scherer formula - Calculation of number of atoms per unit cell - Atomic radius - Coordination number - packing factor for SC, BCC, FCC and HCP structures - Polymorphism and allotropy - Diamond and Graphite structure (qualitative) - Growth of single crystals: Solution and Melt growth Techniques.

UNIT II PROPERTIES OF MATTER 9

Elasticity - Stress - strain diagram and its uses - Poisson's ratio - Relationship between three moduli of elasticity (qualitative) - Factors affecting elastic modulus and tensile strength - Twisting couple - shaft - Torsion pendulum: theory and experiment - bending of beams - bending moment - cantilever: theory and experiment - uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT III QUANTUM PHYSICS 9

Black body radiation - Planck's theory (derivation) - Compton effect: theory -

wave particle duality - electron diffraction - progressive waves - wave equation - concept of wave function and its physical significance - Schrödinger's wave equation - Time independent and Time dependent equations - particle in a box (one dimensional motion) - Tunneling (qualitative) - scanning tunneling microscope.

UNIT IV LASERS AND FIBER OPTICS 9

Lasers: population of energy levels, Einstein's A and B coefficients derivation - pumping methods - resonant cavity, optical amplification (qualitative) - three level and four level laser - CO_2 laser - Semiconductor lasers: Homojunction and Heterojunction.

Fiber optics: Principle, Numerical aperture and Acceptance angle - Types of optical fibers (material, refractive index, mode) - Losses associated with optical fibers - Fiber Optical Communication system (Block diagram) - Fiber optic sensors: pressure and displacement.

UNIT V THERMAL PHYSICS 9

Transfer of heat energy - thermal expansion of solids and liquids - bimetallic strips - thermal conduction, convection and radiation - heat conduction in solids (qualitative) - thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) - thermal insulation - applications: heat exchangers, refrigerators and solar water heaters.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. D.K. Bhattachary & T.Poonam, "Engineering Physics". Oxford University Press, 2015.
2. R.K. Gaur& S.L. Gupta, "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. B.K. Pandey & S.Chaturvedi, "Engineering Physics", Cengage Learning India, 2017.
4. V. Rajendran, "Engineering Physics", Mc Graw Hill Publications Ltd. New Delhi, 2014.
5. M.N. Avadhanulu& P.G. Kshirshagar, "A textbook of Engineering Physics", S. Chand & Co Ltd. 2016.

REFERENCES:

1. D. Halliday, . Resnick & J. Walker, "Principles of Physics", Wiley, 2015.
2. R.A. Serway, & J.W. Jewett, "Physics for Scientists and Engineers", Cengage Learning, 2010.
3. N.K. Verma," Physics for Engineers", PHI Learning Private Limited, 2014.

4. P.A. Tipler & G. Mosca "Physics for Scientists and Engineers", W.H.Freeman, 2020.
5. Brijlal and Subramanyam, "Properties of Matter", S. Chand Publishing, 2018.
6. Shatendra Sharma & Jyotsna Sharma, "Engineering Physics", Pearson, 2018.

OUTCOMES :

Upon completion of the course, the student should be able to

1. To understand the crystal systems and elastic properties of Materials (K2)
2. To distinguish different crystal structures and heat conduction in conductor and insulators (K4)
3. To explain powder diffractionmethod-deformation of materials in response to action load,quantum mechanics to understand wave particle dualism (K2)
4. To apply quantum theory to set up one dimensional Schrodinger's wave equation and applications to a matter wave system and principle of laser action (K3)
5. To analyze bending of beams,types of optical fiber and modes of heat transfer (K4)
6. To discuss light propagation in optical fibers and transfer of heat energy in different measures and its applications (K2)

CO - PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	-	-	-	-	-	-	-	1
CO2	3	2	3	3	-	-	2	-	-	-	-	3
CO3	3	3	3	2	-	-	3	-	-	-	-	2
CO4	3	3	3	3	-	-	-	-	-	-	-	3
CO5	3	3	3	3	-	-	3	-	-	-	-	3
CO6	3	3	3	3	-	-	3	-	-	-	-	3

SEMESTER - I

20BSCY101 SDG NO. 4,6&7	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques
- To illustrate the principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials
- To categorize types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels
- To demonstrate the principles and generation of energy in batteries, nuclear reactors, solar cells, windmills and fuel cells
- To recognize the applications of polymers, composites and nano-materials in various fields

UNIT I WATER TECHNOLOGY AND SURFACE CHEMISTRY 9

Water Technology : Introduction – Hard water and Soft water. Hardness of water – types – expression of hardness (numerical problems). Boiler troubles – scale and sludge, priming and foaming, caustic embrittlement and boiler corrosion. Treatment of boiler feed water – Internal treatment (carbonate, phosphate, calgon, colloidal and sodium aluminate conditioning). External treatment – Ion exchange process, Zeolite process –Domestic water treatment (break point chlorination) –Desalination of brackish water – Reverse Osmosis.

Surface Chemistry: Adsorption – types – adsorption of gases on solids – adsorption of solutes from solution – applications of adsorption –role of adsorbents in catalysis and pollution abatement.

UNIT II ELECTROCHEMISTRY AND CORROSION 9

Electrochemistry: Cells – types (electrochemical and electrolytic cell) Redox reaction – single electrode potential (oxidation potential and reduction potential) – measurement and applications –Nernst equation (derivation and problems) – electrochemical series and its significance.

Corrosion: Causes, factors and types – chemical and electrochemical corrosion (galvanic, differential aeration). Corrosion control – material selection and design aspects, cathodic protection methods (sacrificial anodic and impressed current cathodic method) and corrosion inhibitors. Paints: Constituents and its functions. Electroplating of Copper and electroless plating of Nickel.

UNIT III FUELS AND COMBUSTION 9

Fuels: Introduction – classification of fuels – Coal – analysis of coal (proximate and ultimate). Carbonization – manufacture of metallurgical coke (Otto Hoffmann method) – Petroleum – manufacture of synthetic petrol (Bergius process). Knocking – octane number and cetane number – Gaseous fuels – Compressed natural gas (CNG), Liquefied petroleum gases (LPG). Biofuels – Gobar gas and Biodiesel.

Combustion of Fuels: Introduction – calorific value – higher and lower calorific values- theoretical calculation of calorific value – flue gas analysis (ORSAT Method).

UNIT IV ENERGY SOURCES AND STORAGE DEVICES 9

Energy sources: Nuclear fission – nuclear fusion – differences between nuclear fission and fusion – nuclear chain reactions – nuclear energy – light water nuclear power plant – breeder reactor – solar energy conversion – solar cells – wind energy.

Storage devices: Batteries – types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium–ion–battery), fuel cells – H_2 -O_2 fuel cell and super capacitors.

UNIT V POLYMERS AND NANOMATERIALS 9

Polymers: Classification – types of polymerization – mechanism (Free radical polymerization) –Engineering polymers: Nylon–6, Nylon–6,6, Teflon, Kevlar and PEEK – preparation, properties and uses – Plastic and its types – Conducting polymers – types and applications. Composites – definition, types, polymer matrix composites – FRP.

Nanomaterials: Introduction – Nanoparticles, Nanoclusters, Nanorods, Nanotubes (CNT: SWNT and MWNT) and Nanowires – Properties (surface to volume ratio, melting point, optical and electrical), Synthesis (precipitation, thermolysis, hydrothermal, electrodeposition, chemical vapour deposition, laser ablation, sol-gel process) and Applications.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015.
2. P. C. Jain and Monika Jain, "Engineering Chemistry" DhanpatRai Publishing Company (P) LTD, New Delhi, 2015.
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.
4. Ravikrishnan A, 'Engineering Chemistry', Sri Krishna Hitech Publishing Company Pvt. Ltd, New Edition 2021.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

OUTCOMES

Upon completion of the course, the student should be able to

1. Identify the origin of water resources and develop innovative methods to produce soft water for industrial use and potable water at cheaper cost and recognize the basic design of adsorption systems and its industrial applications. (K2)
2. Recognize the basic concepts of electrochemistry and apply the principles of electrochemistry to corrosion process and the applications of protective coatings to overcome the corrosion. (K2)
3. Disseminating the importance of chemistry of fuels and combustion to enhance the fuel efficiency. (K2)
4. Acquire the basics of non-conventional sources of energy and illustrate the principles and the reaction mechanism of batteries and fuel cells. (K2)
5. Explain the synthesis and applications of polymers, composites and nano-materials. (K2)

CO – PO MAPPING:

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

SEMESTER - I

20ESCS101 SDG NO. 4&9	PROBLEM SOLVING AND PROGRAMMING IN C	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand about the programming language
- To develop C Programs using basic Programming Constructs, Loops Arrays and Strings
- To develop applications in C using Functions , Pointers and Structures
- To perform I/O operations and File Handling in C

UNIT I INTRODUCTION TO PROGRAMMING AND ALGORITHMS FOR PROBLEM SOLVING 10

The Basic Model of Computation, Programming Paradigms- Program Development Life Cycle - Algorithm –Pseudo Code – Flow Chart - Programming Languages - Compilation - Linking and Loading - Testing and Debugging - Documentation - Control Structures – Algorithmic Problem Solving- Problems Based on Sequential, Decision Making - Branching and Iteration.

UNIT II BASICS OF C PROGRAMMING 8

Structure of C program - C programming: Data Types – Storage Classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions – Input / Output Statements - Assignment Statements – Decision making Statements - Switch Statement - Looping Statements – Pre-Processor Directives - Compilation Process

UNIT III ARRAYS AND STRINGS 9

Introduction to Arrays: Declaration, Initialization – One Dimensional Array – Example Program: Computing Mean, Median and Mode - Two Dimensional Arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String Operations: Length, Compare, Concatenate - Copy – Selection Sort - Linear and Binary Search.

UNIT IV FUNCTIONS AND POINTERS 9

Introduction to Functions: Function Prototype, Function Definition, Function Call, Built-in Functions (String Functions, Math Functions) – Recursion – Example Program: Computation of Sine Series - Scientific Calculator using Built-in Functions - Binary Search using Recursive Functions – Pointers – Pointer Operators – Pointer Arithmetic – Arrays and Pointers –

Array of Pointers – Example Program: Sorting of Names – Parameter Passing: Pass by Value - Pass by Reference – Example Program: Swapping of Two Numbers using Pass by Reference.

UNIT V STRUCTURES and FILE PROCESSING 9

Structure - Nested Structures – Pointer and Structures – Array of Structures – Example Program using Structures and Pointers – Self Referential Structures – Dynamic Memory Allocation - Singly Linked List – Typedef.

Files – Types of File Processing: Sequential Access, Random Access – Sequential Access File - Example Program: Finding Average of Numbers stored in Sequential Access File - Random Access File - Example Program: Transaction Processing Using Random Access Files – Command Line Arguments.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2012.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "C How to Program", Seventh edition, Pearson Publication, 2015.
2. Jeri R. Hanly & Elliot B. Koffman, "Problem Solving and Program Design in C", Pearson Education, 2013.
3. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
6. Kanetkar Y, "Let us C", BPB Publications, 2007.
7. Hanly J R & Koffman E.B, "Problem Solving and Programme design in C", Pearson Education, 2009.

WEB REFERENCES:

1. https://www.learn-c.org/
2. https://codeforwin.org/
3. https://www.cprogramming.com/

ONLINE RESOURCES:

1. https://www.linuxtopia.org/online_books/programming_books/gnu_c_programming_tutorial
2. https://nptel.ac.in/courses/106105171
3. https://swayam.gov.in/nd1_noc19_cs42/preview

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the concepts of algorithms for solving a problem. (K2)
2. Illustrate the various constructs in C to develop simple applications. (K3)
3. Understand the concepts of Array & Strings. (K2)
4. Demonstrate the usage of Functions and Pointers. (K3)
5. Explain the Structure and union concepts. (K2)
6. Describe the file manipulation and its organisation.(K2)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1	1	-	2	2	-	3	2	3
CO2	3	3	3	3	2	-	1	1	2	2	3	3	2	3
CO3	3	3	3	3	2	1	1	1	2	-	3	-	3	2
CO4	3	3	3	3	2	1	-	1	2	2	3	3	1	2
CO5	3	3	3	3	2	1	1	1	2	2	3	3	2	1
CO6	3	3	3	3	2	1	1	1	2	2	3	3	3	2

SEMESTER - I

20ESGE101 SDG NO. 4,6,7, 9, 12,14 &15	ENGINEERING GRAPHICS	L	T	P	C
		1	2	0	3

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products
- To visualize the job in three dimensions
- To have a clear conception and appreciation of the shape, size, proportion and design
- To expose the student community to existing national standards related to technical drawings

CONCEPTS AND CONVENTIONS (Not for Examination) 3

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

UNIT I PLANE CURVES AND FREEHAND SKETCHING 6+9

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid on Horizontal Surfaces – construction of involutes of circle for one complete revolution – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF LINES AND PLANE SURFACE 6+9

Orthographic projection- principles-Principal planes- Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method- Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 6+9

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6+9

Sectioning of prisms, pyramids, cylinder and cone in simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and truncated solids in vertical position – Prisms, pyramids cylinder and cone.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+9

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinder, cone- Perspective projection of simple solids-Prisms, pyramids and cylinder by visual ray method.

TOTAL: 78 PERIODS

TEXT BOOKS:

1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.
2. T. Jeyapoovan, "Engineering Graphics using AUTOCAD", Vikas Publishing House Pvt Ltd, 7th Edition.

REFERENCES:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
2. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
3. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
4. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
5. 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.
6. N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
7. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009.

WEB REFERENCES:

1. https://nptel.ac.in/courses/112/103/112103019/

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/105/104/105104148/

PUBLICATION OF BUREAU OF INDIAN STANDARDS:

1. IS10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods

OUTCOMES:

Upon completion of the course, the student should be able to

1. Relate thoughts and ideas graphically in a neat fashion and ability to perform sketching of engineering curves used in engineering practices, multiple views of objects. (K1)
2. Understand the concepts of orthographic projections for basic geometrical constructions. (K2)
3. Acquire the knowledge of orthographic projection in three dimensional object. (K2)
4. Develop knowledge about Sectioning and apply interior shapes of solids. (K3)
5. Analyze the concepts of design in developing various 3 dimensional projections. (K4)
6. Build a strong foundation to analyze the design in various dimensions. (K4)

CO - PO , PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO2	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO3	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO4	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO5	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO6	3	2	2	-	-	-	-	-	2	2	-	2	2	2

SEMESTER - I

20BSPL101 SDG NO. 4	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	3	1.5

PHYSICS LABORATORY

OBJECTIVES:

- To acquaint the students with practical knowledge of physics principles in various fields such as optics, thermal physics and properties of matter for developing basic experimental skills
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis

LIST OF EXPERIMENTS (Any 5 Experiments)

1. Determination of Young's modulus by non-uniform bending method.
2. Determination of rigidity modulus –Torsion pendulum.
3. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
4. (a) Determination of wavelength and particle size using Laser.
   (b) Determination of acceptance angle in an optical fiber.
5. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
6. Determination of specific resistance of a given coil of wire – Carey Foster's bridge.
7. Determination of wavelength of mercury spectrum – spectrometer grating.
8. Determination of band gap of a semiconductor.
9. Determination of Hall coefficient by Hall Effect experiment.
10. Determination of solar cell characteristics.

LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS / 6 (max.) STUDENTS PER EXPERIMENT

1. Young's modulus by non-uniform bending method-experimental set-up – 12 sets
2. Rigidity modulus - Torsion pendulum experimental set-up – 12 sets
3. Ultrasonic Interferometer to determine velocity of sound and compressibility of liquid – 6 sets
4. (a) Experimental set-up to find the wavelength of light, and to find particle size using Laser – 6 sets
   (b) Experimental set-up to find acceptance angle in an optical fiber – 6 sets
5. Lee's disc method- experimental set up to find thermal conductivity of a bad conductor – 6 sets
6. Experimental set-up to find specific resistance of a coil of wire-Carey Foster's Bridge – 6 sets
7. Experimental set-up to find the wavelength of mercury spectrum-spectrometer grating – 6 sets
8. Experimental set-up to find the band gap of a semiconductor – 12 sets
9. Experimental set-up to find the Hall coefficient by Hall Effect Experiment – 6 sets
10. Experimental set-up to study characteristics of solar cells – 6 sets

TEXTBOOKS:

1. J.D. Wilson& C.A. Hernandez Hall "Physics Laboratory Experiments" Houghton Mifflin Company, New York, 2010.
2. M.N. Srinivasan, S. Balasubramanian &R. Ranganathan, "Practical Physics", S. Chand & Sons educational publications, New Delhi, 2011.
3. R. Sasikumar, "Practical Physics", PHI Learning Pvt. Ltd., New Delhi, 2011.

CHEMISTRY LABORATORY

(Any five experiments to be conducted)

OBJECTIVES:

- To acquaint the students with practical knowledge of the basic concepts of chemistry, the student faces during the course of their study in the industry and engineering field
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis
- To understand and develop experimental skills for building technical competence

LIST OF EXPERIMENTS (Any five experiments to be conducted)

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. Determination of strength of given hydrochloric acid using pH meter.
6. Conductometric titration of strong acid vs strong base.
7. Estimation of iron content of the given solution using potentiometer.
8. Estimation of iron content of the water sample using spectrophotometer (1, 10- Phenanthroline / thiocyanate method).
9. Estimation of sodium and potassium present in water using flame photometers.
10. Determination of molecular weights of polymers using Ostwald's Viscometer.

LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS /

6 (MAX.) STUDENTS PER EXPERIMENT.

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample - 6 sets
2. Determination of total, temporary & permanent hardness of water by EDTA method - 6 sets
3. Determination of DO content of water sample by Winkler's method - 6sets
4. Determination of chloride content of water sample by argentometric method – 6 sets
5. Determination of strength of given hydrochloric acid using pH meter - 6 sets
6. Conductometric titration of strong acid vs strong base - 6 sets
7. Estimation of iron content of the given solution using potentiometer - 6 sets
8. Estimation of iron content of the water sample using spectrophotometer (1,10- Phenanthroline / thiocyanate method) - 2 sets
9. Estimation of sodium and potassium present in water using flame photometer - 2 sets
10. Determination of molecular weights of polymer using Ostwald's Viscometer. - 6 sets

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014).

OUTCOMES:

Upon completion of the course, the student should be able to

1. Apply the principles of thermal physics and properties of matter to evaluate the properties of materials and to determine the physical properties of liquid using ultrasonic interferometer. (K1)
2. Understand measurement technique and usage of new instruments in optics for real time application in engineering. (K2)
3. Apply the knowledge of semiconductor materials to evaluate the band gap and Hall coefficient of materials and to study the characteristics of solar cell for engineering solutions. (K3)
4. Interpret quantitative chemical analysis to generate experimental skills in building technical competence. (K3)
5. Analyze the quality of water for domestic and industrial purpose. (K3)

6. Standardize the solutions using volumetric titrations, conductivity, pH, redox potential and optical density measurements. (K3)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	3	3	2	2	1	1	3
CO2	3	3	3	3	3	3	3	2	2	2	2	3
CO3	3	3	3	3	3	3	3	2	1	1	2	3
CO4	3	2	3	3	1	1	2	2	2	2	3	2
CO5	3	2	3	3	1	1	2	2	2	2	3	2
CO6	3	2	3	3	1	1	2	2	2	2	3	2

SEMESTER - I

20ESPL101 SDG NO. 4&9	PROGRAMMING IN C LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To develop programs in C using basic Programming Constructs
- To develop applications in C using Arrays and Strings
- To design and implement applications in C using Functions, Structures
- To develop applications in C using Files

LIST OF EXPERIMENTS

1. Write a program using I/O statements and expressions.
2. Write programs using decision-making constructs.
3. Write a program to find whether the given year is leap year or not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)
4. Write a program to perform the Calculator operations, namely, addition, subtraction, multiplication, division and square of a number.
5. Write a program to check whether a given number is Armstrong number or not?

6. Write a program tocheck whether a given number is odd or even?
7. Write a program to find the factorial of a given number.
8. Write a program to find out the average of 4 integers.
9. Write a program to display array elements using two dimensional arrays.
10. Write a program to perform swapping using function.
11. Write a program to display all prime numbers between two intervals using functions.
12. Write a program to reverse a sentence using recursion.
13. Write a program to get the largest element of an array using the function.
14. Write a program to concatenate two string.
15. Write a program to find the length of String.
16. Write a program to find the frequency of a character in a string.
17. Write a program to store Student Information in Structure and Display it.
18. The annual examination is conducted for 10 students for five subjects. Write a program to read the data and determine the following:
    (a) Total marks obtained by each student.
    (b) The highest marks in each subject and the marks of the student who secured it.
    (c) The student who obtained the highest total marks.
19. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
20. Count the number of account holders whose balance is less than the minimum balance using sequential access file.

TOTAL: 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos.

(or)

Server with C compiler supporting 30 terminals or more.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Solve some simple problems leading to specific applications. (K3)
2. Demonstrate C programming development environment, compiling, debugging, linking and executing a program. (K3)
3. Illustrate C programs for simple applications making use of basic constructs, arrays and strings. (K3)
4. Construct C programs involving functions and recursion. (K3)

5. Demonstrate C programs involving pointers, and structures. (K3)
6. Interpret applications using sequential and random access file. (K3)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1	1	-	2	2	-	3	2	3
CO2	3	3	3	3	2	-	1	1	2	2	3	3	2	3
CO3	3	3	3	3	2	1	1	1	2	-	3	-	3	2
CO4	3	3	3	3	2	1	-	1	2	2	3	3	1	2
CO5	3	3	3	3	2	1	1	1	2	2	3	3	2	1
CO6	3	3	3	3	2	1	1	1	2	2	3	3	3	2

SEMESTER - I

20TPHS101 SDG NO. 4&5	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To enrich social network ethics
- To develop and enhance browsing culture
- To understand the concepts of networking
- To promote self professionalism
- To acquire knowledge about various digital identification procedures

UNIT I SOCIAL NETWORK ETIQUETTES 6

Introduction to social network – Social Networking Etiquettes - Pros and Cons - Usage of Facebook, Instagram, WhatsApp , Telegram, Youtube, Evolution of Android and IOS, Introduction to Linkedin & Benefits. (Practicals – Official Mail id- Linkedin Id Creation, Linkedin Profile Bulilding , Facebook Id and Creation and Modifying the existing FB ID)

UNIT II BROWSING CULTURE 6

Introduction to browsing – Search Engines-Google - Bing -Yahoo!-AOL -MSN –DuckDuckGo ,browsers, phishing – Cookies - URL – https:// extensions , browsing history, Incognito mode- VPN – Pros and Cons – Book mark.

UNIT III NETWORKING **6**

Basics of networking - LAN, MAN, WAN, Introduction to network topologies, Protocols , IP Commands (Command line prompt), Define online complier and editor (Practicals – Find Your System IP,Ping Command, Firewall Fortinet, Basic DOS Commands)

UNIT IV PROFESSIONALISM **6**

Dress Code, Body Language, Appropriate Attire ,Communication Skills, Interview preparation – Introducing yourself - How to greet Superiors, Importance of Eye Contact During conversation.

UNIT V DIGITAL IDENTIFICATION **6**

Introduction to NAD - Importance of Aadhar, PAN Card, Passport, Bank Account, Bar Code, QR scan, Payment Gateway (Gpay, Phone Pe, UPI, BHIM, Paytm), Mobile Banking (Practicals - NAD registration Step by Step, Linking bank account with netbanking , Register for payment gateway).

TOTAL : 30 PERIODS

WEB REFERENCES :

Unit I: Social Network Etiquettes:

1. https://sproutsocial.com/glossary/social-media-etiquette/
2. https://www.shrm.org/resourcesandtools/tools-and-samples/hr-qa/pages/socialnetworkingsitespolicy.aspx
3. https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02711/full
4. https://medium.com/@sirajea/11-reasons-why-you-should-use-telegram-instead-of-whatsapp-ab0f80fbfa79
5. https://buffer.com/library/how-to-use-instagram/
6. https://www.webwise.ie/parents/what-is-youtube/
7. https://www.androidauthority.com/history-android-os-name-789433/
8. https://www.mindtools.com/pages/article/linkedin.htm

Unit II: Browsing Culture:

1. https://sites.google.com/site/bethanycollegeofteacheredn/unit--ict-connecting-with-world/national-policy-on-information-and-communication-technology-ict/accessing-the-web-introduction-to-the-browser-browsing-web
2. https://www.wordstream.com/articles/internet-search-engines-history
3. https://www.malwarebytes.com/phishing/
4. https://www.adpushup.com/blog/types-of-cookies/

5. https://www.eff.org/https-everywhere
6. https://www.sciencedirect.com/topics/computer-science/browsing-history\
7. https://www.vpnmentor.com/blog/pros-cons-vpn/
8. https://www.tech-wonders.com/2016/10/use-hush-private-bookmarking-extension-chrome.html

Unit III:Networking

1. https://www.guru99.com/types-of-computer-network.html
2. https://www.studytonight.com/computer-networks/network-topology-types
3. https://www.cloudflare.com/learning/network-layer/what-is-a-protocol/
4. https://www.howtogeek.com/168896/10-useful-windows-commands-you-should-know/
5. https://paiza.io/en

Unit IV : Professionalism

1. https://career.vt.edu/develop/professionalism.html
2. https://englishlabs.in/importance-dress-code/
3. https://www.proschoolonline.com/blog/importance-of-body-language-in-day-to-day-life
4. https://www.thespruce.com/etiquette-of-proper-attire-1216800
5. https://shirleytaylor.com/why-are-communication-skills-important/
6. https://www.triad-eng.com/interview-tips-for-engineers/
7. https://www.indeed.co.in/career-advice/interviewing/interview-question-tell-me-about-yourself
8. https://toggl.com/track/business-etiquette-rules/

Unit V: Digital Identification

1. https://nad.ndml.in/nad-presentation.html
2. https://www.turtlemint.com/aadhaar-card-benefits/
3. https://www.bankbazaar.com/pan-card/uses-of-pan-card.html
4. https://www.passportindex.org/passport.php
5. https://consumer.westchestergov.com/financial-education/money-management/benefits-of-a-bank-account
6. https://en.wikipedia.org/wiki/QR_code

7. https://www.investopedia.com/terms/p/payment-gateway.asp
8. https://www.paisabazaar.com/banking/mobile-banking/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Learn and apply social network ethics. (K3)
2. Understand the browsing culture. (K2)
3. Analyze the networking concepts . (K4)
4. Develop self professionalism. (K3)
5. Gain hands-on experience in various digital identification procedures. (K2)
6. Analyse and apply the different digital payment gateway methods. (K4)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	3	2	-	3	2	3	-	2
CO2	-	-	-	-	3	2	-	3	2	3	-	2
CO3	-	-	-	-	3	2	-	-	1	3	-	2
CO4	-	-	-	-	3	2	-	3	3	3	-	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2

SEMESTER - I

20HSMG101 SDG NO. 4&5	PERSONAL VALUES	L	T	P	C
		2	0	0	0

OBJECTIVES:

- Values through Practical activities

UNIT I SELF CONCEPT **6**

Understanding self Concept – Identify Yourself – Who am I – an individual, engineer, citizen – Attitude – Measuring Behaviour – Change of Behaviour – Personality – Characteristics in personal, professional life.

UNIT II INDIVIDUAL VALUES **6**

Personal Values – Attributes –Courage – Creativity, Honesty, Perfection, Simplicity, Responsibility – Measuring personal values

UNIT III MORAL VALUES **6**

Moral – Understanding right and wrong – Positive thoughts – Respect to others – Doing good to society.

UNIT IV PHYSICAL AND MENTAL WELL-BEING **6**

Health – Physical fitness –Mental vigour – Diet management – Yoga – Meditation – Peaceful life – Happiness in life

UNIT V DECISION MAKING **6**

Goal Setting – Decision making skill – Overcome of Barriers – Success – Mental strength and weakness

TOTAL: 30 PERIODS

Note:

Each topic in all the above units will be supplemented by practice exercises and classroom activities and projects.

REFERENCE BOOKS:

1. Barun K. Mitra, "Personality Development and Soft Skills", Oxford University Press, 2016.
2. B.N.Ghosh, "Managing Soft Skills for Personality Development" McGraw Hill India, 2012.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Become an individual in knowing the self. (K4)
2. Acquire and express Personal Values, Spiritual values and fitness. (K4)
3. Practice simple physical exercise and breathing techniques. (K2)
4. Practice Yoga asana which will enhance the quality of life. (K1)
5. Practice Meditation and get benefitted. (K1)
6. Understanding moral values and need of physical fitness. (K2)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	2	3	3	1	1	1
CO2	-	-	-	-	-	2	2	3	3	1	1	1
CO3	-	-	-	-	-	2	2	3	3	1	1	1
CO4	-	-	-	-	-	2	2	3	3	1	1	1
CO5	-	-	-	-	-	2	2	3	3	1	1	1
CO6	-	-	-	-	-	2	2	3	3	1	1	1

SEMESTER - II

20BSMA204 SDG NO. 4	DISCRETE STRUCTURES	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To learn the basic concepts of Relations and Functions
- To learn the concepts of Mathematical induction, Permutation and Combination
- To understand the concepts of Logic, Rules of inference and Quantifiers
- To impart the knowledge on Groups, Normal subgroups, Rings and Fields
- To develop Graph Algorithms by using the concepts of Graphs and Trees

UNIT I RELATION AND FUNCTION 12

Binary Relation, Partial Ordering Relation, Equivalence Relation – Sum and Product of functions – Bijective functions – Inverse and composite functions.

UNIT II COMBINATORICS 12

The Principles of Mathematical Induction-The Well-Ordering Principle – Recursive definition – Basic counting techniques – Inclusion and exclusion , Pigeonhole principle – Permutation – Combination.

UNIT III LOGICS AND PROOFS 12

Basic Connectives – Truth Tables – Logical Equivalence: The Laws of Logic, Logical Implication – Rules of Inference – The use of Quantifiers – Proof Techniques: Some Terminology – Proof Methods and Strategies – Forward Proof – Proof by Contradiction – Proof by Contraposition.

UNIT IV ALGEBRAIC STRUCTURES 12

Algebraic Structures with One Binary Operation – Semi Groups, Monoids, Groups, Permutation Groups – Subgroups – Normal subgroups – Algebraic Structures with two Binary Operations - Definition and Examples of Rings and Fields – Boolean Algebra – Identities of Boolean Algebra.

UNIT V GRAPHS AND TREES 12

Graphs and their properties – Degree, Connectivity, Path, Cycle – Sub Graph – Isomorphism – Eulerian and Hamiltonian Walks –Rooted Trees, Trees and Sorting.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications: with Combinatorics and Graph Theory", 7th Edition, Tata McGraw –Hill Education Pvt. Ltd., 2015.
2. J.P. Tremblay and R. Manohar, "Discrete Mathematical Structure with Applications to Computer Science", Tata Mc Graw Hill Education (India) Edition 1997.
3. Narsingh Deo, "Graph theory with applications to Engineering and Computer Science", Prentice Hall Inc., Englewood Cliffs,N.J., 1974.

REFERENCES:

1. Susanna S. Epp, "Discrete Mathematics with Applications", 4th edition, Brooks/Cole, Cengage Learning, 2010.
2. Norman L. Biggs, "Discrete Mathematics", 2nd Edition, Oxford University Press, 2002.
3. Seymour Lipschutz, MarcLipson, "Discrete Mathematics, Schaum's Outlines Series", 3rd edition, McGraw-Hill Education, 2009.
4. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics: A Computer Oriented Approach", 4th Edition, Tata McGraw–Hill Education Pvt. Ltd, 2012.

WEB REFERENCES :

1. https://web.stanford.edu/class/cs103x/cs103x-notes.pdf
2. https://www.cs.cornell.edu/~rafael/discmath.pdf
3. http://home.iitk.ac.in/~arlal/book/mth202.pdf

ONLINE RESOURCES:

1 https://www.youtube.com/watch?v=h_9WjWENWV8&list=PL3o9D 4Dl2FJ9q0_gtFXPh_H4POI5dK0yG
2 https://www.youtube.com/watch?v=xlUFkMKSB3Y&list=PL0862 D1A947252D203.
3 https://www.youtube.com/watch?v=4LlTmsfDS4Y&list=PLEAYk Sg4uSQ2Wfc_l4QEZUSRdx2ZcFziO&index=13
4 https://www.youtube.com/watch?v=jBsEKyx6Rj0&list=PLwdnzl V3ogoVxVxCTlI45pDVM1aoYoMHf
5. https://www.youtube.com/watch?v=rdXw7Ps9vxc&list=PLHXZ9O QGMqxersk8fUxiUMSIx0DBqsKZS

OUTCOMES:

Upon completion of the course, the student should be able to

1. Classify the relations and functions defined on a set. (K2)
2. Apply counting principle and mathematical induction to solve combinatorial problems. (K3)
3. Construct mathematical arguments using logical connectives, quantifiers and verify the correctness of an argument using symbolic logic, truth tables and proof strategies. (K3)
4. Explain the fundamental concepts of algebraic structures such as groups, rings, fields and Boolean algebra. (K3)
5. Illustrate the concepts of graphs and sorting in trees. (K3)

CO- PO MAPPING

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

SEMESTER - II

20HSEN201 SDG NO. 4	TECHNICAL ENGLISH - II	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To strengthen the listening skills for comprehending and critically analyzing passages
- To enhance students' ability with multiple strategies and skills for making technical presentations
- To participate in group discussions for developing group attitude
- To develop skills for preparing effective job application
- To write effective technical reports

UNIT I LANGUAGE DEVELOPMENT 9

Listening – Listening conversations involving two participants – multiple participants – **Speaking** – conversation methods in real life occurrences using expressions of different emotions and imperative usages – **Reading** passages and short stories - **Writing** – preparation of checklist – extended definition – **Language Development** – tenses - subject - verb agreement

UNIT II VOCABULARY BUILDING 9

Listening – listening formal and informal conversation and participative exercises – **Speaking** - creating greetings/wishes/excuses and thanks – **Reading** – articles/novels-**Writing** summary of articles and concise writing identifying new words – homonyms, homophones, homographs – one-word substitutions – easily confused words - creating SMS and using emoticons - sharing information in social media. **Language Development** - reported speeches – regular and irregular verbs - idioms & phrases

UNIT III WRITING TECHNICAL REPORTS 9

Listening – listening conversation – effective use of words and their sound aspects, stress, intonation & pronunciation – **Speaking** - practicing telephonic conversations – observing and responding. **Reading** – regular columns of newspapers/magazines - **Writing** – reports – feasibility, accident, survey and progress - preparation of agenda and minutes – **Language Development** - using connectives – discourse markers

UNIT IV TECHNICAL WRITING 9

Listening – Model debates & documentaries - **Speaking** – expressing agreement/disagreement, assertiveness in expressing opinions – **Reading** biographies/autobiographies – **Writing** – note-making – formal letters – inviting guests – acceptance/declining letters - **Language Development** – degrees of comparison - numerical adjectives – embedded sentences

UNIT V GROUP DISCUSSION AND JOB APPLICATION 9

Listening – Listening - classroom lectures – recommending suggestions & solutions – **Speaking** – participating in group discussion – learning GD strategies – **Reading** – journal articles - Writing – Job application – cover letter - résumé preparation – **Language Development** – purpose statement – editing – verbal analogies.

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Board of editors. Fluency in English: A Course book for Engineering and Technology. Orient Blackswan, Hyderabad 2016.

2. Ashraf Rizvi. M, Effective Technical Communication. 2nd ed. McGraw Hill, New Delhi, 2018.

REFERENCES

1. Bailey, Stephen. Academic Writing: A Practical Guide for Students. Routledge, New York,2011.
2. Raman, Meenakshi and Sharma, Sangeetha. Technical Communication Principles and Practice. Oxford University Press, New Delhi, 2014.
3. Muralikrishnan& Mishra Sunitha, Communication skills for Engineers 2nd ed. Pearson, Tamilnadu, India 2011. P. Kiranmai and Rajeevan, Geetha. Basic Communication Skills, Foundation Books, New Delhi, 2013.
4. Suresh Kumar, E. Engineering English. Orient Blackswan, Hyderabad, 2015
5. Richards, Jack C. Interchange Students' Book – 2. Cambridge University Press, New Delhi, 2015.

WEB REFERENCES :

1. https://swayam.gov.in/nd1_noc20_hs21/preview
2. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/109106122/lec1.pdf
3. https://freevideolectures.com/course/3250/introduction-to-film-studies/10

ONLINE RESOURCES

1. https://www.ef.com/wwen/english-resources/
2. https://www.smilesforlearning.org/gclid=EAIaIQobChMI49DF9bnd6AIVSY6PCh1d_gV9EAAYASAAEgIBPvD_BwE.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Define technical terms with the correct use of grammar (K1)
2 Identify new words, phrases, idioms and summarize articles/ write ups effectively (K2)
3 Pronounce words correctly, speak fluently and share opinions and suggestions effectively in conversations, debates and discussions (K3)
4 Construct reports convincingly and write official letters emphatically (K3)
5 Communicate confidently while speaking and writing by employing language strategies (K2)

6 Adapt group behavior, execute their role as a contributing team member and prepare winning job applications (K3)

CO - PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	2	3	1	2
CO2	-	2	-	-	-	-	-	-	2	3	1	1
CO3	-	-	-	1	-	-	-	2	2	3	1	1
CO4	-	-	-	-	-	2	-	3	2	3	2	2
CO5	-	-	-	-	-	-	-	-	2	3	2	2
CO6	-	-	-	-	-	-	-	2	2	3	1	2

SEMESTER - II

20BSPH203 SDG NO. 4	PHYSICS FOR INFORMATION SCIENCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the essential principles of physics of conducting materials, superconducting and optical properties of materials
- To educate the basic principles of semiconductor device and electron transport properties
- To become proficient in magnetic materials
- To acquire the basic working of nanoelectronic devices

UNIT I CONDUCTING MATERIALS **9**

Classical free electron theory - Expression for electrical conductivity - Thermal conductivity expression - Wiedemann-Franz law - Success and failures - Electrons in metals - Motion of a particle in a three dimensional box (Quantum Mechanical Approach) - degenerate states - Fermi- Dirac statistics - Density of energy states - Electron in periodic potential - Energy bands in solids - Tight binding approximation - Electron effective mass - Concept of hole.

UNIT II SEMICONDUCTOR MATERIALS **9**

Intrinsic Semiconductors - Direct and indirect band gap semiconductors - Carrier concentration in intrinsic semiconductors - extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors - Variation of carrier concentration with temperature - Variation of Fermi level with temperature

and impurity concentration - Carrier transport in Semiconductor: random motion, drift, mobility and diffusion - Hall effect and devices - Ohmic contacts - Schottky diode.

UNIT III MAGNETIC PROPERTIES OF MATERIALS 9

Magnetic dipole moment - atomic magnetic moments - magnetic permeability and susceptibility - Magnetic material classification: diamagnetism - paramagnetism - ferromagnetism - antiferromagnetism - ferrimagnetism - Ferromagnetism: origin and exchange interaction - Domain Theory - M versus H behaviour - Hard and soft magnetic materials - applications - Magnetic principle in computer data storage - Magnetic hard disc - GMR sensor.

UNIT IV SUPERCONDUCTING & OPTICAL PROPERTIES OF MATERIALS 9

Super conductivity - Type-I and Type-II superconductors - Properties and applications - Classification of optical materials - Carrier generation and recombination processes - Photo current in a P-N diode - Solar cell - LED - Organic LED - Optical data storage techniques and devices.

UNIT V NANO DEVICES 9

Introduction - Size dependence of Fermi energy - Quantum confinement - Quantum structures - Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterials - Tunneling: single electron phenomena and single electron transistor - Quantum dot laser - Carbon nanotubes: Properties and applications.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Jasprit Singh, "Semiconductor Devices: Basic Principles", Wiley 2012.
2. Kasap, S.O., "Principles of Electronic Materials and Devices", McGraw-HillEducation, 2017.
3. Kittel, C., "Introduction to Solid State Physics", Wiley, 2018.
4. S.O.Pillai, "Solid State Physics, New Academic Science", 2017.
5. D.K.Bhattacharya & PoonamTandon., "Physics for Information Science and Electronics Engineering", Oxford Higher Education",2017.

REFERENCES:

1. Garcia, N. & Damask, A., "Physics for Computer Science Students", Springer-Verlag, 2012.
2. Hanson, G.W., "Fundamentals of Nanoelectronics", Pearson Education, 2009.
3. Rogers, B., Adams, J. &Pennathur, S., "Nanotechnology: Understanding Small Systems", CRC Press, 2014.

OUTCOMES:

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

1. Understand the basic concepts of free electron theory of solids and apply it to determine the conducting properties, carrier concentration and effective mass of an electron in conductors (K2)
2. Illustrate the various types of semiconductors based on band gap energy and doping, expression for carrier concentration, Fermi energy and their variations (K2)
3. Apply the suitable semiconducting materials for Hall device, Schottky and tunnel diode fabrication and acquire the basic knowledge of magnetic materials and its classification (K3)
4. Gain the knowledge on the types of superconducting and optical materials, properties of superconductors, mechanism of carrier generation and recombination in optical data storage devices (K2)
5. Apply the semiconducting, ferrimagnetic and superconducting materials in optical devices, data storage devices and magnetic levitation (K3)
6. Understand the basics of 1D, 2D, 3D quantum structures, single electron transport, carbon nanotubes and its applications (K3)

CO - PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	3	-	-	-	-	-	-	1
CO2	3	3	-	-	3	-	2	-	-	-	-	3
CO3	3	3	-	2	3	-	3	-	-	-	-	2
CO4	3	3	3	2	3	-	3	-	-	-	-	3
CO5	3	3	3	3	3	-	3	-	-	-	-	3
CO6	3	3	3	2	3	-	-	-	-	-	-	1

SEMESTER - II

20BSCY201 SDG NO. 4,17	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study the nature and facts about environment
- To find and implement scientific, technological, economic and political solutions to environmental problems
- To study the interrelationship between living organism and environment
- To provide the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 9

Definition, scope and importance of environment – need for public awareness – Ecosystem: concept of an ecosystem – structure and functions of an ecosystem – Biotic and abiotic components – Biogeochemical cycle (C, N & P) – energy flow in the ecosystem – food chains, food webs and ecological pyramids – ecological succession - keystone species. Introduction to biodiversity definition: genetic, species and ecosystem diversity – values of biodiversity – IUCN Red list species classification - endemic, endangered, rare, vulnerable, extinct and exotic species – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – man-wildlife conflicts. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of Terrestrial (Forest, Grassland, Desert) and Aquatic ecosystem (Pond, Lake, River, Estuary and Marine)

UNIT II ENVIRONMENTAL POLLUTION 9

Definition – causes, effects and control measures of: Air pollution, Water pollution, Soil pollution Marine pollution, Noise pollution, Thermal pollution and Nuclear pollution – solid waste management: causes, effects and control measures of municipal solid wastes (MSW) – role of an individual in prevention of pollution – Case studies related to environmental pollution.

Disaster management: floods, earthquake, cyclone and landslides – nuclear holocaust – Case studies.

UNIT III NATURAL RESOURCES 9

Forest resources: Use and over – exploitation, deforestation – Land resources: land degradation, man induced landslides, soil erosion and desertification – Water resources: Use and over- utilization of surface and groundwater – dams-benefits and problems, conflicts over water – Mineral resources: Environmental effects of extracting and using mineral resources – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture – fertilizer – pesticide problems, water logging and salinity. Energy resources: Renewable energy (Solar energy, Wind energy, Tidal energy, Geothermal energy, OTE, Biomass energy) and non renewable energy (Coal, Petroleum, Nuclear energy) sources. – role of an individual in conservation of natural resources. Case studies – timber extraction, mining, dams and their effects on forests and tribal people.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 10

Atmospheric Chemistry - Composition and structure of atmosphere. Climate change - greenhouse effect- role of greenhouse gases on global warming. Chemical and photochemical reactions in the atmosphere - Formation of smog, PAN, acid rain (causes, effect and control measures). Oxygen and ozone chemistry - Ozone layer depletion (causes, effect and control measures). environmental ethics: Issues and possible solutions – Green chemistry - 12 principles of green chemistry.

Urbanisation - Urban problems related to energy - Water conservation: rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns - case studies. Environment Legislations and Laws : Environment (protection) act – 1986. Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act. Biomedical Waste(Management and Handling rules):1998 and amendments- scheme of labelling of environmentally friendly products (Ecomark) - Issues involved in enforcement of environmental legislation - central and state pollution control boards, role of non-governmental organization – Public awareness - Environmental Impact Assessment (EIA).

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 8

Population growth, variation among nations – population explosion – family welfare programme – women and child welfare environment and human health – HIV / AIDS – Role of Information Technology in environment and Human health – Case studies – human rights – value education – Sustainable Development – Need for sustainable development – concept – 17 SDG goals – 8 Millennium Development Goals(MDG).

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
3. Ravikrishnan A, 'Environmental Science and Engineering', Sri Krishna Hitech Publishing Company Pvt. Ltd, Revised Edition 2020.

REFERENCES :

1. Dharmendra S. Sengar, "Environmental law", Prentice hall of India Pvt Ltd, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) Pvt Ltd., Hydrabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India Pvt. Ltd., Delhi, 2014.
4. Rajagopalan. R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.

OUTCOMES:

Upon successful completion of this course, student should be able to

1. Explain the different components of environment, structure and function of an ecosystem, importance of biodiversity and its conservation. (K1)
2. Aware about problems of environmental pollution, its impact on human and ecosystem, control measures and basic concepts in Disaster Management. (K2)
3. Disseminate the need for the natural resources and its application to meet the modern requirements and the necessity of its conservation. (K2)
4. Illustrate the various aspects of atmospheric chemistry with a focus on climate change and recognize the principles of green chemistry. Describe suitable scientific, technological solutions and Protection Acts to eradicate social and environmental issues. (K2)
5. Recognize the need for population control measures and the environmental based value education concepts to achieve the Sustainable Development Goals. (K2)

CO - PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	-	-	1	2	-	1	1	-	2
CO2	2	2	2	-	2	2	3	1	2	2	-	2
CO3	1	1	1	1	-	1	1	-	1	2	-	1
CO4	2	2	2	2	1	1	1	-	1	1	1	1
CO5	2	2	1	-	-	1	1	-	-	-	1	-
CO6	1	1	1	1	1	1	1	1	1	1	1	1

SEMESTER - II

20ESIT202 SDG NO. 4&9	PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To develop simple Python programs with conditionals and loops
- To define Python functions and to implement lists, tuples, dictionaries and sets
- To perform file operations and understand OO concepts in Python
- To understand NumPy, Pandas and Matplotlib

UNIT I BASICS OF PYTHON PROGRAMMING 9

Introduction to Python – Literals – Variables and Identifiers – Data Types – Input Operation – Comments – Reserved words – Indentation – Operators and Expressions - Conditionals: Boolean values and operators - conditional if - alternative if - chained conditional - Iteration - Illustrative programs: Evaluation of expressions - String Operations - Circulate the values of n variables - Square root (Newton's method) - GCD - Sum an Array of Numbers.

UNIT II STRING, LISTS, TUPLES, DICTIONARIES, SETS 9

Strings: String slices - Immutability - String functions and methods - String module - Lists: List operations - List slices - List methods - List loop - Mutability - Aliasing - Cloning lists - List parameters - Tuples: Tuple assignment - Tuple as return value.

Dictionaries: Operations and Methods - Advanced list processing - List comprehension - Sets: Creating Sets – Operations and methods – Set comprehension - Illustrative programs: Linear search - Binary search - Selection sort - Insertion sort - Merge sort.

UNIT III FUNCTIONS, MODULES, PACKAGES 9

Functions - definition and use - Flow of execution - Parameters and arguments - Fruitful functions: Return values - Parameters - Local and global scope - Function composition - Recursion - Modules – from import statement – Name of Module – Making your own modules - Packages - Packages in Python – Standard Library Modules – Globals(), Locals() and Reload(); Illustrative programs: Fibonacci series using functions - Arithmetic operations using module - Area of different shapes using packages.

UNIT IV FILES, EXCEPTIONS, CLASSES AND OBJECTS 9

Files and exception: Text files - Reading and writing files - Format operator - Command line arguments - Errors and exceptions - Handling exceptions - Classes and Objects: Defining classes - Creating Objects – Data abstraction – Class constructor – Class variables and Object variables – Public and Private data members – Private Methods; Illustrative programs: Word count - Copy file - Creating user defined exception - Creating student class and object.

UNIT V NUMPY, PANDAS, MATPLOTLIB 9

Introduction - Basics of NumPy - N-dimensional Array in NumPy - Methods and Properties - Basics of SciPy - Broadcasting in NumPy Array Operations - Array Indexing in NumPy, Pandas - Introduction - Series - DataFrame - Matplotlib - Basics - Figures and Axes - Method subplot() - Axis container Illustrative Programs: Multiplying a Matrix by a Vector, Solving Linear System of Equations - Using Pandas to Open CSV files - Creating a Single plot.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Reema Thareja, “Python Programming Using Problem Solving Approach”, Oxford University Press 2018.
2. Anurag Gupta, G.P. Biswas, “Python Programming: Problem Solving, Packages and Libraries”, McGrawHill, 2020.

REFERENCES:

1. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, Second edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
2. Guido van Rossum and Fred L. Drake Jr, “An Introduction to Python – Revised and updated for Python 3.2", Network Theory Ltd., 2011.
3. John V Guttag, “Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013
4. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India

Education Services Pvt. Ltd., 2016.
5. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
6. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
7. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus", Wiley India Edition, 2013.
8. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.

WEB REFERENCES:

1. http://greenteapress.com/wp/think-python/
2. www.docs.python.org
3. https://nptel.ac.in/courses/106/106/106106182/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the syntax and semantics, string operations of python programming language (K2)
2. Develop python programs using control flow statements.(K3)
3. Construct various Data structures to develop python programs. (K3)
4. Illustrate the concepts of Functions, Modules and Packages in Python.(K3)
5. Understand the concepts of Object Oriented Programming, files and Exception handling.(K2)
6. Examine various problem solving concepts in python to develop real time applications.(K4)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	1	0	0	1	0	1	2	2
CO2	3	3	3	3	3	1	0	0	0	0	0	1	2	2
CO3	3	3	3	3	3	2	1	0	0	0	0	1	2	2
CO4	3	3	3	3	3	2	1	0	0	0	0	1	2	2
CO5	3	3	3	3	3	2	2	1	0	2	0	2	3	3
CO6	3	3	3	3	3	3	3	2	3	2	3	2	3	3

SEMESTER - II

20ESIT203 SDG NO. 4 & 9	DIGITAL PRINCIPLES AND SYSTEM DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To analyze and design combinational circuits
- To analyze and design synchronous and asynchronous sequential circuits
- To understand Programmable Logic Devices
- To write HDL code for combinational and sequential circuits

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 – Introduction to HDL – HDL Models of Combinational circuits.

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 – HDL Models of Sequential Circuits.

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

TEXT BOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog", 6th Edition, Pearson Education, 2017.

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 Mc Graw Hill, 2003.

ONLINE RESOURCES:

1. https://ocw.mit.edu/courses/online-textbooks/
2. https://nptel.ac.in/courses/117105080/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understanding Boolean algebra, number systems and simplify Boolean functions using Kmap. (K2)
2. Understand the Combinational and sequential Circuits. (K2)
3. Demonstrate the use of Combinational Circuits and Sequential circuits (K3)
4. Interpret the designs using Programmable Logic Devices. (K3)
5. Apply HDL code for combinational and Sequential Circuits. (K3)
6. Interpret and troubleshoot logic circuits. (K3)

CO – PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	2	-	-	-	-	-	-	-	-	3	1	-	-
CO3	-	2	3	-	-	-	-	-	-	-	3	1	-	-
CO4	-	-	-	-	-	-	-	-	-	-	3	-	-	-
CO5	-	-	-	-	1	-	-	-	-	-	-	2	-	-
CO6	-	-	-	-	-	-	-	-	-	-	3	-	-	-

SEMESTER - II

20ESPL201 SDG NO. 4	PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- Develop Python programs with conditionals, loops and functions
- Represent compound data using Python lists, tuples, dictionaries
- Read and write data from/to files in Python
- Implement NumPy, Pandas, Matplotlib libraries

LIST OF EXPERIMENTS :

1 Compute the GCD of two numbers
2 Find the maximum and minimum of a list of numbers
3 Linear search and Binary search
4 Selection sort, Insertion sort
5 Merge sort, Quick Sort
6 First n prime numbers
7 Multiply matrices
8 Programs that take command line arguments (word count)
9 Find the most frequent words in a text read from a file
10 Exception Handling – License Process
11 Classes and Objects – Student class
12 Solving Linear System of Equations
13 Using Pandas to Open csv files
14 Creating a Single plot
15 Creating Scatter plot, Histogram

TOTAL: 45 PERIODS

LAB REQUIREMENTS

Python 3

OUTCOMES

On completion of the laboratory course, the student should be able to

1. Illustrate simple programs for describing the syntax, semantics and control flow statements. [K3]
2. Describe the core data structures like String, lists, dictionaries, tuples and sets in Python to store, process and sort the data. [K2]
3. Interpret the concepts of functions, modules and packages in Python. [K3]
4. Illustrate the applications of python libraries. [K3]

5. Describe the file manipulation and its operations. [K2]
6. Demonstrate exceptions and classes and objects for any real time applications. [K3]

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	1	2	1	2	-	-	-	1	-	3	3	-	1
CO2	1	2	3	3	3	2	1	1	1	1	1	3	1	2
CO3	-	1	3	3	2	1	-	-	-	-	1	3	-	1
CO4	1	2	3	3	2	-	-	-	-	-	1	3	1	2
CO5	-	-	3	3	2	-	-	1	-	-	2	3	-	-
CO6	-	-	3	3	2	-	-	1	-	-	2	3	-	-

SEMESTER - II

20ESPL202 SDG NO. 4 & 9	DIGITAL LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To design and implement the various combinational circuits
- To design and implement combinational circuits using MSI devices
- To design and implement sequential circuits
- To understand and code with HDL programming

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:
   a) 4 bit binary adder/subractor
   b) Parity generator/checker
   c) Magnitude comparator
5. Application using multiplexers
6. Design and implement shift-registers

7. Design and implement synchronous counters
8. Design and implement asynchronous counter
9. Coding combinational circuits using HDL
10. Coding sequential circuits using HDL
11. Design and implementation of a simple digital system (Mini Project)

LAB REQUIREMENTS:

HARDWARE:

DIGITAL TRAINER KITS

DIGITAL IC's required for the experiments in sufficient numbers

SOFTWARE:

HDL, Verilog simulator

TOTAL: 45 PERIODS

OUTCOMES

On completion of the laboratory course, the student should be able to

1. Implement simplified combinational circuits using basic logic gates. (K6)
2. Implement combinational circuits using MSI devices. (K6)
3. Implement sequential circuits like registers and counters.(K6)
4. Simulate combinational and sequential circuits using HDL.(K4)
5. Implement designs using Programmable Logic Devices. (K6)
6. Design and implementation of a simple digital system.(K6)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	2	1	1	-	2	2	-	2	1	1
CO2	3	3	3	2	3	2	1	1	2	2	2	3	1	1
CO3	2	3	3	3	3	2	2	1	2	2	2	3	1	1
CO4	3	3	3	3	3	2	2	1	3	3	3	3	1	1
CO5	2	3	3	2	2	-	-	2	-	2	2	2	1	1
CO6	2	3	3	2	2	1	-	-	2	2	3	2	1	1

SEMESTER - II

20ESGE201 SDG NO. 4,9,12	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	3	1

OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Electrical and Electronics Engineering, Civil and Mechanical Engineering

ELECTRICAL ENGINEERING PRACTICE

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.

ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
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.

CIVIL ENGINEERING PRACTICE

Buildings:

Study of plumbing and carpentry components of residential and industrial buildings, safety aspects.

Plumbing Works:

1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
2. Study of pipe connections requirements for pumps and turbines.
3. Preparation of plumbing line sketches for water supply and sewage works.

4. Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
5. Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

1. Study of the joints in roofs, doors, windows and furniture.
2. Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

MECHANICAL ENGINEERING PRACTICE

Welding:

1. Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
2. Gas welding practice.

Basic Machining:

1. Simple Turning and Taper turning.
2. Drilling Practice.

Sheet Metal Work:

1. Forming & Bending.
2. Model making – Trays and funnels.
3. Different type of joints.

Machine assembly practice:

1. Study of centrifugal pump.
2. Study of air conditioner.

Demonstration on:

1. Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
2. Foundry operations like mould preparation for gear and step cone pulley.
3. Fitting – Exercises – Preparation of square fitting and V – fitting models.

Total : 45 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

1. 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:	
	Range Finder	2 Nos
	Digital Live-wire detector	2 Nos

2. Electronics

1	Soldering guns	10 Nos
2	Assorted electronic components for making circuits	50 Nos
3	Small PCBs	10 Nos
4	Multimeters	10 Nos

3. 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:	
	Rotary Hammer	2 Nos
	Demolition Hammer	2 Nos
	Circular Saw	2 Nos
	Planer	2 Nos
	Hand Drilling Machine	2 Nos
	Jigsaw	2 Nos

4. 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

OUTCOMES:

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

1. Elaborate on the components, gates, soldering practices. Calculate electrical parameters such as voltage, current, resistance and power. (K1)
2. Design and implement Rectifier and Timer circuits (K2)
3. Measure the electrical energy by single phase and three phase energy meters. (K2)
4. Prepare the carpentry and plumbing joints. (K2)
5. Perform different types of welding joints and sheet metal works (K2)
6. Perform different machining operations in lathe and drilling. (K2)

CO - PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	1	-	-	1	1	1	1
CO2	3	2	1	1	2	1	-	-	1	1	1	1
CO3	2	2	1	1	1	1	-	-	1	1	1	1
CO4	1	1	1	-	-	2	-	-	1	1	1	2
CO5	2	1	1	-	-	1	1	1	1	1	1	2
CO6	2	1	1	-	-	1	-	1	1	1	1	2

SEMESTER - II

20TPHS201 SDG NO. 4&5	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To understand the nuances in resume building
- To explore various virtual meeting tools
- To gain knowledge about online certification courses
- To develop knowledge in Google Suite products
- To enhance presentation skills

UNIT I RESUME BUILDING **6**

Your Strength, Projects, Internship, Paper Presentation, uploading your coding in github, Introduction to HackerRank, HackerEarth virtual online

assessment (Auto Proctored) (Practicals - Construct a resume, Register for a online Mock Assessment / Contest)

UNIT II VIRTUAL MEETINGS **6**

Basic Etiquette of virtual meeting – Introduction to Skype - Zoom - Webex - Google Meet - Gotowebinar - Jio meet – Screen Share - Jamboard - Feedback polling - Chatbox

(Practicals - Accept and Register for a mock class to attend - How to host a meeting).

UNIT III ONLINE LEARNING **6**

Online Certification - Coursera – Udemy – Edx – Cisco – Online Practice Platforms - SkillRack – Myslate - FACEprep - BYTS - aptimithra - Contest Registrations - TCS Campus Commune - HackwithInfy, InfyTQ - Virtusa NurualHack - Mindtree Osmosis – Online assessment - AMCAT-PGPA.

(Practicals - Campus Commune Registration , Coursera registration - Mock Registration (KAAR Technologies as sample).

UNIT IV GOOGLE SUITE **8**

Define google suite - Benefits of google suite - Google Search - Sheet - Docs - Forms - Calender - Drive - Slide - Translate - Duo - Earch - Maps - Hangouts- Sites - Books - Blogger

(Practicals – Create google sheets and share - Create google Forms and share, Create Google Slide and share , Google drive creation and share (Knowledge of Rights), Create poll and share.

UNIT V PRESENTATION SKILLS **4**

Email Writing – Group Discussion - Power Point Presentation

(Practicals- Create a self SWOT Analysis report. A PowerPoint Slide Preparation)

TOTAL : 30 PERIODS

WEB REFERENCES :

Unit I: Resume Building:

1. https://zety.com/blog/resume-tips
2. https://resumegenius.com/blog/resume-help/how-to-write-a-resume
3. https://www.hackerearth.com/recruit/
4. https://www.hackerrank.com/about-us

Unit – II:Virtual Meetings

1. https://www.claphamschool.org/our-community/blog/online-

learning-etiquette-guide-14-principles-to-guide-students
2. https://online.hbs.edu/blog/post/virtual-interview-tips?c1=GAW_SE_NW&source=IN_GEN_DSA&cr2=search__-__nw__-__in__-__dsa__-__general&kw=dsa__-__general& cr5=459341920955&cr7=c&gclid=Cj0KCQjw8fr7BRDSARIsAK0Qqr4dRRbboL3kltrwDsr7hm8oIHtN5dfjD3NIFZULuzNwEXxhjpNFQ2caApn5EALw_wcB
3. https://hygger.io/blog/top-10-best-group-meeting-apps-business/
4. https://www.zdnet.com/article/best-video-conferencing-software-and-services-for-business/

Unit – III:Online Learning

1. https://www.coursera.org/browse
2. https://support.udemy.com/hc/en-us/articles/229603868-Certificate-of-Completion
3. https://www.edx.org/course/how-to-learn-online
4. https://www.cisco.com/c/en/us/training-events/training-certifications/certifications.html
5. https://campuscommune.tcs.com/en-in/intro
6. https://www.freshersnow.com/tcs-campus-commune-registration/
7. https://www.infosys.com/careers/hackwithinfy.html
8. https://www.mindtree.com/blog/osmosis-2013-my-experiences
9. https://www.myamcat.com/knowing-amcat
10. https://www.admitkard.com/blog/2020/02/06/amcat/

Unit IV: Google Suite

1. https://www.inmotionhosting.com/blog/what-is-g-suite-and-why-should-i-consider-using-it/
2. https://en.wikipedia.org/wiki/G_Suite
3. https://blog.hubspot.com/marketing/google-suite
4. https://kinsta.com/blog/g-suite/

Unit V: Presentation Skills

1. https://www.mindtools.com/CommSkll/EmailCommunication.htm
2. https://www.grammarly.com/blog/email-writing-tips/
3. https://business.tutsplus.com/articles/how-to-write-a-formal-email--cms-29793
4. https://www.softwaretestinghelp.com/how-to-crack-the-gd/
5. https://www.mbauniverse.com/group-discussion/tips
6. https://slidemodel.com/23-powerpoint-presentation-tips-creating-

engaging-interactive-presentations/
7. https://business.tutsplus.com/articles/37-effective-powerpoint-presentation-tips--cms-25421
8 https://blog.prezi.com/9-tips-on-how-to-make-a-presentation-a-success/
9. http://www.garrreynolds.com/preso-tips/design/

OUTCOMES:

On completion of this course, the student should be able to

1. Construct a suitable resume and registration procedure for online mock assessments. (K1)
2. Handle various virtual meeting tools. (K3)
3. Acquire exposure about online certification courses. (K4)
4. Get involved and work in a collaborative manner. (K2)
5. Gain knowledge in various presentation methodologies. (K1)
6. Apply knowledge to practice Google suite features and SWOT analysis. (K3)

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	3	2	-	3	2	3	-	2
CO2	-	-	-	-	3	2	-	3	2	3	-	2
CO3	-	-	-	-	3	2	-	-	1	3	-	2
CO4	-	-	-	-	3	2	-	3	3	3	-	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2

SEMESTER - II

20HSMG201 SDG NO. 4 & 5	INTERPERSONAL VALUES	L	T	P	C
		2	0	0	0

OBJECTIVES:

- Values through Practical activities

UNIT I INTERPERSONAL VALUES **6**

Interpersonal Relationships and Values – Importance and Barriers – Building and maintain relationships – Mutual understanding – Respect to others.

UNIT II EFFECTIVE COMMUNICATION **6**

Communication skills –Importance and Barriers - Impressive formation and management – Public speaking

UNIT III GROUP DYNAMICS **6**

Group formation –Teamwork – Identify others attitude and behaviour – Formation of relationship – Personal and professional.

UNIT IV MUTUAL RELATIONSHIP **6**

Building mutual understanding and cooperation – Enhancing decision making skills – Problem solving skills – Comparative Appraisal – Interpersonal needs.

UNIT V POSITIVE ATTITUDE **6**

Fostering trust and cooperation – Developing and maintain positive attitude – Improving socialization – Development of security and comfort.

TOTAL: 30 PERIODS

Note: Each topic in all the above units will be supplemented by practice exercises and classroom activities and projects.

REFERENCE BOOKS:

1. Barun K. Mitra, "Personality Development and Soft Skills", Oxford University Press, 2016.
2. B.N.Ghosh, "Managing Soft Skills for Personality Development", McGraw Hill India, 2012.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Develop a healthy relationship & harmony with others. (K1)
2. Practice respecting every human being. (K3)
3. Practice to eradicate negative temperaments. (K3)
4. Acquire Respect, Honesty, Empathy, Forgiveness and Equality. (K4)
5. Manage the cognitive abilities of an Individual. (K5)
6. Understanding the importance of public speaking and teamwork. (K2)

CO – PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	2	3	3	1	1	1
CO2	-	-	-	-	-	2	2	3	3	1	1	1
CO3	-	-	-	-	-	2	2	3	3	1	1	1
CO4	-	-	-	-	-	2	2	3	3	1	1	1
CO5	-	-	-	-	-	2	2	3	3	1	1	1
CO6	-	-	-	-	-	2	2	3	3	1	1	1

SEMESTER - III

20BSMA304 SDG NO. 4	STATISTICS AND LINEAR ALGEBRA	L	T	P	C
		3	1	0	4

OBJECTIVES:

- The main objective of this course is to provide students with the foundations of statistics and linear algebra mostly used in varied applications in engineering.

UNIT I BASIC STATISTICS 12

Measures of Central tendency: Moments, Skewness and Kurtosis - Probability distributions - Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation

UNIT II TESTING OF HYPOTHESIS 12

Sampling distributions - Estimation of parameters - Statistical hypothesis - Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means - Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independence) - Goodness of fit.

UNIT III VECTOR SPACES 12

Vector spaces – Subspaces – Linear combinations– Linear independence and linear dependence – Bases and dimensions.

UNIT IV LINEAR TRANSFORMATION AND DIAGONALIZATION 12

Linear transformation - Null spaces and ranges - Dimension theorem - Matrix of a linear transformation - Eigenvalues and eigenvectors - Diagonalizability.

UNIT V INNER PRODUCT SPACES 12

Inner product, norms - Gram Schmidt orthogonalization process - Adjoint of linear operations - Least square approximation.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Michael Baron,"Probability and Statistics for Computer Scientists" second edition, CRC press, USA (Unit-I&II)
2. Howard Anton, Chris Rorres, "Elementary Linear Algebra",Wiley Publications,11th edition,2014(Unit-III,IV&V)

REFERENCES:

1. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition,2004.
2. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 8thEdition, Pearson Education, Asia,2007.
3. Kapur J. N., Saxena H.C., "Mathematical Statistics", 18th Edition, S. Chand & Company Ltd., 1997.
4. Friedberg A.H.,Insel A.J. and Spence L., "Linear Algebra", Prentice Hall of India, New Delhi,2014.
5. Strang G., "Linear Algebra and its applications", Thomson (Brooks/Cole), New Delhi, 2005.
6. Kumaresan S., —"Linear Algebra – A Geometric Approach", Prentice – Hall of India, New Delhi, Reprint, 2010.
7. E. Kreyszig, "Advanced Engineering Mathematics", 8th Edition, John Wiley,1999.

WEB REFERENCES:

1. https://people.richland.edu/james/lecture/m113/
2. https://nptel.ac.in/courses/111105041/
3 https://www.imsc.res.in/~svis/Algebra/Sunder-LinearAlg-notes.pdf

ONLINE RESOURCES:

1. https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/video-lectures/
2. https://www.khanacademy.org/math/statistics-probability/significance-tests-one-sample/more-significance-testing-videos/v/hypothesis-testing-and-p-values

OUTCOMES:

Upon completion of the course, the student should be able to

1. Evaluate the statistical parameters of standard distributions using the concepts of probability. (K3)
2. Apply tests of hypotheses for large and small samples. (K3)
3. Compute correlation coefficient, regression, Chi –square statistic and least square approximation. (K3)

4. Compute basis, dimension, null space, range, matrix of linear transformation (K3)
5. Construct the diagonal form of the linear transformation and find the adjoint of linear operators. (K3)
6. Apply the concept of inner product to compute the orthonormal basis using Gram Schmidt orthogonalization process. (K3)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	-	-	-	-	-	-	1
CO2	3	3	2	1	-	-	-	-	-	-	-	1
CO3	3	3	2	1	-	-	-	-	-	-	-	1
CO4	3	3	2	1	-	-	-	-	-	-	-	1
CO5	3	3	2	1	-	-	-	-	-	-	-	1
CO6	3	3	2	1	-	-	-	-	-	-	-	1

SEMESTER - III

20CJPC301 SDG NO. 4,9	OBJECT ORIENTED PROGRAMMING USING JAVA AND UML	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the object-oriented approach to analyzing and designing systems and software solutions.
- To employ the UML notation and symbols to create effective and efficient system designs.
- To understand Object Oriented programming concepts like Data Abstraction, Encapsulation, constructor and inheritance.
- To analyse different types of constructor and inheritance.
- To design the system using dynamic models

UNIT I INTRODUCTION TO OBJECT ORIENTED TECHNOLOGIES AND THE UML METHOD 9

Description of the real world using the Objects Model - Classes, inheritance and multiple configurations - Introduction to the UML Language. Analysis of system requirements - Actor definitions - Writing a case goal. Use Case

Diagram - Use Case Relationships - Requirements Analysis Using Case Modeling Analysis of system requirements

UNIT II INTRODUCTION TO OBJECT ORIENTED PROGRAMMING 10

Object Oriented Programming Features - Benefits of Object Oriented Methodology – Overview of Object oriented programming Languages - JAVA: Introduction to Java Programming –Features of Java- Classes and Objects - Arrays – Methods -Constructor-Access Specifier – Package, Inheritance. Method Overloading - Method Overriding - Nested Classes-Inner Classes - Inheritance Types- Interfaces

UNIT III 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 IV DYNAMIC UML DIAGRAMS 9

Dynamic Diagrams - UML interaction diagrams - System sequence diagram - Collaboration diagram - When to use Communication Diagrams - State machine diagram and Modeling - 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 V DESIGN PATTERNS 8

Design Pattern - Describing Design Patterns - How design patterns solve design problems - Selecting a design Pattern - Using a design pattern - Case Study: Designing a Document Editor

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Bernd Bruegge and Allen H. Dutoit,"Object-Oriented Software Engineering using UML , Patterns, and Java", Third Edition, Prentice Hall, 2010.
2. Herbert Schildt, "Java : The Complete Reference", 9th edition, Tata McGraw Hill, 2014.

REFERENCES:

1. Erich Gamma, Richard Helm, Ralph Johnson, and John M. Vlissides, "Design Patterns: Elements of Reusable Object-Oriented Software" Addison-Wesley Professional, 1994.
2. Ali Bahrami, "Object Oriented Systems Development", McGraw Hill Edition, 2017.
3. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Pearson Education, 3rd Edition, 2005.
4. Martin Fowler ,Kendall Scott, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Addison Wesley, 3rd Edition, 2003.
5. Y. Daniel Liang ,"Introduction to Java Programming",9th Edition , Prentice Hall Publications, 2015.

WEB REFERENCES:

1. http://www.uml.org/
2. http://modeling-languages.com/uml-tutorial-online
3. http://www.javaworld.com
4. http://www.nptel.ac.in

ONLINE RESOURCES:

1. https://www.coursera.org/uml approach
2. https://www.coursera.org/learn/object-oriented-java

OUTCOMES :

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

1. Understand the various steps involved in Software Development ,design with UML diagrams.(K2)
2. Understand and analyze the fundamentals oops concepts of java programming.(K3)
3. Demonstrate real time applications by utilizing different methodologies of static UML diagrams.(K3)
4. Select and apply the appropriate static UML diagram for real time problems.(K3)
5. Illustrate the interaction diagram and Activity diagram for real time problems. (K3)
6. Explain the design pattern and implement package diagram ,component diagram , deployment diagrams.(K3)

CO - PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	3	-	2	2	2	-	-	-	-	1	1	-
CO2	3	1	3	-	2	-	-	-	-	-	2	2	2	1
CO3	2	2	3	-	2	-	-	-	-	-	-	2	2	2
CO4	1	1	2	-	3	-	-		-	-	-	-	1	-
CO5	1	1	2	-	2	-	-	-	-	-	-	1	1	2
CO6	2	2	3	3	2	-	-	-	-	-	3	2	2	2

SEMESTER - III

20ITPC301 SDG NO. 4	DATA STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts of ADT's
- To learn Linear Data Structures – Lists, Stacks, and Queues
- To understand Sorting, Searching and Hashing Algorithms
- To learn Dynamic Data Structures - Tree and Graph

UNIT I LINEAR DATA STRUCTURES – I 9

Stacks and Queues : Abstract Data Types (ADTs) – Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to Postfix expression - Queue ADT – Operations - Circular Queue – Priority Queue –Dequeue – Applications of Queues.

UNIT II LINEAR DATA STRUCTURES – II 9

Linked List: List ADT – Array-Based Implementation – Linked List Implementation –– Singly Linked Lists- Circularly Linked Lists- Doubly-Linked Lists – Applications of Lists –Polynomial Manipulation – All Operations (Insertion, Deletion, Merge, Traversal).

UNIT III NON LINEAR DATA STRUCTURES – I 9

Trees : Tree ADT – Tree Traversals - Binary Tree ADT – Expression Trees – Applications of Trees – Binary Search Tree ADT –Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree -Heap – Applications of Heap.

UNIT IV NON LINEAR DATA STRUCTURES – II 9

Graphs : Definition – Representation of Graph – Types of Graph – Breadth First Traversal –Depth First Traversal – Topological Sort – Bi-Connectivity – Cut Vertex – Euler Circuits – Dijkstra‟s algorithm – Bellman-Ford algorithm – Floyd's Algorithm - minimum spanning tree – Prim's and Kruskal's algorithms – Applications of Graphs.

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching- Linear Search - Binary Search - Sorting - Bubble Sort - Selection Sort - Insertion Sort - Shell Sort – Radix Sort – Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, Pearson Education Asia, 2002.
2. Reema Thareja, “Data Structures Using C”, Second Edition, Oxford University Press, 2011.

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, “Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Stephen G. Kochan, “Programming in C”, 3rd edition, Pearson Education.
3. Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.
4. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, University Press, 2008.

WEB REFERENCES :

1. https://www.programiz.com/dsa
2. http://masterraghu.com/subjects/Datastructures/ebooks/rematharej a.pdf

OUTCOMES:

Upon completion of the course, the student should be able to

1. Recognize the concepts of ADT for linear data structures.(K1)
2. Recognize ADT for non-linear data structure.(K1)
3. Understand linear and non-linear data structures to problem solutions.(K2)
4. Understand the various sorting and searching algorithms. (K2)
5. Apply appropriate ADT to problems involving Graph, Trees and Heap. (K3)

6. Apply appropriate data structures to solve real world problems efficiently.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	1	1	1	0	2	2	3	3	1	1
CO2	2	2	1	2	1	1	1	0	2	2	3	3	1	1
CO3	3	3	2	3	3	1	1	1	2	2	3	3	1	1
CO4	2	2	1	2	3	2	1	0	1	1	2	1	1	2
CO5	2	2	1	2	3	0	0	1	2	1	2	2	1	2
CO6	3	3	3	3	1	0	0	0	1	1	2	1	2	2

SEMESTER - III

20ITPC303 SDG NO. 4,9	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the basic structure and operations of a Computer
- To study the implementation of Fixed-Point and Floating Point Arithmetic unit
- To understand Parallelism and Multi-core processors using Pipelined execution
- To understand the Cache memories, Virtual memories and Communication of I/O devices

UNIT I BASIC STRUCTURE OF A COMPUTER SYSTEM 7

Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations –Decision Making – MIPS Addressing.

UNIT II ARITHMETIC OPERATIONS IN PROCESSORS 11

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Subword Parallelism.

UNIT III PROCESSOR AND CONTROL UNIT 11

A Basic MIPS implementation – Building a Datapath – Control Implementation

Scheme – Pipelining – Pipelined Datapath and Control – Handling Data Hazards & Control Hazards – Exceptions.

UNIT IV PARALLELISM **7**

Parallel Processing Challenges – Flynn's classification – SISD, MIMD, SIMD, SPM and Vector Architectures – Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors – Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

UNIT V MEMORY AND I/O SYSTEMS **9**

Memory Hierarchy – memory technologies – Cache Memory – Measuring and Improving Cache Performance – Virtual Memory, TLB's – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus Operation – Arbitration – Interface circuits – USB.

TOTAL: 45 PERIODS

TEXT BOOKS:

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, ZvonkoVranesic, SafwatZaky and NaraigManjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.

REFERENCES:

1. William Stallings, "Computer Organization and Architecture – Designing for Performance", Eighth Edition, Pearson Education, 2010.
2. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 2012.
3. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106/106/106106147/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Describe the physical, logical and functional aspects of Computer System- (K2)
2. Demonstrate the basic fixed point and floating point operations(addition,

subtraction,multiplication and Division) carried out by the processor. (K2)

3. Explain the significance and hazards associated with the pipelined datapath and control unit of computer system (K2)
4. Express the significance of the parallel processing architectures (K2)
5. Discuss the various multicore architectures and multiprocessor architectures (K2)
6. Elucidate the significance of Memory and I/O hierarchy.(K2)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	1	-	2	1	1	-	-	-	-	-	2	2
CO2	3	3	3	3	2	1	1	-	-	-	-	1	1	2
CO3	2	3	3	3	1	-	-	-	-	-	-	1	1	2
CO4	3	2	3	3	3	2	2	1	-	-	1	2	3	1
CO5	3	2	3	3	3	2	2	1	-	-	-	1	1	1
CO6	2	1	1	3	3	1	1	1	-	-	-	2	1	1

SEMESTER - III

20CBPC303 SDG NO. 4	SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the phases in a software project.
- To recognize the Cost estimation, risk and mitigation of Software project
- To understand fundamental concepts of requirements engineering and Analysis Modelling.
- To analyze the various software design methodologies, testing and maintenance measures.
- To Study the quality and Reliability of software products

UNIT I INTRODUCTION **6**

Programming in the small vs. Programming in the large - Software project failures and importance of software quality and timely availability - Engineering approach to software development - Role of software engineering towards successful execution of large software projects - Emergence of software engineering as a discipline - Basic concepts of life cycle models – Different models and milestones.

UNIT II SOFTWARE PROJECT MANAGEMENT AND ESTIMATION TECHNIQUES 11

Software Project Management: Software project planning – Identification of activities and resources – Concepts of feasibility study - Techniques for estimation of schedule and effort - Introduction to the concepts of risk and its mitigation - configuration management. Estimation Techniques: Software cost estimation models and concepts of software engineering economics - techniques of software project control and reporting - Introduction to measurement of software size - Software metrics and metrics - Based control methods- Measures of code and design quality.

UNIT III SOFTWARE REQUIREMENTS & OBJECT ORIENTED ANALYSIS, DESIGN AND CONSTRUCTION 10

Software Requirements Analysis - Design and Construction: Introduction to SRS and requirement elicitation techniques - Requirement modeling techniques – Decision tables- Event tables - State transition tables - Petri nets OOAD and Construction: Introduction to UML - Use cases - Concepts – The principles of Abstraction – Modularity – Specification - Encapsulation and Information hiding - Concepts of abstract data type - Class Responsibility Collaborator (CRC) model - Quality of design - Design measurements - Design patterns – Refactoring - Object-oriented construction principles - Object oriented metrics.

UNIT IV SOFTWARE TESTING 9

Introduction to faults and failures - Basic testing concepts - Concepts of verification and validation - Black box and white box tests - White box test coverage – Code coverage, Condition coverage, Branch coverage - Basic concepts of black-box tests – Equivalence classes - Boundary value tests - Usage of state tables - Testing use cases - Transaction-based testing - Testing for non-functional requirements – Volume, performance and efficiency - Concepts of inspection.

UNIT V SOFTWARE QUALITY AND RELIABILITY 9

Internal and external qualities - Process and product quality - Principles to achieve software quality – Introduction to different software quality models like McCall, Boehm, FURPS / FURPS+, Dromey, ISO – 9126 - Introduction to Capability Maturity Models (CMM and CMMI) - Introduction to software reliability, reliability models and estimation.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", SeventhEdition,McGraw-Hill International Edition,2010.
2. Ian Sommerville,"Software Engineering", 9th Edition, Pearson Education Asia,2011.

REFERENCES:

1. Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI LearningPrivateLimited,2009.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
3. Kelkar S.A.,"SoftwareEngineering",PrenticeHallofIndiaPvtLtd,2007. 4. Stephen R.Schach,"Software Engineering", Tata McGraw-Hill Publishing Company Limited,2007.

ONLINE RESOURCES:

1. http://nptel.ac.in/.
2. http://infolab.stanford.edu/~burback/watersluice/watersluice.html.

WEB RESOURCES:

1. https://www.vssut.ac.in/lecture_notes/lecture1428551142.pdf.
2. http://www.darshan.ac.in/Upload/DIET/Documents/CE/2160701_Software%20Engineering%20Study%20Material%20GTU_23042016_032444AM.pdf.
3. https://jnec.org/lab-manuals/cse/te/se.pdf.

OUTCOMES :

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

1. Define the key approaches of engineering that yield the importance of software project quality.(K1)
2. Understand the different activities in software project plan , activities , management and cost estimation techniques.(K2)
3. Understand the software requirement specifications and the principles of unified modelling language to model the business requirements.(K2)
4. Select and apply the various testing concepts in software projects to maintain stable software products.(K3)
5. Compare and contrast the reliability and quality metrics of a software product.(K2)

6. Implement different software quality models to manage process and product quality.(K3)

CO - PO , PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	-	2	2	-	1	2	3	2	1	2
CO2	3	3	2	1	2	-	-	-	2	1	3	1	1	2
CO3	2	2	2	1	2	3	2	-	-	-	3	-	2	-
CO4	-	3	3	-	-	-	-	-	-	1	3	-	3	2
CO5	2	2	2	1	2	-	-	-	-	-	2	-	2	2
CO6	-	-	-	-	2	2	2	-	-	-	1	1	2	1

SEMESTER - III

20ITPL301 SDG NO. 4	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To implement Linear and Non-linear Data Structures
- To understand the different operations of Search Trees
- To implement Graph Traversal algorithms
- To get familiarized to Sorting and Searching algorithm

LIST OF EXPERIMENTS :

1. Array implementation of Stack and Queue ADTs
2. Array implementation of List ADT
3. Linked list implementation of List, Stack and Queue ADTs
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Trees and operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues
9. Graph representation and Traversal algorithms
10. Applications of Graphs- Implementation of searching and sorting algorithms

11. Implementation of any two Collision Techniques in Hashing

TOTAL: 45 PERIODS

LAB REQUIREMENTS :

Turbo C/Dev C++, Borland C

OUTCOMES:

On completion of this laboratory course, the student should be able to

1. Write functions to implement linear and non-linear data structure operations. [K1]
2. Suggest appropriate linear / non-linear data structure operations for solving a given problem. [K2]
3. Design and analyze the time and space efficiency of data structure.[K2]
4. Apply sorting and searching techniques. [K3]
5. Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval. [K3]
6. Choose and implement efficient data structures and apply them to solve problems. [K3]

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	2	1	1	-	-	-	-	2	2	2	2
CO2	2	3	2	2	2	1	-	-	-	-	2	3	2	2
CO3	3	3	2	2	1	1	-	-	-	-	2	2	2	2
CO4	3	3	2	2	1	1	-	-	-	-	2	3	2	2
CO5	1	2	2	1	2	1	-	-	-	-	1	1	2	2
CO6	1	2	2	1	1	-	-	-	-	-	1	1	2	2

SEMESTER - III

20CJPL301 SDG NO. 4,9	OBJECT-ORIENTED ANALYSIS AND DESIGN LAB	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- Understand the object-oriented software development process, funda mentals Java
- Design suitable pattern to develop software models
- Analyse requirements to create requirements design model
- Apply business modelling and modelling languages to design software
- Develop correct and robust software deployment models

LIST OF EXPERIMENTS:

1. Write a java program to find the largest among three numbers
2. Sort the strings in ascending order using constructors.
3. Design a package to perform bank accounting transactions.
4. Payroll processing using Inheritance for n employees.
5. To develop a mini-project by following the 4 exercises listed below.
   - Identify a software system that needs to be developed.
   - Document the Software Requirements Specification (SRS) for the identified system.
   - Identify use cases and develop the Use Case model.
   - Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
   - Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
   - Draw relevant State Chart and Activity Diagrams for the same system.
   - Implement the system as per the detailed design
   - Test the software system for all the scenarios identified as per the use case diagram

Suggested domains for Mini-Project:

1. Passport automation system.
2. Book bank
3. Exam Registration
4. Stock maintenance system.
5. Online course reservation system
6. E-ticketing

7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system

TOTAL: 45 PERIODS

LAB REQUIREMENTS :

Hardware :

Desktop Systems - Pentium IV with 2 GB RAM 160 GB HARD Disk

Monitor 1024 x 768 color

Software :

Windows operating system JDK .8,Rational Rose Enterprise version

OUTCOMES :

On completion of this laboratory course, the student should be able to

1. Understand the object-oriented software development process , fundamentals in Java (K 1)
2. Design suitable pattern to develop software models(K 2)
3. Analyze requirements to create requirements design model
4. Apply business modeling and modeling languages to design software
5. Elicit requirements and design a user interface model. (K6)
6. Create a deployment model ,Apply object-oriented design to develop a software. (K3)

CO - PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	3	-	-	-	-	-	-	-	1	-
CO2	3	2	1	1	3	-	-	-	-	-	-	-	1	-
CO3	3	2	1	1	3	-	-	-	-	-	-	-	2	2
CO4	3	2	1	1	3	-	-	-	-	-	-	-	1	-
CO5	3	2	1	1	3	-	-	-	-	-	-	-	2	-
CO6	3	2	2	-	-	-	-	-	-	-	-	-	2	-

SEMESTER - III

20CSTE301 SDG NO. 4,11,15	LIVE-IN-LAB – I	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To understand the engineering aspects of design with reference to simple products
- To foster innovation in design of products
- To develop design that add value to products and solve technical problems.
- To create awareness among the students of the characteristics of several domain areas where IT can be effectively used

COURSE PLAN :

Study: Take minimum three simple products, processes or techniques in the area of specialization, study, analyze and present them. The analysis shall be focused on functionality, construction, quality, reliability, safety, maintenance, handling, sustainability, cost etc. whichever are applicable. Each student in the group has to present individually; choosing different products, processes or techniques.

Design: The project team shall identify an innovative product, process or technology and proceed with detailed design. At the end, the team has to document it properly and present and defend it. The design is expected to concentrate on functionality; design for strength is not expected.

Note: *The one hour/week allotted for tutorial shall be used for discussions and presentations. The project team (not exceeding four) can be students from different branches, if the design problem is multidisciplinary.*

EVALUATION:

1. First evaluation (Immediately after first internal examination) : 20 marks
2. Second evaluation (Immediately after second internal examination): 20 marks
3. Final evaluation (Last week of the semester) : 60 marks

Note: *All the three evaluations are mandatory for course completion and for awarding the final grade.*

OUTCOMES:

Upon completion of the course, the student should be able to

1. List the problems and conduct literature survey to identify the gap and come up with an application oriented research problem in the specific domain.(K1)
2. Understand the project characteristics and explore necessary tools and components needed at various stages of the project(K2)
3. Design and validate the proposed system using simulation.(K3)
4. Develop the Prototype of the proposed system by adapting Industrial safety standards and best financial management practices(K5)
5. Analyze the obtained results and prepare a technical report.(K4)
6. Evaluate the project and go for journals and patents publication.(K5)

CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	3	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO3	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO4	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO5	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO6	2	2	2	1	2	1	1	1	3	2	3	3	3	2

SEMESTER - III

20CJTP301 SDG NO. 4&5	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

APTITUDE & COGNITIVE SKILLS – PHASE 1

OBJECTIVE:

- To educate and enrich the students on quantitative ability, reasoning ability, and verbal ability.
- Improve their quantitative ability.
- Improve the ability of arithmetic reasoning
- Enhance their verbal ability through vocabulary building and grammar
- Equip with creative thinking and problem solving skills

UNIT I QUANTITATIVE ABILITY – I **10**

Problems on Trains - Time and Distance - Height and Distance - Time and Work

UNIT II QUANTITATIVE ABILITY – II **10**

Problems on Ages - Alligation or Mixture - Chain Rule - Simple Interest - Simple Equation - Theory Of Equation.

UNIT III REASONING ABILITY – I **8**

Analytical Reasoning - Pipes and Cistern - Logical Problems - Logical Games - Logical Deduction - Data Sufficiency - Arithmetic Reasoning

UNIT IV VERBAL ABILITY – I **10**

Idioms & Phrases - Synonyms - Antonyms - Classification

UNIT V CREATIVITY ABILITY – I **7**

Venn Diagrams -Cube and Cuboids - Dice - Cubes and Dice - Figure Matrix.

TOTAL : 45 PERIODS

REFERENCES:

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2. Quantum CAT by Sarvesh Verma
3. A Modern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun sharma

PROBLEM SOLVING USING C PROGRAMMING - PHASE 2

OBJECTIVES:

- To provide exposure to problem-solving through programming.
- To train the student to the basic concepts of the C-programming language.
- To provide exposure to problem-solving through programming.
- To give the student hands-on experience with the concepts

UNIT I INTRODUCTION TO PRINCIPLES OF PROGRAMMING 9

Introduction to Programming , Programming Domain : Scientific Application , Business Applications, Artificial Intelligence, Systems Programming , Web Software Categories of Programming Languages: Machine Level Languages, Assembly Level Languages , High Level Languages Programming Design Methodologies : Top Down and Bottom UP Program Development Cycle with case study, Program Execution and Translation Process ,Problem solving using Algorithms and Flowcharts, Performance Analysis and Measurements: Time and Space complexity.

UNIT II INTRODUCTION TO C PROGRAMMING 9

Features of C and its Basic Structure, Simple C programs, Constants, Integer Constants, Real Constants, Character Constants, String Constants, Backslash Character Constants, Concept of an Integer and Variable, Rules for naming Variables and assigning values to variables, Floating-point Numbers, Converting Integers to Floating-point and vice-versa, Mixed-mode Expressions, The type cast Operator, The type char, Keywords, Character Input and Output, Formatted input and output, The gets() and puts() functions, Interactive Programming.

UNIT III OPERATORS, EXPRESSIONS AND CONTROL STATEMENTS 9

Arithmetic Operators, Unary Operators, Relational and Logical Operators, The Conditional Operator, Library Functions, Bitwise Operators, The Increment and Decrement Operators, The Size of Operator, Precedence of operators, The goto statement, The if statement, The if-else statement, Nesting of if statements, The conditional expression, The switch statement, The while loop, The do…while loop, The for loop, The nesting of for loops, The break statement and continue statement.

UNIT IV ARRAYS, STRINGS AND POINTERS 9

One Dimensional Arrays, Passing Arrays to Functions, Multidimensional Arrays, Strings, Basics of Pointers, Pointers and One-dimensional Arrays,

Pointer Arithmetic, Pointer Subtraction and Comparison, Similarities between Pointers and One-dimensional Arrays, Null pointers, Pointers and Strings, Pointers and two-dimensional arrays, Arrays of Pointers.

UNIT V STRUCTURES, UNIONS AND FUNCTIONS 9

Basics of Structures, Arrays of Structures, Pointers to Structures, Self-referential Structures, Unions, Function Philosophy, Function Basics, Function Prototypes, and Passing Parameters: Passing Parameter by value and Passing Parameter by reference, passing string to function, Passing array to function, Structures and Functions Recursion.

TOTAL : 45 PERIODS

REFERENCES:

1. Programming in ANSI C - Balagurusamy - Tata McGraw-Hill Education, 2008
2. Programming in C (3rd Edition), by Stephen G. Kochan, Sams, 2004
3. Programming in C - Stephen G. Kochan, III Edition, Pearson Education.

COURSE OUTCOMES :

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

1. Analyze their quantitative ability. (K3)
2. Understand the ability of arithmetic reasoning along with creative thinking and problem solving skills. (K2)
3. Create their verbal ability through vocabulary building and grammar. (K3)
4. Evaluate the situations to analyze the computational methods in order to identify and abstract the programming task involved. (K3)
5. Analyze tasks in which the numerical techniques are applicable in order to apply them to write, edit, compile, debug, correct, recompile and run programs. (K3)
6. Analyze and Design applications using Arrays, Strings,Pointers,Structures and Unions. (K3)

CO- PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	3	2	-	3	2	3	-	2	-	-
CO2	-	-	-	-	3	2	-	3	2	3	-	2	-	-
CO3	-	-	-	-	3	2	-	-	1	3	-	2	-	-
CO4	-	-	-	-	3	2	-	3	3	3	-	2	2	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2	2	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2	2	2

SEMESTER - III

20MGMC301 SDG NO. 4	CONSTITUTION OF INDIA	L	T	P	C
		2	0	0	0

OBJECTIVES:

At the end of the course, the student is expected to

- To know about Indian constitution
- To know about central government functionalities in India
- To know about state government functionalities in India
- To know about Constitution function
- To Know about Constitutional remedies

UNIT I INTRODUCTION **6**

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties

UNIT II STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT **6**

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India.

UNIT III STRUCTURE AND FUNCTION OF STATE GOVERNMENT **6**

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

UNIT IV CONSTITUTION FUNCTIONS 6

Indian Federal System – Centre – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries.

UNIT V CONSTITUTIONAL REMEDIES 6

Enforcement of fundamental rights - Power of parliament to modify the rights the conferred by this part in their application to forces.

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.
2. R.C. Agarwal, (1997) "Indian Political System", S. Chand and Company, New Delhi.
3. M.V. Pyle (2019) , "An Introduction to The Constitution of India, 5/e", Vikas Publishing, New Delhi.
4 P.M. Bakshi, (2018) , "Constitution of India", Universal Law Publishing, New Delhi.

REFERENCES:

1. Sharma, Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
2. U.R.Gahai, "Indian Political System", New Academic Publishing House, Jalandhar.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Explain the Constitution and Fundamental rights of citizens (K2)
2. Discuss the structure, hierarchy and functions of Central Government (K2)
3. Explain the functions of Supreme Court and Judiciary Systems in the state (K2)
4. Discuss the structure, hierarchy and functions of State Government (K2)
5. Recall the Centre-State relationship, constitutional amendments and functionaries (K1)
6. Discuss the remedies and rights available to India Citizens (K2)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	1	1	-	-	-	-	-
CO2	-	-	-	-	-	1	1	-	-	-	-	-
CO3	-	-	-	-	-	1	1	-	-	-	-	-
CO4	-	-	-	-	-	1	1	-	-	-	-	-
CO5	-	-	-	-	-	2	1	3	-	-	-	-
CO6	-	-	-	-	-	2	1	2	3	-	-	-

SEMESTER - IV

20BSMA402 SDG NO. 4	PROBABILITY AND QUEUEING THEORY	L	T	P	C
		3	1	0	4

OBJECTIVES:

- To impart necessary basic knowledge in Probability theory, Random Processes and Queueing models which are invariably used in Computer science courses

UNIT I PROBABILITY AND RANDOM VARIABLES 12

Probability – Axioms of probability – Conditional probability – Baye's theorem - Discrete and Continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Erlang and Normal distributions.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear Regression – Transformation of Random Variables – Central Limit Theorem (for independent and identically distributed random variables).

UNIT III RANDOM PROCESSES 12

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

UNIT IV QUEUEING MODELS 12

Markovian queues – Birth and Death processes – Single and multiple server Queueing models – Little's formula - Queues with finite waiting rooms –Self-service model.

UNIT V ADVANCED QUEUEING MODELS 12

Finite source models - M/G/1 queue – Pollaczek-Khinchin formula - M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.

TOTAL: 60 PERIODS

TEXT BOOKS:

1 Ibe, O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007. (1.1-1.3, 1.6, 1.7 - 1.7.1, 1.8, 1.13 - Exercise problems in the above sections ; 2.1 – 2.8, 3.1 – 3.5, 3.9 , 4.1 - 4.3, 4.4 - 4.4.2, 4.7 – 4.11, 5.1 - 5.7, 6.1 – 6.3, 6.8, 6.10, 8.1 - 8.5, 10.5 (10.5.1 - 10.5.6), 10.6, 10.7 – 10.7.1-10.7. 5) (Units I, II & III).

2. Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., "Fundamentals of Queueing Theory", Wiley Student 4th Edition, 2014. (1.1 – 1.5, 1.7, 2.1 - 2.7, 4.1, 4.2, 5.1 – 5.1.1) (Units IV and V)

REFERENCES:

1. Hwei Hsu, "Schaum's Outline Theory and Problems of Probability, Random variables and Random Processes", Tata Mcgraw Hill Edition, New Delhi, 2004.
2. Taha, H.A., " Operations Research", 9th Edition , Pearson India Education Services, Delhi,2016.
3. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2002.
4. Yates, R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
5. Veerarajan T., "Probability and Statistics, Random Processes and Queueing Theory", TataMc-Graw Hill Education Pvt. Ltd., New Delhi

WEB REFERENCES:

1. https://nptel.ac.in/courses/117103017/
2. https://nptel.ac.in/courses/111105041/
3. http://home.iitk.ac.in/~skb/ee679/ee679.html

ONLINE RESOURCES:

1. https://freevideolectures.com/course/3066/performance-evaluation-of-computer-systems/5
2. https://freevideolectures.com/course/3066/performance-evaluation-of-computer-systems/6

OUTCOMES:

Upon completion of the course, the student should be able to

1. Apply the knowledge of basic concepts of probability, one dimensional random variables and standard distributions in real life situations. (K3)
2. Study the relationship between two random variables and transformation by applying its basic concepts. (K3)

3. Apply the concepts of random processes in engineering disciplines. (K3)
4. Acquire the skills in analyzing Markovian queuing models. (K3)
5. Analyze the behavior of Non-Markovian queuing models, series queues and open networks. (K3)

CO- PO MAPPING :

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

SEMESTER - IV

20CSPC401 SDG NO. 4,9	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basic concepts, functions of Operating Systems, Processes and Threads
- To analyze Scheduling algorithm and understand the concept of Deadlock
- To analyse various Memory Management schemes and understand I/O management and File Systems
- To be familiar with the basics of Linux system and Mobile OS like iOS and Android

UNIT I OPERATING SYSTEM OVERVIEW **7**

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

UNIT II PROCESS MANAGEMENT 11

Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication - CPU Scheduling - Scheduling Criteria - Scheduling Algorithms- Multiple - Processor Scheduling - Real Time Scheduling - Threads - Overview - Multithreading Models - Threading Issues - Process Synchronization - The Critical - Section Problem - Synchronization Hardware - Mutex Locks - Semaphores - Classic Problems of Synchronization - Critical Regions - Monitors - Deadlock – System Model - Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock.

UNIT III STORAGE MANAGEMENT 9

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

UNIT IV FILE SYSTEMS AND I/O SYSTEMS 9

Mass Storage System – Overview of Mass Storage Structure - Disk Structure - Disk Scheduling and Management - Swap Space Management - File-System Interface - File Concept - Access Methods - Directory Structure - Directory Organization - File System Mounting - File Sharing and Protection - File System Implementation- File System Structure - Directory Implementation - Allocation Methods - Free Space Management - Efficiency and Performance - Recovery - I/O Systems – I/O Hardware - Application I/O Interface - Kernel I/O Subsystem - Streams - Performance.

UNIT V CASE STUDY 9

Linux System - Design Principles - Kernel Modules - Process Management - Scheduling - Memory Management - Input-Output Management - File System - Inter-Process Communication - Mobile OS - iOS and Android - Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.

TOTAL : 45 PERIODS

TEXT BOOK :

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012.
2 William Stallings, “Operating Systems – Internals and Design Principles”,7th Edition, Prentice Hall, 2011

REFERENCES :

1. Ramez Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.
2. AchyutS.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Pearson Education, 2004.
4. Gary Nutt, "Operating Systems", Third Edition, Pearson Education, 2004.
5. Harvey M. Deitel, "Operating Systems", Third Edition, Pearson Education, 2004.

WEB REFERENCES :

1. https://nptel.ac.in/courses/106/106/106106144/
2. https://www.coursera.org/courses?query=operating%20system
3. https://www.computerhope.com/jargon/o/os.html
4. https://www.os-book.com/OS9/slide-dir/
5. http://web.iitd.ac.in/~minati/MTL458.html

ONLINE RESOURCES:

1. https://www.udacity.com/course/introduction-to-operating-systems--ud923
2. https://freevideolectures.com/course/3670/introduction-to-operating-systems

OUTCOMES:

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

1. Understand the basic concepts and functions of the operating system. (K2)
2. Analyze various scheduling algorithms. (K4)
3. Understand deadlock, prevention and avoidance algorithms. (K2)
4. Compare and contrast various memory management schemes. (K4)
5. Understand the functionality of file systems (K2)
6. Understand the performance of administrative tasks on Linux servers. (K2)

CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	1	-	1	1	-	-	-	1	2	2
CO2	3	3	3	2	2	-	1	1	-	-	-	1	2	2
CO3	3	3	2	2	2	-	1	1	-	-	-	1	2	2
CO4	2	2	3	2	2	-	1	1	-	-	-	1	2	2
CO5	3	3	3	2	2	-	1	1	-	-	-	1	2	2
CO6	3	3	2	2	2	-	1	1	-	-	-	1	2	2

SEMESTER - IV

20CSPC402 SDG NO. 4,9	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To design a database using ER diagrams, convert them to Relational Databases and to write SQL Queries
- To understand the fundamental concepts of Transaction Processing, Concurrency Control techniques and Recovery procedures
- To understand the Internal Storage structures and about the Query Processing Techniques
- To have an introductory knowledge about the Object Databases, XML Databases and NoSQL Databases

UNIT I DATABASE DESIGN **7**

Purpose of Database System – Views of Data –Database System Architecture-Data Models– Entity Relationship Model – ER Diagrams – Enhanced ER Model.

UNIT II RELATIONAL DATABASES **11**

Introduction to Relational Databases – Relational Model-ER-to-Relational Mapping– Keys –Relational Algebra – SQL Fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL-Functional Dependencies – Non-loss

Decomposition – First – Second - Third Normal Forms - Dependency Preservation – Boyce/CoddNormal Form – Multi Valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT III TRANSACTIONS 9

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery – Save Points – 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 – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics - Cost Estimation.

UNIT V ADVANCED TOPICS 9

Distributed Databases – Architecture - Data Storage - Transaction Processing – Object Based Databases - Object Database Concepts – Object Relational Features - ODMG Object Model – ODL - OQL – XML Databases - XML Hierarchical Model – DTD - XML Schema –Xquery.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, Tata McGraw Hill, 2020.
2. RamezElmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2016.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, McGraw-Hill Education, 2015.
3. G.K.Gupta,"Database Management Systems", Tata McGraw Hill, 2011.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_cs46/
2. http://www.nptelvideos.in/2012/11/database-management-system.html

3. https://www.classcentral.com/course/swayam-database-management-system-9914
4. http://learnsql.com
5. https://www.w3schools.com/sql/default.asp
6. https://www.khanacademy.org/computing/computer-programming/sql

OUTCOMES:

Upon completion of the course, the student should be able to

1. Discuss the concepts of database to apply the Relational, ER model for design and SQL for implementation of the database. (K2)
2. Recognize and identify the use of normalization and functional dependencies to reine the database system. (K1)
3. Demonstrate various SQL queries for the Transaction Processing & Locking using concept of Concurrency control. (K2)
4. Build the query processing techniques for the optimization of SQL queries. (K3)
5. Implement the indexing and hashing techniques for the organisation of database records. (K3)
6. Illustrate how the advanced databases differ from the traditional databases. (K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	2	1	0	0	0	0	0	0	2	2
CO2	2	2	2	2	1	1	0	0	0	0	0	0	2	2
CO3	2	1	2	1	2	1	0	0	0	0	0	0	2	2
CO4	2	2	2	2	1	1	0	0	0	0	0	0	2	2
CO5	2	2	2	2	1	1	0	0	0	0	0	0	2	2
CO6	2	2	2	1	2	1	0	0	0	0	0	0	2	2

SEMESTER - IV

20CJPC401 SDG NO. 4,9	CORE JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To explain the features of java programming, Inheritance and Interfaces
- To illustrate the use of file system, JDBC.
- To define Exceptions and use I/O streams
- To develop a Java application with threads and generic classes ,GUI

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 10

JVM-Internals, JVM Architecture, JDK, JRE,JVM Memory. Class fundamentals: Declaring objects, Assigning object reference variable, Methods & Method Signatures, Method returning Values, Method with parameters, Variable argument, Input / Output Basics – Streams – Byte Streams and Character Streams – Reading and Writing Console – Reading and Writing Files.

UNIT II INHERITANCE AND INTERFACES 9

Inheritance – Superclasses– Subclasses –Protected Members – Constructors in SubClasses– 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 -Array Lists -Strings.

UNIT III EXCEPTION, CONCURRENCY, ENUMERATION 12

Exceptions – Exception Hierarchy– Throwing and Catching Exceptions – Built-in Exceptions-Creating own Exceptions - Thread Life Cycle - Creating Threads, Inter Thread Communication, Synchronization of threads using Synchronized keyword and lock method. Thread pool and Executors framework, Futures and callable, Fork-Join in Java. Deadlock conditions. Enumeration - usage

UNIT IV MULTI-THREADING AND GENERIC PROGRAMMING 8

Basics , Generic Programming – Generic Classes – Generic Methods ,Generics and type safety Collections Interfaces –Collection, Set, List, Queue, Collections Classes – Array List, Hash Set, Tree Set. Accessing a Collection via Iterators. MapInterfaces. MapClasses– AbstractMap, HashMap, TreeMap - Generic Programming .

UNIT V EVENT-DRIVEN PROGRAMMING 7

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– buttons – layout management

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Herbert Schildt, "Java - The Complete Reference", 8th Edition, McGrawHill Education, 2011.
2. E.Balagurusamy- "Programming with Java", 6th Edition, McGrawHill Education, 2019.
3. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", Eighth Edition, Sun Microsystems Press, 2008.

REFERENCES:

1. Paul Deitel, Harvey Deitel, "Java SE 8 for Programmers", 3rd Edition, Pearson, 2015.
2. Steven Holzner, "Java 2 Blackbook", Dream Tech Press, 2011.
3. Timothy Budd, "Understanding Object-Oriented Programming with Java",
4. Updated Edition, Pearson Education, 2000.

WEB REFERENCES:

1. https://www.geeksforgeeks.org/java/
2. https://www.tutorialspoint.com/java/
3. https://www.javatpoint.com/java-tutorial
4. https://www.w3schools.com/java/
5. http://www.javaworld.com

ONLINE RESOURCES:

1. https://www.coursera.org/specializations/object-oriented-programming
2. https://www.udemy.com/topic/java-certification/
3. https://www.edx.org/learn/java

OUTCOMES:

Upon completion of the course, students should be able to

1. Explain the features of java programming, Inheritance and Interfaces (K2)
2. Illustrate the purpose of packages, Java documents and Analyse the various types of Inheritance. (K4)

3. Apply the Object Oriented Programming Concepts to develop the reusable Applications. (K3)
4. Illustrate the java applications using Java Exceptions and I/O Streams. (K4)
5. Understand the concept of Multithreading and Generic Classes in Java.(K2)
6. Design and implement the solution for real time problems using Event driven programming. (K3)

CO - PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	2	-	2	-	-	-	-	-	2	3	2
CO2	3	1	3	2	-	2	-	-	2	-	-	2	3	2
CO3	3	1	3	2	-	2	-	-	-	-	-	2	3	3
CO4	3	1	3	2	-	2	-	-	-	-	-	2	3	2
CO5	3	1	3	2	3	2	-	-	-	-	-	2	3	2
CO6	3	1	3	2	3	2	-	-	1	-	-	2	3	2

SEMESTER - IV

20ITPC401 SDG NO. 4	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		2	1	0	3

OBJECTIVES:

- To understand and apply the algorithm analysis techniques
- To critically analyze the efficiency of alternative algorithmic solutions for the same problem
- To understand different algorithm design techniques
- To understand the limitations of Algorithmic power

UNIT I INTRODUCTION 10

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties - Analysis Framework – Empirical analysis - Mathematical analysis for Recursive and Non-recursive algorithms – Visualization.

UNIT II BRUTE FORCE AND DIVIDE-AND-CONQUER 9

Brute Force – Computing an – String Matching - Closest-Pair and Convex-Hull Problems - Exhaustive Search - Travelling Salesman Problem - Knapsack Problem - Assignment Problem.

Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort - Multiplication of Large Integers – Closest-Pair and Convex - Hull Problems.

UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUES 9

Dynamic programming – Principle of optimality - Coin Changing Problem - Computing a Binomial Coefficient – Floyd's Algorithm – Multi Stage Graph - Optimal Binary Search Trees – Knapsack Problem and Memory functions - Greedy Technique – Container Loading Problem - Prim's Algorithm and Kruskal's Algorithm – 0/1 Knapsack Problem - Optimal Merge pattern - Huffman Trees.

UNIT IV ITERATIVE IMPROVEMENT 8

The Simplex Method - The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs - Stable Marriage problem.

UNIT V COPING WITH THE LIMITATIONS OF ALGORITHM POWER 9

Lower - Bound Arguments - P, NP, NP - Complete and NP-Hard Problems- Backtracking – n-Queen Problem - Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – LIFO Search and FIFO Search - Assignment Problem – Knapsack Problem – Travelling Salesman Problem - Approximation Algorithms for NP-Hard Problems – Travelling Salesman Problem – Knapsack Problem.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. AnanyLevitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Computer Algorithms/ C++", Second Edition, Universities Press, 2007.

REFERENCES:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

2. Alfred V.Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
3. Harsh Bhasin, "Algorithms Design and Analysis", Oxford university press, 2016.
4. S. Sridhar, "Design and Analysis of Algorithms", Oxford university press, 2014.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106101060
2. https://www.cse.iitm.ac.in/course_details.php?arg=OTI
3. https://swayam.gov.in/nd1_noc19_cs47/previ

ONLINE RESOURCES:

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/
2. http://www.learnalgorithms.in/
3. https://courses.cs.vt.edu/ csonline/Algorithms/Lessons/
4. http://openclassroom.stanford.edu/MainFolder/Course Page.php?course=IntroToAlgorithms.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Review the fundamentals of algorithmic problem solving and analyzing efficiency of algorithms [K2]
2. Apply mathematical formulation,complexity analysis and methodologies to solve recurrence relations for algorithms [K3]
3. Compare the time complexities of various algorithms [K3]
4. Critically analyze the different algorithm design techniques for a given problem [K3]
5. Illustrate NP class problems and formulate solutions using standard approach [K2]
6. Articulate solutions for real life problems using algorithm design principles [K3]

CO-PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	0	0	0	0	0	0	0	0	0	0	1
CO2	3	3	1	0	0	0	0	0	0	0	0	0	0	1
CO3	2	3	0	1	0	0	0	0	0	0	0	0	0	1
CO4	2	3	0	2	0	0	0	0	0	0	0	0	0	1
CO5	1	2	0	1	0	0	0	0	0	0	0	0	0	1
CO6	1	2	1	2	0	0	0	0	0	0	0	0	0	1

SEMESTER - IV

20CSPL401 SDG NO. 4,9	OPERATING SYSTEMS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To learn Unix commands and Shell programming
- To implement various CPU scheduling algorithm, Process Creation and Interprocess Communication
- To implement Deadlock avoidance and Deadlock Detection algorithms
- To implement Page Replacement algorithms and File strategies

LIST OF EXPERIMENTS :

1. Basics of UNIX commands & Administrator commands (man, uptime, users, service, pkill, pmap, wget, free, Shutdown commands, ping, su, who, env).
2. Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir.
3. Write programs to simulate UNIX commands like cp, ls, grep, etc.
4. Shell Programming.
5. Write programs to implement the various CPU Scheduling Algorithms.
6. Implementation of Semaphores.
7. Implementation of Shared memory and IPC.
8. Implementation of Bankers Algorithm for Deadlock Avoidance.
9. Implementation of Deadlock Detection Algorithm.

10. Write program to implement Threading & Synchronization Applications.
11. Implementation of the following Memory Allocation Methods for fixed partition
    a) First Fit b) Worst Fit c) Best Fit
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

TOTAL: 45 PERIODS

LAB REQUIREMENTS

1. Standalone desktops with C / C++ / Java / Equivalent compiler 30 Nos. with Linux OS

OUTCOMES:

On completion of this laboratory course, the student should be able to

1. Compare the performance of various CPU Scheduling Algorithms (K4)
2. Implement Deadlock avoidance and Detection Algorithms (K2)
3. Implement Semaphores. Create processes and implement IPC (K2)
4. Analyze the performance of the various Page Replacement Algorithms (K4)
5. Implement File Organization and File Allocation Strategies (K2)
6. Implement File Allocation Strategies (K2)

CO-PO,PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	1	-	-	-	-	-	-	1	2	2
CO2	3	3	3	2	1	1	1	2	2	2	1	2	2	2
CO3	3	3	3	3	1	2	1	2	2	2	2	2	2	2
CO4	3	3	3	2	1	-	-	1	1	1	1	2	2	2
CO5	3	3	3	2	1	-	-	1	1	1	1	1	2	2
CO6	3	3	2	2	1	-	-	1	1	1	1	1	2	2

SEMESTER - IV

20CSPL402 SDG NO. 4&9	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To learn the use of Data Definition, Data Manipulation Commands, Nested and Join queries
- To understand Functions, Procedures and Procedural extensions of databases
- To be familiar with the use of a Front End tool
- To understand design and implementation of typical Database applications

LIST OF EXPERIMENTS :

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements.
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins.
3. Implementation of Views, Sequences and Synonyms.
4. Database Programming: Implicit and Explicit Cursors.
5. Procedures and Functions.
6. Triggers.
7. Exception Handling.
8. Database Design using ER Modeling, Normalization and Implementation for any application.
9. Database Connectivity with Front End Tools.
10. Case Study using Real Life Database applications.

TOTAL: 45 PERIODS

LAB REQUIREMENTS

SOFTWARE

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

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

OUTCOMES :

On completion of this laboratory course, the student should be able to

1. Use typical data definitions and manipulation commands. (K1)
2. Design applications to test Nested and Join Queries. (K3)

3. Implement simple applications that use Views. (K3)
4. Critically analyze the use of Tables, Views, Functions and Procedures. (K4)
5. Make use of ER modeling and normalization to design and implement database. (K3)
6. Implement real life applications that require a Front-end Tool as a Team. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	2	1	0	0	0	0	0	0	2	2
CO2	2	2	2	1	2	1	0	0	0	0	0	0	2	2
CO3	2	2	2	1	2	1	0	0	0	0	0	0	2	2
CO4	2	2	2	1	2	1	0	0	0	0	0	0	2	2
CO5	2	2	2	2	1	1	0	0	0	0	0	0	2	2
CO6	2	2	2	1	2	1	0	0	0	0	0	0	2	2

SEMESTER - IV

20JPL401 SDG NO. 4&9	JAVA PROGRAMMING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of Packages, Inheritance and Interfaces
- To develop a Java application with Threads and Generic classes
- To make the students understand life cycle of the Applets and its functionality

LIST OF EXPERIMENTS:

1. Basic JAVA Programs

a. Write a program to find the sum of individual digits of a positive integer.

b. Write a program to generate the first n terms of the sequence.

c. Write a program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

d. Write a program to find both the largest and smallest number in a list of integers.

e. Write a program to find the factorial of the list of number reading input as a command.

2. Write a program to calculate bonus for different departments using method overriding.

3. Write a program to sort a list of elements in ascending and descending order and show the exception handling.

4. Write a program to implement the concept of importing classes from user defined packages and creating packages.

5. Write programs that illustrate how the following forms of inheritance are supported:

a) Single inheritance

b) Multiple inheritance

c) Multi level inheritance

d) Hierarchical inheritance

6. Write a program to demonstrate use of implementing interfaces.

7. Write a program to implement interfaces for all string operations.

8. Write a program to create a student report using an applet, read the input using text boxes and display the output using buttons.

9. Write a program to implement thread priorities.

10. Write a program to implement thread, applets and graphics to animate ball movement.

11. JAVA Applet program

a) Write a Applet program using paint brush

b) Write a program to display analog clock using Applet

c) Write a program to create different shapes and fill colors using Applet

12. JAVA Event Handling program

a) Write a program that display the x and y position of the cursor movement using Mouse

b) Write a program that identifies key-up key-down event user entering text in a Applet

13. JAVA programs on Swings

a) Write a program to build a Calculator in Swings

b) Write a program to display the digital watch in swing

c) Write a program that creates a single ball bouncing inside a Jpanel.

d) Write a program JTree as displaying a real tree upside down

TOTAL : 45 PERIODS

LAB REQUIREMENTS:

Hardware :

Desktop Systems - Pentium IV with 2 GB RAM 160 GB HARD Disk

Monitor 1024 x 768 color

Software :

Systems with either Netbeans or Eclipse / Windows operating system / JDK 1.8

OUTCOMES :

On completion of this laboratory course, the student should be able to

1. Write Java programs in accordance with the object oriented programming concepts. (K6)
2. Design user defined java packages. (K6)
3. Create Java programs using Inheritance and Polymorphism. (K6)
4. Implement Error-handling techniques using Exception handling and Multithreading. (K6)
5. Develop Applet program and GUI using Swing components. (K6)
6. Enumerate the event handling techniques in Java Programming. (K5)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	2	-	-	-	-	2	2	3	2
CO2	2	2	3	2	-	2	-	-	-	-	2	2	3	2
CO3	2	2	3	2	-	2	-	-	2	2	2	2	3	2
CO4	3	3	2	2	-	2	-	-	-	-	2	2	3	2
CO5	3	3	3	2	-	2	-	-	-	-	2	2	3	2
CO6	2	3	3	2	-	2	-	-	2	2	2	2	3	2

SEMESTER - IV

20CSTE401 SDG NO. 4,11,15	LIVE-IN-LAB – II	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To provide opportunities for the students, expose to Industrial environment and real time work
- To offer students a glimpse into real world problems and challenges that need IT based solutions
- To improve the team building, communication and management skills of the students
- To introduce students to the vast array of literature available of the various research challenges in the field of CSE

COURSE METHODOLOGY:

1. This initiative is designed to inculcate ethical principles of research and to get involve in life-long learning process for the students.
2. The course must involve engineering design with realistic constraints. It must also include appropriate elements of the following: Engineering standards, design analysis, modeling, simulation, experimentation, prototyping, fabrication, correlation of data, and software development.
3. Project can be individual work or a group project, with maximum of 3 students. In case of group project, the individual project report of each student should specify the individual's contribution to the group project.
4. On completion of the project, the student shall submit a detailed project report. The project should be reviewed and the report shall be evaluated and the students shall appear for a viva-voce oral examination on the project approved by the Coordinator and the project guide.

EVALUATION:

1. First evaluation (Immediately after first internal examination) : 20 marks
2. Second evaluation (Immediately after second internal examination): 30marks
3. Final evaluation (Last week of the semester) : 50marks

Note: *All the three evaluations are mandatory for course completion and for awarding the final grade*

TOTAL: 45 PERIODS

OUTCOMES:

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

1. Conduct literature survey to identify the gap and an application oriented research problem in the specific domain(K4)
2. Design and validate the proposed system using simulation(K6)
3. Prototype the proposed system(K5)
4. Analyze the obtained results and prepare a technical report(K4)
5. Publish the work in journals and apply for the patents.(K3)
6. Prepare for industrial environment and real time work(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	3	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO3	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO4	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO5	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO6	2	2	2	2	3	2	2	2	2	2	3	3	3	3

SEMESTER - IV

20CJTP401 SDG NO. 4&5	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

APTITUDE AND COGNITIVE SKILLS – PHASE 1

OBJECTIVES:

- Improve their quantitative ability.
- Improve their reasoning ability.
- Enhance their verbal ability through vocabulary building and grammar
- Equip with creative thinking and problem solving skills

UNIT I QUANTITATIVE ABILITY – III **10**

Compound Interest - Profit and Loss- Partnership - Percentage- Set Theory

UNIT II QUANTITATIVE ABILITY – IV **10**

True Discount-Ratio and Proportion - Simplification - Problems On H.C.F and L.C.M

UNIT III REASONING ABILITY – II **8**

Course of Action - Cause and Effect - Statement and Conclusion - Statement and Argument - Data Sufficiency (DS) - Statement and Assumption - Making Assumptions.

UNIT IV VERBAL ABILITY – II **10**

Change of Voice - Change of Speech - Letter and Symbol Series - Essential Part-Verbal Reasoning - Analyzing Arguments.

UNIT V CREATIVITY ABILITY – II **7**

Seating Arrangement - Direction Sense Test - Character Puzzles - Missing Letters Puzzles - Mirror &Water Images.

TOTAL : 45 PERIODS

REFERENCES:

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2. Quantum CAT by Sarvesh Verma
3. A Modern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun sharma

ADVANCED C PROGRAMMING - PHASE 2

COURSE OBJECTIVE:

- To improve C programming skills with understanding of code organization and functional hierarchical decomposition with using complex data types.
- To understand procedural programming methods using Dynamic memory Allocation.

UNIT I INTRODUCTION TO RECURSION **9**

Introduction to Recursion, Types of Recursion - Head Recursion , Tail Recursion, Tree Recursion, Indirect Recursion and Nested Recursion . Recursion vs Looping - Analysis on efficiency of looping and recursion,

Working of recursive code in main memory. Recurrence Relation , Different types of recurrence relation. Deriving time complexity and space complexity using recurrence relation.

UNIT II GROWTH FUNCTIONS AND RECURSION 9

Polynomial Equations, Compare growth functions - order growth functions, omega growth functions, theta growth functions - Constant time, Linear time, Logarithmic time, Quadratic time and exponential time. Problems on Recursions - Factorial Number, Sum of first N Natural Numbers, Nth Fibonacci Number, Exponent Function, Taylor Series, Tower of Hanoi.

UNIT III STORAGE CLASSES, THE PREPROCESSOR AND DYNAMIC MEMORY ALLOCATION 9

Storage Classes and Visibility, Automatic or local variables, Global variables, Static variables, External variables, File Inclusion, Macro Definition and Substitution, Macros with Arguments, Nesting of Macros, Conditional Compilation, Dynamic Memory Allocation, Allocating Memory with malloc, Allocating Memory with calloc, Freeing Memory, Reallocating Memory Blocks, Pointer Safety, The Concept of linked list, Inserting a node by using Recursive Programs, Sorting and Reversing a Linked List, Deleting the Specified Node in a Singly Linked List.

UNIT IV FILE MANAGEMENT 9

Defining and Opening a file, Closing Files, Input/output Operations on Files, Predefined Streams, Error Handling during I/O Operations, Random Access to Files, Command Line Arguments.

UNIT V BIT MANIPULATION 9

The hexadecimal number system, C bitwise operators, Working with individual bits, How to check if a given number is a power of 2, Count the number of ones in the binary representation of the given number, Check if the ith bit is set in the binary form of the given number, How to generate all the possible subsets of a set, Find the largest power of 2 (most significant bit in binary form), which is less than or equal to the given number N, Tricks with Bits, Applications of bit operations.

TOTAL : 45 PERIODS

REFERENCES:

1. R. G. Dromey, "How to Solve It By Computer", Pearson, 1982
2. A.R. Bradley, "Programming for Engineers", Springer, 2011
3. Kernighan and Ritchie, "The C Programming Language", (2nd ed.) Prentice Hall, 1988

COURSE OUTCOMES :

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

1. Analyze their quantitative ability. (K4)
2. Understand the ability of arithmetic reasoning along with creative thinking and problem solving skills. (K2)
3. Create their verbal ability through vocabulary building and grammar. (K6)
4. Evaluate code organization and functional hierarchical decomposition with complex data types. (K5)
5. Understand C programming skills to apply advanced structured and procedural programming. (K2)
6. Apply Various File and Bit Manipulation algorithms in Problem Solving. (K3)

CO- PO & PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	3	2	-	3	2	3	-	2	-	-
CO2	-	-	-	-	3	2	-	3	2	3	-	2	-	-
CO3	-	-	-	-	3	2	-	-	1	3	-	2	-	-
CO4	-	-	-	-	3	2	-	3	3	3	-	2	2	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2	2	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2	2	2

SEMESTER - V

20CJPC501 SDG NO. 4 & 9	DATA WAREHOUSING AND DATA MINING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand Data Warehouse concepts, Architecture, Business Analysis and Tools
- To understand Data Preprocessing and Data Visualization techniques
- To study algorithms for finding Hidden and Interesting patterns in Data
- To understand and apply various Classification and Clustering techniques

UNIT I DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING 9

Basic Concepts – Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors – Multidimensional Data Model – Data Warehouse Schemas for Decision Support - Concept Hierarchies - Characteristics of OLAP Systems – Typical OLAP Operations - OLAP and OLTP.

UNIT II INTRODUCTION TO DATA MINING 9

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – Applications- Data Objects and Attribute Types - Statistical Description of Data - Data Preprocessing – Cleaning - Integration - Reduction - Transformation and Discretization - Data Visualization - Data Similarity and Dissimilarity Measures-Perform data transformation and handling missing values using R programming.

UNIT III FREQUENT PATTERN ANALYSIS 9

Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.-Using R programming language - Apriori algorithm, FP Growth algorithm.

UNIT IV CLASSIFICATION 9

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Backpropagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the

Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.- Using R programming language- Decision tree algorithm, Bayesian Classification.

UNIT V CLUSTERING ANALYSIS 9

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis - Implement k-means clustering -Hierarchical Clustering algorithm using R Programming

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Jiawei Han and MichelineKamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.
2. Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, 35th Reprint 2016.

REFERENCES:

1. K.P. Soman, Shyam Diwakar and V. Ajay, "Insight into Data Mining Theory and Practice", Eastern Economy Edition, Prentice Hall of India, 2006.
2. Ian H.Witten and Eibe Frank, "Data Mining: Practical Machine Learning Tools and Techniques", Second Edition, Elsevier, 2005.
3. Parteek Bhatia, "Data Mining and Data Warehousing: Principles and Practical Techniques", Cambridge University Press, 2019.
4. Pranjali Deshpande, Soudamini Patil, "Data Warehousing and Data Mining", First Edition, Technical Publications, 2020.
5. Dr. B. Shadaksharappa,Mr. P.Ramkumar,Dr. T.N. Prabakar, "Data Warehousing and Data Mining", First Edition, Book Rivers, 2022.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc20_cs12/preview
2. https://freevideolectures.com/course/3609/data-warehousing

ONLINE RESOURCES:

1. https://www.tutorialspoint.com/data_mining/index.htm
2. https://www.guru99.com/online-analytical-processing.html
3. https://www.cs.waikato.ac.nz/ml/weka/courses.html
4. https://www.tutorialspoint.com/weka/what_is_weka.htm

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand Data warehouse system and perform business analysis with OLAP tools. (K2)
2. Illustrate the various data mining , data preprocessing concepts ,Use suitable pre-processing and visualization techniques for data analysis (K3)
3. Understand frequent pattern, association rule mining techniques and to examine frequent patterns (K3)
4. Summarize the various data mining techniques ,apply appropriate classification techniques to analyze the real world problems and evaluate it. (K3)
5. Implement Frequent pattern analysis, classification algorithm for real world data problems using R programming.(K3)
6. Extract the various clustering techniques, apply appropriate clustering techniques to solve the real world problems and evaluate them. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	2	1	1	-	2	2	2	2	3	3
CO2	3	3	3	2	2	2	1	-	2	2	2	3	3	2
CO3	2	2	2	2	2	1	1	-	2	2	2	3	3	3
CO4	2	2	2	2	2	2	1	-	2	3	3	3	2	2
CO5	3	2	3	2	3	2	2	-	2	2	2	3	2	3
CO6	3	2	3	2	3	2	2	-	2	2	2	3	2	3

SEMESTER - V

20CJPC502 SDG NO. 4 & 9	AGILE METHODOLOGIES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of Agile development and testing techniques.

- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing.

UNIT I AGILE METHODOLOGY 9

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT II AGILE PROCESSES 9

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT 9

Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT IV AGILITY AND REQUIREMENTS ENGINEERING 9

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V AGILITY AND QUALITY ASSURANCE 9

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. David J. Anderson and Eli Schragenheim,,"Agile Management for Software Engineering: Applying the Theory of Constraints for Business Result", Prentice Hall, 2003.

2. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.

REFERENCES:

1. Craig Larman, "Agile and Iterative Development: A Manager's Guide", Addison-Wesley, 2004.
2. Kevin C. Desouza, "Agile Information Systems: Conceptualization, Construction, and Management", Butterworth-Heinemann, 2007.

ONLINE RESOURCES:

1. https://www.wrike.com/project-management-guide/faq/what-is-agile-methodology-in-project-management/
2. https://www.pmi.org/learning/library/agile-approach-projects-market-globalization-5777
3. https://www.seamgen.com/blog/agile-qa-process/

OUTCOMES:

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

1. Realize the importance of interacting with business stakeholders in determining the requirements for a software system.(K2)
2. Perform iterative software development processes: how to plan them, how to execute them.(K1)
3. Point out the impact of social aspects on software development success.(K2)
4. Develop techniques and tools for improving team collaboration and software quality.(K3)
5. Perform Software process improvement as an ongoing task for development teams.(K1)
6. Show how agile approaches can be scaled up to the enterprise level.(K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	2	1	1	-	2	2	2	2	3	3
CO2	3	3	3	2	2	2	1	-	2	2	2	3	3	2
CO3	3	3	3	3	2	1	1	-	2	2	2	3	3	3
CO4	3	3	3	3	2	2	1	-	2	3	3	3	2	2
CO5	3	2	3	2	3	2	2	-	2	2	2	3	2	3
CO6	3	2	3	2	3	2	2	-	2	2	2	3	2	3

SEMESTER - V

20CSPC502 SDG NO. 4	THEORY OF COMPUTATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- 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 –Finite Automata –Deterministic Finite Automata – Non-deterministic Finite Automata –Finite Automata with Epsilon Transitions

UNIT II REGULAR EXPRESSIONS AND LANGUAGES 9

Regular Expressions–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 Pushdown Automata –Languages of Pushdown Automata –Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

UNIT IV PROPERTIES OF CONTEXT FREE LANGUAGES 9

Normal Forms for CFG –Pumping Lemma for CFL –Closure Properties of CFL –Turing Machines –Programming Techniques for TM.

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

TEXT BOOK:

1. J.E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2011.

2. Peter Linz, "An Introduction to Formal Languages and Automata", 5th Edition, Jones & Bartlett Learning, 2011.

REFERENCES:

1. H.R.Lewis and C.H.Papadimitriou, "Elements of the theory of Computation", Second Edition, PHI, 2010.
2. J.Martin, "Introduction to Languages and the Theory of Computation", 4th Edition, TMH, 2019.
3. Micheal Sipser, "Introduction of the Theory and Computation", 4th Edition Thomson Brokecole, 2014.
4. K.L.P.Mishra , N.Chandrasekaran ,"Theory of Computer Science (Automata, Languages and Computation)", Third Edition,PHI,2008.
3. S.P.Eugene Xavier "Theory of Automata, Formal Languages and Computation", New Age International Publishers, 2007.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106/104/106104148
2. https:// automation simulator.com/
3. https://swayam.gov.in/nd1_noc19_cs79/

ONLINE RESOURCES:

1. http://www.youtube.com/watch?v=eqCkkC9A0Q4
2. http://www.udemy.com/course/theory-of-computation-toc/
3. https://online.standford.edu/courses/soe-ycsautomata-automata-theory
4. https://www.aduni.org/courses/theory/index.php?view=cw

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the models of computation, including formal languages, Grammars and Automata, and their connections (K2)
2. Construct Automata, Regular Expression for any pattern (K3)
3. Develop Context Free Grammar for any given language and understand the language of Push Down Automata (K3)
4. Construct Turing Machines for any Language, solve various problems by applying normal form techniques (K3)
5. Identify Computation Solutions using Turing Machines (K2)
6. Identify whether a problem is decidable or not. (K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	2	1	1	-	2	2	2	2	3	3
CO2	3	3	3	2	2	2	1	-	2	2	2	3	3	2
CO3	3	3	3	3	2	1	1	-	2	2	2	3	3	3
CO4	3	3	3	3	2	2	1	-	2	3	3	3	2	2
CO5	3	2	3	2	3	2	2	-	2	2	2	3	2	3
CO6	3	2	3	2	3	2	2	-	2	2	2	3	2	3

SEMESTER - V

20CJPW501 SDG NO. 4 & 9	JEE FRAMEWORK WITH LABORATORY	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To learn the fundamentals of JEE concepts and usage of build tools like Maven .
- To understand Agile development and testing To acquire knowledge on core technologies like IOC, DI , AOP
- To develop and deploy application in frameworks like Spring, Spring MVC and Building REST Services with spring MVC
- To understand Logging process, ORM framework and build secure applications using JWT and OAUTH

UNITI INTRODUCTION TO JAKARTA ENTERPRISE EDITION (FORMERLY CALLED AS JAVA EE): 9

Java EE 8 Platform Overview - Evolution - Standard architecture-Profiles- JEE Specifications-Application components- Distributed Multi tiered Applications- J2EE clients- J2EE Server communications -Web & Business Components-Java EE Containers – services & types - Java EE Application Assembly & Deployment – Packaging Applications-EAR File-Java EE modules - Development role-Getting Started with Web applications-Java EE software Implementation.

UNIT II MODEL VIEW CONTROLLER 9

MVC framework - Architecture & Packaging- Three tier architecture vs MVC pattern – Web application lifecycle -Web Module structure - Web application deployment descriptor(web.xml file) - Web Application Archive (*.WAR file),

Java ARchive (*.JAR), Enterprise Application aRchive(*.EAR). Build Tools: Maven -Environment setup - Lifecycle-Build profile-Configuration, Archetype, Local Maven Repository and MavnRepository-Multimodule using command line - Dependency Plugins-Types -Dependency scope.

UNIT III DATA PERSISTENCE **9**

Object/Relation Mapping using Simple JDBC Integration with native sql commands-ORM Models - Tools- SQl JNDI(Java Naming and Directory Interface), JNDI Data source Configuration,Data source objects creation - Files --Application Deployment in Tomcat with JNDI, Hibernate: Introduction, Integrating and configuring Hibernate, understanding connection pool-Architecture-core components-Hibernate and JAVA persistence API(JPA)-Dependencies-Domain Model classes..

UNIT IV ORM ARCHITECTURE **9**

ORM Architecture, Spring Data, JPA, Hibernate,JPA annotations,JPA - ORM components ,Installations , Entity Manager, Entity Relationships – Many To One Relation, One To Many,Relation, One To One Relation and Many To Many Relation. Java Persistence query language -Building a sample application using JPA-JPA - Advanced mapping- Criteria API- Service classes.

UNIT V WEB SECURITY **9**

Web Security Framework: Specifying an Authorization Constraint-Authentication Mechanisms-JSON Web Token (JWT), JWT structure and configuration,JWT Signature,OAUTH2-Roles, Architecture, Authentication grant, Obtaining Access Token, Accessing a protected resource, OAuth Registry-Authorization endpoints, Extensibility. Case Study: Develop a Spring based application with JWT-OAUTH2

LAB EXERCISES:

1. Developing simple applications in Maven.
2. Implement Spring IOC.
3. Implement Spring
4. Create a web application using Spring MVC.
5. Implement Data Persistence using JPA and Hibernate.
6. Creating RESTFUL services and Test using Postman or
7. Usage of Java Naming and Directory Interface
8. Implement Logging using Log4j.
9. Implement Spring Security using JWT and OAUTH2.

LAB REQUIREMENTS:

- Java Programming
- NetBeans IDE

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Jim Keogh, "J2EE: The Complete Reference", McGraw Hill, 2002
2. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.
3. Joseph B.Ottinger, Jeff LinWood, Dave Minter, " Beginning Hibernate: for Hibernate 5", 4th Edition, Apress, 2016

REFERENCES:

1. Elder Moraes, "Java EE 8 Cookbook", Packt Publishing, 2018..
2. Jon Brisbin, Oliver Gierke, Thomas Risberg, Mark Pollack, Michael Hunger," Spring Data: Modern Data Access for Enterprise Java", O'Reilly Media, November, 2012

ONLINE RESOURCES:

1. https://www.baeldung.com/rest-with-spring-series
2. https://www.coursera.org/courses?query=spring%20framework
3. https://www.gangboard.com/spring-and-hibernate-courses
4. https://netbeans.apache.org/kb/docs/javaee/javaee-getting started.html

OUTCOMES:

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

1. Understand the concepts of JEE and build tools like maven..(K2)
2. Apply core Technologies in real world application(K1)
3. Demonstrate real world application in different frameworks like spring and spring MVC(K2)
4. Develop techniques and tools for improving team collaboration and software quality(K3)
5. Apply logging process and spring security in real world applications.(K3)
6. Perform Software process improvement as an ongoing task for development teams.(K1)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	-	2	2	-	1	2	3	2	1	2
CO2	3	3	2	1	2	-	-	-	2	1	3	1	1	2
CO3	2	2	2	1	2	3	2	-	-	-	3	-	2	-
CO4	-	3	3	-	-	-	-	-	-	1	3	-	3	2
CO5	2	2	2	1	2	-	-	-	-	-	2	-	2	2
CO6	-	-	-	-	2	2	2	-	-	-	1	1	2	1

SEMESTER - V

20CJPC503 SDG NO. 4 & 9	WEB TECHNOLOGY FOUNDATION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Learn the basic concepts in HTML, CSS, Javascript
- To understand the responsive design and development
- To understand the fundamentals of Javascript
- To explore advanced ES6 features

UNIT I WEB DESIGN - HTML MARKUP FOR STRUCTURE 9

Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5- Introduction to nodeJs.

UNIT II CASCADING STYLE SHEETS 9

CSS - Formatting text - Colors and Background - Padding, Borders and Margins - Floating and positioning - Page Layout with CSS - Transition, Transforms and Animation - Mobile-First or Desktop-First - CSS Grids, CSS Frameworks, UI Kits, and Flexbox for Responsive Web Design.

UNIT III JAVA SCRIPT FUNDAMENTALS 9

Introduction - Variables and Data Types - Operators and Expressions - Control flow and Conditional Statements - Functions and Scope - Arrays and Loops - Objects and Properties - Events and Event Handling - Document Object Model - Basic manipulation of HTML and CSS using Javascript - Handling Errors and Exceptions.

UNIT IV JAVA SCRIPT WITH ES6 **9**

Introduction to ES6 - Arrow functions and default parameters - Template literals and string interpolation - Block scoped variables with let and const - Destructuring and Spreading - Map,Filter and Reduce - Callbacks - Async/Await and Asynchronous programming.

UNIT V JAVA SCRIPT HTML DOM **9**

Using Script Tag to Link/code JS with html -jQuery Library usage - DOM - Manipulation and Traversal using JQuery- Elements- HTML- FORMS--CSS-Events- Variable Hoisting, AJAX Calls.-Introduction to bootstrap.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Jennifer Niederst Robbins, "Learning Web Design", O'REILLY 4th Edition, 2012
2. Ricardo Zea, "Mastering Responsive Web Design", PACKT Publishing, 2015
3. David Flanagan, "JavaScript: The Definitive Guide", O'Reilly Media, 2020

REFERENCES:

1. Jon Duckett, "HTML and CSS: Design and Build Websites", John Wiley and Sons, edition 2014
2. Jon Duckett, Jack Moore, "JavaScript & JQuery: Interactive Front-End Web Development",John Wiley and Sons, edition 2014
3. Ethan Brown, "JavaScript and ES6: A Comprehensive Guide" O'Reilly Media 2021

WEB REFERENCES:

1. https://www.tutorialspoint.com/javascript
2. https://www.w3schools.com/css/
3. https://www.w3schools.com/jquery/

ONLINE RESOURCES:

1. https://www.edx.org/course/html5-and-css-fundamentals
2. https://www.udemy.com/course/html-css-javascript-course/

OUTCOMES:

Upon completion of the course, students shall have ability to

1. Understand the basic concepts in HTML, NODEJS(K2)
2. Apply the basic concepts of CSS styling the webpages(k3)
3. Understand the basic structure of Java Script to solve the for real world problems(K2)

4. Understand the Java Script & ES6 CO concepts to solve the for real world problems(K2)
5. Apply the Java Script & ES6 concepts to solve the for real world problems(K3)
6. Interpret the JS and ES6 to design the webpage based on the application (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	-	-	-	-	-	2	-	2	3	2	2
CO2	2	3	3	-	-	-	-	-	2	-	2	3	2	2
CO3	2	3	3	-	-	-	-	-	2	-	2	3	3	3
CO4	2	3	3	-	-	-	-	-	2	-	2	3	3	3
CO5	2	3	3	-	-	-	-	-	2	-	2	2	3	3
CO6	2	3	3	-	-	-	-	-	2	-	2	3	2	2

SEMESTER - V

20CSPW401 SDG NO. 4 & 9	COMPUTER NETWORKS WITH LABORATORY	L	T	P	C
		3	0	2	4

OBJECTIVES:

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

UNIT I INTRODUCTION AND PHYSICAL LAYER 9

Networks – Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.

UNIT II DATA LINK LAYER & MEDIA ACCESS 9

Introduction – Data Link Layer - Addressing – DLC Services – Data-Link Layer Protocols – HDLC – PPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices.

UNIT III NETWORK LAYER **9**

Network Layer Services – Packet switching – Performance – IPV4 Addresses – Forwarding of IP Packets - Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol.

UNIT IV TRANSPORT LAYER **9**

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram protocol – Transmission Control Protocol – SCTP.

UNIT V APPLICATION LAYER **9**

WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP.

LIST OF EXPERIMENTS : **15**

1. Simple client server program.
2. Socket program for echo/ping commands.
3. Implementing Link state routing algorithm.
4. Implementing distance vector routing algorithm.
5. Study of Network Simulator (NS2 or NS3) and Simulation of Congestion Control Algorithms using NS.
6. Study of TCP/UDP performance using Simulation tool.
7. Simulation of error correction code (like CRC).
8. Traffic Analysis using Wireshark.

TOTAL: 60 PERIODS

LAB REQUIREMENTS:

1. C/C++/JAVA/Equivalent compiler
2. Network Simulator like NS2/OPNET/Wireshark

TEXT BOOKS:

1. Behrouz A. Forouzan, “Data communications and networking with TCP/IP protocol suite", Sixth Edition, McGraw Hill, cop. 2022.
2. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

REFERENCES:

1. William Stallings, “Data and Computer Communications”, Tenth Edition, Pearson Education, 2014.
2. Nader F. Mir, "Computer and Communication Networks", Second Edition Prentice Hall, 2014.

3. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill Publisher, 2011.
4. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.
5. Andrew S. Tanenbaum, David J. Wetherall,"Computer Networks ", 5th edition, Pearson Education,2011

WEB REFERENCES:

1. https://swayam.gov.in/nd2_cec19_cs07/preview
2. https://nptel.ac.in/courses/106105081/
3. https://www.isi.edu/nsnam/ns/

ONLINE RESOURCES:

1. https://ptgmedia.pearsoncmg.com/images/9780789749048/samplepages/0789749041.pdf
2. https://www.cse.iitb.ac.in/~sri/cs348/cs378-lab00-overview.pdf
3. https://freevideolectures.com/course/2276/computer-networks
4. https://www.youtube.com/watch?v=g8iY36onLeM&list=PLWPirh4EWFpHJrW1D9UB24wsbM3zx7QMx

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the basic layers and its functions in computer networks. (K2)
2. Demonstrate the performance of a network. (K2)
3. Explain the basics of how data flows from one node to another. (K2)
4. Understand IEEE standards, analyze and design routing algorithms. (K2)
5. Describe the working of various transport and application layer protocols.(K2)
6. Apply the protocols for various functions in the network.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	3	2	2	-	2	1	-	1	3	2
CO2	3	3	2	-	-	-	1	-	-	-	-	-	2	1
CO3	3	3	3	-	1	-	1	-	-	1	-	1	3	1
CO4	3	3	3	-	-	-	1	-	-	1	-	-	2	2
CO5	3	3	3	-	1	-	2	-	-	1	-	1	3	2
CO6	3	3	3	-	1	-	1	-	-	1	-	-	3	2

SEMESTER - V

20CJPL501 SDG NO. 4	WEB TECHNOLOGY LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To develop UI using HTML5 and CSS3
- To design interactive web pages using Java Script.
- To learn jQuery.

LIST OF EXPERIMENTS :

1. Create an HTML form to collect details about a person, including their name, email, phone, and date of birth. Add a text area for a brief description and appropriate labels for accessibility.
2. Create an HTML page that displays a table containing information on 10 books. Each row of the table should display the book name, author name, published year, and a purchase link for the book, with the book name being a hyperlink to the purchase link.
3. Create an HTML page that includes a header, main content section, and footer. In the main content section, add an image gallery with multiple images that can be clicked on to view a larger version. Use CSS to style the image gallery, including the layout, colors, and borders.Add appropriate alt attribute to each image for accessibility.
4. Create a navigation bar that includes links to different sections of a website. Use CSS to style the navigation bar, including the layout, colors, and font.When a user hovers over a link, the background color of the link should change, and when a link is clicked, the background color of the link should remain changed to indicate the current page. Additionally, use media queries to make the navigation bar responsive and easy to use on any device.
5. Write a JavaScript program to calculate multiplication and division of two numbers (input from form styled with html and css).
6. Write a program that takes an array of objects representing a group of students, each with a name and an array of test scores. The program should use map, filter, and reduce to calculate the average test score for each student, and then return an array of objects containing only the students who have an average score above 90.
7. Write a jQuery program to create a simple slideshow of images that automatically transition to the next image after a certain time interval. The program should allow the user to pause and resume the slideshow, as well as navigate back and forth between images using buttons styled with CSS.

The images should be stored in an array, and the slideshow should loop back to the beginning once the last image is reached.

TOTAL: 45 PERIODS

LAB REQUIREMENTS:

1. VS Code -HTML ,CSS,JS

OUTCOMES :

On completion of this laboratory course, the student should be able to

1. Develop web pages using HTML, DHTML and Cascading Styles sheets(K3)
2. Apply better UI for web pages using JQuery. (K3)
3. Develop a dynamic web pages using JavaScript (client side programming). (K3)
4. Create XML documents and XML Schema (K6)
5. Build and consume web services. (K6)
6. Develop JSP applications implementing Session management and Database Connectivity. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	3	1	1	-	-	-	2	2	3	2
CO2	3	3	3	2	3	1	1	-	-	-	2	2	2	2
CO3	3	3	3	3	3	-	-	-	-	-	2	2	3	2
CO4	2	2	3	2	3	-	-	-	-	-	2	2	3	2
CO5	3	3	3	3	2	1	1	-	-	-	3	3	3	2
CO6	3	3	3	3	2	1	1	-	-	-	2	2	3	2

SEMESTER - V

20CJTE501 SDG NO. 4,11 &15	LIVE-IN-LAB III	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To provide opportunities for the students, expose to Industrial environment and real time work
- To give access to NASSCOM research and intelligence that tracks industry trends, growth opportunities and best practices, access to a repository of industry presentations, blogs, discussions and articles

- To impart detailed knowledge of Computer Networks, various protocols used in Communication, Managing and configuring Cisco Switches and Routers and various WAN technologies
- To automate repetitive and redundant tasks and eliminates the human intervention using UiPath a Robotic Process Automation tool

COURSE METHODOLOGY:

1. This initiative is designed to inculcate ethical principles of research and to get involve in life-long learning process for the students.
2. To engage students in CSE beyond their robust academic curriculum that sparks curiosity and imagination while teaching critical knowledge and skills.
3. This practice will engage beyond curriculum using industry-relevant technologies that help students get ready for the next step in their educations or careers. It helps the learners expand knowledge; develop skills, and their innovativeness.
4. The initiative is designed to provide students with foundational knowledge and skills in areas of CSE that are universally in high demand across computing jobs
5. On completion of the course, the student shall be able to develop applications and submit a detailed report for evaluation.

EVALUATION:

1. First evaluation (Immediately after first internal examination) : 20 marks
2. Second evaluation (Immediately after second internal examination): 30marks
3. Final evaluation (Last week of the semester) : 50marks

Note: All the three evaluations are mandatory for course completion and for awarding the final grade

TOTAL: 45 PERIODS

OUTCOMES:

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

1. Perform literature survey to identify the gap and an application oriented research problem in the specific domain (K2)
2. Design and validate the proposed system using simulation (K3)
3. Implement the proposed system (K3)
4. Examine the obtained results and prepare a technical report (K4)
5. Publish the work in journals and apply for the patents.(K3)

6. Prepare for industrial environment and real time work (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	3	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO3	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO4	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO5	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO6	2	2	2	2	3	2	2	2	2	2	3	3	3	3

SEMESTER - V

20CJTP501 SDG NO. 4&5	SKILL ENHANCEMENT (DB)	L	T	P	C
		0	0	2	1

Analytical & Critical thinking Skills – Phase 1

COURSE OBJECTIVES

To enable students to,

- Enhance their quantitative ability.
- Enhance their reasoning ability
- Enhance their verbal ability.
- Equip with creative thinking and problem solving skills

Unit I Quantitative Ability – V **10**

Square Root And Cube Root, Logarithm, Volume and Surface Area, Permutation and Combination

Unit II Quantitative Ability – VI **10**

Probability, Averages, Area, Odd Man Out, Crypt Arithmetic, Flowcharts

Unit III Reasoning Ability – III **8**

Data Interpretation Table Charts, Data Interpretation Bar Charts, Blood Relationship, Puzzles

Unit IV Verbal Ability – III **10**

Spellings, Selecting Words, Spotting Errors, Ordering of Words, Logical Sequence of Words

Unit V Creativity Ability – III **7**

Logical Puzzles, Playing Cards Puzzles, Clock Puzzles, Number Puzzles, Sudoku

TOTAL : 45 PERIODS

REFERENCES

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2. Quantum CAT by Sarvesh Verma
3. A Modern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun Sharma

Python Programming – Part 1 & Web Technology

OBJECTIVES:

- The course is designed to provide Strong knowledge of Python. Python programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the Python programming language.

UNIT I INTRODUCTION, DATA TYPES AND STRINGS, LIST & TUPLES 10

DataTypes - Integer , Float , Boolean , String , List , Tuple , Dictionary and Sets. String - Concatenation and Replication, isalnum functions, Slicing Operation sorted() , reversed() , min() , max() , index() and count() function, packing and unpacking of data in a tuple

UNIT II DICTIONARY AND SETS and HANDLING **10**

Dictionary - del Keyword,. Sets - Frozen sets, Internal working of sets, add() , union() , intersection() and difference() method, symmetric_difference, clear() method, Operators in sets, Higher Order Functions - map , filter , reduce and lambda function, Random Library

UNIT III EXCEPTIONAL HANDLING,Regular REGULAR EXPRESSIONS AND OBJECT ORIENTED PROGRAMMING **10**

Exception Handling - All Error Categories, try , except , finally blocks, Raising an exception, Regular Expression, Object Oriented Programming - Types of Inheritence, Data encapsulation and Abstraction, Polymorphism, Method OverRiding, Operator overloading, operator overRiding.

UNIT IV HTML **8**

Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols -The World Wide Web-HTTP request message-response message-Web Clients Web Servers. Markup Languages: XHTML-Basic XHTML Syntax and Semantics-HTML 5.0.

UNIT V CSS **7**

CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML-CSS3.0. Client-Side Programming: The JavaScript Language-Variables and Data Types-Statements-Operators-Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debugger-Server-Side Programming: Java Servlets- Architecture -Overview-A Servlet-Generating Dynamic Content-Life Cycle.

TOTAL : 45 PERIODS

REFERENCES:

1. Python-(Mark Lutz)
2. Python Training guide (BPB Publications)
3. HTML & CSS- Jeffrey C Jackson, "Web Technologies– A Computer Science Perspective", Pearson Education, 2006.

ONLINE RESOURCE:

1. https://nptel.ac.in/courses/106105084

WEB RESOURCE:

1. https://www.coursera.org/courses?query=web%20technologies

OUTCOMES

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

1. Explain basic principles of Python programming language (K2)
2. Implement object oriented concepts.(K3)
3. Implement database and GUI applications.(K3)
4. Design Simple Web Pages using markup languages like HTML & XHTML.(K4)
5. Program Server side web pages that have to process requests from client side web pages.(K3)
6. Understand various web services and how these web services interact.(K2)

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2	2	1	-	-	-	-	-	-	1	1	2
CO2	2	2	1	1	1	-	-	-	-	-	-	2	2	2
CO3	2	2	1	2	2	-	-	-	-	-	-	1	1	2
CO4	1	2	2	1	3	-	-	-	-	-	-	2	2	2
CO5	1	2	1	1	3	-	-	-	-	-	-	2	2	2

SEMESTER - VI

20CSPC601 SDG NO. 4 & 9	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the various characteristics of Intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents and about the various applications of AI

UNIT I INTRODUCTION **9**

Introduction - Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents – Typical Intelligent Agents – Problem Solving Approach to Typical AI Problems – Search Strategies - Uninformed - Heuristics - Informed.

UNIT II PROBLEM SOLVING METHODS **9**

Local Search Algorithms and Optimization Problems - Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing – Optimal Decisions in Games – Alpha-Beta Pruning - Stochastic Games.

UNIT III REPRESENTATION OF KNOWLEDGE **9**

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining - Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering - Categories and Objects - Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information.

UNIT IV PLANNING AND LEARNING **9**

Planning – Planning with State Space Search- Partial Order Planning Algorithm – Planning Graphs - Logical Formulation of Learning - Knowledge in Learning - Explanation-based Learning - Learning using Relevance Information.

UNIT V NATURAL LANGUAGE PROCESSING **9**

Language models - Phrase Structure Grammars - Syntactic Analysis – Augmented Grammars and Semantic Interpretation - Application with NLP: Developing a Simple Chatbot - Types of Chatbot.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Stuart J Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
2. Elaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", Tata McGraw-Hill Education, Third Edition, 2008.

REFERENCES:

1. M. Tim Jones, "Artificial Intelligence: A Systems Approach(Computer Science)", Jones and Bartlett Publishers, Inc.; First Edition, 2008.
2. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009.
3. William F. Clocksin and Christopher S. Mellish, "Programming in Prolog: Using the ISO Standard", Springer, Fifth Edition, 2003.
4. George F Luger, "Artificial Intelligence: Structures and Strategies for Complex Problem Solving", Pearson Education, New Delhi, Fifth Edition, 2017.
5. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", O'Reilly, 2009, https://www.nltk.org/book/.
6. I. Bratko, "Prolog: Programming for Artificial Intelligence", Addison-Wesley Educational Publishers Inc., Fourth Edition, 2011.

WEB REFERENCES:

1. https://books.google.co.in/books?id=uSvYmki2yg0C&printsec=frontcover&dq=Supervised+Learning&hl=en&sa=X&ved=0ahUKEwigkNa1xN3oAhWawjgGHe8hAzoQ6AEIKDAA#v=onepage&q=Supervised% 20learning &f=false

OUTCOMES:

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

1. Infer the agent characteristics and its problem solving approaches.(K2)
2. Select appropriate search algorithms for any AI problem.(K1)
3. Apply the principles of AI in game playing.(K3)
4. Construct and solve a problem using first order and predicate logic.(K3)
5. Identify the methods of solving problems using planning and learning.(K3)
6. Implement applications for Natural Language Processing that use Artificial Intelligence.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	3	2	1	1	-	1	-	-	1	2	3
CO2	2	3	2	3	2	1	1	-	1	-	-	1	3	3
CO3	2	3	2	3	2	1	1	-	1	-	-	1	3	2
CO4	2	3	2	3	2	1	1	-	1	-	-	1	3	3
CO5	2	3	2	3	3	1	1	-	2	-	-	1	2	2
CO6	2	3	2	3	3	1	1	-	2	-	-	1	2	3

SEMESTER - VI

20CJPC601 SDG NO. 4 & 9	CLOUD COMPUTING Technologies	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concept of Cloud Computing
- To appreciate the Evolution of Cloud from the existing technologies
- To have knowledge on the various issues in Cloud Computing
- To appreciate the Emergence of Cloud as the next generation computing paradigm

UNIT I INTRODUCTION 9

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

UNIT II CLOUD ENABLING TECHNOLOGIES 10

Service Oriented Architecture – REST – Web Services – Publish-Subscribe Model – Micro services – Micro services Architecture - 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 8

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

UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 10

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

UNIT V CLOUD TECHNOLOGIES AND ADVANCEMENTS 8

Hadoop – Map Reduce – Virtual Box - Google App Engine – Programming Environment for Google App Engine – OpenStack –Introduction to Cloud-Fog-Edge Computing-Architecture and Components-Data Management and Storage-Real-Time Analytics in Fog and EdgeScalability and Performance Optimization.

TOTAL: 45 PERIODS

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. Rittinghouse, John W., and James F. Ransome, “Cloud Computing: Implementation, Management and Security”, CRC Press, 2017.

REFERENCES:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, “Mastering Cloud Computing”, Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach”, Tata Mcgraw Hill, 2009.
3. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)”, O'Reilly, 2009.
4. Douglas Comer,"The Cloud Computing Book: The Future of Computing Explained",Chapman and Hall/CRC,2021
5. Hemanand D,Chembian W T,Vallem Ranadheer Reddy, "CLOUD COMPUTING: Cloud Concepts;Methodology,Network Architecture"July 2021,LAP LAMBERT Academic Publishing

ONLINE RESOURCES:

1. https://eniac2017.files.wordpress.com/2017/03/distributed-and-cloud-computing.pdf.
2. https://www.vmware.com/topics/glossary/content/distributed-cloud.html

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc20_cs20/preview
2. https://nptel.ac.in/courses/106/105/106105167/
3. https://freevideolectures.com/course/4639/nptel-cloud-computing
4. https://www.udemy.com/course/learn-cloud-computing-from-scratch/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Identify the main concepts, key technologies, strengths and limitations of cloud computing. (K3)
2. Explain the key and enabling technologies that help in the development of the cloud.(K2)
3. Understand and use the architecture of compute and storage cloud,service and delivery models.(K2)
4. Explain the core issues of cloud computing such as resource management and security.(K2)
5. Discover and use current cloud technologies. (K3)
6. Identify the appropriate technologies, explain the cloud Fog Edge computing (K3)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	-	-	-	-	-	-	-
CO2	2	3	2	1	-	-	-	-	-	-	-	-
CO3	3	2	2	1	3	-	-	-	-	-	-	-
CO4	3	3	3	2	3	3	2	2	1	1	2	2
CO5	3	3	2	2	2	-	-	-	-	1	-	2
CO6	3	3	3	3	1	3	1	3	-	-	2	2

SEMESTER - VI

20CJPW601 SDG NO. 4 & 9	MOBILE APPLICATION DEVELOPMENT WITH LABORATORY	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To understand basic concepts of mobile technologies, different operating systems and how to work with Android .
- To develop applications for current and emerging mobile computing devices, performing tasks at all stages of the software development life-cycle.
- To learn how to code with object oriented programming.
- To design, implement and deploy mobile applications for Android .
- To design, implement and deploy mobile applications for windows OS.

UNIT I INTRODUCTION TO ANDROID 9

Introduction to mobile technologies, mobile operating systems- brief history, Types of mobile phone generations, The Mobile Ecosystem, Types of Mobile Applications, Mobile Information Architecture,Android Versions, Features of Android, Android Architecture, Installing Android SDK Tools,Configuring Android in Eclipse IDE, Android Development Tools (ADT), Creating Android Virtual Devices (AVD).

UNIT II ANDROID BUILDING BLOCKS & COMPONENTS 9

Creating first android application, Anatomy of android application, Deploying Android app on USB connected Android device, Android application components, Introduction to Activities and Intents- Activity life cycle,Understanding activities, Linking activities using intents, Linking Activities, Passing Data,Toast,Exploring Intent objects, Intent Types, Displaying a Dialog Window and Notifications. Content Provider, Services, Broadcast receivers, accessing databases, Location and sensors, Multimedia audio, video and camera

UNIT III ANDROID FRAGMENTS 9

Fragments life cycle, Interaction between fragments, Understanding the components of a screen (Layouts), Adapting to display orientation, Managing changes to screen orientation,Utilizing the Action Bar, Working with Views(UI Widgets)-Button, Toast, ToggleButton,CheckBox, RadioButton, Spinner, WebView, EditText, DatePicker, TimePicker, ListView,ProgressBar, Analog and Digital clock, Handling UI events, List fragment, Dialog fragment.

UNIT IV ANDROID MENUS **9**

Working with Menus-Option menu, Context menu, Popup menu, Working with images- ImageView, ImageSwitcher, AlertDialog, Alarm manager, SMS messaging, Sending E-mail, Media Player, Using camera for taking pictures, recording video, Handling Telephony Manager, sample applications, debugging and deploying app, publish in Playstore.

UNIT V DATABASE CONNECTIVITY IN ANDROID **9**

Storing the data persistently-Introducing the Data Storage Options: The preferences, The Internal Storage, The External Storage, The Content Provider , The SQLite database,Connecting with the SQLite database and operations-Insert, Delete, Update, Fetch, Publishing android applications-preparing for publishing, Deploying APK files.

LAB EXERCISES:

1. To implement mobile application life cycle methods.
2. To implement simple calculator application.
3. To implement simple SMS application.
4. To implement authentication verification application without and with database.
5. To implement navigation application with multiple pages / activities.
6. To implement student placement registration form with database.
7. To implement a simple notification application.
8. To implement simple intent with data passing application.
9. To implement simple profile changer application through SMS.
10. To create mobile web browser application.
11. To create mobile e-mail application to sent a mail.

LAB REQUIREMENTS:

1. Android Studio -IDE
2. Windows OS - 64 bit

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Reto Meier, "Professional Android Application Development", Wrox, 2010.
2. Iggy Krajci, Darren Cummings , "Android on x86", Apress , 2013

REFERENCES:

1. John Horton, Android Programming for Beginners,2nd edition, Packt Publishing, 2018
2. Dawn Griffiths,"Headfirst Android Development",1st edition,O'Reilly,2015

ONLINE RESOURCES:

1. http://www.tutorialspoint.com/android/index.htm
2. http://developer.android.com/training/index.html
3. http://www.youtube.com/playlist?list=PLGLfVvz_LVvQUjiCc8lUT9aO0GsWA4uNe

OUTCOMES:

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

1. Understand the technologies and business trends impacting mobile applications.(K1)
2. Understand and remember the components of android mobile applications. (K1)
3. Learn the programming languages and techniques for developing mobile applications. (K1)
4. Develop mobile applications with user interface and database connectivity for real time applications.(K2)
5. Deploy mobile applications with user interface and database connectivity for real time applications for android.(K3)
6. Develop and deploy mobile applications with android IDE.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	-	2	2	-	1	2	3	2	1	2
CO2	3	3	2	1	2	-	-	-	2	1	3	1	1	2
CO3	2	2	2	1	2	3	2	-	-	-	3	-	2	-
CO4	-	3	3	-	-	-	-	-	-	1	3	-	3	2
CO5	2	2	2	1	2	-	-	-	-	-	2	-	2	2
CO6	-	-	-	-	2	2	2	-	-	-	1	1	2	1

SEMESTER - VI

20CSPL601 SDG NO. 4 & 9	ARTIFICIAL INTELLIGENCE LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To learn Prolog Program
- To Implement in Prolog, C and its working environment
- To Implement N-Queen problem and puzzle problem using Prolog
- To Analyze the problem using BFS and DFS algorithm

LIST OF EXPERIMENTS :

1. Study of Prolog.
2. Write simple fact for the statements using Prolog.
3. Write predicates - one converts centigrade temperature to Fahrenheit, other checks if a temperature is below freezing.
4. Write a program to solve 4-Queen problem.
5. Write a program to solve 8-Puzzle problem.
6. Write a program to solve any problem using Breadth First Search.
7. Write a program to solve any problem using Depth First Search.
8. Write a program to solve Travelling Salesman Problem.
9. Write a program to solve Water Jug problem.
10. Write a program to solve Missionaries and Cannibal problem.
11. Write a program to implement Library Management System.

TOTAL: 45 PERIODS

LAB REQUIREMENTS :

SOFTWARE : Prolog, Turbo C

OUTCOMES:

On completion of this laboratory course, the student should be able to

1. Interpret the concepts of Turbo and Prolog programming in AI.(K3)
2. Examine First order predicate logic to solve AI problems. (K4)
3. Apply Informed search strategies to solve AI problems.(K3)
4. Apply Uninformed search strategies to solve AI problems.(K3)
5. Select State Space Searching method to solve AI problems.(K3)
6. Demonstrate an application using Natural Language Processing. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	-	1	-	1	-	-	-	-	-	1	2
CO2	3	2	2	1	1	-	-	-	-	-	-	-	2	2
CO3	3	2	1	-	2	-	-	-	-	-	-	1	2	1
CO4	3	2	1	-	2	-	-	-	-	-	-	1	2	1
CO5	2	2	2	-	1	-	1	-	-	-	-	-	2	2
CO6	2	2	1	2	2	-	-	-	-	-	-	-	2	1

SEMESTER - VI

20CSPL602 SDG NO. 4	CLOUD COMPUTING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To develop Web Applications in Cloud
- To learn the design and development process involved in creating a Cloud Based Application
- To understand the installation of Cloud Simulation tools and Cloud Setup tools
- To learn to implement and use Parallel programming using Hadoop

LIST OF EXPERIMENTS :

1. Install VirtualBox/VMware Workstation with different flavors of Linux or Windows OS on top of Windows 7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute simple programs.
3. Install Google App Engine. Create hello world app and other simple web applications using Python/Java.
4. Use GAE launcher to launch the Web Applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one Virtual Machine to another Virtual Machine.
7. Find a procedure to launch Virtual Machine using try stack (Online Openstack Demo Version)

8. Install Hadoop single node cluster and run simple applications like wordcount.

TOTAL: 45 PERIODS

LAB REQUIREMENTS:

S.No.	Software
1.	Virtual box
2.	VMware Workstation
3.	Openstack, Hadoop
4.	Cloudism
5.	GAE launcher

OUTCOMES :

On completion of this laboratory course, the student should be able to

1. Discuss various virtualization tools such as Virtual Box, VMware to create virtual Environment. (K2)
2. Design and Implement applications on the Cloud.(K3)
3. Illustrate web applications in a PaaS environment. (K3)
4. Understand how to simulate a cloud environment to implement new schedulers. (K2)
5. Demonstrate and use a Generic Cloud environment that can be used as a private cloud. (K3)
6. Manipulate large data sets in a parallel environment. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	3	1	1	-	-	-	2	2	3	2
CO2	3	3	3	2	3	1	1	-	-	-	2	2	2	2
CO3	3	3	3	3	3	-	-	-	-	-	2	2	3	2
CO4	2	2	3	2	3	-	-	-	-	-	2	2	3	2
CO5	3	3	3	3	2	1	1	-	-	-	3	3	3	2
CO6	3	3	3	3	2	1	1	-	-	-	2	2	3	2

SEMESTER - VI

20HSPL501 SDG NO. 4 & 8	COMMUNICATION AND SOFT SKILLS LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To develop effective communication and presentation skills
- To enhance the employability and career skills of the learners
- To enable the learners for preparing job application and e-portfolio
- To make the learners use soft skills efficiently
- To develop their confidence and help them in attending interviews successfully

UNIT I LISTENING AND SPEAKING SKILLS 6

Conversational skills participate in formal and informal talks – general, – group discussion – time management – group dynamics – GD strategies - making effective presentations - listening/watching interviews conversations, documentaries - listening to lectures, discussions from social media – improving articulation.

UNIT II ADVANCED READING AND WRITING SKILLS 6

Reading different genres of texts - writing job applications – cover letter – résumé – emails – memos - writing abstracts – summaries – interpreting visual texts - e-portfolio.

UNIT III SKILLS FOR COMPETITIVE EXAMS 6

Reading passages for competitive exams – language focus exercise – building vocabulary tasks - FAQs related to competitive exams – current affairs - improving global reading skills – elaborating ideas – summarizing – understanding arguments – identifying opinion/attitude and making inferences - critical reading.

UNIT IV SOFT SKILLS 6

Motivation – emotional intelligence – managing changes – stress management – leadership straits – team work – career planning – intercultural communication – creative and critical thinking

UNIT V INTERVIEW SKILLS 6

Different types of interview – personal interview – panel interview – telephone/online interview - interview etiquette - answering questions – offering information – mock interviews – FAQs related to job interviews

TOTAL: 30 PERIODS

REFERENCES:

1. Business English Certificate Materials, Cambridge University Press.
2. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge, 2011.
3. International English Language Testing System Practice Tests, Cambridge University Press.
4. Personality Development (CD-ROM), Times Multimedia, Mumbai.

WEB REFERENCES:

1. https://nptel.ac.in/courses/109/107/109107121/
2. https://swayam.gov.in/nd1_noc19_hs33/preview
3. https://ict.iitk.ac.in/courses/enhancing-soft-skills-and-personality/

ONLINE RESOURCES:

1. https://www.britishcoucil.my/english/courses-adults/learning-tips/importance-of-soft-skills
2. https://www.skillsoft.com/content-solutions/business-skills-training/soft-skills-training/

OUTCOMES:

Upon completion of the course learners should be able to

1. Demonstrate a better understanding of the communication process by articulating effectively(K2)
2. Exhibit soft skills & technical skills and construct e-portfolio effectively(K3)
3. Apply critical thinking abilities and perform well in group discussions(K2)
4. Adapt the skills towards grooming as a professional continuously(K2)
5. Identify different types of personal interview skills through mock interviews and practices(K2)
6. Execute the employability and career skills in their chosen profession(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	2	3	1	1
CO2	-	-	-	-	-	-	-	2	3	3	2	1
CO3	-	-	-	-	-	-	-	2	3	2	-	1
CO4	-	-	-	-	-	-	-	1	1	3	2	2
CO5	-	-	-	-	-	2	-	1	2	3	-	1
CO6	-	-	-	-	-	-	-	1	1	3	2	2

SEMESTER - VI

20CJTP601 SDG NO. 4 & 9	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

Aptitude and Cognitive Skills – Phase 1

COURSE OBJECTIVES

To enable students to,

- Enhance their quantitative ability.
- Enhance their reasoning ability
- Enhance their verbal ability.

UNIT I Quantitative Ability – VII **10**

Races And Games, Boats and Streams, Surds and Indices, Pipes and Cistern, Alligations And Mixtures

UNIT II Quantitative Ability – VIII **10**

Numbers, Problems on Numbers, Pick Wrong Number, Missing Number, Areas, Shapes, Perimeter

UNIT III Reasoning Ability – IV **8**

Data Interpretation Pie Charts, Data Interpretation Line Charts, Data Sufficiency (DS), Data Arrangements, LR – Arrangements, LR – Ranking.

UNIT IV Verbal Ability – IV **10**

Sentence Correction, Sentence Improvement, Completing Statements, Sentence Formation, Paragraph Formation

UNIT V Creativity Ability – IV **7**

Dot Situation, Rule Detection, Embedded Images, Grouping Of Images, Image Analysis

TOTAL: 45 PERIODS

REFERENCES

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2. Quantum CAT by Sarvesh Verma
3. A Modern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun Sharma

Problem Solving using Basic Data Structures – Mobile Application Development & Android Studio – Phase 2

OBJECTIVES:

- Familiarize students with basic data structures and their use in fundamental algorithms.
- Understand and develop application using Android

UNIT I LINKED LIST & STACK, QUEUE & HEAP **10**

Linked List - Doubly Linked List Traversal, Circular Linked List, Structure, Node creation, Traversal Stack, Stack –Time Complexities of the Operations, Infix to Postfix/Prefix Conversation, Histogram Problem, Implementation - Using Array, Using Linked List, Queue Implementation - Queue using Stack

UNIT II BINARY TREE AND HASHING **10**

Binary Tree - Types of Binary Tree,Balanced Tree, Degenerate or pathological Tree, Binary Search Tree, Inorder , Preorder , PostOrder and LevelOrder Traversal, Hashing, Linear Probing for Collision Handling, Union and Intersection of two Linked Lists

UNIT III TREES AND GRAPH **10**

AVL Tree -Right-Left Imbalance, Left and Right Rotation, - Red Black Tree, Rules of coloring Left and Right Rotation,Graph terminology –Representation of graphs –Path matrix –Graph Traversal –BFS (breadth first search) –DFS (depth first search) –Minimum spanning Tree –Kruskal's Algorithm & Prim's Algorithm –Warshall's algorithm (shortest path algorithm).

UNIT IV INTRODUCTION TO ANDROID STUDIO APPLICATION **8**

Android Studio Development Kit - The Android Platform - Eclipse Installation- Understanding the Anatomy of Android Application - Android Installation - Building the First Android Application - Android Manifest File -Android

Technology - Android Application Design Essentials : Android Applications Anatomy -Application- Activities, Context, Services, Intents - Receiving and Broadcasting Intents - Using Intent Filter, Permissions - Android Manifest File and common settings.

UNIT V ANDROID APPLICATION PROGRAMMING INTERFACES 7

Using Android Data and Storage APIs - Designing User Interfaces and Layouts - Sharing Data between Applications with Content Providers - Managing Data Using Sqlite - Using Android Networking APIs - Using Android Telephony APIs - Using Android Web APIs - Deploying Android Application to the world - Testing Android Applications : Using Android Preferences - Publishing Android Application- Managing Application Resources in a Hierarchy - Drawing and working with Animation

TOTAL: 45 PERIODS

REFERENCES:

1. Weiss, Mark. A. (2012), Data structures and algorithm analysis in Java. 3 edition. Harlow, Essex : Pearson (632 p).
2. Zobel, Justin (2014), Writing for Computer Science. 3rd edition,. Springer Verlag London Ltd (270 p).
3. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference"Google Developer Training Team, 2017
4. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd, 2014.
5. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O'Reilly SPD Publishers, 2015.
6. J F DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126565580
7. AnubhavPradhan, Anil V Deshpande, " Composing Mobile Apps" using Android, Wiley 2014, ISBN: 978-81-265-4660-2

WEB LINK:

1. https://www.gitbook.com/book/google-developer-training/android-developerfundamentals- course-concepts/details (Download pdf file from the above link)

ONLINE RESOURCE:

https://nptel.ac.in/courses/106105084

WEB RESOURCE:

https://www.coursera.org/courses?query=web%20technologies

OUTCOMES

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

1. Analyze the applications of linear data structure using Stack and Queue implementation. (K4)
2. Define the various hash functions and its implementation. (K2)
3. Apply the basic concepts of the Non Linear Data Structure - Trees and Graph. (K3)
4. Apply the components and structure of mobile application development frameworks for Android studio and windows OS. (K3)
5. Analyze various Android Application Programming Interfaces.(K4)
6. Analyze and discover your own mobile app for simple needs. (K4)

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	-	-	-
CO5	1	1	3	2	3	2	3	1	-	-	-	-	-	-
CO6	1	3	1	1	1	2	1	2	-	-	-	-	-	-

SEMESTER - VI

20CJTE601 SDG NO. 4,11 &15	LIVE IN LAB-IV	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To understand the engineering aspects of design with reference to simple products
- To foster innovation in design of products
- To develop design that add value to products and solve technical problems.
- To create awareness among the students of the characteristics of several domain areas where IT can be effectively used

COURSE PLAN :

Study: Take minimum three simple products, processes or techniques in the area of specialization, study, analyze and present them. The analysis shall be focused on functionality, construction, quality, reliability, safety, maintenance, handling, sustainability, cost etc. whichever are applicable. Each student in the group has to present individually; choosing different products, processes or techniques.

Design: The project team shall identify an innovative product, process or technology and proceed with detailed design. At the end, the team has to document it properly and present and defend it. The design is expected to concentrate on functionality; design for strength is not expected.

Note: The one hour/week allotted for tutorial shall be used for discussions and presentations. The project team (not exceeding four) can be students from different branches, if the design problem is multidisciplinary.

EVALUATION:

1. First evaluation (Immediately after first internal examination) : 20 marks
2. Second evaluation (Immediately after second internal examination): 20 marks
3. Final evaluation (Last week of the semester) : 60 marks

Note: All the three evaluations are mandatory for course completion and for awarding the final grade.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand how to approach innovation challenges from a human-centred perspective [K2]
2. Develop many creative ideas through structured brainstorming sessions [K3]
3. Apply the perspectives of different people that lead to best innovations [K3]
4. Comprehend the importance of incorporating multidisciplinary approach that address human needs and sustainable development [K3]
5. The significance of developing innovation projects with a prototyping mind set, where iterations, trial and error, and even failure are all part of a valuable, creative learning process [K4]

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	2	3	3	3	2	3	3
CO2	3	3	3	3	3	3	2	2	3	3	3	2	3	3
CO3	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO4	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO5	2	2	2	1	2	1	1	1	3	2	3	3	3	2

SEMESTER - VII

20CSPC702 SDG NO. 4 & 11	MACHINE LEARNING TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the need for machine learning for various problem solving
- To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
- To understand the latest trends in machine learning
- To design appropriate machine learning algorithms for problem solving

UNIT I INTRODUCTION **9**

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT II NEURAL NETWORKS AND GENETIC ALGORITHMS **9**

Neural Network Representation – Problems – Perceptrons –Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

UNIT III BAYESIAN AND COMPUTATIONAL LEARNING **9**

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT IV INSTANCE BASED LEARNING **9**

K-Nearest Neighbor Learning – Locally weighted Regression – Radial Basis Functions –Case Based Learning.

UNIT V ADVANCED LEARNING **9**

Learning Sets of Rules – Sequential Covering Algorithm –Learning Rule Set –First Order Rules –Sets of First Order Rules– Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Based Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Tom M. Mitchell, "Machine Learning", TATA McGraw-Hill Education (India) Private Limited, 2017.
2. Marco Gori , "Machine Learning: A Constraint-Based Approach", Morgan Kaufmann. 2017

REFERENCES:

1. Ethem Alpaydin, "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press 2004.
2. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", CRC Press, 2009
3. Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Classification", Wiley, Second Edition.
4. Christopher Bishop, "Pattern Recognition and Machine Learning", illustrated Edition, Springer, 2006.
5. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", First Edition, Cambridge University Press, 2012.

WEB REFERENCES:

1. https://towardsdatascience.com/best-resources-for-ai-machine-learning-data-science-72625d4689d
2. https://www.analyticsvidhya.com/resources-machine-learning-deep-learning-neural-networks/
3. https://www.ritchieng.com/machine-learning-resources/
4. https://www.guru99.com/machine-learning-tutorial.html

OUTCOMES:

Upon completion of the course, the student should be able to

1. Gain knowledge about basic concepts of Machine Learning and differentiate between supervised, unsupervised, semi-supervised machine learning approaches. (K2)
2. Discuss and apply the back propagation algorithm and genetic algorithms to various problems.(K2)
3. Discuss the Decision Tree algorithm, identity and overcome the problem of over fitting and applying the Bayesian concepts to Machine Learning.(K2)
4. Solve the problems using various Machine Learning techniques and apply instant based learning techniques. (K3)
5. Analyze and suggest appropriate Machine Learning approaches for various types of problems. (K4)
6. Demonstrate various machine learning algorithms in a range of real-world applications. (K3)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	1	-	3	3	2	2	3	2
CO2	3	3	3	3	3	2	1	-	3	3	2	2	3	2
CO3	3	3	3	3	3	2	1	-	3	3	2	2	3	2
CO4	3	3	3	3	3	2	2	-	3	3	2	2	3	2
CO5	3	3	3	3	3	2	2	-	3	3	2	2	3	2
CO6	2	2	2	1	2	1	-	-	-	-	1	2	2	2

SEMESTER - VII

20ITPC701 SDG NO. 4 & 9	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand Cryptography Theories, Algorithms and Systems
- To understand necessary approaches and techniques to build protection mechanisms in order to secure Computer Networks
- To know the Symmetric Cryptography Techniques
- To understand the Public Key Cryptography techniques

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 Cryptanalysis - Block Cipher Design Principles – Block Cipher Mode of Operation – Evaluation Criteria for AES – Advanced Encryption Standard - RC4 – Key Distribution.

UNIT III PUBLIC KEY CRYPTOGRAPHY 9

Mathematics of Asymmetric Key Cryptography - 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 - ElGamal Cryptosystem – Elliptic Curve Arithmetic - Elliptic Curve Cryptography.

UNIT IV MESSAGE AUTHENTICATION AND KEY DISTRIBUTION 9

Authentication Requirement – Authentication Function – MAC – Hash Function – Security of Hash Function and MAC – SHA –Digital Signature and Authentication Protocols – DSS - Entity Authentication - Biometrics - Passwords - Challenge Response Protocols - Authentication Applications - Kerberos - X.509.

UNIT V NETWORK AND INTERNET SECURITY 9

Electronic Mail Security – PGP-S/MIME – IP Security – Web Security – System Security - Intruders – Malicious Software – Viruses – Firewalls - Network Access Control and Cloud Security – Transport Level Security – Wireless Network Security – Email Security.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", PHI 7th Edition (Global Edition), Pearson 2017.

REFERENCES:

1. C K Shyamala, N Harini and Dr. T R Padmanabhan: "Cryptography and Network Security", Wiley India Pvt. Ltd, 2011.
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.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106/105/106105162/
2. https://nptel.ac.in/courses/106/105/106105031/

ONLINE RESOURCES:

1. https://freevideolectures.com/course/4727/nptel-cryptography-and-network-security

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the concepts of Network Security and Remember the various mathematical techniques applied in Cryptography.(K2)
2. Discuss the mathematical formulas used to implement symmetric key cryptography techniques.(K2)
3. Interpret the mathematical background to implement asymmetric key cryptography techniques.(K2)
4. Apply the Symmetric and Asymmetric Cryptographic methods and design Secure Applications to operate Digital Signature in Real World Situations (K3)
5. Illustrate the various Message authentication schemes to simulate different applications. (K3)
6. Apply Data authentication mechanisms for a web based and system level application. (K3)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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	-
CO6	2	2	2	-	-	-	-	-	-	2	-	2	2	-

SEMESTER - VII

20CJPL701 SDG NO. 4	MACHINE LEARNING LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To develop knowledge in Machine Learning.
- To expose the various algorithms In Machine Learning
- To Analyze the real time data sets and Model-Based Algorithms
- To extend and visualize data using Machine Learning Algorithms

LIST OF EXPERIMENTS :

1. Implementation of Python Programming basic libraries - Math ,NumPy, Pandas, SciPy, Matplotlib, Scikit Learn for Machine learning applications.
2. Creation and loading of different datasets in Python.
3. Write a python program to compute Mean, Median , Mode , Variance and Standard deviations using datasets.
4. Write a python program to compute Reshaping the data,Filtering the data,Merging the data and handling the missing values in datasets.
5. Implementation of Candidate Elimination algorithm.
6. Implementation of Simple Linear regression algorithm to plot graph using Python.
7. Implementation of Logistic regression algorithm for IRIS dataset using sklearn.
8. Implementation of Naives Bayes classifier algorithm.
9. Implementation of SVM classification algorithm.
10. Case Study - Performance analysis on a specific dataset.

LAB REQUIREMENTS:

1. Python version 2.7.X, 3.6.X.,3.8.X
2. Windows OS.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to

1. Describe Machine Learning Algorithms. (K1)
2. Analyze and Construct the Data Visualization. (K4)
3. Configure the Programming Environment. (K2)
4. Analyze a real time data set. (K4)
5. Implement Machine Learning Algorithms for data analysis. (K3)
6. Implement advanced machine learning concepts for real time applications. (K3)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	3	2	1	1	-	1	-	-	1	3	3
CO2	2	3	2	3	2	1	1	-	1	-	-	1	3	3
CO3	2	3	2	3	2	1	1	-	1	-	-	1	3	2
CO4	2	3	2	3	3	1	1	-	2	-	-	1	2	2
CO5	2	3	2	3	3	1	1	-	2	-	-	1	2	3
CO6	2	3	2	3	3	1	1	-	2	-	-	1	2	2

SEMESTER - VII

20ITPL701 SDG NO. 4	CRYPTOGRAPHY & NETWORK SECURITY LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To learn different Substitution Techniques
- To learn different Transposition Techniques
- To implement the algorithms DES, RSA, MD5, SHA-1
- To use Network Security Tools and Vulnerability Assessment Tools

LIST OF EXPERIMENTS:

1. Perform Encryption, decryption using the following substitution techniques

i) Ceaser Cipher, (ii) Play fair Cipher iii) Hill Cipher iv) Vigenere Cipher

2. Perform encryption and decryption using following transposition techniques.

i) Rail Fence Row & Column Transformation.

3. Implement the DES algorithm for practical applications.
4. Implement AES algorithm for practical applications.
5. Implement RSA algorithm using HTML and JavaScript.
6. Implements the Diffie- Hellman Key Exchange Algorithm for Given Problem.
7. Calculate the Message Digest of text using the SHA-1 algorithm.
8. Implement the Signature Scheme-Digital Signature Standard.
9. Demonstrate Intrusion Detection System (IDS) using any online tools.
10. Automated Attack and Penetration Tools
11. Defeating Malware

i) Building Trojans
ii) Rootkit Hunter

TOTAL:45 PERIODS

TEXT BOLAB REQUIREMENTS:

1. C/C++/Java or equivalent compiler GnuPG, Snort, N-Stalker or Equivalent

OUTCOMES:

Upon completion of the course, the student should be able to

1. Develop code for Classical Encryption Techniques. (K3)
2. Build Cryptosystems by applying Symmetric Encryption Algorithms. (K3)
3. Build Cryptosystems by applying Public Key Encryption algorithms. (K3)
4. Construct code for Authentication Algorithms. (K3)
5. Develop a Signature scheme using Digital Signature Standard. (K3)
6. Demonstrate the Network security system using Open Source Tools. (K2)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	2	-	2	2	-
CO2	3	3	2	-	-	-	-	-	-	2	-	3	2	-
CO3	3	3	2	-	-	-	-	-	-	2	-	3	2	-
CO4	3	3	2	-	-	-	-	-	-	2	-	3	2	-
CO5	3	3	2	-	-	-	-	-	-	2	-	3	2	-
CO6	1	3	2	-	-	-	-	-	-	2	-	3	2	-

SEMESTER - VII

20CJPJ701 SDG NO. 4,6,7,8, 9,11,12,13 & 17	INNOVATIVE DESIGN PROJECT-I	L	T	P	C
		0	0	4	1

OBJECTIVES:

- Identify and describe the problem and scope of project
- Collect, analyze and present data into meaningful information using relevant tools
- Select, plan and execute a proper methodology in problem solving, work independently and ethically
- Present the results in written and oral format effectively and identify basic entrepreneurship skills in project management

GUIDELINES TO BE FOLLOWED:

The students may be grouped into 2 to 3 and work under a project supervisor and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor (faculty member). The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by External and Internal examiners constituted by the Head of the Department. The Project Work Phase-I will have the following sequence:

I. Problem Identification

1. A statement of system / process specifications proposed to be developed (Block Diagram / System Architecture / Process Flow)
2. Feasibility Study
3. List of possible solutions including alternatives and constraints
4. Timeline of activities

II. A report highlighting the design finalization [based on functional requirements and standards (if any)]

III. A presentation including the following:

1. Literature survey on existing system
2. Implementation Phase (Hardware & Software)
3. Testing and Validation of the developed system

IV. Consolidated report preparation

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to

1. Comprehend an industrial or real life problem and identify the right/ real issue with a solution. (K2)
2. Analyze the necessary studies and review the literature, design a setup of equipment, complete the analysis. (K3)
3. Compose a project report based on the findings. (K6)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	2	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
Co3	2	2	2	1	2	1	1	1	3	2	3	3	3	2

SEMESTER - VII

20CJTP701 SDG NO. 4	SKILL ENHANCEMENT	L	T	P	C
		0	0	2	1

APTITUDE REFRESHER & APTITUDE COMPANY SPECIFIC TRAINING SKILLS – PHASE 1

OBJECTIVES:

- Enhance their quantitative ability.
- Enhance their reasoning ability
- Enhance their verbal ability.

UNIT I PRODUCT COMPANY SPECIFIC TRAINING – I 10

Product Specific Training for Amazon, Microsoft, IBM, ThoughtWorks, Juspay, Paypal, Mu Sigma, Zoho Corporation, VM Ware, Directi, Oracle, Wells Fargo, Goldman Sachs, Chargebee, Coda Global, Temenos, Freshworks, Adobe Systems.

UNIT II PRODUCT COMPANY SPECIFIC TRAINING – II 10

Product Specific Training for Ernst and Young, BA Continuum, Standard Chartered, AON Hewitt, Soliton Technologies, Payoda Technologies, Infoview Technologies, Athena Health Technology.

UNIT III SERVICE COMPANY SPECIFIC TRAINING - I 10

TCS, Wipro, TechMahindra, InfoView, RobertBosch, , NTT Data, Verizon, Payoda Technologies.

UNIT IV SERVICE COMPANY SPECIFIC TRAINING - II 10

CTS, Accenture, MindTree, MPhasis, Odessa Technologies, Vuram Technologies, Hewlett Packard, HCL.

UNIT V SERVICE COMPANY SPECIFIC TRAINING - III 5

Capgemini, Infosys, IBM, UGAM Solutions, Skava Systems, L&T Infotech, Bahwan Cybertech, Dhyan Infotech.

TOTAL : 45 PERIODS

REFERENCES:

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2. Quantum CAT by Sarvesh Verma
3. A Modern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun sharma

APTITUDE & TECHNICAL REFRESHER & COMPANY SPECIFIC TRAINING & UNITY BASICS - PHASE 2

COURSE OBJECTIVE:

- Enhance their quantitative ability.
- Enhance their reasoning ability
- Enhance their verbal ability.

UNIT I PRODUCT COMPANY SPECIFIC TRAINING – I 10

Product Specific Training for Amazon, Microsoft, IBM, ThoughtWorks, Juspay, Paypal, Mu Sigma, Zoho Corporation, VMWare, Directi, Oracle, Wells Fargo, Goldman Sachs, Chargebee, Coda Global, Temenos, Freshworks, Adobe Systems., Ernst and Young, BA Continuum, Standard Chartered, AON Hewitt, Soliton Technologies, Payoda Technologies, Infoview Technologies, AthenaHealth Technology.

UNIT II PRODUCT COMPANY SPECIFIC TRAINING – II 10

Product Specific Training for TCS,Wipro,TechMahindra, InfoView, RobertBosch, , NTT Data, Verizon, Payoda Technologies. CTS, Accenture, MindTree, MPhasis, Odessa Technologies, Vuram Technologies, Hewlett Packard, HCL.

UNIT III SERVICE COMPANY SPECIFIC TRAINING - I 10

Capgemini, Infosys, IBM, UGAM Solutions, Skava Systems, L&T Infotech, Bahwan Cybertech, Dhyan Infotech.

UNIT IV UNITY INTRODUCTION 8

Downloading unity and Project setup, Unity Objects and Components - Toolbar Tools, Toolbar Buttons, Project window, Scene view, Game View - Hierarchy window, Inspector window, customizing your workspace, Wrap up, Creating our own component, Unity Engine UI- Working with user interface text, Creating a countdown Timer, Creating a Digital Clock, Unity UI – Images, Buttons, Toggles, Sliders, Drop down.

UNIT V C# AND UNITY CODING 7

Introduction to C# with Unity, C# if-Else statement, While-do While, for loop, for each loop, switch statement. Creating a simple calculator, creating a 2D side scroller, 3D game development Animations –Introduction, Animation Controller, Creating 2D Animations and 3D Animations, Triggering Animations from script.

TOTAL : 45 PERIODS

REFERENCES:

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal.
2. Quantum CAT by Sarvesh Verma
3. A Modern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun Sharma.
5. Jeremy Gibson Bond, "Introduction to Game Design, Prototyping, and Development", Latest Edition - Third, Publisher - Addison-Wesley
6. Alan Thorn, Unity Animation Essentials, Packt Publishing Limited, 24 June 2015.

WEB LINK :

1. https://docs.unity3d.com/560/Documentation/Manual/UnityBasics.html
2. https://unity.com/learn

OUTCOMES:

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

1. Apply quantitative and reasoning skills. (K3)
2. Improve verbal ability (K6)
3. Recognize Unity Interface such as panels, Tools and Components. (K1)
4. Understand foundational language and theory of game development technology (K2)
5. Define C# and its Role in Unity. (K1)
6. Apply problem solving, design and decision-making methodologies to develop components, systems and processes to meet specified requirements. (K3)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	2	2	1	-	2	1	-	2	1	-
CO2	-	-	-	-	1	1	1	1	-	1	-	1	-	-
CO3	3	2	2	3	2	2	1	-	2	1	-	2	2	-
CO4	3	2	2	3	2	2	1	-	2	1	-	2	2	-
CO5	3	2	2	3	3	2	1	-	1	1	-	2	2	-
CO6	3	2	2	3	3	2	1	-	2	1	-	2	2	-

SEMESTER - VIII

20CJPC801 SDG NO. 4 & 9	COMPUTER VISION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To review image processing techniques for Computer Vision
- To understand shape and region analysis
- To understand Hough Transform and its applications to detect lines, circles, ellipses
- To understand three-dimensional Image Analysis & Motion Analysis techniques

UNIT I IMAGE PROCESSING FOUNDATIONS 9

Review of Image Processing Techniques – Classical Filtering Operations – Thresholding Techniques – Edge Detection Techniques – Corner and Interest Point Detection – Mathematical Morphology – Texture.

UNIT II SHAPES AND REGIONS 9

Binary Shape Analysis – Connectedness – Object Labeling and Counting – Size Filtering – Distance Functions – Skeletons and Thinning – Deformable Shape Analysis – Boundary Tracking Procedures – Active Contours – Shape Models And Shape Recognition – Centroidal Profiles – Handling Occlusion – Boundary Length Measures – Boundary Descriptors – Chain Codes – Fourier Descriptors – Region Descriptors – Moments.

UNIT III HOUGH TRANSFORM 9

Line Detection – Hough Transform (HT) for Line Detection – Foot-of-normal Method – Line Localization – Line Fitting – Ransac for Straight Line Detection – HT Based Circular Object Detection – Accurate Center Location – Speed Problem – Ellipse Detection – Case Study: Human Iris Location– Hole Detection – Generalized Hough Transform (GHT) – Spatial Matched Filtering – GHT for Ellipse Detection – Object Location – GHT for Feature Collation.

UNIT IV 3D VISION AND MOTION 9

Methods for 3D Vision – Projection Schemes – Shape from Shading – Photometric Stereo – Shape from Texture – Shape from Focus – Active Range Finding – Surface Representations – Point-based Representation – Volumetric Representations – 3D Object Recognition – 3D Reconstruction – Introduction to Motion – Triangulation – Bundle Adjustment – Translational Alignment – Parametric Motion – Spline-based Motion – Optical Flow – Layered Motion.

UNIT V APPLICATIONS **9**

Application: Photo Album – Face Detection – Face Recognition – Eigenfaces – Active Appearance And 3D Shape Models of Faces Application: Surveillance – Foreground - Background Separation – Particle Filters – Chamfer Matching - Tracking - and Occlusion – Combining Views From Multiple Cameras – Human Gait Analysis Application - In-vehicle Vision System - Locating Roadway – Road Markings – Identifying Road Signs – Locating Pedestrians.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. E. R. Davies, "Computer & Machine Vision", Fourth Edition, Academic Press, 2017.
2. R. Szeliski, "Computer Vision: Algorithms and Applications", Springer 2011.

REFERENCES:

1. D. L. Baggio et al., "Mastering OpenCV with Practical Computer Vision Projects", Packt Publishing, 2012.
2. Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms for analyzing images", O'Reilly Media, 2012.
3. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Third Edition, Academic Press, 2012.
4. Simon J. D. Prince, "Computer Vision: Models, Learning and Inference", Cambridge University Press, 2012.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106105216/
2. https://nptel.ac.in/courses/106105032/
3. https://swayam.gov.in/nd1_noc19_cs58/preview
4. http://www.cse.iitd.ernet.in/~suban/vision/index.html
5. http://www.cse.iitm.ac.in/~vplab/courses/CV_DIP/PDF/INTRO_CV.pdf

ONLINE RESOURCES:

1. https://youtu.be/715uLCHt4jE
2. https://www.coursera.org/lecture/deep-learning-in-computer-vision/introduction-to-video-analysis-alApg
3. https://www.coursera.org/lecture/introduction-computer-vision-watson-opencv/applications-of-computer-vision-EEDvi
4. https://www.analyticsvidhya.com/blog/2020/01/computer-vision-learning-path-2020/

OUTCOMES:

Upon completion of the course, the student should be able to

1. Implement fundamental image processing techniques required for computer vision.(K3)
2. Perform shape analysis, Implement boundary tracking techniques & Apply chain codes and other region descriptors.(K3)
3. Apply Hough Transform for line, circle, and ellipse detections.(K3)
4. Apply 3D vision techniques.(K3)
5. Design of a computer vision system for identification and recognition of objects.(K4)
6. Implement motion related techniques & Develop applications using computer vision techniques.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	1	1	1	2	2	3	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	2	2
CO3	3	3	3	3	3	-	-	-	-	-	-	-	2	2
CO4	3	3	3	3	3	2	2	2	2	2	1	3	2	2
CO5	3	3	3	3	3	3	3	2	2	2	2	3	3	3
CO6	3	3	3	3	3	3	3	2	2	2	2	3	3	3

SEMESTER - VIII

20CSPC701 SDG NO. 4 & 9	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To describe the basic concepts of Big Data Characteristics and Analytics
- To examine the Hadoop and MapReduce framework for processing large volume of data sets
- To demonstrate Hive, Pig, MongoDB and Report generation
- To analyze the Big Data for useful Business applications and get familiarized with the Visualization

UNIT I INTRODUCTION TO BIG DATA ANALYTICS 9

Classification of Digital Data - Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of

Data - Why Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop Environment - Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics importance - Data Science - Data Scientist - Terminologies used in Big Data Environments - Basically Available Soft State Eventual Consistency - Top Analytics Tools.

UNIT II HADOOP AND MAPREDUCE PROGRAMMING 9

Hadoop: Features – Advantages – Versions – Ecosystems – Distributions – Hadoop Versus RDBMS - Distributed Computing Challenges – History - Hadoop Overview - Use Case of Hadoop - Hadoop Distributors - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem – MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression.

UNIT III DATA PROCESSING SERVICES: HIVE & PIG 9

Hive: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub-Query – Joins – Aggregation - Group By and Having - RCFile Implementation - Hive User Defined Function - Serialization and Deserialization - Hive Analytic Functions - Pig: Introduction - History and Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions - Parameter Substitution - Diagnostic Operator - Word Count Example using Pig - Pig at Yahoo! - Pig Versus Hive.

UNIT IV NOSQL: MONGODB AND JASPER REPORTS 9

NoSQL Databases: Advantages - Usage - Vendors - New SQL - Comparison of SQL, NoSQL and NewSQL - MongoDB: Why Mongo DB - Terms used in RDBMS and MongoDB - Data Types - MongoDB Query Language Methods: Insert - Save - Update - Remove - Find - NULL - Count - Limit - Sort - Skip - Arrays - Aggregate- MapReduce - Cursors in MongoDB - Indexes - Import and Export - Jasper Report using Jaspersoft - Connecting to MongoDB NOSQL Database.

UNIT V FRAMEWORKS AND VISUALIZATION 9

Apache Hbase - Architecture/Storage - Features - Data Model - Shell and Implementation - Hbase Vs RDBMS - Zookeeper - Installation and Configuration - Running Zookeeper - Sqoop - Architecture - Import and Export Data – Sqoop Job - Flume - Log Collection - Working with Twitter Stream - Oozie - Simple and Complex Flow - Components - Service/Scheduler - Workflow - Apache Spark - Lambda Architecture - Spark Streaming - Spark

Processing - Apache Kafka - Operations - Visualizations - Visual Data Analysis Techniques - Interaction Techniques.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publications, First Edition, 2015.
2. TomWhite, "Hadoop:The Definitive Guide", 3rd Edition, O'Reilly, 2012.

REFERENCES:

1. Seema Acharya, “Data Analytics using R”, McGraw Hill Publications, New Edition, 2018.
2. Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, “Big data for dummies”, John Wiley & Sons, Inc. , 2013.
3. Donald Miner, “Map Reduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems”, O'Reilly Media, 2012.
4. Vignesh Prajapati, “Big Data Analytics with R and Hadoop”, 1 st Edition, Packet Publishing Limited, 2013.
5. Kyle Banker, “Mongo DB in Action”, Manning Publications Company, 2012.

WEB REFERENCES:

1. https://www.mongodb.org
2. https://hadoop.apache.org/
3. https://hive.apache.org/
4. https://pig.apache.org/
5. https://community.jaspersoft.com

OUTCOMES:

Upon completion of the course, the student should be able to

1. Describe the characteristics and challenges of big data analytics.(K2)
2. Apply Hadoop and MapReduce framework for processing massive volume of data.(K3)
3. Use Hive and Pig to demonstrate the structured and semi structured data.(K3)
4. Illustrate CRUD operations using MongoDB and Report generation using Jaspersoft studio.(K3)
5. Explore the usage of Hadoop and its integration tools to manage Big Data and Use Visualization techniques.(K3)
6. Apply suitable frameworks and NoSQL Database to solve the real time problems. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	2
CO2	3	3	3	1	3	-	-	-	-	3	-	-	2	2
CO3	3	3	3	3	3	-	-	-	2	3	1	2	3	2
CO4	3	3	3	3	3	-	-	-	-	-	-	-	3	2
CO5	3	3	3	3	3	-	-	-	-	2	2	2	3	2
CO6	3	3	3	3	3	-	-	-	-	2	2	3	3	2

SEMESTER - VIII

20CJPW801 SDG NO. 4	FRONT END FRAMEWORK ENGINEERING WITH LABORATORY	L	T	P	C
		3	0	2	4

OBJECTIVES:

- To understand different Internet Technologies.
- To study HTML tags CSS to design the web pages
- To understand JS and develop interactive Web pages
- To design and build simple Graphical User Interfaces

UNIT I INTRODUCTION TO Es6 9

History of java script, Features of JS - JS Libraries - Understanding HTML,CSS,Java Script - let & Const and its example - Arrow functions - alternative - tips & Arrow functions - Exports and imports - Classes - Objects - Array - Inheritance - Spread and rest parameter - Destructing.

UNIT II REACT JS ENVIRONMENT SETUPS, FORMS AND UI 9

Node setup - How to use NPM - json package creation - Webpack: Introduction - React app creation - Explore - Hot reloading - Auto reloading - Ejecting - Create React App with an API Server. Forms - text input - Remote data - Form module.

UNIT III OVERVIEW OF JSX 9

Introduction - UI Layer - Virtual DOM - philosophies of react - JSX :Introduction - Transpiler - Syntax basics of JSX-- Introducing Babel -Elements ,Attribute Expressions, Conditional Child expressions, boolean attributes, JSX comments, Spread syntax, Gotchas - JSX components - Containers - Advanced Component configuration (props,state and children)

UNIT IV FLUX AND REDUX **9**

Introduction to Flux and Redux - Architecture - flux implementations - Redux 's key ideas - Building a counter - Building the store - the core of redux - Building the reducer() - Subscribing to the store - connecting Redux to React . Hooks : Introduction - The Built - in Hooks - Finding and using custom hooks.

UNIT V INTRODUCTION TO PHP **9**

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories

LIST OF EXPERIMENTS :

1. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.
2. Build a fitness tracking application that allows users to set goals, track workouts, and receive personalized recommendations using React js.
3. Build an educational platform with course creation, enrollment, and interactive learning features.
4. Develop a social media platform with emphasis on user engagement, real-time updates, and content sharing.
5. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation using chart.js
6. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.

LAB REQUIREMENTS:

1. Sublime Text editor / Notepad (PC) or Text Edit (Mac)

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Chris Minnick, "Beginning -ReactJS Foundations Building user Interfaces with ReactJS ",John Wiley & Sons, 9 May 2023.

2. Nate Murray,Ari Lerner , Clay Allsopp, David Guttman ,Taylor McGinnis, "FullStack React - The complete guide to reactJS ,and friends" ,Anthony Accomazzo , Fullstack.io (2017); eBook (Online Edtion, 2020)

REFERENCES:

1. Ethan Brown ,"JavaScript and ES6: A Comprehensive guide" O'Reilly Media 2021
2. Adam D. Scott, Matthew MacDonald, Shelley Power,"JavaScript Cookbook", 3rd Edition,O'Reilly Media, Inc.,ISBN: 9781492055709

ONLINE RESOURCES:

1. https://www.hackerrank.com/skills-directory/htmlcssjs_basic
2. https://www.tutorialspoint.com/css/index.htm
3. https://www.w3schools.com/html/default.asp

WEB REFERENCES :

1. https://www.geeksforgeeks.org/redux-and-the-flux-architecture
2. https://www.udemy.com/topic/react
3. https://www.tutorialspoint.com/reactjs/reactjs_environment_setup.htm
4. https://www.w3schools.com/react/react_components.asp

OUTCOMES:

Upon completion of the course, the student should be able to

1. Students gain a better understanding of asynchronous programming patterns, leading to more robust and scalable applications.(K2)
2. Building strong foundations in modern JavaScript development(K2)
3. Students gain the ability to create responsive and interactive user interfaces. also familiar with popular UI libraries and frameworks that complement React.(K2)
4. Integrate and use Redux DevTools, which provides a powerful set of developer tools for inspecting and manipulating the Redux state.(K3)
5. Develop effective testing strategies for applications built with Flux and Redux, ensuring the r reliability and stability of the codebase.(K2)
6. Create HTML forms and process user input securely using PH.(K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	3	-	-	3	-	-	-	-	-	1
CO2	3	3	3	-	3	-	-	3	-	-	1	1	-	1
CO3	3	3	3	2	-	-	-	-	-	-	-	1	2	1
CO4	3	3	2	1	-	-	-	-	-	-	-	1	2	1
CO5	3	3	3	2	-	-	-	-	-	-	-	1	2	1
CO6	3	3	3	3	-	-	1	2	-	3	2	1	2	1

SEMESTER - VIII

20CSPL701 SDG NO. 4 & 9	BIG DATA ANALYTICS LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

- To implement MapReduce programs for processing Big Data
- To analyze Big Data using Hive and Pig
- To realize storage of Big Data using MongoDB and Hbase
- To develop Big Data applications for streaming data using Apache Spark

LIST OF EXPERIMENTS :

1. Install, configure and run Hadoop and HDFS.
2. Implement word count / frequency programs using MapReduce.
3. Implement an MR program that processes a weather dataset.
4. Implement an application using Hive/Pig.
5. Visualize data using any plotting framework.
6. Implement an application that stores big data in Hbase / MongoDB using Hadoop/R.
7. Install, deploy and configure Apache Spark cluster. Run an application using Apache Spark.

TOTAL: 45 PERIODS

LAB REQUIREMENTS :

1. Hadoop / R
2. Hive and Pig
3. Hbase
4. MongoDB
5. Apache Spark

OUTCOMES:

Upon completion of the course, the student should be able to

1. Demonstrate Big Data using Hadoop framework.(K3)
2. Implement Map Reduce framework for processing big data.(K3)
3. Perform Data Analysis using Hive/Pig.(K3)
4. Use NoSQL database to Store and retrieve the data.(K3)
5. Perform Graphical Data Analysis.(K3)
6. Apply Apache Spark to build big data applications.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2	-	3	-	-	-	-	-	-	-	3	1
CO2	3	3	3	3	3	-	-	-	-	2	-	1	2	2
CO3	1	3	3	3	3	-	-	-	-	2	-	1	1	2
CO4	1	3	3	3	3	-	-	-	-	2	-	1	3	2
CO5	1	1	1	1	3	-	-	-	-	3	-	1	3	2
CO6	3	3	3	3	3	-	-	-	-	3	-	1	3	2

SEMESTER - VIII

20CJPJ801 SDG NO. 4, 6, 7, 8, 9, 11, 12, 13 & 17	INNOVATIVE DESIGN PROJECT-II	L	T	P	C
		0	0	4	2

OBJECTIVES:

- Identify and describe the problem and scope of project
- Collect, analyze and present data into meaningful information using relevant tools
- Select, plan and execute a proper methodology in problem solving, work independently and ethically
- Present the results in written and oral format effectively and identify basic entrepreneurship skills in project management

GUIDELINES TO BE FOLLOWED:

The students may be grouped into 2 to 3 and work under a project supervisor and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor (faculty member). The progress of the project is evaluated based on a minimum of three reviews. The review committee may

be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by External and Internal examiners constituted by the Head of the Department. The Project Work Phase-I will have the following sequence:

I. Problem Identification

1. A statement of system / process specifications proposed to be developed (Block Diagram / System Architecture / Process Flow)
2. Feasibility Study
3. List of possible solutions including alternatives and constraints
4. Timeline of activities

II. A report highlighting the design finalization [based on functional requirements and standards (if any)]

III. A presentation including the following:

1. Literature survey on existing system
2. Implementation Phase (Hardware & Software)
3. Testing and Validation of the developed system

IV. Consolidated report preparation

TOTAL: 60 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to

1. Comprehend an industrial or real life problem and identify the right/ real issue with a solution. (K2)
2. Analyze the necessary studies and review the literature, design a setup of equipment, complete the analysis. (K3)
3. Compose a project report based on the findings. (K6)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	2	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
Co3	2	2	2	1	2	1	1	1	3	2	3	3	3	2

SEMESTER - IX

20CJPJ901 SDG NO. 4, 6, 7, 8, 9, 11, 12, 13 & 17	PROJECT PHASE - I	L	T	P	C
		0	0	24	9

Aim:

To identify and solve the engineering problem, provide solution to Engineering community and present the technical solution.

Course Outcomes:

The Students will be able to

Co1: Synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problems.

Co2: Select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.

Co3: Present the findings of their technical solution in a written report.

Co4: Demonstrate the design methodology for the project.

Co5: Improve their communication skills, presentation skills and other soft skills.

Co6: Gain knowledge about various magazines, newsletters and journals related to their field.

SYLLABUS CONTENTS:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- Relevance to social needs of Society
- Relevance to value addition to existing facilities in the Institution
- Relevance to Industry need
- Problems of National importance
- Research and development in various domain

The student should complete the following:

- The student should complete the following:
- Literature Survey Problem Definition
- Motivation for study and Objectives

- Preliminary Design / Feasibility / Modular approaches
- Implementation and Verification
- Report and Presentation

TOTAL: 24 PERIODS

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	2	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO3	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO4	2	3	3	3	3	3	2	2	2	2	3	3	2	2
CO5	3	3	2	2	2	2	2	3	3	2	3	2	2	2
CO6	2	2	3	3	3	2	3	2	2	3	3	2	2	2

SEMESTER - X

20CJPJ1001 SDG NO. 4, 6, 7, 8, 9, 11, 12, 13 & 17	PROJECT PHASE - II	L	T	P	C
		0	0	24	12

Aim:

To identify and solve the engineering problem, provide solution to Engineering community and present the technical solution.

Course Outcomes:

The Students will be able to

Co1: Demonstrate a sound technical knowledge of their selected project topic.

Co2: Undertake problem identification, formulation and solution.

Co3: Perform a literature search to review current knowledge and developments in the chosen project

Co4: Undertake detailed technical work in the chosen area using one or more of theoretical studies and modeling.

Co5: Prepare an interim report describing the work undertaken and results.

Co6: Present the work in a forum involving seminar, conference, project Expo and poster presentations

SYLLABUS CONTENTS:

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

- Experimental verification / Proof of concept.
- Design, fabrication and testing of proposed research work.
- The viva-voce examination will be based on the above report and work

TOTAL: 24 PERIODS

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	2	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO3	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO4	2	3	3	3	3	3	2	2	2	2	3	3	2	2
CO5	3	3	2	2	2	2	2	3	3	2	3	2	2	2
CO6	2	2	3	3	3	2	3	2	2	3	3	2	2	2

PROFESSIONAL ELECTIVE - I

20ESEC502 SDG NO. 4	MICROPROCESORS AND MICROCONTROLLERS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the basics of 8086 Microprocessor and 8051 Microcontroller
- To understand and implement the 8086 family Assembly Language Programming and basic 8051 programming
- To explore the I/O interfacing with 8086 and 8051
- To learn about advanced Microprocessors like Pentium and Intel Core i7 Processors

UNIT I INTRODUCTION TO MICROPROCESSOR 8

Introduction - Microprocessors and Microcontrollers - Evolution of Microprocessors - Basic Functional Blocks of a Microprocessor – 8086 Architecture - Instruction and data flow in 8086 - Even and Odd Memory Banks - Addressing Modes.

UNIT II 8086 FAMILY ASSEMBLY LANGUAGE PROGRAMMING 8

Pin Diagram-Instruction Set-Assembler Directives- System Bus Timing - Bus Cycles of 8086 - Timing Diagram.

UNIT III PROGRAMMING CONCEPTS 9

Password Validation - Reverse a String - Rotate a byte 3 places to the left - Convert to uppercase letter - Modular Programming - Using the Keyboard and Video Display - Data Conversions - Example Programs: Binary to ASCII - ASCII to Binary.

UNIT IV I/O INTERFACE AND ADVANCED MICROPROCESSORS 10

Introduction to I/O Interfacing - Programmable Peripheral Interface - Intel 8253/8254 Programmable Timer/Counter - Programmable Keyboard/ Display Controller - Programmable Interrupt Controller - Intel 8237 DMA Controller - Case Studies: Traffic Light Control System - LED Display - Architecture of Intel Pentium IV and Intel Core i7 Processors.

UNIT V ARCHITECTURE AND PROGRAMMING 8051 10

Introduction to the Intel 8051 Microcontroller - Architecture of 8051 - Special Function Registers - Instruction set - Addressing modes - ALP - Programming -

8051 Timers - Serial Port Programming - Interrupt Programming - Stepper Motor Control using 8051.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. A. NagoorKani, "Microprocessors and Microcontrollers", McGrawHill Education (India) Private Limited, 2013.
2. Yu-Cheng Liu, Glenn A.Gibson,,"Microcomputer Systems: The 8086 / 8088 Family - Architecture Programming and Design", Second Edition, Prentice Hall of India, 2007.

REFERENCES:

1. N. Senthilkumar, M. Saravanan, S. Jeevananthan, "Microprocessors and Microcontrollers", Oxford University Press, 2011.
2. A.K.Ray and K.M. Bhurchandi, "Advanced Microprocessor and Peripherals", Tata McGraw Hill, 3rd Edition, 2013.
3. Kenneth J Ayala, "The 8086 Microprocessor: Programming and Interfacing the PC", Cengage Learning, Reprint 2014.
4. Kenneth J Ayala, "The 8051 Microcontroller", 3rd edition, Cengage Learning, Reprint 2014.
5. Muhammed AliMazidi, Janice GillispleMaidi, Rolin.D. McKinlay, "The 8051 Microcontroller and Embedded Systems, Using Assembly and C", Second edition, Pearson Prentice Hall, 2015.

ONLINE RESOURCES:

1. http://read.pudn.com/downloads165/ebook/754892/micro.pdf
2. http://www.openloop.com/education/classes/sjsu_engr/engr_compOrg/spring2002/studentProjects/Truc_Tran/Eng120.htm
3. https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/ia-introduction-basics-paper.pdf
4. http://ecerelatedbooks.blogspot.com/2018/01/microprocessor-and-microcontroller.html

OUTCOMES:

Upon completion of the course, the student should be able to

1. Describe the fundamental concepts of 8086 Microprocessors.(K2)
2. Understand the pin diagram, instruction set and assembler directives of 8086 Microprocessor. (K2)
3. Summarize the timing diagram of 8086.(K2)
4. Implement various Assembly Language Programming using 8086.(K3)

5. Interpret I/O interfaces using 8086 and advanced microprocessors.(K3)
6. Discuss the concepts of 8051 Microcontroller.(K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	1	1	2
CO2	2	1	-	-	-	-	-	-	-	-	-	1	1	2
CO3	2	1	-	-	-	-	-	-	-	-	-	1	1	2
CO4	2	1	2	-	-	-	-	-	-	-	-	1	1	2
CO5	2	1	2	-	-	-	-	-	-	-	-	1	1	2
CO6	2	1	2	-	-	-	-	-	-	-	-	1	1	2

PROFESSIONAL ELECTIVE - I

20CSEL503 SDG NO. 4	DISTRIBUTED SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand the foundations of Distributed Systems
- Introduce the idea of Peer-to-Peer services and File System
- Understand in detail the system level and support required for Distributed Systems
- Understand the issues involved in studying Process and Resource Management

UNIT I INTRODUCTION 7

Examples Of Distributed Systems–Trends In Distributed Systems – Focus on Resource Sharing – Challenges - Case Study: World Wide Web.

UNIT II COMMUNICATION IN DISTRIBUTED SYSTEM 10

System Model – Inter Process Communication - The API for Internet Protocols – External Data Representation and Multicast Communication. Network Virtualization: Overlay Networks. Case Study: MPI Remote Method Invocation and Objects: Remote Invocation – Introduction - Request-Reply Protocols - Remote Procedure Call - Remote Method Invocation. Case Study: Java RMI - Group Communication - Publish-Subscribe Systems - Message Queues -

Shared Memory Approaches -Distributed Objects - Case Study: Enterprise Java Beans - From Objects to Components.

UNIT III PEER TO PEER SERVICES AND FILE SYSTEM 10

Peer-to-Peer Systems – Introduction - Napster and Its Legacy - Peer-to-Peer – Middleware - Routing Overlays. Overlay Case Studies: Pastry, Tapestry-Distributed File Systems –Introduction - File Service Architecture – Andrew File System. File System: Features-File Model -File Accessing Models - File Sharing Semantics Naming: Identifiers, Addresses, Name Resolution – Name Space Implementation – Name Caches – LDAP.

UNIT IV SYNCHRONIZATION AND REPLICATION 9

Introduction - Clocks, Events and Process States - Synchronizing Physical Clocks- Logical Time and Logical Clocks - Global States – Coordination and Agreement – Introduction - Distributed Mutual Exclusion – Elections – Transactions and Concurrency Control– Transactions - Nested Transactions – Locks – Optimistic Concurrency Control - Timestamp Ordering – Atomic Commit Protocols -Distributed Deadlocks – Replication – Case Study – Coda.

UNIT V PROCESS & RESOURCE MANAGEMENT 9

Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation - Resource Management: Introduction-Features of Scheduling Algorithms – Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

TOTAL: 45 PERIODS

TEXT BOOK:

1. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education India, 2012.
2. Brendan Burns,"Designing Distributed Systems", O'Reilly Media, 2018.

REFERENCES:

1. Andriy Luntovskyy,Josef Spillner, "Architectural Transformations in Network Services and Distributed Systems", Springer Fachmedien Wiesbaden GmbH, 2017.
2. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
3. Maarten van Steen Andrew S. Tanenbaum., "Distributed Systems", Published by Maarten van Steen This book was previously published by: Pearson Education, Inc. Edition: 3. Version: 02, 2018.
4. Ajay D. Kshemkalyani and Mukesh Singhal, " Distributed Computing Principles, Algorithms and Systems", Cambridge University Press, 2008.

5. Sukumar Ghosh, "Distributed Systems: An Algorithmic Approach" , Second Edition, Chapman & Hall/CRC Computer and Information Science Series, 2014.

WEB REFERENCES:

1. https://link.springer.com/book/10.1007/978-3-658-14842-3#about
2. https://www.udemy.com/course/distributed-systems-cloud-computing-with-java/

ONLINE RESOURCES:

1. https://books.google.co.in/books?id=-bJ3DgAAQBAJ&pg=Pr4&source=kp_read_button&redir_esc=y#v=onepage&q&f=false
2. https://books.google.co.in/books/about/Distributed_Computing.html?id=G7SZ32dPuLgC&printsec=frontcover&source=kp_read_button&redir_esc=y#v=onepage&q&f=false2.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Outline the foundations and issues of distributed systems(K1)
2. Understand the clock synchronisation and message ordering (K2)
3. Analyse the various Group Communication Techniques (K3)
4. Illustrate the distributed mutex and deadlock detection (K2)
5. Evaluating the various recovery and consensus techniques in distributed systems (K3)
6. Describe the concepts of P2P and distributed shared memory (K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	1	1	-	-	1	1	2	3	2
CO2	2	3	1	2	-	1	2	-	1	2	1	1	2	3
CO3	3	3	2	2	-	1	1	-	1	2	2	3	3	3
CO4	3	2	1	-	-	1	1	-	2	1	1	1	3	2
CO5	2	1	2	1	-	1	-	-	2	2	1	2	2	1
CO6	3	3	2	1	-	1	1	-	2	1	2	1	3	3

PROFESSIONAL ELECTIVE - I

20CSEL505 SDG NO. 4 & 9	NOSQL DATABASE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To define, compare and use the four types of NoSQL Databases
- To demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.
- To explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.

UNIT I INTRODUCTION TO NoSQL DATABASES 9

Overview of NoSQL Databases -Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Aggregate-Oriented Databases.

UNIT II DATABASE FOR MODERN WEB 9

Replication and sharding, Map Reduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication Document Databases ,Scaling, Suitable Use Cases,Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure

UNIT III COLUMN- ORIENTED NOSQL DATABASES 9

Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platfo rms, Counters, Expiring Usage.

UNIT IV KEY VALUE DATABASE DESIGNS 9

NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets.

UNIT V GRAPH DATABASE DESIGN 9

Graph NoSQL databases using Neo4,NoSQL database development tools and programming languages, Graph Databases, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Pramod J. Sadalage & Martin Fowler ,"NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison- Wesley, Fist Edition, 2013.
2. Andreas Meier & Michael Kaufmann, “SQL & NoSQL Databases: Models, Languages, Consistency Options and Architectures for Big Data Management”, Springer 2019.

REFERENCES:

1. Redmond, E. & Jim Wilson R . "A Guide to Modern Databases and the NoSQL Movement Edition," Second Edition, 2018.
2. "MongoDB: The Definitive Guide (2nd ed.). Upper Saddle River", NJ: Pearson Education India, Inc. ISBN-13: 978-1449344689 ISBN-10: 1449344682.
3. Andreas Meier, Michael Kaufmann, “SQL & NoSQL Databases Models, languages, Consistency options and architectures for big data management”, Springer Vieweg, 2019.
4. Shashank Tiwari, “Professional NoSQL”, Wrox, 2011.
5. Dan Sullivan, “NoSQL for Mere Mortals”, Addison Wesley, 2015.

WEB REFERENCES:

1. https://www.mongodb.com/nosql-explained
2. https://en.wikipedia.org/wiki/NoSQL
3. https://docs.microsoft.com/en-us/dotnet/architecture/microservices/microservice-dddcqrs-patterns/nosql-database- persistence-infrastructure

ONLINE RESOURCES:

1. https://www.w3resource.com/mongodb/nosql.php
2. https://www.couchbase.com/resources/why-nosqlOUTCOMES:

OUTCOMES:

Upon completion of the course, the student should be able to

1. Evaluate NoSQL database development tools and programming languages.(K1)
2. Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.(K1)
3. Define, compare and use the four types of NoSQL Databases (Document-oriented, KeyValue Pairs, Column-oriented and Graph).(K3)
4. Perform hands-on NoSql database lab assignments by using the four NoSQL database types via products such as Cassandra, Hadoop Hbase, MongoDB, and Neo4J.(K3)
5. Perform CRUD operations (create, read, update and delete) on data in NoSQL environment.(K5)
6. Explore the emergence, requirements and benefits of a NoSQL database. (K4)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	-	-	3	2
CO2	3	3	2	2	3	-	-	-	-	1	-	-	3	3
CO3	3	3	3	2	3	1	-	-	2	2	-	-	2	2
CO4	3	3	3	3	3	2	-	-	-	3	-	-	3	2
CO5	3	3	3	2	3	-	-	-	-	1	-	-	2	2
CO6	3	3	2	2	2	2	-	-	2	3	-	-	3	2

PROFESSIONAL ELECTIVE - I

20ITEL706 SDG NO. 4 & 9	COMPUTER GRAPHICS AND MULTIMEDIA	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To gain knowledge about Graphics Hardware Devices and Software used
- To understand the 2D/3D Graphics and their Transformations
- To get knowledge about various Object representation methods and Visible Surface Detection methods
- To study the Multimedia concepts and various I/O technologies

UNIT I OUTPUT PRIMITIVES AND 2D GRAPHICS 9

Graphics Devices- Line – Curve and Ellipse Drawing Algorithms – Examples – Applications – Attributes – Input Techniques - 2D Geometric Transformations – 2D Clipping And Viewing.

UNIT II 3D GRAPHICS 9

3D Geometric and Modeling Transformations – Translation - Rotation - Scaling- Composite Transformations - 3D Viewing – Viewing Pipeline - Viewing Coordinates - Projections - Clipping - Visible Surface Detection Methods.

UNIT III ILLUMINATION, COLOR MODELS AND ANIMATION 9

Light Sources - Basic Illumination Models – Halftone Patterns and Dithering Techniques- Properties of Light - Standard Primaries and Chromaticity Diagram; Intuitive Colour Concepts - RGB Colour Model - YIQ Colour Model - CMY Colour Model - HSV Colour Model - HLS Colour Model - Colour Selection- Virtual Reality - Animation.

UNIT IV MULTIMEDIA SYSTEMS DESIGN AND FILE HANDLING 9

Multimedia Basics – Multimedia Applications – Multimedia System Architecture - Defining Objects for Multimedia Systems – Multimedia Data Interface Standards – Multimedia Databases - Compression and Decompression – Data and File Format Standards – Digital Voice and Audio – Video Image and Animation – Full Motion Video – Storage and Retrieval Technologies.

UNIT V HYPERMEDIA 9

Multimedia Authoring and User Interface - Hypermedia Messaging -Mobile Messaging – Hypermedia Message Component – Creating Hypermedia Message – Integrated Multimedia Message Standards – Integrated Document Management – Distributed Multimedia Systems - Case Study: Blender Graphics -Blender Fundamentals–Drawing Basic Shapes – Modelling – Shading & Textures

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Donald Hearn and Pauline Baker M, “Computer Graphics", Prentice Hall, New Delhi,2007
2. Andleigh, P. K and KiranThakrar, “Multimedia Systems and Design”, PHI, 2003.

REFERENCES:

1. Judith Jeffcoate, "Multimedia in practice: Technology and Applications", PHI, 1998.
2. Foley, Vandam, Feiner and Hughes, "Computer Graphics: Principles and Practice", 2nd Edition, Pearson Education, 2003.
3. Jeffrey McConnell, "Computer Graphics: Theory into Practice", Jones and Bartlett Publishers,2006.
4. Hill F S Jr., "Computer Graphics", Maxwell Macmillan , 1990.
5. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, KelvinSung, and AK Peters, "Fundamentals of Computer Graphics", CRC Press, 2010.
6. William M. Newman and Robert F.Sproull, "Principles of Interactive Computer Graphics", McGraw Hill 1978.

WEB REFERENCES:

1. https://www.blender.org/support/tutorials
2. http://www.doc.ic.ac.uk/~dfg/graphics/graphics.html
3. http://www.nptelvideos.in/2012/11/computer-graphics.html
4. http://cs.wellesley.edu/~cs110/lectures/M01-color/graphics.pdf

ONLINE RESOURCES:

1. www.scratchapixel.com
2. http://dl.finebook.ir/book/9e/11032.pdf
3. https://www.blender.org/support/tutorials
4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-837-computer-graphics-fall-2012/download-course-materials

OUTCOMES:

Upon completion of the course, the student should be able to

1. Understand the concept of various Output Primitives,Illumination and Color Models (K2)
2. Demonstrate 2D transformations, viewing and clipping techniques (K3)
3. Illustrate various 3D Object representations, transformations,Projections and detect the Visible surfaces. (K3)
4. Understand Multimedia System Architecture, Data Interface standards and Databases (K2)
5. Interpret various Multimedia design and File Formats. (K2)
6. Demonstrate basic 3D Scenes using Blender Graphics in hypermedia messages. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	1	2	-	-	-	2	-	-	1	1	-	1	-	-
CO4	-	-	-	-	-	-	-	-	2	2	1	2	-	1
CO5	-	-	1	-	-	-	-	-	2	2	1	2	-	1
CO6	-	1	1	-	2	1	2	-	2	2	1	2	1	2

PROFESSIONAL ELECTIVE - I

20MGEL707 SDG NO. 4,8,9,12	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To get an introductory insight about the IPR in national and international context.
- To understand the procedures for IPR, registration and its eforcement.

UNIT I INTRODUCTION **9**

Intellectual property: Introduction, Meaning, Nature and significance types of intellectual property, importance of intellectual property rights, Protection of human innovations by IPR such as Patents, Trademarks, Copyright, Industrial Designs Geographical Indications, and Trade Secrets

UNIT II AGREEMENTS AND TREATIES **9**

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, General agreement on trade and tariff (GATT), Ben convention, Rome convention ,Role of WTO and WIPO

UNIT III PATENTS **9**

Concept of Patent – Historical view of Patent system in India and International Scenario, patent searching process, ownership rights and transfer, compulsory licenses, Procedure for filing of patents, Grants of patent , Benchmarks for patentability of inventions, Recent key changes and development.

UNIT IV TRADEMARKS AND COPYRIGHTS 9

Concept of Trademarks and copyrights – Rationale behind the protection-Purpose, function and acquisition, ownership issues, Procedure for Registration, Industrial design and integrated circuits, protection of geographical indications and plant varieties, Recent Trends in copyrights and Trademark., Trade secrets -liability for misappropriations of trade secrets

UNIT V LEGAL ASPECTS AND NEW DEVELOPMENTS 9

Infringements of patents– Criteria of Infringement – Modes of Infringement-remedies and modification Protection against unfair competition, enforcement of intellectual property rights, Intellectual property audits, New developments of intellectual property, Impact of international instruments relating to the protection of intellectual properties Future of IPR in National and International levels.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. S.V. Satarkar, Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002.
2. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
3. P.Narayanan, Intellectual property rights Eastern law house-2018 3rd Edition (revised and updated)
4. Deborah, E. Bouchoux, Intellectual property right, Cengage learning- 2018 5th Edition

REFERENCES

1. Sterling, J. L. A., World copyright law, (2008) 3rd Edition, London, Sweet & Maxwell
2. GP Reddy, Intellectual property rights & other laws, Gogia law agency
3. Barrett, Margreth, Intellectual Property, (2009) 3rd Edition, New York Aspen publishers
4. Inventing the Future: An introduction to Patents for small and medium sized Enterprises; WIPO publication
5. Cornish, William Intellectual Property: Patents, Copyright, Trademarks and allied rights, (2010) 7th Edition, London Sweet & Maxwell.
6. Kankanala and Kalyan.C : Indian Patent Law and Practice (2010), India, Oxford University Press

WEB RESOURCES:

1. https://www.wipo.int/edocs/lexdocs/laws/en/ws/ws020en.pdf
2. http://caaa.in/Image/34_Hb_on_IPR.pdf
3. http://www.ipindia.nic.in/patents.htm
4. http://www.ipindia.nic.in/trade-marks.htm
5. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627956/IP-Rights-in-India.pdf
6. https://economictimes.indiatimes.com/small-biz/resources/startup-handbook/intellectual-property-rights- registration/articleshow/59126802.cms?from=mdr

ONLINE RESOURCES:

1. https://www.coursera.org/learn/introduction-intellectual-property
2. https://www.edx.org/course/intellectual-property-law-and-policy-part-1
3. https://www.classcentral.com/tag/intellectual-property
4. https://swayam.gov.in/nd1_noc19_mg58/preview

OUTCOMES:

Upon completion of the course, the student should be able to

1. Describe the concepts of Intellectual property rights. (K2)
2 Explain the agreements and treaties of Intellectual property rights. (K2)
3 Identify the needs and avenues for patents. (K2)
4 Discuss the necessity of Trade marks and Copy rights. (K2)
5 Explain the legal context and developments of Intellectual property rights. (K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	-	1	1	1	1	1	-	-	1	2	1
CO2	3	1	3	1	2	-	1	1	-	-	-	1	2	1
CO3	1	1	2	2	2	-	1	1	-	-	-	1	1	1
CO4	2	1	1	2	2	-	1	1	-	-	-	1	1	2
CO5	1	1	1	2	2	2	1	1	-	-	-	1	2	2

PROFESSIONAL ELECTIVE - I

20CJEL601 SDG NO. 4 & 9	FOUNDATION OF CYBER SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Students should be able to understand.
- The difference between threat, risk, attack and vulnerability.
- How threats materialize into attacks.
- Where to find information about threats, vulnerabilities and attacks.
- Typical threats, attacks and exploits and the motivations behind them.

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 - Rootkit - Network security attack- Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.

UNIT III DEFENCES: SECURITY COUNTERMEASURES 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

TEXT BOOKS:

1. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition , Pearson Education , 2015

REFERENCES:

1. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.
2. Martti Lehto, Pekka Neittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015
3. Nelson Phillips and Enfinger Steuart, —Computer Forensics and Investigations||, Cengage Learning, New Delhi, 2009.

OUTCOMES:

Upon completion of the course, the student should be able to

1. Describe the fundamental concepts of Cyber Security.(K2)
2. Understand the Security in Operating Systems and Network. (K2)
3. Summarize the security measures in Network and requirement of security measures in Database(K2)
4. Summarize the privacy concepts in cyberspace(K2)
5. Describe the security planning and Handling incidents(K2)
6. Analyze the emerging technologies in security aspects like Economics-electronic voting ,Cyber welfare ,laws ,Cyber (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	-	-	3	2
CO2	3	3	2	2	3	-	-	-	-	1	-	-	3	3
CO3	3	3	3	2	3	1	-	-	2	2	-	-	2	2
CO4	3	3	3	3	3	2	-	-	-	3	-	-	3	2
CO5	3	3	3	2	3	-	-	-	-	1	-	-	2	2
CO6	3	3	2	2	2	2	-	-	2	3	-	-	3	2

PROFESSIONAL ELECTIVE - I

20CSPC602 SDG NO. 4 & 9	COMPILER DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn about the various phases of the Compiler
- To learn various Parsing techniques
- To understand Intermediate code generation & run time environment
- To analyze Code optimization techniques & Code generation algorithm

UNIT I INTRODUCTION TO COMPILERS 9

Translators-Compilation and Interpretation-Language processors – Analysis of the source program – Phases of a compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens– Recognition of Tokens – LEX tool–Regular Expressions to Automata Direct method.

UNIT II SYNTAX ANALYSIS 12

Role of the parser –Writing a Grammar –Context-Free Grammars – Top Down parsing – Recursive Descent Parsing – Predictive LL(1) Parsing – Bottom-up parsing – Shift Reduce Parsing – Operator Precedence Parsing – LR Parsers – SLR Parser – Introduction to LALR & CLR Parser - Error Handling and Recovery in Syntax Analyzer-YACC.

UNIT III INTERMEDIATE CODE GENERATION 8

Intermediate languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements –BackPatching – Procedure calls. Type Systems-Specification of a simple type checker- Equivalence of Type Expressions-Type Conversions.

UNIT IV RUN-TIME ENVIRONMENT AND CODE GENERATION 8

Source Language Issues-Storage Organization-Storage Allocation-Parameter Passing-Symbol Tables- Dynamic Storage Allocation. Issues in the design of code generator – The target machine - Basic Blocks and Flow Graphs – Next-use Information – A simple Code generator – DAG Representation of Basic Blocks.

UNIT V CODE OPTIMIZATION **8**

Principal Sources of Optimization – Peep-hole optimization - DAG- Optimization of Basic Blocks- Global Data Flow Analysis - Efficient Data Flow Algorithm.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques and Tools", Second Edition, Pearson Education, 2009.
2. V. Raghavan, "Principles of Compiler Design", Tata McGraw Hill Education Publishers, 2010.

REFERENCES:

1. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence based Approach", Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, "Advanced Compiler Design and Implementation", Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003
3. Keith D Cooper and Linda Torczon, "Engineering a Compiler", Morgan Kaufmann Publishers Elsevier Science, 2004.
4. Allen I. Holub, "Compiler Design in C", Prentice-Hall Software Series, 1993.
5. Charles N. Fischer, Richard. J. LeBlanc, "Crafting a Compiler with C", 2008.

WEB REFERENCES:

1. http://www.holub.com/software/compiler.design.in.c.docs.pdf
2. http://www.cs.usfca.edu/~galles/compilerdesign/x86.pdf

ONLINE RESOURCES:

1. https://www.javatpoint.com/compiler-tutorial

OUTCOMES:

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

1. Explain the role of each phase of a compiler with its construction tools.(K2)
2. Illustrate the role of a Lexical Analyzer for recognizing the tokens of a given language with the knowledge of symbol table management and error-handling (K3)
3. Construct parsers like top-down, bottom-up for a given grammar (K3)
4. Develop semantic analyzers for type-checking and intermediate code generators to translate the source program into an intermediate code (K3)

5. Outline Runtime environment and a simple Code Generator using the code generation Algorithm (K2)
6. Implement code optimizers to optimize the target code generated (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	2	2
CO2	3	2	-	1	2	-	-	-	-	-	-	1	2	2
CO3	2	3	-	2	-	-	-	-	-	-	-	1	2	2
CO4	2	3	1	2	-	-	-	-	-	-	-	1	2	2
CO5	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO6	1	-	3	-	1	-	-	-	-	-	-	1	2	2

PROFESSIONAL ELECTIVE - I

20CSEL608 SDG NO. 4	SOFT COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To classify the various Soft Computing Frameworks
- To learn the design of Neural Networks
- To understand about Fuzzy logic, Fuzzy systems and Decision making
- To be exposed to Hybrid Soft Computing systems and applications

UNIT I INTRODUCTION TO SOFT COMPUTING 9

Soft Computing Constituents - From Conventional AI to Computational Intelligence - Artificial Neural Network - Introduction - Characteristics- Learning Methods – Taxonomy – Evolution of Neural Networks - Basic Models - Important Technologies – Applications - Introduction to Fuzzy Logic – Classical Sets – Fuzzy Sets – Introduction to Genetic Algorithm and Genetic Programming - Traditional Optimization and Search Techniques.

UNIT II NEURAL NETWORKS 9

Mcculloch-Pitts Neuron - Linear Separability - Hebb Network - Supervised Learning Network:Perceptron Networks - Adaptive Linear Neuron, Multiple Adaptive Linear Neuron, BPN, RBF- Associative Memory Network: BAM, Hopfield Networks – Unsupervised Learning Networks: Kohonen Self-Organizing Feature Maps – CP Networks, ART Network.

UNIT III FUZZY LOGIC **9**

Membership Functions: Features, Fuzzification, Methods of Membership Value Assignments-Defuzzification: Lambda Cuts - Methods - Fuzzy Arithmetic and Fuzzy Measures: Fuzzy Arithmetic - Fuzzy Measures - Measures of Fuzziness - Fuzzy Integrals - Fuzzy Rule Base and Approximate Reasoning : Truth Values and Tables, Fuzzy Propositions, Formation of Rules-Decomposition of Rules, Aggregation of Fuzzy Rules, Fuzzy Reasoning-Fuzzy Inference Systems Overview of Fuzzy Expert System-Fuzzy Decision Making.

UNIT IV GENETIC ALGORITHM **9**

Genetic Algorithm- Genetic Basic Concepts - Operators – Encoding Scheme – Fitness Evaluation – Crossover - Mutation - Genetic Programming – Multilevel Optimization – Advances in GA.

UNIT V HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS 9

Neuro-Fuzzy Hybrid Systems - Genetic Neuro Hybrid Systems - Genetic Fuzzy Hybrid and Fuzzy Genetic Hybrid Systems - Applications: A Fusion Approach of Multispectral Images with SAR, Optimization of Traveling Salesman Problem using Genetic Algorithm Approach, Soft Computing Based Hybrid Fuzzy Controllers.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd, 2011.
2. J.S.R.Jang, C.T. Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI/ Pearson Education, 2004.

REFERENCES:

1. S.Rajasekaran and G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications", Prentice-Hall ofIndia Pvt. Ltd., 2006.
2. David E. Goldberg, “Genetic Algorithm in Search Optimization and Machine Learning”, Pearson Education India, 2013.
3. George J. Klir, Ute St. Clair, Bo Yuan, “Fuzzy Set Theory: Foundations and Applications”, Prentice Hall, 1997.
4. Simon Haykin, “Neural Networks Comprehensive Foundation”, Second Edition, Pearson Education, 2005.
5. B.K. Tripathy and J. Anuradha, “Soft Computing-Advances and Applications”, First edition, Cengage Learning, 2015.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106105173/

ONLINE RESOURCES:

1. https://cse.iitkgp.ac.in/~dsamanta/courses/sca/index.html

OUTCOMES:

Upon completion of the course, the student should be able to

1. Illustrate various soft computing concepts for practical applications. (K2)
2. Apply suitable neural networks for real time problems. (K3)
3. Use fuzzy rules and reasoning to create decision making and an expert system. (K3)
4. Explain the importance of optimization techniques and genetic programming. (K2)
5. Develop suitable soft computing techniques for various applications. (K3)
6. Classify the various hybrid soft computing techniques and apply in real time problems. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	-	3	2
CO2	2	3	3	-	-	-	-	-			-		3	2
CO3	2	3	3	3	3	-	-	-	-	-	-	-	3	2
CO4	2	2	2	-	-	-	-	-	-	-	-	-	3	2
CO5	2	3	3	3	3	-	-	-	2	-	-	-	3	2
CO6	2	3	3	-	3		-	-	-	-	-	-	3	2

PROFESSIONAL ELECTIVE - I

20CSEL703 SDG NO. 4 & 12	INFORMATION RETRIEVAL TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the basics of Information Retrieval
- To apply Machine Learning techniques for Text Classification and Clustering
- To implement various Search engine system operations
- To learn different techniques of Recommender system

UNIT I INTRODUCTION 9

Information Retrieval – Early Developments – The IR Problem – The Users Task – Information Vs Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How the Web Changed Search – Practical Issues on the Web – How People Search – Search Interfaces Today – Visualization in Search Interfaces.

UNIT II MODELING AND RETRIEVAL EVALUATION 9

Basic IR Models - Boolean Model - TF / IDF (Term Frequency/Inverse Document Frequency) Weighting - Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural Network Model – Retrieval Evaluation – Retrieval Metrics – Precision and Recall – Reference Collection – User-Based Evaluation – Relevance Feedback and Query Expansion – Explicit Relevance Feedback.

UNIT III TEXT CLASSIFICATION AND CLUSTERING 9

A Characterization of Text Classification – Unsupervised Algorithms - Clustering – Naıv̈ e Text Classification – Supervised Algorithms – Decision Tree – KNN Classifier – SVM Classifier – Feature Selection or Dimensionality Reduction – Evaluation Metrics – Accuracy and Error – Organizing the Classes – Indexing and Searching – Inverted Indexes – Sequential Searching – Multi-Dimensional Indexing.

UNIT IV WEB RETRIEVAL AND WEB CRAWLING 9

The Web – Search Engine Architectures – Cluster based Architecture – Distributed Architectures – Search Engine Ranking – Link based Ranking – Simple Ranking Functions – Learning to Rank – Evaluations - Search Engine

Ranking – Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation.

UNIT V RECOMMENDER SYSTEM 9

Recommender Systems Functions – Data and Knowledge Sources – Recommendation Techniques – Basics of Content-Based Recommender Systems – High Level Architecture – Advantages and Drawbacks of Content-Based Filtering – Collaborative Filtering – Matrix factorization models – Neighborhood models.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, "Modern Information Retrieval: The Concepts and Technology behind Search", Second Edition, ACM Press Books, 2011.
2. Ricci, F, Rokach, L. Shapira, B.Kantor, "Recommender Systems Handbook", First Edition, 2011.

REFERENCES:

1. C. Manning, P. Raghavan, and H. Schü tze, "Introduction to Information Retrieval", Cambridge University Press, 2008.
2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, "Information Retrieval: Implementing and Evaluating Search Engines", The MIT Press, 2010.
3. ChengXiang Zhai, "Statistical Language Models for Information Retrieval (Synthesis Lectures Series on Human Language Technologies)", Morgan & Claypool Publishers, 2008.
4. Gerald J. Kowalski, Mark T. Maybury, "Information Storage and Retrieval Systems – Theory and Implementation", Second Edition, Springer 2013.
5. Frakes, W.B., Ricardo Baeza-Yates, "Information Retrieval Data Structures and Algorithms", Prentice Hall, 2007.

WEB REFERENCES:

1. https://libguides.lamk.fi/informationretrieval/techniques

ONLINE RESOURCES:

1. www.informationretrieval.org
2. https://nlp.stanford.edu/IR-book/html/htmledition/irbook.html

OUTCOMES:

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

1. Identify and design the various components of an Information Retrieval system. (K1)
2. Use an open source Search engine framework and explore its capabilities. (K3)
3. Apply appropriate method of Classification or Clustering. (K3)
4. Design and implement innovative features in a Search engine. (K2)
5. Design and implement a Recommender system. (K2)
6. Demonstrate Information visualization technologies like Cognition and perception in the Internet or Web search engine.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	1	1	1	2	1	1	2	1	2
CO2	3	3	3	3	3	1	2	2	3	2	1	2	1	2
CO3	3	3	3	3	3	1	1	1	1	2	1	2	1	2
CO4	3	3	3	2	3	1	2	2	2	2	1	2	2	2
CO5	3	3	3	3	3	1	2	2	3	3	2	2	2	2
CO6	3	3	-	-	2	2	-	-	-	-	1	1	2	2

PROFESSIONAL ELECTIVE - II

20ITEL607 SDG NO. 4 & 7	EMBEDDED SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the building blocks of Embedded System
- To Educate in various Embedded development strategies
- To Introduce bus communication in Processors, Input/Output interfacing
- To impart knowledge in various Processor Scheduling algorithms

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to Embedded Systems – The Build Process for Embedded Systems- Structural Units in Embedded Processor - Selection of Processor & Memory Devices- DMA – Memory Management Methods- Timer and Counting Devices - Watchdog Timer - Real Time Clock - In Circuit Emulator - Target Hardware Debugging.

UNIT II EMBEDDED NETWORKING 9

Embedded Networking: Introduction - I/O Device Ports & Buses– Serial Bus Communication Protocols – RS232 Standard – RS422 – RS485 – CAN Bus - Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – Need for Device Drivers.

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT 9

Embedded Product Development Life Cycle - Objectives - Different Phases of EDLC - Modelling of EDLC - Issues in Hardware - Software Co-design - Data Flow Graph - State Machine Model - Sequential Program Model - Concurrent Model - Object Oriented Model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to Basic Concepts of RTOS - Task - Process & Threads - Interrupt Routines in RTOS - Multiprocessing and Multitasking - Preemptive and Non-Preemptive Scheduling - Task Communication Shared Memory - Message Passing - Inter Process Communication – Synchronization between Processes-Semaphores - Mailbox - Pipes - Priority Inversion - Priority Inheritance.

UNIT V EMBEDDED SYSTEM APPLICATION AND DEVELOPMENT 9

Case Study of Washing Machine - Automotive Application - Smart Card System Application-ATM Machine –Digital Camera.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Peckol, "Embedded System Design", John Wiley & Sons, 2010.
2. Shibu. K.V, "Introduction to Embedded Systems", Second Edition, Mc Graw Hill, 2017.

REFERENCES:

1. Raj Kamal, "Embedded System-Architecture, Programming, Design", Mc Graw Hill, 2013.
2. Lyla B Das," Embedded Systems - An Integrated Approach", Pearson, 2013.
3. C.R.Sarma, "Embedded Systems Engineering", University Press (India) Pvt. Ltd, 2013.
4. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006.
5. Han-Way Huang, "Embedded System Design Using C8051", Cengage Learning, 2009.

WEB REFERENCES:

1. https://nptel.ac.in/courses/108102045/

OUTCOMES:

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

1. Understand the Building Blocks of Embedded System and Networking Concepts (K2)
2. Examine the various Embedded Development Environment (K4)
3. Explain the Basic Concepts of Realtime Operating System (K2)
4. Summarize the important aspects of multiprocessing and multitasking (K2)
5. Examine the issues in Hardware and Software CoDesign (K4)
6. State the Embedded systems applications and Development in Real time Applications (K1)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	-	-	-	1	-	-	1	-	1	1	1
CO2	3	1	-	-	3	3	3	-	-	-	3	1	3	1
CO3	2	2	2	-	2	2	2	-	-	3	1	1	2	2
CO4	3	1	-	3	2	1	1	-	2	1	1	1	3	1
CO5	2	2	1	2	2	-	1	-	1	-	1	1	2	2
CO6	3	1	-	3	2	1	1	-	2	1	1	1	3	1

PROFESSIONAL ELECTIVE - II

20CJEL701 SDG NO. 4 & 6	ARTIFICIAL INTELLIGENCE: KNOWLEDGE REPRESENTATION AND REASONING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn a new revolution in the world by making intelligent machines
- To be exposed with understanding, reasoning, and interpreting knowledge.
- To be familiar with Search Methods for Problem Solving
- To explore a variety of representation formalisms and the associated algorithms for reasoning

UNIT I INTRODUCTION **9**

Overview: History and Philosophy-Abductive inferences and Expectations-Machine learning-Test on intelligence-Domain of Reasoning-Hierarchies - Representation-Logic -Representation.

UNIT II SYMBOLIC REASONING AND PROPOSITIONAL LOGIC **9**

Symbols and though-Truth logic-Syntactic Machine-Probability-Language of Logic-Patterns - Patterns in Arguments-Rules of Inference-Propositional Logic- Syntax and Semantics-Natural Deductions - Deduction theorem - Models- Tableau Method.

UNIT III FIRST ORDER LOGIC **9**

First Order Logic-Syntax and Semantics-Truth Assignments-Universal Instantiation. The Unification Algorithm-Skolemization-Expert Systems-Backward Chaining-FOL - Clause-Equality-Consistency-Completeness-The Resolution Refutation Method

UNIT IV LOGICAL PROGRAMMING **9**

Arithmetics-Horn Clause-Prolog-Programming-Procedural interpretation-Query Evaluation- Unifying Terms-Goal order-Tabling-Cut Operator-OPSS Language-Rete Algorithm-Knowledge Representation-Reification-Description Logics-Dependency theory.

UNIT V TAXONOMIES AND EVENT CALCULUS **9**

Inference-Action-SemanticParsing-Knowledge-Structures-Scripts-Goals-PAM-Inheritance in Taxonomies-Default Logic -Event calculus-Epistemic action-Reason with beliefs-Reasoning.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.
2. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India), 2013.

REFERENCES:

1. Schank, Roger C., Robert P. Abelson: Scripts, Plans, Goals, and Understanding: An Inquiry into Human Knowledge Structures. Hillsdale, NJ: Lawrence Erlbaum, 1977.
2. R. C. Schank and C. K. Riesbeck: Inside Computer Understanding: Five Programs Plus Miniatures, Lawrence Erlbaum, 1981.
3. Murray Shanahan: A Circumscriptive Calculus of Events. Artif. Intell. 77(2), pp. 249-284, 1995.

ONLINE RESOURCES:

1. https://archive.nptel.ac.in/courses/106/106/106106140/
2. https://www.youtube.com/watch?v=9iN3O_oL2ac

OUTCOMES:

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

1. Learn the approaches of syntax and semantics in AI. (K1)
2. Understand approaches to solve the most complex tasks based on the knowledge . (K1)
3. Implement how thinking contributes to intelligent behavior of agents. (K3)
4. Analyzing knowledge is awareness or familiarity gained by experiences of facts. (K3)
5. Apply inheritable knowledge representation. (K2)
6. Interpret different approaches to knowledge representations(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	1	2	-	1	2	2
CO2	2	3	3	2	3	2	-	1	3	1	2	2	3	2
CO3	3	3	2	2	-	-	-	1	2	1	3	2	1	1
CO4	3	3	1	-	3	-	-	2	1	1	-	1	2	1
CO5	2	2	1	-	1	1	-	-	-	-	1	1	2	2

PROFESSIONAL ELECTIVE - II

20CSEL604 SDG NO. 4 & 15	BIO INFORMATICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To analyze the need for Bioinformatics Technologies
- To be familiar with the modeling techniques
- To learn microarray analysis
- To implement Pattern Matching and Visualization

UNIT I INTRODUCTION 9

Need for Bioinformatics Technologies – Overview of Bioinformatics Technologies - Structural Bioinformatics – Data Format and Processing – Secondary Resources and Applications – Role of Structural Bioinformatics - Biological Data Integration System.

UNIT II DATA WAREHOUSING AND DATA MINING IN BIOINFORMATICS 9

Bioinformatics Data – Data Warehousing Architecture – Data Quality – Biomedical Data Analysis – DNA Data Analysis – Protein Data Analysis – Machine Learning – Neural Network Architecture - Applications in Bioinformatics.

UNIT III MODELING FOR BIOINFORMATICS 9

Hidden Markov Modeling for Biological Data Analysis – Sequence Identification –Sequence Classification – Multiple Alignment Generation – Comparative Modeling –Protein Modeling – Genomic Modeling – Probabilistic Modeling – Bayesian Networks – Boolean Networks - Molecular Modeling – Computer Programs for Molecular Modeling.

UNIT IV PATTERN MATCHING AND VISUALIZATION 9

Gene Regulation – Motif Recognition – Motif Detection – Strategies for Motif Detection – Visualization – Fractal Analysis – DNA Walk Models – One Dimension – Two Dimension – Higher Dimension – Game Representation of Biological Sequences – DNA –Protein -Amino Acid Sequences.

UNIT V MICROARRAY ANALYSIS 9

Microarray Technology for Genome Expression Study – Image Analysis for Data Extraction – Preprocessing – Segmentation – Gridding – Spot Extraction – Normalization - Filtering – Cluster Analysis – Gene Network Analysis

–Scientific Data Management Systems – Cost Matrix – Evaluation Model - Benchmark – Tradeoffs.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Yi-Ping Phoebe Chen (Ed), "BioInformatics Technologies", First Indian Reprint, Springer Verlag, 2007.
2. Jin Xiong, "Essential Bioinformatics", Cambridge University Press, 2012.

REFERENCES:

1. Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education India, 2003.
2. Arthur M Lesk, "Introduction to Bioinformatics", Second Edition, Oxford University Press, 2005.
3. David W.Mount, "Bioinformatics: Sequence and Genome Analysis", Second Edition, Cold Spring Harbor Laboratory Press,U.S., 2004.
4. Andreas D. Baxevanis, B. F. Francis Ouellette, "Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins", Second Edition, Wiley Interscience, 2001.
5. Mitchell L Model, "Bioinformatics Programming Using Python", O'Reilly Media, 2009.

ONLINE RESOURCES:

1. https://www.classcentral.com/subjects/bioinformatics
2. https://mooc-list.com/tags/bioinformatis?_cf_chi_jschi_tk
3. https://www.udemy.com/topic/bioinformatics/?utm_source=adwords?

OUTCOMES:

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

1. Understand the basic concepts of Bioinformatics and its significance in biological data analysis.(K2)
2. Describe the history, scope and importance of Bioinformatics and role of the internet in bioinformatics. (K1)
3. Elaborate the methods to characterize and manage the different types of biological data.(K2)
4. Discuss the classification of biological databases.(K1)
5. Explore the basics of sequence alignment and analysis. (K3)
6. Describe how bioinformatics methods can be used to relate sequence, structure and functions.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	1	2	1	-	1	-	-	2	2	2
CO2	2	3	3	2	2	2	2	1	1	-	1	2	2	2
CO3	3	3	3	3	3	2	2	1	3	1	2	3	2	2
CO4	3	3	3	3	3	2	2	1	3	1	2	3	2	2
CO5	2	3	1	2	3	2	2	1	3	1	2	3	2	2
CO6	3	1	1	2	-	-	-	-	1	2	-	1	2	1

PROFESSIONAL ELECTIVE - II

20ITEL601 SDG NO. 4 & 9	SOFTWARE TESTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the criteria and design of Test Cases
- To learn the design of Test Cases
- To understand 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 Maturity Model - 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- Developer/Tester Support of Developing a Defect Repository.

UNIT II TEST CASE DESIGN STRATEGIES **9**

Test Case Design Strategies – Using Black Box Approach to Test Case Design – Boundary Value Analysis – Equivalence Class Partitioning – State Based Testing – Cause-Effect Graphing – Compatibility Testing – User Documentation Testing – Domain Testing - Random Testing – Requirements Based Testing – Using White Box Approach to Test design – Test Adequacy Criteria – Static Testing Vs. Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – Code Complexity Testing – Additional White Box Testing Approaches.

UNIT III LEVELS OF TESTING **9**

The Need for Levels of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit Tests and Recording Results – Integration Tests – Designing Integration Tests – Integration Test Planning – Scenario Testing – Defect Bash Elimination System Testing – Acceptance Testing – Performance Testing – Regression Testing – Internationalization Testing – Ad Hoc Testing – Alpha, Beta Tests – Testing Object Oriented Systems – Usability and Accessibility Testing – Configuration Testing – Compatibility Testing – Testing the Documentation – Website Testing.

UNIT IV TEST MANAGEMENT **9**

People and Organizational Issues in Testing – Organization Structures for Testing Teams – Testing Services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – Test Management – Test Process – Reporting Test Results – Introducing the Test Specialist – Skills Needed by a Test Specialist – Building a Testing Group- The Structure of Testing Group - The Technical Training Program.

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 – Test Metrics and Measurements – Project, Progress and Productivity Metrics.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2006.
2. Ron Patton, "Software Testing Second Edition", Sams Publishing, Pearson Education, 2007.

REFERENCES:

1. Ilene Burnstein, "Practical Software Testing", Springer International Edition, 2003.
2. Edward Kit, "Software Testing in the Real World – Improving the Process", Pearson Education, 1995.
3. Boris Beizer, "Software Testing Techniques" 2nd Edition, Van Nostrand Reinhold, New York, 1990.
4. Aditya P. Mathur "Foundations of Software Testing - Fundamental Algorithms and Techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

5. Naresh chauhan-software testing principles and practices,2nd edition,oxford University Press, 2017.

WEB REFERENCES :

1. https://nptel.ac.in/courses/106/105/106105150/

ONLINE RESOURCES:

1. https://www.javatpoint.com/software-testing-tutorial
2. https://www.toolsqa.com/software-testing-tutorial/

OUTCOMES:

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

1. Understand about the Software Testing Principles and Defect Classes(K2)
2. Apply test cases suitable for software development for different domains(K3)
3. Discuss the various Levels of Testing (K2)
4. Identify suitable tests to be carried out.(K2)
5. Discuss the concepts of Test plan and its skill set(K2)
6. Apply automatic testing tools and discuss the various test metrics and measurements.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	2	-	2	3
CO2	2	3	3	-	-	-	-	-	2	-	1	-	3	3
CO3	2	3	3	-	-	-	-	-	3	-	1	2	3	3
CO4	2	3	3	-	-	-	-	-	3	-	3	3	3	3
CO5	-	2	1	-	-	-	-	-	2	-	2	-	3	3
CO6	3	2	2	-	-	-	-	-	1	2	2	2	3	3

PROFESSIONAL ELECTIVE - II

20MGEL607 SDG NO. 4 & 9	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts and philosophies of Quality Management
- To know the impact and significance of TQM principles on organizations in recent times.

UNIT I INTRODUCTION 8

Need and Evolution of Quality, Quality-Definitions, statements and dimensions of product and service quality TQM-concepts, Elements and Framework, Benefits & Obstacles of TQM , TQM-Culture, Strategic Quality Management, Costs of Quality.

UNIT II CONTRIBUTIONS AND APPROACHES TO QUALITY MANAGEMENT 9

Renowned quality gurus- Deming, Juran, Crosby and Ishikawa, Contributions of Taguchi – Loss Function, Signal to Noise Ratio and design of experiments, Kaizen -principles and practices-5 S tools, Poka Yoke-8 Discipline Methodology, Just in time, Continuous process improvement-PDCA cycle and 5 why analysis

UNIT III CUSTOMER FOCUS AND TEAMWORK 8

Identifying Customer Needs, QFD - Process, Building HoQ, Customer Satisfaction Measurement Techniques. Employee Involvement Practices. Individual Participation - Suggestion Systems & Empowerment, Motivation,Leadership, Partnerships - Cross-Functional Teams, Supplier/Customer Partnerships, Problem -Solving Teams - Quality Circles.

UNIT IV STATISTICAL TOOLS & TECHNIQUES 11

SQC - Tools For Data Collection And Analysis – Seven tools(old and new),Statistical Process Control (SPC) – Construction of Control Chart – Variables and Attributes. Process Capability – concepts and measurement. Six Sigma models ,Lean six sigma, BPR, TPM, FMEA and Benchmarking.

UNIT V QUALITY SYSTEMS AND STANDARDS 9

Need for ISO 9000- ISO 9001: 2015 quality system-guidelines and clause wise requirements, Quality audits-types and responsibilities, ISO 14001:2004 EMS,

ISO / TS 16949:2002, ISO 27001:2005 ISMS, SEI – CMMIand Awards - Demings Prize, MBNQA and criteria.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Besterfield, Total Quality Management, 3rd Edition, Pearson India
2 Shridhara K Bhat, Total Quality Management. Himalaya Publishing House, 2010.

REFERENCE BOOKS:

1. Bedi Kanishka, Quality Management, Oxford University Press
2. Kiran D.R., Total Quality Management - Key Concepts and Case Studies, Butterworth-Heinemann, 2016.
3. Poornima M Charantimath, Total Quality Management. Pearson India, 2017
4. Sharma DD, Total Quality Management, Principles, Practice and Cases, Sultan Chand and Sons.
5. Douglas C. Montgomory, Introduction to Statistical Quality Control, Wiley Student Edition, 4 th Edition, Wiley India Pvt Limited, 2008

MOOC REFERENCES:

1. https://www.coursera.org/lecture/supply-chain-management/total-quality-management-wLrvy
2. https://swayam.gov.in/nd1_noc20_mg34/preview
3. https://www.openlearning.com/courses/total-quality-management/
4. https://www.udemy.com/course/tqm-in-academics/

MOOC REFERENCES:

1. https://www.unido.org/sites/default/files/2009-04/A_roadmap_to_quality_volume_1_0.pdf
2. https://www.investopedia.com/terms/t/total-quality-management-tqm.asp
3. https://www.researchgate.net/publication/237006071_Total_Quality_Management_in_Academic_Libraries_A_Study
4. https://www.isixsigma.com/methodology/total-quality-management-tqm/introduction-and-implementation-total-quality-management- tqm/
5. https://study.com/academy/lesson/five-principles-of-total-quality-management-tqm.html

OUTCOMES:

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

1. Understand quality concepts and philosophies of TQM. (K2)
2. Apply TQM principles and concepts of continuous improvement. (K3)
3. Explain the quality tools, management tools and statistical fundamentals to improve quality. (K2)
4. Demonstrate the various TQM tools as a means to improve quality. (K2)
5. Illustrate quality tools and procedures for better quality output. (K3)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVE - II

20CSEL502 SDG NO. 4 & 16	CYBER FORENSICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn Computer Forensics
- To become familiar with Forensics tools
- To learn to analyze and validate Forensics data
- To study about Ethical Hacking

UNIT I INTRODUCTION TO COMPUTER FORENSICS 9

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques – Incident and incident response methodology – Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. – Forensics Technology and Systems – Understanding Computer Investigation – Data Acquisition

UNIT II EVIDENCE COLLECTION AND FORENSICS TOOLS 9

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

UNIT III ANALYSIS AND VALIDATION 9

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics

UNIT IV ETHICAL HACKING 9

Introduction to Ethical Hacking – Footprinting and Reconnaissance – Scanning Networks – Enumeration – System Hacking – Malware Threats – Sniffing

UNIT V ETHICAL HACKING IN WEB 9

Introduction to Ethical Hacking – Common methods used in Ethical hacking – Social Engineering - Vulnerability Analysis - Web Application Attacks - Cross-Site Scripting –Injection Attacks – Path traversal – Denial of Service – Man in the middle attack – Brute force attack – Phishing attack – Web Application Penetration Testing.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, "Computer Forensics and Investigations", Cengage Learning, Pearson India Edition, 2016.
2. "CEH official Certified Ethical Hacking Review Guide", Wiley India Edition, 2015.

REFERENCES:

1. John R.Vacca, "Computer Forensics", Cengage Learning, 2005.
2. Marjie T.Britz, "Computer Forensics and Cyber Crime: An Introduction", Third Edition, Prentice Hall of India, 2013.
3. Ankit Fadia, "Ethical Hacking", Second Edition, Macmillan India Ltd, 2006.
4. Kenneth C.Brancik, "Insider Computer Fraud Auerbach Publications", Taylor & Francis Group, 2008.
5. Marie-Helen Maras, "Computer Forensics: Cybercriminals, Laws, and Evidence", Jones & Bartlett Learning; 2nd Edition, 2014.

WEB REFERENCES:

1. https://www.cs.nmt.edu/~df/home.html
2. https://www.cs.nmt.edu/~df/lectures.html
3. https://swayam.gov.in/nd2_ugc19_hs25/preview

ONLINE RESOURCES:

1. https://freevideolectures.com/course/5045/udemy-course-network-security-course

OUTCOMES:

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

1. Understand the basics of Computer Forensics. (K1)
2. Apply a number of different Computer Forensic tools to a given scenario. (K2)
3. Analyze and validate Forensics data. (K3)
4. Describe the concept of Ethical Hacking in different ways. (K2)
5. Identify the Vulnerabilities in a given Network Infrastructure. (K2)
6. Implement Real-world hacking techniques to test System security. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	-	2	-	-	-	-	2	2	3	1
CO2	2	1	3	3	-	2	-	-	-	-	2	2	2	1
CO3	3	2	3	2	-	2	-	-	-	-	2	2	3	2
CO4	3	2	2	2	1	-	-	1	-	2	2	2	3	2
CO5	3	1	3	2	3	3	-	-	-	-	2	2	3	1
CO6	3	1	2	2	3	2	-	-	2	3	2	2	3	1

PROFESSIONAL ELECTIVE - II

20CJEL702 SDG NO. 4 & 9	R PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understanding and being able to use basic programming concepts
- Automate data analysis
- Working collaboratively and openly on code
- Knowing how to generate dynamic documents
- Being able to use a continuous test-driven development approach

UNIT I INTRODUCTION 9

Overview of R, R data types and objects, reading and writing data, subsetting R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex numbers in R, Rounding, Arithmetic, Modulo and integer quotients, Variable names and assignment, Operators, Integers, Factors, Logical operations

UNIT II CONTROL STRUCTURES AND VECTORS 10

Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations

UNIT III LISTS 8

Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations

UNIT IV FACTORS AND TABLES 8

Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables , Extracting a Subtable, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions

UNIT V OBJECT-ORIENTED PROGRAMMING 10

S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation

TOTAL : 45 PERIODS

TEXT BOOKS:

1. R Programming for Data Science by Roger D. Peng
2. The Art of R Programming by Prashanth singh, Vivek Mourya, Cengage Learning India

REFERENCES:

1. Hands-On Programming with R: Write Your Own Functions and Simulations
2. by Garrett Grolemund , Hadley Wickham ,2009, 1st Edition
3. The Art of R Programming – A Tour of Statistical Software Design by Norman Matloff,2011
4. S Programming, Venables, W. N., and Ripley, B. D. (2000), Springer-Verlag, New York.

WEB RESOURCES:

1. https://swayam.gov.in/nd1_noc19_ma33/preview
2. https://data-flair.training/blogs/object-oriented-programming-in-r/
3. http://www.r-tutor.com/elementary-statistics
4. https://www.tutorialspoint.com/r/

ONLINE RESOURCES

1. https://www.r-tutor.com/elemntary-statstics
2. https://www.edx.org/learn/r-programming
3. https://www.javatpoint.com/r-tutorial

OUTCOMES:

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

1. Study and use basic fundamental concepts to solve the real world problem using R programming language
2. Design and implement the solution using scalar, vectors ,matrices and statistical problems in R program
3. Design and implement the program using data frame ,list to provide the solution for various problem

4. Study about factors and tables and to solve statistical problems
5. Minimize and maximize functions ,simulation and visualization and statistical analysis using R

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	1	-	3	-	-	-	2	1	-	3	3	1
CO2	3	-	1	-	3	-	-	-	2	1	-	3	3	1
CO3	3	-	1	-	3	-	-	-	2	1	-	3	3	1
CO4	3	-	1	-	3	-	-	-	2	1	-	3	3	1
CO5	3	-	1	-	3	-	-	-	2	1	-	3	3	1

PROFESSIONAL ELECTIVE - II

20CSEL805 SDG NO. 4 & 10	SPEECH PROCESSING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the fundamentals of Speech Processing
- To explore the various Speech Models, Phonetics and Pronunciation
- To perform Wavelet analysis of Speech
- To understand the concepts of Speech Recognition

UNIT I INTRODUCTION **9**

Introduction – Knowledge in Speech and Language Processing – Ambiguity – Models and Algorithms – Language – Thought – Understanding – Regular Expression And Automata – Words & Transducers – N Grams.

UNIT II SPEECH MODELING **9**

Word Classes and Part of Speech Tagging – Hidden Markov Model - Computing Likelihood: The Forward Algorithm – Training Hidden Markov Model – Maximum Entropy Model – Transformation – Based Tagging – Evaluation and Error Analysis – Issues in Part of Speech Tagging – Noisy Channel Model for Spelling.

UNIT III SPEECH PRONUNCIATION AND SIGNAL PROCESSING 9

Phonetics – Speech Sounds and Phonetic Transcription – Articulatory Phonetics – Phonological Categories and Pronunciation Variation – Acoustic Phonetics and Signals.

UNIT IV SPEECH IDENTIFICATION 9

Speech Synthesis – Text Normalization - Phonetic Analysis – Prosodic Analysis – Diphone Waveform Synthesis – Unit Selection Waveform Synthesis – Evaluation.

UNIT V SPEECH RECOGNITION 9

Automatic Speech Recognition – Architecture – Applying Hidden Markov Model – Feature Extraction: Mfcc Vectors – Computing Acoustic Likelihoods – Search And Decoding – Embedded Training – Multipass Decoding: N-best Lists And Lattices – A*('stack') Decoding – Context-dependent Acoustic Models: Triphones –Discriminative Training – Speech Recognition By Humans.

TOTAL:45 PERIODS

TEXT BOOKS:

1. 1. Daniel Jurafsky and James H.Martin, "Speech and Language Processing: An Introduction to Natural Language Processing , Computational Linguistics and Speech Recognition", Pearson Education, 2013.
2. Rabiner/Yegnanarayana, "Fundamentals of Speech Recognition", Pearson India, 1st Edition, 2008.

REFERENCES:

1. Kai-Fu Lee, "Automatic Speech Recognition", The Springer International Series in Engineering and Computer Science, 1999.
2. Himanshu Chaurasiya, "Soft Computing Implementation of Automatic Speech Recognition", LAP Lambert Academic Publishing, 2010.
3. Claudio Becchetti, Klucio PrinaRicotti, "Speech Recognition: Theory and C++ implementation", Wiley publications 2008.
4. Ikrami Eldirawy, Wesam Ashour, "Visual Speech Recognition",W i l e y publications, 2011.
5. Thomas F.Quatieri, "Discrete-Time Speech Signal Processing: Principles and Practice", Pearson India, 1st Edition, 2003.

WEB REFERENCES:

1. https://www.sciencedirect.com/topics/neuroscience/speech-processing
2. https://nptel.ac.in/courses/117105145/

ONLINE RESOURCES:

1. https://www.cse.iitb.ac.in/~pjyothi/cs753/index.html
2. https://link.springer.com/chapter/10.1007/978-3-540-49127-9_1

OUTCOMES:

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

1. Understand the basic concepts in for Speech Processing.(K2)
2. Illustrate the various approaches in modeling the speech.(K3)
3. Describe the terms in language Phonetic. (K2)
4. Illustrate the wavelet approaches of Speech.(K3)
5. Enumerate the basics of Speech Recognition System.(K3)
6. Explain the decoding aspects of Speech Processing and Recognition. (K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	-	-	-	2	3	-	-	3	2
CO2	3	2	3	2	2	-	-	-	2	3	2	-	2	3
CO3	2	1	3	-	-	-	-	-	-	-	-	-	2	2
CO4	3	3	3	2	2	-	-	-	2	2	2	-	3	2
CO5	3	2	2	-	-	-	-	-	2	2	-	-	2	3
CO6	2	1	2	1	-	-	-	-	1	-	1	-	2	2

PROFESSIONAL ELECTIVE - II

20CSEL806 SDG NO. 4	COGNITIVE SCIENCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn about theories, methods and discoveries in cognitive science, the historical context and the philosophical roots that allowed the rising of this multidisciplinary field of studies.
- To help students develop general scientific thinking and study skills that will be an important requirement for all the master courses
- To help students understand cognitive science application to real world artifacts.
- To help students to develop a critical approach to scientific research and literature

UNIT I INTRODUCTION TO COGNITIVE SCIENCE, PSYCHOLOGY, NERVOUS SYSTEM AND BRAIN 9

Introduction to the study of cognitive sciences. A brief history of cognitive science. Methodological concerns in philosophy, artificial intelligence and psychology. Structure and constituents of the brain; Brief history of neuroscience; Mathematical models; Looking at brain signals.

UNIT II BRAIN AND SENSORY MOTOR INFORMATION, REPRESENTATION OF SENSORY INFORMATION FROM SENSATION TO COGNITION AND ROOTS OF COGNITIVE SCIENCE 9

Processing of sensory information in the brain; Neural Network Models; Processing of sensory information in the brain; motor and sensory areas; Brain Imaging, fMRI, MEG, PET, EEG, Multisensory integration in cortex; information fusion; from sensation to cognition, cybernetics; From physics to meaning; Analog vs. Digital: Code duality

UNIT III LANGUAGE AND EMBODIMENT 9

What is language?; Linguistic knowledge: Syntax, semantics, (and pragmatics); Generative linguistics;Brain and language; Language disorders; Lateralization; The great past tense debate. Cognitivist and emergent standpoints; A robotic perspective

UNIT IV AFFORDANCE IN BIOLOGICAL AND ARTIFICIAL SYSTEM AND COGNITIVE DEVELOPMENT, ATTENTION 9

Affordances, direct perception, Ecological Psychology, affordance learning in robotics, Development, child and robotic development, Attention and related concepts; Human visual attention; Computational models of attention; Applications of computational models of attention.

UNIT V LEARNING –MEMORY AND REASONING 9

Categories and concepts; Concept learning; Logic ; Machine learning, Constructing memories; Explicit vs. implicit memory; Information processing (three-boxes) model of memory; Sensory memory; Short term memory; Long term memory, Rationality; Bounded rationality; Prospect theory ; Heuristics and biases; Reasoning in computers

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Gardner, The Mind's New Science, Gardner, Howard E, "The mind's new science: A history of the cognitive revolution", Basic books, 2008.
2. José Luis Bermú dez, "Cognitive Science: An Introduction to the Science of the Mind", Cambridge University Press, New York, 2014.

REFERENCES:

1. Michael I Posner, "The Foundations of Cognitive Science", MIT Press, Prentice October 1993
2. José Luis Bermú dez, "Cognitive Science: An Introduction to the Science of the Mind", Cambridge University Press, August 2010.
3. Gilbert Ryle, "The Concept of Mind", Cambridge University Press, 2003.
4. Pranjali Deshpande, Soudamini Patil, "Evolution of the Brain and Intelligence", Cambridge University Press, 2003.
5. Miller, Earl K., and Jonathan D. Cohen. "An Integrative Theory of Prefrontal Cortex Function." Annu Rev Neurosci 24 (2001): 167-202.
6. Bermudez Wallace, Mark T., and Barry E. Stein. "Sensory organization of the superior colliculus in cat and monkey." Progress in brain research 112 (1996): 301-311.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc21_hs105/preview
2. https://onlinecourses.nptel.ac.in/noc20_hs29/preview

ONLINE RESOURCES:

1. https://en.wikipedia.org/wiki/Cognitive_science
2. https://plato.stanford.edu/entries/cognitive-science/
3. https://cognitivesciencesociety.org/
4. https://www.forcepoint.com/cyber-edu/cognitive-science

OUTCOMES:

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

1. Compare and contrast different philosophical views on the nature of mind.(K3)
2. Apply basic Artificial Intelligence techniques to solve some simple problems.(K3)
3. Interpret findings from cognitive psychology and cognitive neuroscience.(K3)
4. Discuss social, evolutionary, and other ecological aspects of cognition.(K2)
5. Promote cognitive science.(K1)
6. Understand the concept of memory.(K1)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	1	2	1	1	-	2	1	2	2	2
CO2	3	1	1	2	-	1	2	-	1	-	2	2	2	1
CO3	2	1	3	1	-	2	1	2	-	2	2	2	2	1
CO4	3	1	2	2	2	1	-	1	1	-	2	1	3	2
CO5	2	1	3	1	2	2	1	-	2	3	2	2	3	2
CO6	3	1	3	1	2	2	1	-	2	3	2	2	3	2

PROFESSIONAL ELECTIVE - II

20CJEL703 SDG NO. 4 & 16	ETHICAL HACKING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To teach students how to think like a hacker providing them with a deep understanding of security issues and concerns
- To provide the students with specialist knowledge and experience of advanced hacking techniques and their countermeasures
- To critically evaluate the potential countermeasures to advanced hacking techniques
- To analyze and critically evaluate techniques used to break into an insecure web application and identify relevant countermeasures

UNIT I INTRODUCTION 9

Understanding the Importance of Security - Concept of Ethical Hacking and Essential Terminologies-Threat - Attack - Vulnerabilities - Target of Evaluation - Exploit - Phases Involved In Hacking - Footprinting - Scanning - System Hacking - Session Hijacking.

UNIT II BUFFER OVERFLOWS AND SNIFFERS 9

Significance of Buffer Overflow Vulnerability - Why Programs/Applications is Vulnerable - Reasons for Buffer Overflow Attacks - Methods of Ensuring that Buffer Overflows are Trapped - Sniffers - Active and Passive Sniffing - ARP Poisoning and Countermeasures - Man in the Middle Attacks - Spoofing and Sniffing Attacks - Sniffing Countermeasures.

UNIT III SQL INJECTION **9**

Attacking SQL Servers - Sniffing - Brute Forcing and Finding Application Configuration Files - Input Validation Attacks - Preventive Measures - Web Application Threats - Web Application Hacking - Cross Site Scripting / XSS Flaws / Countermeasures Correct Web Application Set-up.

UNIT IV WEB APPLICATION SECURITY AND TECHNOLOGIES **9**

Core Defence Mechanisms - Handling User Access - Authentication - Session Management - Access Control - Web Application Technologies - HTTP Protocol - Requests - Responses and Methods - Encoding Schemes - Server Side Functionality Technologies (Java, ASP, PHP).

UNIT V ATTACKING AUTHENTICATION **9**

Attacking Session Management - Design Flaws in Authentication Mechanisms Attacking Forgotten Password Functionality - Attacking Password Change Functions - Countermeasures to Authentication Attacks - Attacking Other Users - Reflected XSS Vulnerabilities - Stored XSS Vulnerabilities - DOM-Based XSS Vulnerabilities - HTTP Header Injection, Counter Measures to XSS.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Patrick Engebretson, "The Basics of Hacking and Penetration Testing", Elsevier, 2013.
2. Rajat Khare, "Network Security and Ethical Hacking", Luniver Press, 2006.

REFERENCES:

1. AnkitFadia, Manu Zacharia, Thomson "Network Intrusion Alert: An Ethical Hacking Guide to Intrusion Detection", Course Technology PTR, 2007.
2. Thomas Mathew, "Ethical Hacking", OSB Publisher, 2003.
3. Stuart McClure, Joel Scambray and George Kurtz, "Hacking Exposed: Network Security Secrets & Solutions", McGraw-Hill, 2005.
4. Jon Erickson, "Hacking: The Art of Exploitation", Second Edition, No Starch Press, 2008.
5. Dafydd Stuttard, "The Web Application Hacker's Handbook", Second Edition, Wiley, 2011.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_cs68/preview
2. https://nptel.ac.in/courses/106105217/
3. https://medium.com/quick-code/the-best-ethical-hacking-video-tutorials-for-everyone-e0cbd465b03c

ONLINE RESOURCES:

1. https://www.o'reilly.com/library/view/ethical-hacking/9781491978375/
2. https://www.guru99.com/ethical-hacking-tutorials.html

OUTCOMES:

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

1. Obtain knowledge about Ethical hacking and basics of web application attacks(K3)
2. Learn about various types of attacks, attackers and security threats and vulnerabilities present in the computer system.(K1)
3. Examine how social engineering can be done by attacker to gain access of useful & sensitive information about the confidential data.(K2)
4. Review and practice computer and network etiquette and ethics found in working environments.(K3)
5. Acquire knowledge of the tools, techniques and ethical issues likely to face the domain of ethical hacking and ethical responsibilities(K3)
6. Evaluate best practices in security concepts to maintain confidentiality, integrity and availability of computer systems(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	3	-	-	-	-	-	-	-	2	1
CO2	2	3	1	-	2	-	-	-	-	-	1	-	3	2
CO3	1	-	3	2	-	-	-	-	1	-	-	-	3	2
CO4	1	-	2	3	-	3	-	-	-	2	-	-	2	1
CO5	2	1	2	-	-	-	2	2	1	-	-	3	2	3
CO6	3	2	2	1	-	-	-	1	1	2	-	1	2	2

PROFESSIONAL ELECTIVE - II

20CSEL809 SDG NO. 4	GAME PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Understand the concepts of Game design and development
- To Learn the processes, mechanics and issues in Game Design
- To be exposed to the Core architectures of Game Programming
- To know about Game programming platforms, frameworks and engines

UNIT I 3D GRAPHICS FOR GAME PROGRAMMING 9

3D Transformations, Quaternions, 3D Modeling and Rendering - Ray Tracing - Shader Models - Lighting - Color - Texturing - Camera and Projections - Culling and Clipping - Character Animation - Physics - Based Simulation - Scene Graphs.

UNIT II GAME ENGINE DESIGN 9

Game Engine Architecture - Engine Support Systems - Resources and File Systems - Game Loop and Real-time Simulation - Human Interface Devices - Collision and Rigid Body Dynamics - Game Profiling.

UNIT III GAME PROGRAMMING APPLICATION 9

Application Layer - Game Logic - Game Views - Managing Memory - Controlling the Main Loop - Loading and Caching Game Data - User Interface Management - Game Event Management.

UNIT IV GAMING PLATFORMS AND FRAMEWORKS 9

2D and 3D Game Development Using Flash - DirectX - Java - Python - Game Engines - Unity - DX Studio.

UNIT V GAME DEVELOPMENT 9

Developing 2D and 3D Interactive Games Using DirectX or Python – Isometric and Tile Based Games - Puzzle Games - Single Player Games - Multiplayer Games.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Mike Mc Shaffrfy and David Graham, “Game Coding Complete”, Fourth Edition, Cengage Learning, PTR, 2012.
2. Jason Gregory, “Game Engine Architecture”, CRC Press / A K Peters, 2009.

REFERENCES:

1. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", 3rd Edition, Course Technology PTR, 2011.
2. David H. Eberly, "3D Game Engine Design - A Practical Approach to Real-Time Computer Graphics", Second Edition, Morgan Kaufmann, 2006.
3. Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", 2nd Edition, Prentice Hall /NewRiders,2009.
4. Jesse Schell, "The Art of Game Design: A book of lenses", First Edition, CRC Press, 2008.
5. Rod Afshar, Cliff Jones, Duke Banerjee, "Advergaming Developer's Guide: Using Macromedia Flash MX 2004 and Director MX (Game Development Series)", Charles River Media, Feb, 2004.

ONLINE RESOURCES:

1. https://www.youtube.com/watch?v=GfwpRU0cT10

OUTCOMES:

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

1. Understand the concepts of Game design and development (K2).
2. Design the processes and use mechanics for game development (K3).
3. Study the Core architectures of Game Programming (K1).
4. Implement Game programming platforms, frameworks and engines (K3).
5. Develop Interactive Games(K3).
6. Apply design and development principles in the construction of two-dimensional (2D) and Three-dimensional (3D) computer and mobile games(K3).

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	3	-	-	-	1	2	-	1	2	2
CO2	2	3	3	2	1	3	-	1	3	1	1	2	3	3
CO3	3	-	2	2	-	3	-	1	2	1	1	2	1	1
CO4	2	1	1	-	3	3	-	2	1	1	-	1	2	1
CO5	2	1	3	-	3	3	-	2	1	1	-	1	2	1
CO6	2	1	3	-	3	-	-	1	1	1	2	1	1	1

PROFESSIONAL ELECTIVE - II

20CJEL704 SDG NO. 4 & 16	FOUNDATION OF CYBER PHYSICAL SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Understand concepts related to Cyber-Physical Systems
- To analyze real time and communication CPS systems
- To understand the design of CPS.
- To understand how to analyze the automata based CPS.
- To learn filters and attacks in the CPS

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to Embedded Systems – The Build Process for Embedded Systems- Structural Units in Embedded Processor - Selection of Processor & Memory Devices- DMA – Memory Management Methods- Timer and Counting Devices - Watchdog Timer - Real Time Clock - In Circuit Emulator - Target Hardware Debugging.

UNIT II EMBEDDED NETWORKING 9

Embedded Networking: Introduction - I/O Device Ports & Buses– Serial Bus Communication Protocols – RS232 Standard – RS422 – RS485 – CAN Bus - Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – Need for Device Drivers.

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT 9

Embedded Product Development Life Cycle - Objectives - Different Phases of EDLC - Modelling of EDLC - Issues in Hardware - Software Co-design - Data Flow Graph - State Machine Model - Sequential Program Model - Concurrent Model - Object Oriented Model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to Basic Concepts of RTOS - Task - Process & Threads - Interrupt Routines in RTOS - Multiprocessing and Multitasking - Preemptive and Non-Preemptive Scheduling - Task Communication Shared Memory - Message Passing - Inter Process Communication – Synchronization between Processes-Semaphores - Mailbox - Pipes - Priority Inversion - Priority Inheritance.

UNIT V EMBEDDED SYSTEM APPLICATION AND DEVELOPMENT 9

Case Study of Washing Machine - Automotive Application - Smart Card System Application-ATM Machine –Digital Camera.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. "Principles of Cyber-Physical Systems" - Rajeev Alur
2. "Introduction to Embedded Systems — A Cyber— Physical Systems Approach" - E. A. Lee, Sanjit Seshia"

REFERENCES:

1. R. Rajkumar, D. de. Niz and M. Klein, (2017), Cyber Physical Systems, Addision-Wesely.
2. E.A.Lee and S A Shesia, (2018), Embedded system Design: A Cyber-Physical Approach, Second Edition, MIT Press.
3. A.Platzer, (2017), Logical Foundations of Cyber Physical Systems, Springer.

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc23_cs62/preview

OUTCOMES:

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

1. Explain the basics of cyber physical systems (K2)
2. Understand the real time and communications cypher physical systems (K2)
3. Explain the various design of cyber physical systems (K2)
4. Apply various hybrid based automata cyber physical systems (K3)
5. Understand the filters and attacks detection in the cyber physical systems (K2)
6. Apply the various real time models in cyber physical systems. [K3]

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	2	-	2	-	-	-	-	2	2	3	1
CO2	2	1	3	3	-	2	-	-	-	-	2	2	2	1
CO3	3	2	3	2	-	2	-	-	-	-	2	2	3	2
CO4	3	2	2	2	1	-	-	1	-	2	2	2	3	2
CO5	3	1	3	2	3	3	-	-	-	-	2	2	3	1
CO6	3	1	2	2	3	2	-	-	2	3	2	2	3	1

PROFESSIONAL ELECTIVE - III

20ITEL709 SDG NO. 4,9,11 &12	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand Smart Objects, IoT Architectures and IoT protocols
- To build simple IoT Systems using Arduino and Raspberry Pi
- To understand Data Analytics and Cloud in the context of IoT
- To develop IoT infrastructure for popular applications

UNIT I FUNDAMENTALS OF INTERNET OF THINGS 9

Evolution of Internet of Things - Enabling Technologies – IoT Architectures: oneM2M - IoT World Forum (IoTWF) and Alternative IoT models – Simpli ied IoT Architecture and Core IoT Functional Stack - Fog, Edge and Cloud in IoT – Functional Blocks of an IoT Ecosystem – Sensors - Actuators - Smart Objects and Connecting Smart Objects.

UNIT II IOT PROTOCOLS 9

IoT Access Technologies - Physical and MAC Layers - Topology and Security of IEEE 802.15.4,802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer - IP Versions - Constrained Nodes and Constrained Networks – Optimizing IP for IoT - From 6LoWPAN to 6Lo - Routing Over Low Power and Lossy Networks – Application Transport Methods - Supervisory Control and Data Acquisition – Application Layer Protocols - CoAP and MQTT.

UNIT III DESIGN AND DEVELOPMENT 9

Design Methodology - Embedded Computing Logic - Microcontroller - System on Chips - IoT System Building Blocks - Arduino - Board Details - IDE Programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

UNIT IV DATA ANALYTICS AND SUPPORTING SERVICES 9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kaka, Apache Spark – Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with NETCONF-YANG.

UNIT V CASE STUDIES / INDUSTRIAL APPLICATIONS 9

Cisco IoT System - IBM Watson IoT Platform – Manufacturing - Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks

Reference Model - Smart and Connected Cities - Layered Architecture - Smart Lighting - Smart Parking Architecture and Smart Traffic Control.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things", Cisco Press, 2017.
2. Rajkamal,"Internet of Things: Architecture, Design Principles And Applications",McGraw Hill HigherEducation,2017.

REFERENCES:

1. ArshdeepBahga, VijayMadisetti, "Internet of Things – A Hands-on approach", Universities Press, 2011.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key Applications and Protocols", Wiley, 2012.
3. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand and David Boyle, "From Machine-to-Machine to the Internet of Things and Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
5. Michael Margolis, Arduino Cookbook, "Recipes to Begin, Expand and Enhance Your Projects, 2 Edition, O'Reilly Media, 2011.

WEB REFERENCES:

1. https://www.arenasolutions.com/blog/10-valuable-iot-webresources/
2. https://nevonprojects.com/iot-projects/
3. https://www.sky ilabs.com/blog/list-of-latest-iot-projects-forengineering-students

ONLINE RESOURCES:

1. https://www.arenasolutions.com/blog/10-valuable-iot-webresources/
2. https://nevonprojects.com/iot-projects/

OUTCOMES:

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

1. Interpret the concept of IoT ,its Components and its architecture.(K2)
2. Learn the design methods of various protocols(K2)
3. Build the design methodology for a IoT system using Raspberry(K3)
4. Apply the Data analytics and Support servicing tool related to IoT(K3)

5. Experiment the case study and application of IoT in real time scenario(K3)
6. Illustrate the solutions for various distributed applications using the Big data technologies.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	2	1	0	0	0	0	0	2	3	2	2
CO2	2	3	1	2	1	0	0	0	0	0	2	3	2	2
CO3	3	2	3	0	3	0	0	0	0	0	2	1	3	3
CO4	2	3	2	3	2	0	0	0	0	0	1	1	3	3
CO5	2	3	3	3	2	2	2	2	1	2	1	2	3	3
CO6	2	3	3	3	3	2	3	2	1	2	1	2	3	3

PROFESSIONAL ELECTIVE - III

20ITEL702 SDG NO. 4,7,9	WIRELESS AD HOC AND SENSOR NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the concepts of Ad Hoc network
- To address the MAC protocol and its issues
- To explain the knowledge about Routing protocol and Transport layer
- To comprehend the concepts of WSN Routing and QoS

UNIT I INTRODUCTION 9

Fundamentals of Wireless Communication Technology - The Electromagnetic Spectrum - Radio Propagation Mechanisms - Characteristics of the Wireless Channel Mobile Ad Hoc Networks (MANETs) - Wireless Sensor Networks (WSNs): Concepts and Architectures - Applications of Ad Hoc and Sensor Networks - Design Challenges in Ad Hoc and Sensor Networks.

UNIT II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS 9

Issues in Designing a MAC Protocol - Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks - Design Goals of a MAC Protocol for Ad Hoc Wireless Networks - Classification of MAC Protocols - Contention Based Protocols - Contention Based Protocols with Reservation Mechanisms - Contention Based Protocols with Scheduling Mechanisms - Multi Channel MAC - IEEE 802.11.

UNIT III ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORK 9

Routing Protocol: Issues in Designing a Routing Protocol for Ad Hoc Networks - Classification- Proactive Routing - Reactive Routing (On-Demand) Hybrid Routing-Transport Layer Protocol for Ad Hoc Networks - Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks - Classification of Transport Layer Solutions - TCP over Ad Hoc Wireless - Network Security - Security in Ad Hoc Wireless Networks - Network Security Requirements.

UNIT IV WIRELESS SENSOR NETWORKS AND MAC PROTOCOLS 9

Single Node Architecture: Hardware and Software Components of a Sensor Node - WSN Network Architecture: Typical Network Architectures - Data Relaying and Aggregation Strategies - MAC Layer Protocols: Self-Organizing - Hybrid TDMA/FDMA and CSMA based MAC -IEEE 802.15.4.

UNIT V WSN ROUTING, LOCALIZATION AND QoS 9

Issues in WSN Routing – OLSR - Localization – Indoor and Sensor Network Localization - Absolute and Relative Localization- Triangulation- QoS in WSN - Energy Efficient Design–Synchronization.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Pearson Education, 2008.
2. Labiod. H, “Wireless Ad Hoc and Sensor Networks”, Wiley, 2008.

REFERENCES:

1. Carlos De MoraisCordeiro, Dharma PrakashAgrawal “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing and Company, 2nd edition, 2011.
2. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”, Wiley, 2005 .
3. Kazem Sohraby, Daniel Minoli & Taieb Znati, “Wireless Sensor Networks Technology, Protocols and Application”, John Wiley,2007.
4. Li, X, “Wireless Ad Hoc and Sensor Networks: Theory and Applications”, Cambridge University Press, 2008.

WEB REFERENCES:

1. www.wirelessnetworksonline.com
2. www.securityinwireless.com
3. www.ida.liu.se/~petel71/SN/lecture-notes/sn.pdf

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/106105160/
2. https://www.classcentral.com/course/swayam-wireless-ad-hoc-andsensor-networks-7888

OUTCOMES:

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

1. Understand the fundamental concepts and applications of Ad Hoc and wireless sensor networks. (K1)
2. Explain the MAC protocol of Ad Hoc networks. (K2)
3. Explain Routing protocols for Ad Hoc Wireless networks with respect to TCP design issues. (K3)
4. Explain the concepts of Network architecture and MAC layer protocol for WSN in different scenarios. (K3)
5. Explore the WSN routing issues by considering QoS measurements. (K3)
6. Apply Routing protocols in the different scenarios of WSN and compare the performance metrics. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	1	-	-	-	-	1	1	3	1
CO2	3	2	2	1	1	2	-	-	-	-	2	1	3	1
CO3	3	2	2	2	1	1	-	-	-	-	1	1	3	1
CO4	3	2	2	2	1	2	-	-	-	-	1	1	3	1
CO5	3	2	2	2	1	1	-	-	-	-	1	1	3	1
CO6	3	3	2	3	1	2	-	-	-	-	1	1	3	1

PROFESSIONAL ELECTIVE - III

20CSEL605 SDG NO. 4	PREDICTIVE MODELING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the terms and terminologies of predictive modeling.
- To study the various predictive models, their merits, demerits and application.
- To get exposure to various analytical tools available for predictive modeling.
- To learn the predictive modeling markup language.
- To get familiar with the technologies in predictive modeling

UNIT I INTRODUCTION TO PREDICTIVE MODELING 9

Core ideas in data mining - Supervised and unsupervised learning Classification vs Prediction - Steps in data mining- SEMMA Approach - Sampling -Pre-processing - Data cleaning - Data Partitioning - Building a model Statistical models - Statistical models for predictive analytics.

UNIT II PREDICTIVE MODELING BASICS 9

Data splitting – Balancing- Over fitting –Oversampling –Multiple Regression Artificial neural networks (MLP) - Variable importance- Profit/loss/prior probabilities - Model specification - Model selection - Multivariate Analysis.

UNIT III PREDICTIVE MODELS 9

Association Rules-Clustering Models –Decision Trees- Ruleset Models K Nearest Neighbors – Naive Bayes - Neural Network Model – Regression Models – Regression Trees – Classification & Regression Trees (CART) – Logistic Regression - Multiple Linear Regression Scorecards – Support Vector Machines – Time Series Models - Comparison between models - Lift chart Assessment of a single model.

UNIT IV PREDICTIVE MODELING MARKUP LANGUAGE 9

Introduction to PMML – PMML Converter - PMML Structure – Data Manipulation in PMML – PMML Modeling Techniques - Multiple Model Support – Model Verification..

UNIT V TECHNOLOGIES AND CASE STUDIES 9

Weka – RapidMiner – IBM SPSS Statistics- IBM SPSS Modeler – SAS Enterprise

Miner – Apache Mahout – R Programming Language.-Real time case study with modeling and analysis.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Kattamuri S. Sarma, "Predictive Modeling with SAS Enterprise Miner: Practical Solutions for Business Applications", 2nd Edition, SAS Publishing, 2007.
2. Alex Guazzelli, Wen-Ching Lin, Tridivesh Jena, James Taylor, "PMML in Action Unleashing the Power of Open Standards for Data Mining and Predictive Analytics", 2nd Edition, Create Space Independent Publishing Platform,2012.

REFERENCES:

1. Ian H. Witten, EibeFrank , "Data Mining: Practical Machine Learning Tools and Techniques", Morgan Kaufmann Series in Data Management Systems, Morgan Kaufmann, 3rd Edition, 2011.
2. Eric Siegel , "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die", 1st Edition, Wiley, 2013
3. Conrad Carlberg, "Predictive Analytics: Microsoft Excel", 1st Edition, Que Publishing, 2012.
4. Jeremy Howard, Margit Zwemer, Mike Loukides, "Designing Great Data Products- Inside the Drive train Approach, a Four-Step Process for Building Data Products – Ebook", 1st Edition, O'Reilly Media, March 2012.

WEB REFERENCES:

1. https://nptel.ac.in/courses/108108111/
2. https://www.coursera.org/learn/predictive-modeling-analytics

ONLINE RESOURCES:

1. https://bookdown.org/egarpor/PM-UC3M/
2. https://cics.nd.edu/research/applications/materials/

OUTCOMES:

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

1. Design and analyze appropriate predictive models. (K2)
2. Define the predictive models using PMML. (K1)
3. Apply statistical tools for analysis.(K3)
4. Use various analytical tools available for predictive modeling.(K3)
5. Apply predictive modeling markup language in data manipulation. (K2)

6. Apply regression and classification model on applications for decision making and evaluate the performance. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	2	-	1	-	-	-	-	1	1	1	2
CO2	2	1	1	1	-	2	-	-	-	-	2	2	1	2
CO3	2	2	1	2	-	2	-	-	-	-	2	2	2	2
CO4	2	2	2	2	3	2	-	-	-	-	2	2	2	2
CO5	2	2	3	2	3	2	-	-	2	3	2	2	2	2
CO6	3	2	2	-	3	3	-	-	-	-	1	1	1	2

PROFESSIONAL ELECTIVE - III

20CSEL601 SDG NO. 4	SOFTWARE PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the Software Project Planning and Evaluation techniques
- To plan and manage projects at each stage of the Software Development Life Cycle (SDLC)
- To learn about the Activity Planning and Risk management principles
- To manage Software Projects and control Software deliverables

UNIT I PROJECT EVALUATION AND PROJECT PLANNING 9

Importance of Software Project Management – Activities - Methodologies – Categorization of Software Projects – Setting Objectives – Management Principles – Management Control – Project Portfolio Management – Cost-Benefit Evaluation Technology – Risk Evaluation – Strategic Program Management – Stepwise Project Planning.

UNIT II PROJECT LIFE CYCLE AND EFFORT ESTIMATION 9

Software Process and Process Models – Choice of Process Models - Rapid Application Development – Agile Methods – Dynamic System Development Method – Extreme Programming– Managing Interactive Processes – Basics of Software Estimation – Effort and Cost Estimation Techniques – COSMIC Full Function Points - COCOMO II - a Parametric Productivity Model.

UNIT III ACTIVITY PLANNING AND RISK MANAGEMENT 9

Objectives of Activity Planning – Project Schedules – Activities – Sequencing and Scheduling – Network Planning Models – Formulating Network Model – Forward Pass & Backward Pass Techniques – Critical Path (CPM) Method – Risk Identification – Assessment – Risk Planning –Risk Management – PERT Technique – Monte Carlo Simulation – Resource Allocation – Creation of Critical paths – Cost Schedules.

UNIT IV PROJECT MANAGEMENT AND CONTROL 9

Framework for Management and Control – Collection of Data – Visualizing Progress – Cost Monitoring – Earned Value Analysis – Prioritizing Monitoring – Project Tracking – Change Control – Software Configuration Management – Managing Contracts – Contract Management.

UNIT V STAFFING IN SOFTWARE PROJECTS 9

Managing People – Organizational Behavior – Best Methods of Staff Selection – Motivation – The Oldham – Hackman Job Characteristic Model – Stress – Health and Safety – Ethical and Professional Concerns – Working in Teams – Decision Making – Organizational Structures – Dispersed and Virtual Teams – Communications Genres – Communication Plans – Leadership.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Bob Hughes, Mike Cotterell and Rajib Mall, "Software Project Management", Tata McGraw Hill, New Delhi, Fifth Edition, 2012.
2. Robert K. Wysocki, "Effective Software Project Management", Wiley Publication, 2011."

REFERENCES:

1. Walker Royce, "Software Project Management", Addison-Wesley, 1998.
2. Gopalaswamy Ramesh, "Managing Global Software Projects", McGraw Hill Education (India), Fourteenth Reprint 2013.

WEB REFERENCES:

1. https://swayam.gov.in/nd2_cec20_mg07/preview
2. https://onlinecourses.nptel.ac.in/noc19_cs70/preview

ONLINE RESOURCES:

1. https://www.edx.org/learn/project-management
2. https://opentextbc.ca/projectmanagement/chapter/chapter-16-riskmanagement-planning-project-management/

OUTCOMES:

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

1. Understand Project Management principles while developing software. (K2)
2. Gain extensive knowledge about the basic project management concepts, framework and the process models. (K3)
3. Obtain adequate knowledge about software process models and software effort estimation techniques. (K3)
4. Estimate the risks involved in various project activities. (K3)
5. Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles(K1)
6. Learn the staff selection process and the issues related to people management and determine an appropriate project management approach through an evaluation of the business context and scope of the project.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	-	-	-	-	1	1	2	2	3	2
CO2	3	3	3	1	-	-	-	-	1	1	2	2	3	2
CO3	3	3	3	2	-	-	-	-	2	2	2	2	3	2
CO4	3	3	3	2	2	-	-	-	2	2	2	2	3	2
CO5	3	3	3	2	2	-	-	-	2	3	2	2	3	2
CO6	3	3	3	1	1	-	-	-	2	3	3	3	2	2

PROFESSIONAL ELECTIVE - III

20MGEL701 SDG NO. 9 &12	FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the global trends and development methodologies of various types of products and services.
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems.

- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them into design specification.
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics.
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customers.

UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT 9

Global Trends Analysis and Product decision - Social Trends - Technical Trends- Economical Trends - Environmental Trends - Political/Policy Trends - Introduction to Product Development Methodologies and Management - Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies - Product Life Cycle – Product Development Planning and Management.

UNIT II REQUIREMENTS AND SYSTEM DESIGN 9

Requirement Engineering - Types of Requirements - Requirement Engineering - traceability Matrix and Analysis - Requirement Management - System Design & Modeling - Introduction to System Modeling - System Optimization - System Specification - Sub-System Design - Interface Design.

UNIT III DESIGN AND TESTING 9

Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques – Challenges in Integration of Engineering Disciplines - Concept Screening & Evaluation - Detailed Design - Component Design and Verification – Mechanical, Electronics and Software Subsystems - High Level Design/Low Level Design of S/W Program - Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – Prototyping - Introduction to Rapid Prototyping and Rapid Manufacturing - System Integration, Testing, Certification and Documentation

UNITIV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL)SUPPORT 9

Introduction to Product verification processes and stages - Introduction to Product Validation processes and stages - Product Testing Standards and Certification - Product Documentation - Sustenance -Maintenance and Repair– Enhancements - Product EoL - Obsolescence Management – Configuration Management - EoL Disposal.

UNIT V BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY 9

The Industry - Engineering Services Industry - Product Development in Industry versus Academia –The IPD Essentials - Introduction to Vertical Specific Product Development processes -Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and Software Systems – Product Development Trade-offs - Intellectual Property Rights and Confidentiality – Security and Configuration Management

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Book specially prepared by NASSCOM as per the MoU.
2. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development", Tata McGraw Hill, 5th Edition, 2011.
3. John W Newstorm and Keith Davis, "Organizational Behavior", Tata McGraw Hill, 11th Edition, 2005.

REFERENCES:

1. Hiriyappa B, “Corporate Strategy – Managing the Business”, Author House, 2013.
2. Peter F Drucker, “People and Performance”, Butterworth – Heinemann [Elsevier], Oxford, 2004.
3. Vinod Kumar Garg and Venkita Krishnan N K, “Enterprise Resource Planning – Concepts”, 2nd Edition, Prentice Hall, 2003.
4. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design", McGraw Hill Education, 7th Edition, 2013.

WEB REFERENCES:

1. https://www.udemy.com/course/strategic-product-management-and-leadership/
2. https://www.udemy.com/course/building-insanely-great-products/
3. https://www.coursera.org/learn/customer-insights-orientation

ONLINE RESOURCES:

1. https://pursuite-production.s3-ap-southeast1.amazonaws.com/media/cms_page_media/162/FSIPD+OBF+-+2012+F0_1.pdf
2. https://futureskillsnasscom.edcast.com/pathways/product-management-primer-pathway/cards/5603673#

OUTCOMES:

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

1. Explain the basic essentials of product development. (K2)

2. Discuss the learnings to incorporate effective design for product development. (K2)
3. Describe the various tools of innovation & product development process in the Business context. (K2)
4. Identify the various processes and choose the appropriate tools for designing, development and testing. (K2)
5. Discuss disruptive models / processes to manage product development from start to finish. (K2)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVE - III

20CJEL705 SDG NO. 4 & 9	CYBER SECURITY PRINCIPLES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the difference between threat, risk, attack and vulnerability.
- To know how threats materialize into attacks.
- To find information about threats, vulnerabilities, and attacks.
- To analyze typical threats, attacks , exploits and the motivations behind them.

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 SYSTEMS AND NETWORKS 9

Security in Operating Systems - Security in the Design of Operating Systems - Rootkit - Networking basics (home network and large-scale business

networks), Networking protocols, Security of protocols, sample application hosted on-premises.

UNIT III DIGITAL SECURITY **9**

Basics of digital security, protecting personal computers and devices, protecting devices from Virus and Malware, Identity, Authentication and Authorization, need for strong credentials, keeping credentials secure, protecting servers using physical and logical security, World Wide Web (www), the Internet and the HTTP protocol, security of browser to web server interaction,

UNIT IV PRIVACY IN CYBERSPACE **9**

Introduction to cyber-attacks, application security (design, development and testing), operations security, monitoring, identifying threats and remediating them, Principles of data security - Confidentiality, Integrity and Availability, Data Privacy, Data breaches, preventing attacks and breaches with security controls, Compliance standards, Computer Ethics.

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 HomeLand Security.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Charles P. Pleeger Shari Lawrence Pleeger Jonathan Margulies, "Security in Computing", 5th Edition , Pearson Education , 2015.
2. Robert C Newmans,"Computer Security: Protecting Digital Resources ",5 March 2009,Publisher Jones and Bartlett Publishers, Inc

REFERENCES:

1. George K.Kostopoulous, "Cyber Space and Cyber Security", CRC Press,2013.
2. Martti Lehto, Pekka Neittaanmäki, "Cyber Security: Analytics, Technology and Automation edited", Springer International Publishing Switzerland 2015
3. Nelson Phillips and Eninger Steuart, "Computer Forensics and Investigations,Cengage Learning", New Delhi, 2009.

WEB REFERENCES:

1. https://skillsforall.com/course/cybersecurity-essentials
2. https://www.ncsc.gov.uk/cyberessentials/overview

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc23_cs127/preview
2. https://www.coursera.org/collections/cybersecurity-for-beginners

OUTCOMES:

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

1. Describe about the foundation in digital security over threats. (K2)
2. Learning access control mechanism and understand how to protect servers.(K2)
3. Understand the importance of basic network protocols and security. (K1)
4. Knowledge of the application and operational security with data protection.(K1)
5. Identify the principles of data availability , integrity , confidentiality.(K2)
6. Understand cyber security and need of cyber Laws.(K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	-	1	2
CO2	2	2	-	1	-	-	-	-	-	-	-	1	2	2
CO3	2	2	-	-	-	-	-	-	-	-	-	1	2	2
CO4	2	1	-	-	-	-	-	-	-	-	-	1	2	2
CO5	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	1	-	-	-	-	-	-	-	-

PROFESSIONAL ELECTIVE - III

20ITEL701 SDG NO. 4	C# AND .NET PROGRAMMING	L	T	P	C
		0	0	0	3

OBJECTIVES:

- To understand the foundations of CLR execution
- To learn the technologies of the .NET framework
- To know the object oriented aspects of C#
- To learn web based applications on .NET(ASP.NET)

UNIT I INTRODUCTION TO C# 9

Introducing C# - Understanding .NET - Overview of C# - Literals –Variables - Data Types – Operators - Checked and Unchecked Operators –Expressions–Branching –Looping –Methods - Implicit and Explicit Casting –Constant–Arrays -Array Class -Array List – String -String Builder –Structure–Enumerations - Boxing and Unboxing.

UNIT II OBJECT ORIENTED ASPECTS OF C# 9

IClass – Objects - Constructors and its Types – Inheritance – Properties - Indexers - Index Overloading - Polymorphism - Sealed Class and Methods –Interface - Abstract Class - Abstract and Interface - Operator Overloading –Delegates- Events - Errors and Exception - Threading.

UNIT III APPLICATION DEVELOPMENT ON .NET 9

DBuilding Windows Application -Creating Our Own Window Forms WithEvents and Controls - Menu Creation - Inheriting Window Forms - SDI and MDIApplication -Dialog Box(Modal and Modeless) - Accessing Data with ADO.NET– Dataset - Typed Dataset - Data Adapter - Updating Database Using Stored Procedures -SQL Server with ADO.NET - Handling Exceptions - ValidatingControls - Windows Application

UNIT IV WEB BASED APPLICATION DEVELOPMENT ON .NET 9

Programming Web Application with Web Forms – ASP.NET Introduction - Working with XML and .NET - Creating Virtual Directory and Web Application - Session Management Techniques - web.config Web Services - PassingDatasets - Returning Datasets from Web Services - Handling Transaction -Handling Exceptions - Returning Exceptions from SQL Server

UNIT V CLR AND .NET FRAMEWORK 9

Assemblies –Versoning – Attributes –Reflection--Viewing Metadata - Type Discovery -Reflection ontype-–Marshaling –Remoting -Security in .NET.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Herbert Schildt, "The Complete Reference: C# 4.0", Tata Mc Graw Hill,2012.
2. Christian Nagel et al. "Professional C# 2012 with .NET 4.5", Wiley India,2012.

REFERENCES:

1. Andrew Troelsen , "Pro C# 2010 and the .NET 4 Platform, Fifth edition, A Press, 2010.
2. Ian Griffiths Matthew Adams, Jesse Liberty, "Programming C# 4.0", Sixth Edition, O"Reilly,2010.

WEB REFERENCES:

1. ttp://archive.oreilly.com/oreillyschool/courses/csharp2/C.NET%202%20C%20Programming%20in%20the%20.NET%20Framework%20v1.pdf
2. ttp://mocom.xmu.edu.cn/home/project/soft/CSharp/Professional%20Csharp%207%20and%20.NET%20Core%202.0.pdf

ONLINE RESOURCES:

1. https://www.youtube.com/watch?v=YT8s-90oDC0
2. https://www.udemy.com/course/c-sharp-for-beginners/

OUTCOMES:

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

1. Understand the foundation of the .NET framework and learn the .NET technologies. (K2)
2. Understand the basic concepts and structure of object oriented concepts in c# to develop the c# applications. (K2)
3. Apply the C# concept to implement the database application in .NET framework. (K3)
4. Apply the advanced techniques to implement the window based application in .NET Framework.(K3)
5. Implement the web based application and web services in .NET Framework using the advanced techniques (K3)
6. Illustrate about CLR and .NET framework (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	3	1	0	0	0	0	3	2	2	2
CO2	3	2	3	2	3	1	0	0	0	0	2	2	2	2
CO3	3	2	3	2	3	2	0	1	0	0	2	2	2	2
CO4	3	3	3	3	3	2	0	1	0	0	2	2	2	2
CO5	3	3	3	3	3	2	0	2	0	0	3	3	2	2
CO6	3	3	3	3	3	2	0	2	0	0	3	3	2	2

PROFESSIONAL ELECTIVE - III

20CJEL707 SDG NO. 4 & 11	REINFORCEMENT LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Model a control task in the framework of MDPs.
- To Identify the model based on the model free methods.
- To Identify stability/convergence and approximation properties of RL algorithms.
- To Use deep learning methods to RL problems in practice.

UNIT I Introduction **9**

Course logistics and overview. Origin and history of Reinforcement Learning research. Its connections with other related fields and with different branches of machine learning. Probability Primer Brush up of Probability concepts - Axioms of probability, concepts of random variables, PMF, PDFs, CDFs, Expectation. Concepts of joint and multiple random variables, joint, conditional and marginal distributions. Correlation and independence.

UNIT II Markov Decision Process **9**

Introduction to RL terminology, Markov property, Markov chains, Markov reward process (MRP). Introduction to and proof of Bellman equations for MRPs along with proof of existence of solution to Bellman equations in MRP. Introduction to Markov decision process (MDP), state and action value functions, Bellman expectation equations, optimality of value functions and policies, Bellman optimality equations.

UNIT III Prediction and Control by Dynamic Programing 9

Overview of dynamic programing for MDP, definition and formulation of planning in MDPs, principle of optimality, iterative policy evaluation, policy iteration, value iteration, Banach fixed point theorem, proof of contraction mapping property of Bellman expectation and optimality operators, proof of convergence of policy evaluation and value iteration algorithms, DP extensions.

UNIT IV Monte Carlo Methods for Model Free Prediction and Control9

Overview of Monte Carlo methods for model free RL, First visit and every visit Monte Carlo, Monte Carlo control, On policy and off policy learning, Importance sampling. TD Methods Incremental Monte Carlo Methods for Model Free Prediction, Overview TD(0), TD(1) and TD(λ), k-step estimators, unified view of DP, MC and TD evaluation methods, TD Control methods - SARSA, Q-Learning and their variants.

UNIT V Function Approximation Methods 9

Getting started with the function approximation methods, Revisiting risk minimization, gradient descent from Machine Learning, Gradient MC and Semi-gradient TD(0) algorithms, Eligibility trace for function approximation, Afterstates, Control with function approximation, Least squares, Experience replay in deep Q-Networks -Policy Gradients Getting started with policy gradient methods, Log-derivative trick, Naive REINFORCE algorithm, bias and variance in Reinforcement Learning, Reducing variance in policy gradient estimates, baselines, advantage function, actor-critic methods.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Richard S. Sutton and Andrew G. Barto, Introduction to Reinforcement Learning, 2nd Edition, MIT Press. 2017. ISBN-13 978-0262039246.
2. Dimitri Bertsekas and John G. Tsitsiklis, Neuro Dynamic Programming, Athena Scientific. 1996. ISBN-13: 978-1886529106

REFERENCES:

1. V. S. Borkar, Stochastic Approximation: A Dynamical Systems Viewpoint, Hindustan Book Agency, 2009. ISBN-13: 978-0521515924
2. Deep Learning. Ian Goodfellow and Yoshua Bengio and Aaron Courville. MIT Press. 2016.ISBN-13: 978-0262035613.

OUTCOMES:

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

1. Learn how to define RL tasks and the core principles behind the RL, including policies, value functions, deriving Bellman equations Implement in code common algorithms following code standards and libraries used in RL K2
2. Understand and work with tabular methods to solve classical control problems K2
3. Understand and work with approximate solutions. K2
4. Learn the policy gradient methods from vanilla to more complex cases K2
5. Explore imitation learning tasks and solutions K3
6. Recognize current advanced techniques and applications in RL K3

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	2	-	2	-	-	-	-	2	2	3	1
CO2	2	1	3	3	-	2	-	-	-	-	2	2	2	1
CO3	3	2	3	2	-	2	-	-	-	-	2	2	3	2
CO4	3	2	2	2	1	-	-	1	-	2	2	2	3	2
CO5	3	1	3	2	3	3	-	-	-	-	2	2	3	1
CO6	3	1	2	2	3	2	-	-	2	3	2	2	3	1

PROFESSIONAL ELECTIVE - III

20ITEL802 SDG NO. 4 & 9	VIRTUAL AND AUGMENTED REALITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce Virtual Reality, Input and Output devices
- To acquire knowledge on Computing architectures and modelling
- To explore VR programming and human factors
- To learn various application of Virtual and Augmented reality

UNIT I INTRODUCTION TO VIRTUAL REALITY AND INPUT AND OUTPUT DEVICES 9

Introduction - The Three I's of Virtual Reality - A Short History of Early Virtual Reality - Early Commercial VR Technology - VR becomes an Industry - The Five

Classic Components of a VR System. Input Devices - Three-Dimensional Position Trackers - Tracker Performance Parameters - Ultrasonic Trackers - Optical Trackers - Navigation and Manipulation Interfaces - Gesture Interfaces - Output Devices - Graphics Displays - Large - Volume Displays - Sound Displays.

UNIT II COMPUTING ARCHITECTURES AND MODELING OF VR SYSTEM 9

Computing Architectures for VR - The Rendering Pipeline - The Graphics Rendering Pipeline - The Haptics Rendering Pipeline - PC Graphics Architecture - PC Graphics Accelerators - Graphics Benchmarks - Distributed VR Architectures - Multipipeline Synchronization - Colocated Rendering Pipelines - Modeling - Geometric Modeling - Kinematics Modeling - Physical and Behavior Modeling.

UNIT III VR PROGRAMMING AND HUMAN FACTORS 9

Toolkits and Scene Graphs - World Tool Kit - Model Geometry and Appearance - The WTK Scene Graph - Sensors and Action Functions - WTK Networking - Java 3D - Model Geometry and Appearance - Java 3D Scene Graph - Sensors and Behaviors - Java 3D Networking - WTK and Java 3D Performance Comparison Methodology and Terminology - User Performance Studies - VR Health and Safety Issues - VR and Society.

UNIT IV APPLICATIONS OF VR 9

Medical Applications of VR - Virtual Anatomy - Triage and Diagnostic - Surgery - VR in Education - VR and the Arts - Entertainment Applications of VR - Military VR Applications - Army Use of VR - VR Applications in the Navy - Air Force use of VR - Applications of VR in Robotics - Robot programming - Robot Teleportation.

UNIT V AUGMENTED REALITY 9

Augmented Reality - An overview - Introduction - History - Augmented Reality Technologies – Computer Vision Methods in AR - AR Devices - AR Interfaces - AR Systems - Visualization Techniques for Augmented Reality - Data Integration - Depth Perception - Augmenting Pictorial Depth Cues - Occlusion Handling - Image Based X-ray Visualization - Scene Manipulation - Rearranging Real World Objects - Space - Distorting Visualization - AR in Healthcare.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Grigore C. Burdea, Philippe Coiffet, "Virtual Reality Technology", Wiley, Second Edition, 2006
2. BorkoFurht, "Handbook of Augmented Reality", Springer, 2011.

REFERENCES:

1. C. Burdea & Philippe Coiffet, "Virtual Reality Technology", Second Edition, Gregory, John Wiley & Sons, Inc.,2008
2. Jason Jerald. 2015. The VR Book: Human-Centred Design for Virtual Reality. Association for Computing Machinery and Morgan & Claypool, New York, NY, USA. Augmented Reality: Principles and Practice (Usability) by Dieter Schmalstieg & Tobias Hollerer, Pearson Education (US), Addison-Wesley Educational Publishers Inc, New Jersey, United States, 2016. ISBN: 9780321883575
3. Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR (Usability),Steve Aukstakalnis, Addison-Wesley Professional; 1 edition, 2016.
4. The Fourth Transformation: How Augmented Reality & Artificial Intelligence Will Change Everything, Robert Scoble & Shel Israel, Patrick Brewster Press; 1 edition, 2016.

WEB REFERENCE:

1. http://www.cs.upc.edu/~virtual/RVA/CourseSlides/03.%20VR%20Input%20H

OUTCOMES:

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

1. Summarize the basics of virtual reality and IO devices. (K2)
2. Associate the computing architectures and rendering pipelines used. (K2)
3. Demonstrate the virtual reality system using various toolkits and scene graphs. (K3)
4. Infer various applications of virtual reality systems. (K2)
5. Summarize the basics of augmented reality, IO devices and visualization techniques. (K2)
6. Construct augmented reality applications for various real time problems. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO2	2	1		-	-	-	-	-	-	-	-	1	-	1
CO3	3	2	1	-	1	-	-	1	-	1	1	1	2	1
CO4	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO5	2	1	-	-	-	-	-	-	-	-	-	1	-	1
CO6	3	2	1	-	1	-	-	1	-	1	1	1	2	1

PROFESSIONAL ELECTIVE - III

20CJEL706 SDG NO. 4	HUMAN COMPUTER INTERACTION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the foundations of Human Computer Interaction.
- To become familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.
- To learn the guidelines for user interface.

UNIT I FOUNDATIONS OF HCI 9

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices– Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles –elements – interactivity- Paradigms- Case Studies.

UNIT II DESIGN AND SOFTWARE PROCESS 9

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

UNIT III MODELS AND THEORIES 9

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV MOBILE HCI **9**

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets,Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies.

UNIT V WEB INTERFACE DESIGN **9**

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004
2. Brian Fling, "Mobile Design and Development", First Edition, O'Reilly Media Inc., 2009.
3. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O'Reilly, 2009.

REFERENCES:

1. Dix A., Finlay J,Abowd G. D. and Beale R. Human Computer Interaction, 3rd edition,Pearson Education, 2005.
2. Preece J., Rogers Y.,Sharp H.,Baniyon D., Holland S. and Carey T. Human Computer,Interaction,Addison-Wesley, 1994.
3. B.Shneiderman; Designing the User Interface,Addison Wesley 2000 (Indian Reprint).
4. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia.
5. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.
6. User Interface Design, Soren Lauesen , Pearson Education.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106103115
2. https://onlinecourses.nptel.ac.in/noc19_cs86/preview

ONLINE RESOURCES:

1. https://www.coursera.org/courses?query=human%20computer%20interaction
2. https://www.edx.org/learn/human-computer-interaction

OUTCOMES:

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

1. Design effective dialog for HCI . (K3)
2. Design effective HCI for individuals and persons with disabilities. (K3)
3. Assess the importance of user feedback (K2)
4. Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.(K2)
5. Develop a meaningful user interface. (K3)
6. Create an applications using human computer interaction between the various end users.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	3	1	0	0	0	0	3	2	2	2
CO2	3	2	3	2	3	1	0	0	0	0	3	2	2	2
CO3	3	2	3	2	3	1	0	1	0	0	3	2	2	2
CO4	3	3	3	3	3	2	0	1	0	0	2	2	2	2
CO5	3	3	3	3	3	2	0	2	0	0	3	3	2	2
CO6	3	3	3	3	3	2	0	2	0	0	3	3	2	2

PROFESSIONAL ELECTIVE - III

20CJEL709 SDG NO. 4 & 9	ARTIFICIAL INTELLIGENCE SEARCH METHODS FOR PROBLEM SOLVING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the foundation of AI & Heuristic search
- To understand population-based methods and game-playing algorithm
- To understand the automated planning method and problem decomposition method
- To understand Rule-Based Expert system and constraint processing System

UNIT I FOUNDATIONS OF AI & HEURISTIC SEARCH 9

Introduction: Philosophy, Mind, Reasoning, Computation, Dartmouth Conference, The Chess Saga, Epiphenomena-State Space Search: Depth First

Search, Breadth First Search, Depth First Iterative Deepening. Heuristic Search: Best First Search, Hill Climbing, Solution Space, TSP, Escaping Local Optima, Stochastic Local Search

UNIT II POPULATION-BASED METHODS & GAME PLAYING 9

Population Based Methods: Genetic Algorithms, SAT, TSP, Emergent Systems, Ant Colony Optimization. Game Playing: Game Theory, Board Games and Game Trees, Algorithm Minimax, AlphaBeta and SSS*

UNIT III AUTOMATED PLANNING & PROBLEM DECOMPOSITION 9

Automated Planning: Domain Independent Planning, Blocks World, Forward & Backward Search, Goal Stack Planning, Plan Space Planning. Problem Decomposition: Means Ends Analysis, Algorithm Graphplan, Algorithm AO*.

UNIT IV RULE BASED EXPERT SYSTEMS 9

Rule Based Expert Systems: Introduction to Rule-based Expert System, Production Systems, Inference Engine, Match-Resolve-Execute, Rete Net. Deduction as Search:Introduction- Logic, Soundness, Completeness, First Order Logic, Forward Chaining, Backward Chaining.

UNIT V CONSTRAINT PROCESSING SYSTEM 9

Constraint Processing: Introduction to Constraint Processing,CSPs, pros and cons Consistency Based Diagnosis, Algorithm Backtracking, Arc Consistency, Algorithm Forward Checking.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India), 2013.
2. Stefan Edelkamp and Stefan Schroedl. Heuristic Search: Theory and Applications, Morgan Kaufmann, 2011

REFERENCES:

1. Pamela McCorduck, Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence, A K Peters/CRC Press; 2 edition, 2004.
2. Zbigniew Michalewicz and David B. Fogel. How to Solve It: Modern Heuristics. Springer; 2nd edition, 2004
3. Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall, 2009.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc23_cs92/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs56/preview

ONLINE RESOURCES:

1. https://medium.com/@this.shoaib/top-10-learning-resources-for-artificial-intelligence-a-comprehensive-guide-6fb72c31a921
2. https://innovationatwork.ieee.org/artificial-intelligence-resources/
3. https://github.com/mrsaeeddev/free-ai-resources

OUTCOMES:

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

1. Understand the Foundations of AI and Heuristic Search(K2)
2. Implement Genetic Algorithms, Ant Colony Optimization, and other population-based methods to solve problems.(K3)
3. Understand of game theory, game trees, and algorithmic approaches such as Minimax, AlphaBeta, and SSS* in the context of board games, and apply these strategies to game-playing scenarios.(K3)
4. Implement domain-independent planning techniques, including Forward & Backward Search, Goal Stack Planning, Means Ends Analysis, and Graphplan algorithm, to solve problems effectively.(K3)
5. Understand the components of rule-based expert systems, including production systems, inference engines.(K2)
6. Understand the fundamentals of constraint processing, including CSPs and consistency-based diagnosis, and analyze the pros and cons of constraint-based approaches.(K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	1	1	1	2	2	3	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	2	2
CO3	3	3	3	3	3	-	-	-	-	-	-	-	2	2
CO4	3	3	3	3	3	2	2	2	2	2	1	3	2	2
CO5	3	3	3	3	3	3	3	2	2	2	2	3	3	3
CO6	3	3	3	3	3	3	3	2	2	2	2	3	3	3

PROFESSIONAL ELECTIVE - III

20CJEL708 SDG NO. 4 & 9	PRIVACY AND SECURITY IN ONLINE SOCIAL MEDIA	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the basic concepts in Social Networks.
- To Learn techniques for optimizing network performance, including traffic
- To understand the concepts and principles behind OSN.
- To Understand and identify the trust and identifying management in online social networks.

Unit I Introduction to Online Social Networks 9

Introduction to Social Networks, From offline to Online Communities, Online Social Networks, Evolution of Online Social Networks, Analysis and Properties, Security Issues in Online Social Networks, Trust Management in Online Social Networks, Controlled Information Sharing in Online Social Networks, Identity Management in Online Social Networks, data collection from social networks, challenges, opportunities, and pitfalls in online social networks, APIs; Collecting data from Online Social Media.

Unit II Trust Management in Online Social Networks 9

Trust and Policies, Trust and Reputation Systems, Trust in Online Social, Trust Properties, Trust Components, Social Trust and Social Capital, Trust Evaluation Models, Trust, credibility, and reputations in social systems; Online social media and Policing, Information privacy disclosure, revelation, and its effects in OSM and online social networks; Phishing in OSM & Identifying fraudulent entities in online social networks.

Unit III Controlled Information Sharing in Online Social Networks 9

Access Control Models, Access Control in Online Social Networks, Relationship-Based Access Control, Privacy Settings in Commercial Online Social Networks, Existing Access Control Approaches.

Unit IV Identity Management in Online Social Networks 9

Identity Management, Digital Identity, Identity Management Models: From Identity 1.0 to Identity 2.0, Identity Management in Online Social Networks, Identity as Self-Presentation, Identity thefts, Open Security Issues in Online Social Networks

Unit V Case Study **9**

Privacy and security issues associated with various social media such as Facebook, Instagram, Twitter, LinkedIn etc, Research paper discussion

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Chbeir, Richard, Al Bouna, Bechara (Eds.),"Security and Privacy-Preserving in Social Networks", Springer, 2013.
2. Barbara Carminati, Elena Ferrari, Marco Viviani, Morgan ,"Security and Trust in Online Social Networks" Claypool publications Life Sciences (30 December 2013)
3. Altshuler, Y., Elovici, Y., Cremers, A.B., Aharony, N., Pentland, A.,"Security and Privacy in Social Networks", Springer, 2013

REFERENCES:

1. Elie Raad & Richard Chbeir, Richard Chbeir& Bechara Al Bouna,"Security and privacy preserving in social networks", 2013
2. Michael Cross , "Social Media Security: Leveraging Social Networking While Mitigating Risk", : November 2013

ONLINE RESOURCES:

1. https://www.udemy.com/course/the-complete-internet-security-privacy-course-volume-1/
2. https://www.udemy.com/course/become-a-kick-ass-social-media-manager/
3. https://www.coursera.org/learn/data-security-privacy

OUTCOMES:

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

1. Understand working of online social networks (K2)
2. Describe privacy policies of online social media (K2)
3. Analyse countermeasures to control information sharing in Online social networks (K3)
4. Apply knowledge of identity management in Online social networks (K3)
5. Compare various privacy issues associated with popular social media. (K3)
6. Analyze the methods used for user authentication on social media platforms.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	3	1	0	0	0	0	3	2	2	2
CO2	3	2	3	2	3	1	0	0	0	0	2	2	2	2
CO3	3	2	3	2	3	2	0	1	0	0	3	2	2	2
CO4	3	3	3	3	3	2	0	1	0	0	2	2	2	2
CO5	3	3	3	3	3	2	0	2	0	0	3	3	2	2
CO6	3	3	3	3	3	2	0	2	0	0	3	3	2	2

PROFESSIONAL ELECTIVE - IV

20CSEL606 SDG NO. 4	IOT ARCHITECTURE, NETWORK AND SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand the fundamentals of the Internet of Things.
- Learn about the basics of IOT protocols.
- Build a small low cost embedded system using Raspberry Pi.
- Apply the concept of Internet of Things in the real world.

UNIT I INTRODUCTION TO IoT **9**

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology.

UNIT II IoT ARCHITECTURE **9**

M2M High-level ETSI Architecture - IETF Architecture for IoT - OGC Architecture - IoT Reference Model - Domain Model - Information Model - Functional Model - Communication Model - IoT Reference Architecture.

UNIT III IoT PROTOCOLS **9**

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LoWPAN - CoAP – Security.

UNIT IV BUILDING IoT WITH RASPBERRY PI & ARDUINO **9**

Building IOT with RASPBERRY PI- IoT Systems - Logical Design using Python –IoT Physical Devices & Endpoints - IoT Device - Building blocks - Raspberry Pi - Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

UNIT V IOT REAL-WORLD APPLICATIONS AND TOOLS **9**

Real World Design Constraints - Applications - Asset Management, Industrial Automation, Smart Grid, Commercial Building Automation, Smart Cities - Participatory Sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, " IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things", Cisco Press, 2017.
2. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach" , WordPress, 2015

REFERENCES:

1. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012 (for Unit 2).
2. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence'', Elsevier, 2014.
3. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective",CRC Press, 2012.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
5. Michael Margolis, Arduino Cookbook, "Recipes to Begin, Expand, and Enhance Your Projects", 2nd Edition, O'Reilly Media, 2011.

ONLINE RESOURCES:

1. https://www.arduino.cc/
2. https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet
3. https://www.cisco.com/c/en/us/solutions/internet-of-things/resources/case-studies.html

OUTCOMES:

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

1. Understand the fundamentals of the Internet of Things (K2)
2. Discuss various networking protocols for IoT (K2)
3. Interpret web services to access/control IoT devices (K2)
4. Construct a small low cost embedded system using Raspberry Pi (K3)
5. Extend an IoT application and connect to the cloud (K2)
6. Demonstrate applications of IoT in real time scenarios (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2		1 -	-	-	-	-	-	-	-	-	1
CO2	2	2	2	1	-	-	-	-	-	-	-	-	-	1
CO3	3	2	2	1	1	-	-	-	-	-	-	-	-	1
CO4	3	3	3	1	2	1	-	-	-	-	-	-	1	2
CO5	3	3	3	1	2	1	-	-		-	-	-	1	2
CO6	3	3	3	2	2	1	1	1	1	1	1	1	1	2

PROFESSIONAL ELECTIVE - IV

20CJEL801 SDG NO. 4 & 11	FUNDAMENTALS OF OPEN SOURCE SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Be exposed to the context and operation of open source software (OSS) communities and associated software projects.
- Be familiar with participating in a OSS project
- Learn scripting language like Python or Perl
- Learn programming language like Ruby
- Learn some important OSS tools and techniques

UNIT I PHILOSOPHY 9

Notion of Community--Guidelines for effectively working with OSS community--, Benefits of Community based Software Development -- Requirements for being open, free software, open source software –Four degrees of freedom - OSS Licensing Models - OSS Licenses – GPL- AGPL-LGPL - FDL - Implications – OSS examples.

UNIT II LINUX 9

Linux Installation and Hardware Configuration – Boot Process-The Linux Loader (LILO) - The Grand Unified Bootloader (GRUB) - Dual-Booting Linux and other Operating System - Boot-Time Kernel Options- X Windows System Configuration-System Administration – Backup and Restore Procedures-Strategies for keeping a Secure Server.

UNIT III PROGRAMMING LANGUAGES **9**

Programming using languages like Python or Perl or Ruby

UNIT IV PROGRAMMING TOOLS AND TECHNIQUES **9**

Usage of design Tools like Argo UML or equivalent, Version Control Systems like Git or equivalent, – Bug Tracking Systems- Package Management Systems.

UNIT V OSS CASE STUDIES **9**

Open Source Software Development - Case Study – Libreoffice -Samba

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, "Linux in a Nutshell", Sixth Edition, OReilly Media, 2009.

REFERENCES:

1. Philosophy of GNU URL: http://www.gnu.org/philosophy/.
2. LinuxAdministration URL: http://www.tldp.org/LDP/lame/LAME/linux-admin-made-easy/.
3. The Python Tutorial available at http://docs.python.org/2/tutorial/.
4. Perl Programming book at http://www.perl.org/books/beginning-perl/.
5. Ruby programming book at http://ruby-doc.com/docs/Programming Ruby/.
6. Version control system URL: http://git-scm.com/.
7. Samba: URL : http://www.samba.org/.
8. Libre office: http://www.libreoffice.org/

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc24_hs01/preview

ONLINE RESOURCES:

1. https://synopsys.skilljar.com/introduction-to-open-source-software

OUTCOMES:

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

1. Install and run open-source operating systems.
2. Gather information about Open Source Software projects from software releases and from sites on the internet.

3. Build and modify one or more Open Source Software packages.
4. Use a version control system.
5. Contribute software to and interact with Open Source Software development projects.

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	-	-	-	-	1	1	2	2	3	2
CO2	3	3	3	1	-	-	-	-	1	1	2	2	3	2
CO3	3	3	3	2	2	-	-	-	2	2	2	2	3	2
CO4	3	3	3	2	2	-	-	-	2	2	2	2	3	2
CO5	3	3	3	2	2	-	-	-	2	3	2	2	3	2
CO6														

PROFESSIONAL ELECTIVE - IV

20CSEL701 SDG NO. 4 & 8	SOCIAL NETWORK ANALYSIS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concept of Semantic Web and related applications
- To learn knowledge representation using Ontology
- To understand human behaviour in social web and related communities
- To learn visualization of Social Networks

UNIT I INTRODUCTION 9

Introduction to Semantic Web - Limitations of Current Web – Development of Semantic Web – Emergence of the Social Web – Social Network Analysis: Development of Social Network Analysis – Key Concepts and Measures in Network Analysis – Electronic Sources for Network Analysis: Electronic Discussion Networks - Blogs and Online Communities – Web-based Networks – Applications of Social Network Analysis.

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION 9

Ontology and their role in the Semantic Web - Ontology-based Knowledge Representation – Ontology Languages for the Semantic Web - Resource

Description Framework – Web Ontology Language – Modelling and Aggregating Social Network Data: State-of-the-art in Network Data Representation – Ontological Representation of Social Individuals – Ontological Representation of Social Relationships – Aggregating and Reasoning with Social Network Data – Advanced Representations.

UNIT III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS 9

Web Archive – Detecting Communities in Social Networks – Definition of Community – Evaluating Communities – Methods for Community Detection and Mining – Applications of Community Mining Algorithms – Tools for Detecting Communities Social Network Infrastructures and Communities – Decentralized Online Social Networks – Multi-Relational characterization of dynamic social network communities.

UNIT IV PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES 9

Understanding and Predicting Human Behaviour for Social Communities – User Data Management – Inference and Distribution – Enabling New Human Experiences – Reality Mining – Context – Awareness – Privacy in Online Social Networks – Trust in Online Environment – Trust Models Based on Subjective Logic – Trust Network Analysis – Trust Transitivity Analysis – Combining Trust and Reputation – Trust Derivation based on Trust Comparisons – Attack Spectrum and Counter Measures.

UNIT V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS9

Graph Theory – Centrality – Clustering – Node-Edge Diagrams – Matrix Representation – Visualizing Online Social Networks - Visualizing Social Networks with Matrix-based Representations – Matrix and Node-Link Diagrams – Hybrid Representations – Applications – Cover Networks – Community Welfare – Collaboration Networks – Co-Citation Networks.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer, 2007.
2. BorkoFurht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.

REFERENCES:

1. GuandongXu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and Applications", First Edition, Springer, 2011.

2. Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009.
4. John G. Breslin, Alexander Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009.
5. Przemyslaw Kazienko, Nitesh Chawla, "Applications of Social Media and Social Network Analysis", Springer, 2015.

WEB REFERENCES:

1. https:// www.sagepub.com/sites/default/files/upm-binaries/35208_Chapter1.pdf
2. http://www.orgnet.com/sna.html
3. http://www.analytictech.com/networks/whatis.htm

ONLINE RESOURCES:

1. http://www.mjdenny.com/workshops/SN_Theory_I.pdf

OUTCOMES:

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

1. Understand a broad range of Network concepts and theories. (K1)
2. Appreciate how Network analysis can contribute to increasing knowledge about diverse aspects of society. (K1)
3. Use a relational approach to answer questions of interest to them (i.e. be able to apply 'Network Thinking'). (K2)
4. Analyse Social Network data using various software packages. (K3)
5. Present results from Social Network Analysis, both orally and in writing. (K2)
6. Use software to simulate the dynamics of networks based on social network models.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	1	-	-	-	-	-	2	3	3	2
CO2	3	3	3	2	2	-	-	-	-	-	2	3	3	2
CO3	3	3	1	2	2	2	1	-	-	-	2	3	3	2
CO4	3	3	1	3	3	3	2	-	-	-	2	3	3	2
CO5	3	3	3	3	1	2	3	-	-	-	2	3	3	2
CO6	2	2	2	1	3	3	3	-	-	-	1	2	2	2

PROFESSIONAL ELECTIVE - IV

20ITEL804 SDG NO. 4&9	DIGITAL IMAGE PROCESSING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To get exposed to simple Image Enhancement techniques in Spatial and Frequency Domain
- To learn concepts of Degradation function and Restoration techniques
- To study the Image Segmentation and Representation techniques
- To become familiar with Image Compression and Recognition methods

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships Between Pixels - Color Image Fundamentals - RGB - HSI Models - Two Dimensional Mathematical Preliminaries - 2D transforms-DFT-DCT.

UNIT II IMAGE ENHANCEMENT 9

SpatialDomain:GrayLevelTransformations–HistogramProcessing–Basics ofSpatialFiltering–SmoothingandSharpeningSpatialFiltering-Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening Frequency Domain Filters – Ideal - Butterworth and Gaussian Filters - Homomorphic Filtering - Color Image Enhancement.

UNIT III IMAGE RESTORATION 9

Image Restoration - Degradation Model - Properties - Noise Models – Mean Filters – Order Statistics – Adaptive Filters – Band Reject Filters – Band Pass Filters–NotchFilters–OptimumNotchFiltering–InverseFiltering–Wiener Filtering.

UNIT IV IMAGE SEGMENTATION 9

EdgeDetection-EdgeLinkingViaHoughTransform–Thresholding-Region Based Segmentation – Region Growing – Region Splitting and Merging – Morphological Processing - Erosion and Dilation - Segmentation by MorphologicalWatersheds–BasicConcepts–DamConstruction–Watershed SegmentationAlgorithm.

UNIT V IMAGE COMPRESSION AND RECOGNITION 9

NeedForDataCompression-Huffman-RunLengthEncoding-ShiftCodes-Arithmetic Coding - JPEG Standard - MPEG - Boundary Representation - Boundary Description - Fourier Descriptor - Regional Descriptors – Topological Feature, Texture - Patterns and Pattern Classes - Recognition BasedonMatching.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Pearson, Third Edition, 2010.
2. AnilK. Jain, “Fundamentals of Digital Image Processing”, Pearson, 2002

REFERENCES:

1. KennethR.Castleman,“DigitalImageProcessing”,Pearson,2006.
2. RafaelC.Gonzalez,RichardE.Woods,StevenEddins,“DigitalImage Processing using MATLAB”,Pearson Education,Inc., 2011.
3. D.E.DudgeonandRM.Mersereau,“MultidimensionalDigitalSignal Processing”,PrenticeHallProfessionalTechnicalReference,1990
4. William.Pratt,“DigitalImageProcessing'',JohnWiley,NewYork,2002
5. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision", Fourth Edition, Cengage Learning, 2013.
6. S.Sridhar,“DigitalImageProcessing”,OxfordUniversityPress,2016.

WEB REFERENCES:

1. https://www.geeksforgeeks.org/digital-image-processing-basics/
2. https://towardsdatascience.com/introduction-to-images- c9c7abe6bfd2

OUTCOMES:

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

1. Summarize the fundamentals of Digital Image Processing. (K2)
2. Use spatial domain and frequency domain filters for Image Enhancement. (K3)
3. Distinguish All The Image Restoration Methods(K2)
4. Demonstrate Various Image segmentation algorithms (K3)
5. Interpret various image compression and recognition techniques.(K3)
6. Experiment the real world images with all the digital image processing techniques(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	1	1	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1	1	2
CO3	2	1	-	-	-	-	-	-	-	-	1	1	1	1
CO4	3	2	1	-	-	-	-	-	-	-	-	1	1	2
CO5	3	2	1	-	-	-	-	-	-	-	-	1	1	2

PROFESSIONAL ELECTIVE - IV

20HSMG801 SDG NO. 3,4,5,8, 10,13,14,15,16	PROFESSIONAL ETHICS AND VALUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- An understanding of their duties and responsibilities as professionals through gaining knowledge of the philosophies of ethics, professional practice, and world culture.
- Basic knowledge to make informed ethical decisions when confronted with problems in the working environment.
- Improved awareness of potential ethical issues within an engineering context.
- Team skills through working in teams on assignments and in-class assignments.
- Subjective analytical skills through investigation and evaluation of ethical problems in engineering settings using accepted tests for moral problem solving.

- An understanding of how societal morals vary with culture and its influence on ethical thought and action.
- Improved communications skills with regard to ethical and professional issues in engineering.
- Know some of the classic cases as well as contemporary issues in engineering ethics.

UNIT I HUMAN VALUES

Morals, Values, and Ethics – Integrity –Trustworthiness – Work Ethics – Service-Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value Time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character.

UNIT II PRINCIPLES FOR HARMONY

Truthfulness – Customs and Traditions -Value Education – Human Dignity – Human Rights – Fundamental Duties – Aspirations and Harmony (I, We & Nature) – Gender Bias – Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

UNIT III ENGINEERING ETHICS AND SOCIAL EXPERIMENTATION

History of Ethics – Need of Engineering Ethics – Senses of Engineering Ethics- Profession and Professionalism ––Self Interest – Moral Autonomy – Utilitarianism – Virtue Theory – Uses of Ethical Theories – Deontology- Types of Inquiry –Kohlberg's Theory – Gilligan's Argument – Heinz's Dilemma – Comparison with Standard Experiments –– Learning from the Past – Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law – Role of Codes – Codes and Experimental Nature of Engineering.

UNIT IV ENGINEERS' RESPONSIBILITIES TOWARDS SAFETY AND RISK

The concept of Safety – Safety and Risk – Types of Risks – Voluntary v/sInvoluntary Risk – Consequences – Risk Assessment –Accountability – Liability – Reversible Effects – Threshold Levels of Risk – Delayed v/sImmediate Risk – Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT V ENGINEERS' DUTIES AND RIGHTS

Concept of Duty – Professional Duties – Collegiality – Techniques for Achieving Collegiality – Senses of Loyalty – Consensus and Controversy – Professional and Individual Rights – Confidential and Proprietary Information – Conflict of Interest-Ethical egoism – Collective Bargaining – Confidentiality – Gifts and Bribes – Problem solving-Occupational Crimes- Industrial Espionage- Price Fixing-Whistle Blowing.

UNIT VI GLOBAL ISSUES

Globalization and MNCs –Cross Culture Issues – Business Ethics – Media Ethics – Environmental Ethics – Endangering Lives – Bio Ethics – Computer Ethics – War Ethics – Research Ethics -Intellectual Property Rights.

TEXT BOOKS:

1. M.Govindarajan, S.Natarajan and V.S.SenthilKumar, "Engineering Ethics & Human Values", PHI Learning Pvt. Ltd., 2009.
2. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw-Hill – 2003

REFERENCE BOOKS:

1. Sekhar, R.C., "Ethical Choices in Business Response Books", New Delhi, Sage Publications, 1997.
2. Kitson, Alan and Campebell, Robert, "The Ethical Organisation", Great Britain Macmillan Press Ltd., 1996.
3. Pinkus, Rosa Lyun B., Larry J Shulman, Norman Phummon, Harvey Wolfe, "Engineering Ethics",New York, Cambridge Uty., Press, 1997.
4. R. Subramaniam, "Professional Ethics", Oxford Publications, New Delhi.
5. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw-Hill – 2003.
6. Prof.A.R.Aryasri, Dharanikota Suyodhana, "Professional Ethics and Morals" Maruthi Publications.
7. Harris, Pritchard, and Rabins, "Engineering Ethics", Cengage Learning, New Delhi.
8. S. B. Gogate, "Human Values & Professional Ethics", Vikas Publishing House Pvt. Ltd., Noida.
9. A. Alavudeen, R.Kalil Rahman and M. Jayakumaran, "Professional Ethics and Human Values", University Science Press.
10. Prof.D.R.Kiran, "Professional Ethics and Human Values" Tata McGraw-Hill – 2013.
11. Jayshree Suresh and B. S. Raghavan, "Human Values and Professional Ethics", S.Chand Publications.

WEB RESOURCES:

1. Ethos Education provides a concise guide on developing a code of ethics for primary and secondary schools.
2. The Ethics Resource Center has a toolkit available for use. When used for commercial purposes, a nominal license fee is required.
3. Creating A Code Of Ethics for Your Organization, with many suggested books, by Chris MacDonald

4. The Deloitte Center for Corporate Governance offers a variety of resources for those who are active in governance, including a variety of resources and a set of suggested guidelines for writing a code of ethics or a code of conduct.

MOOC REFERENCES:

1. https://www.udemy.com/course/worlplace-ethics-and-attitude/
2. https://www.udemy.com/course/business-ethics-how-to-create-an-ethical-organization/
3. https:// nptel. ac. in/ courses/ 110/ 105/ 110105097/ Ethics in Engineering Practice
4. https://nptel.ac.in/courses/109/104/109104068/Human Values
5. https://www.coursera.org/learn/ethics-technology-engineering
6. https://www.classcentral.com/course/ethics-technology-engineering-10485

OUTCOMES:

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

1. Classify between ethical and non-ethical situations. (K2)
2. Discuss and practice moral judgment in conditions of dilemma. (K2)
3. Explain and relate the code of ethics to social experimentation and real world scenarios. (K2)
4. Describe risk and safety measures in various engineering fields. (K2)
5. Explain the impact of engineering solutions in a global/societal / professional context. (K2)

CO- PO, PSO MAPPING :

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

PROFESSIONAL ELECTIVE - IV

20CSEL803 SDG NO. 4 & 9	BLOCK CHAIN AND CRYPTO CURRENCY TECHNOLOGIES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand how Block Chain systems (Bitcoin and Ethereum) work
- To securely interact with them
- Design, build, deploy Smart Contracts and Distributed applications
- Integrate ideas from Block Chain technology into their own projects

UNIT I BASICS **9**

Distributed Database - Two General Problem - Byzantine GeneralProblem and Fault Tolerance - Hadoop Distributed File System - Distributed Hash Table - ASIC Resistance - Turing Complete - Cryptography - Hash Function - Digital Signature - ECDSA – MemoryHardAlgorithm-ZeroKnowledgeProof.

UNIT II BLOCKCHAIN **9**

Introduction, Advantage Over Conventional Distributed Database - Block Chain Network - Mining Mechanism – DistributedConsensusMerkle Patricia Tree - Gas Limit - Transactions and Fee - Anonymity - Reward - Chain Policy - Life of Block Chain Application - Soft & Hard Fork - Private and Public Block Chain.

UNIT III DISTRIBUTED CONSENSUS **9**

Nakamoto Consensus - Proof of Work - Proof of Stake - Proof of Burn - Difficulty Level- Sybil Attack - Energy Utilization and Alternate.

UNIT IV CRYPTOCURRENCY **9**

Crypto Currency: History - Distributed Ledger - Bit coin Protocols - Mining Strategy and Rewards - Ethereum - Construction, - DAO - Smart Contract - GHOST - Vulnerability - Attacks - Side Chain, Name coin

UNIT V CRYPTO CURRENCY REGULATION AND BLOCK CHAIN APPLICATIONS **9**

Crypto Currency Regulation: Stakeholders - Roots of Bit coin- Legal Aspects - Crypto Currency Exchange -Black Market and Global Economy-Block chainApplications: Internet of Things-Medical Record Management System-Domain Name Service - Future of Block Chain.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Crypto Currency Technologies: A Comprehensive Introduction", Princeton UniversityPress(July 19,2016).
2. Narayanan et al., "Bit coin and Crypto currency Technologies: A Comprehensive Introduction," Princeton University Press, 2016.

REFERENCES:

1. Antonopoulos, "Mastering Bit coin: Unlocking Digital Crypto currencies", O'Reilly Media Inc., 2015.
2. Dr. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellowpaper, 2014.
3. Mastering Bitcoin: Unlocking Digital Crypto currencies, by Andreas M Antonopoulos 2018.
4. Henning Diedrich, Ethereum: Block chains, Digital Assets, Smart Contracts, and Decentralized Autonomous Organizations-2016.
5. Don and Alex Tapscott, "Block chain Revolution". Portfolio Penguin 2016.

WEB REFERENCES:

1. https://www.blockchain.com/

ONLINE RESOURCES:

1. https://www.pwc.com/us/en/industries/financial-services/ fintech/ bitcoin-blockchain-cryptocurrency.html
2. https://www.investopedia.com/terms/b/blockchain.asp

OUTCOMES:

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

1. Understand Design principles of Bit coin and Ethereum. (K2)
2. Ability to extract the knowledge of Nakamoto consensus. (K2)
3. List and describe differences between proof-of-work and proof-of-stake consensus. (K1)
4. Design, build and deploy a Distributed application. (K3)
5. Ability to analyze the algorithms developed for bit coin mining. (K2)
6. Identify the security, privacy and efficiency of a given Block Chain system.(K1)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	-	-	1	-	2	3	3	2
CO2	3	2	3	2	-	2	-	-	-	-	3	2	3	2
CO3	3	1	3	2	1	2	-	-	-	-	2	3	3	2
CO4	3	2	2	2	3	2	-	-	1	-	2	2	3	2
CO5	3	1	2	2	3	2	-	-	2	3	2	2	3	2
CO6	3	2	2	1	2	2	-	-	1	-	2	3	3	2

PROFESSIONAL ELECTIVE - IV

20CJEL802 SDG NO. 4	NATURAL LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the techniques in natural language processing
- To be familiar with the natural language generation
- To be exposed to machine translation
- To understand the information retrieval techniques

UNIT I OVERVIEW AND LANGUAGE PROCESSING 9

Overview: Origins and Challenges of NLP-Language and Grammar - Processing Indian Languages - NLP Applications - Information Retrieval - Language Modeling - Various Grammar -Based Language Models-Statistical Language Model.

UNIT II WORD LEVEL AND SYNTACTIC ANALYSIS 9

Word Level Analysis - Regular Expressions-Finite-State AutomataMorphological Parsing-Spelling Error Detection and Correction-Words and Word Classes-Part-of Speech Tagging - Syntactic Analysis - Context-Free Grammar-Constituency- Parsing-Probabilistic Parsing.

UNIT III SEMANTIC ANALYSIS AND DISCLOSURE PROCESSING 9

Semantic Analysis: Meaning Representation-Lexical Semantics - AmbiguityWord Sense Disambiguation - Discourse Processing - Cohesion-Reference Resolution- Discourse Coherence and Structure-Entropy Models.

UNIT IV NATURAL LANGUAGE GENERATION AND MACHINE TRANSLATION 9

Entity Linking -CKY-PCFG's -Probabilities- LDA variants-Machine Translation -Text Classification and Extraction-Problems in Machine Translation - Characteristics of Indian Languages - Machine Translation Approaches - Translation Involving Indian Languages.

UNIT V INFORMATION RETRIEVAL AND LEXICAL RESOURCES 9

Information Retrieval - Design features of Information Retrieval SystemsClassical - Non-classical - Alternative Models of Information Retrieval – Valuation Lexical Resources - World Net-Frame Net- Stemmers - POS Tagger-Research Corpora.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
2. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", First Edition, O_Reilly Media, 2009.

WEB REFERENCES:

1. https://www.tutorialspoint.com/natural_language_processing/natural_language_processing_information_retrieval.htm
2. https://towardsdatascience.com/your-guide-to-natural-languageprocessing-nlp-48ea2511f6e1
3. https://machinelearningmastery.com/natural-language-processing/
4. https://becominghuman.ai/a-simple-introduction-to-natural-languageprocessing-ea66a1747b32

ONLINE RESOURCES:

1. https://www.coursera.org/learn/language-processing
2. https://www.youtube.com/playlist?list=PLoROMvodv4rOhcuXMZkNm7j3fVwBBY42z

OUTCOMES:

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

1. Learn the approaches of syntax and semantics in NLP. (K1)
2. Understand approaches to discourse, generation, dialogue and summarization within NLP. (K1)
3. Implement current methods for statistical approaches to machine translation. (K3)

4. Analyze machine learning techniques used in NLP. (K3)
5. Apply information retrieval techniques. (K2)
6. Develop Statistical Methods for Real World Applications and explore deep learning based NLP. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	1	2	-	1	2	2
CO2	2	3	3	2	3	2	-	1	3	1	2	2	3	2
CO3	3	3	2	2	-	-	-	1	2	1	3	2	1	1
CO4	3	3	1	-	3	-	-	2	1	1	-	1	2	1
CO5	2	2	1	-	1	1	-	-	-	-	1	1	2	2
CO6	2	2	2	2	-	-	-	1	2	1	2	1	2	2

PROFESSIONAL ELECTIVE - IV

20CJEL803 SDG NO. 4 & 9	WEB ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Learn how to use and deploy web/social/mobile analytics platforms.
- To understand web Intelligence and Business Analytics Terminology.
- To Deploy web intelligence to improve the outcomes of your marketing or business plan.
- To know the impact of the bottom line within various businesses and lines of business.
- To know Growth potentials for Web Analysts and Big Data professionals.

UNIT I BRIEF HISTORY OF WEB ANALYTICS 9

Web Analytics—Present and Future: A Brief History of Web Analytics - Current Landscape and Challenges, Traditional Web Analytics is Dead. Data Collection—Importance and Options: Understanding the Data Landscape, Click stream Data, Outcomes Data, Research Data, and Competitive Data.

UNIT II QUALITATIVE ANALYSIS 9

Overview of Qualitative Analysis: Overview of Qualitative Analysis - Lab Usability Testing - Heuristic Evaluations - Critical Components of a Successful

Web Analytics Strategy - Focus on Customer Centricity - Solve for Business Questions - Follow the 10/90 Rule - Hire Great Web Analysts - Identify Optimal Organizational Structure and Responsibilities.

UNIT III FUNDAMENTALS OF WEB ANALYTICS 9

Web Analytics Fundamentals: Capturing Data - Web Logs or JavaScript tags - Selecting Your Optimal Web Analytics Tool - Understanding Clickstream Data Quality - Implementing Best Practices - Apply the "Three Layers of So What" Test.

UNIT IV WEB DATA ANALYSIS 9

Diving Deep into Core Web Analytics Concepts: Preparing to Understand the Basics - Revisiting Foundational Metrics - Understanding Standard Reports - Using Website Content Quality and Navigation Reports. Jump-Start Your Web Data Analysis: Creating Foundational Reports - E-commerce Website - Support Website - Blog Measurement.

UNIT V SEARCH ANALYTICS 9

Search Analytics—Internal Search, SEO, and PPC Performing Internal Site Search Analytics - Beginning Search Engine Optimization - Measuring SEO Efforts - Analyzing Pay per Click Effectiveness - Website Experimentation and Testing - Shifting the Power: Why Test and What Are Your Options? What to Test, Build a Great Experimentation and Testing Program.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Practical Web Analytics for User Experience by Michael Beasley, 2013 Publisher: Morgan Kaufmann.
2. Deven Shah, Advanced Internet Technology, DT Editorial Services, Dreamtech Press, 2014.

REFERENCE BOOKS:

1. Actionable Web Analytics: Using Data To Make Smart Business Decisions by Jason Burby and Shane Atchison,2007, Publisher(s): Sybex.
2. Sergei Dunaev, Advanced Internet Programming: Technologies and Applications, Charles River Media, Inc. 2001.

ONLINE REFERENCES:

1. https://www.oreilly.com/library/view/web-analytics-an/9780470130650/

OUTCOMES:

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

1 .Understand the importance of various data collections. (K2)
2. Identify Optimal Organizational Structure and Responsibilities. (K2)
3. Learn Various Optimal Web Analytics Tools. (K3)
4. Understand the basic Website Content Quality and Navigation Reports.. (K3)
5. Measure SEO Efforts using Search Engine Optimization. (K2)
6. Implement Experimentation and Testing Program (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2	2	-	1	2	2	2	2	2
CO2	3	3	3	3	2	2	2	-	1	2	2	2	2	2
CO3	3	3	3	3	2	2	2	-	1	2	2	2	2	2
CO4	3	3	3	3	2	2	2	-	1	2	2	2	2	2
CO5	3	3	3	3	2	2	1	-	1	2	2	2	2	2
CO6	3	3	3	3	2	2	1	-	1	2	2	2	2	2

PROFESSIONAL ELECTIVE - II

20CJEL804 SDG NO. 4,6,7,8, 9,11,12,13 & 17	ENTREPRENEURSHIP DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To develop and strengthen entrepreneurial quality.
- To provide motivation in students to become an entrepreneur
- To impart basic entrepreneurial skills and understanding
- To run a business efficiently and effectively.

UNIT I ENTREPRENEURSHIP **9**

Entrepreneur–Types of Entrepreneurs–Difference between Entrepreneur and Intrapreneur-Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

UNIT II MOTIVATION **9**

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS **9**

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING **9**

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

UNIT V SUPPORT TO ENTREPRENEURS **9**

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures- Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Khanka. S.S., "Entrepreneurial Development" S.Chand & Co. Ltd., Ram Nagar, New Delhi, 2013.
2. Donald F Kuratko, "Entrepreneurship – Theory, Process and Practice", 9th Edition, Cengage Learning, 2014.

REFERENCE BOOKS:

1. Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013
2. Mathew J Manimala, "Entrepreneurship theory at cross roads: paradigms and praxis" 2nd Edition Dream tech, 2005.

ONLINE REFERENCES:

1. https://www.coursera.org/browse/business/entrepreneurship
2. https://onlinecourses.swayam2.ac.in/cec20_mg19/preview

OUTCOMES:

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

1. Understand and get clarity about the business idea.(K3)
2. Analyze Market potential for the product or service.(K3)
3. Apply skills in preparing business plan.(K3)
4. Implement and conduct a project feasibility study.(K3)
5. Describe and Explain various entrepreneurship models.(K2)
6. Organize interaction with successful entrepreneurs(K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	3	3	3	3	3	3	-	-	-
CO2	-	-	-	-	-	3	3	-	2	3	-	-	-	-
CO3	-	-	-	-	-	3	3	3	3	3	3	-	-	-
CO4	-	-	-	-	-	-	-	3	3	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	3	3	-	-	-	-
CO6	-	-	-	-	-	-	-	3	3	3	-	-	-	-

PROFESSIONAL ELECTIVE - IV

20CSEL808 SDG NO. 4	SCIENTIFIC VISUALIZATION TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the various types of Data
- To apply and evaluate the principles of Data Visualization.
- To acquire skills to apply Visualization Techniques to a problem and its associated dataset.
- To apply structured approach to create effective visualizations thereby building visualization dashboard to support decision making.

UNIT I INTRODUCTION TO DATA VISUALIZATION 9

Overview of Data Visualization - Data Abstraction -Analysis: Four Levels for Validation- Task Abstraction - Analysis: Four Levels for Validation.

UNIT II VISUALIZATION TECHNIQUES 9

Scalar and Point Techniques Color Maps Contouring Height Plots - Vector Visualization Techniques - Vector Properties – Vector Glyphs - Vector Color Coding - Stream Objects.

UNIT III VISUAL ANALYTICS 9

Visual Variables - Networks and Trees - Map Color and Other Channels- Manipulate View - Arrange Tables - Geo Spatial data - Reduce Items and Attributes.

UNIT IV VISUALIZATION TOOLS AND TECHNIQUES 9

Introduction to Data Visualization Tools- Tableau - Visualization Using R- Time- Series Data Visualization - Text Data Visualization -Multivariate Data Visualization and Case Studies.

UNIT V VISUALIZATION DASHBOARD CREATIONS 9

Dashboard Creation Using Visualization Tools for the Use Cases: Finance- Marketing-Insurance Healthcare-Service and Support- Human Resources - Management - Procurement - IT

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Tamara Munzer, "Visualization Analysis and Design" (AK Peters Visualization Series), CRC Press 2014.
2. Alexandru Telea, "Data Visualization Principles and Practice", CRC Press 2014.

REFERENCES:

1. Brodlie, K.W., Carpenter, L.A., Earnshaw, R.A., Gallop, J.R., Hubbold, R.J., Mumford, A.M., Osland, C.D., Quarendon, P, "Scientific Visualization", Springer, 1992.
2. Foley, Van Dam, Feiner and Hughes, "Computer Graphics Principles & practice", second edition in C, Pearson Education, July 2013.
3. Helen Wright , "Introduction to Scientific Visualization Paperback – Illustrated", Springer, 29 November 2006
4. N.M Patrikalakis, Scientific Visualization of Physical Phenomena, Springer-Verlag.
5. Claus O. Wilke, Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures, March 2019, Oreilly.

WEB REFERENCES:

1. https://www.coursera.org/lecture/data-visualization-science-communication/introduction-to-scientific-visualization-vniPb
2. https://www.edx.org/course/data-science-visualization

ONLINE RESOURCES:

1. https://web.cse.ohio-state.edu/~crawfis.3/cis694L/index.html.
2. https://engineering.purdue.edu/online/courses/introduction-scientific-isualization
3. https://www.heavy.ai/technical-glossary/scientific-visualization

OUTCOMES:

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

1. Identify the different data types, attributes, identify and create various Visualizations for geospatial and table data.(K1)
2. Interpret the categorical, quantitative and text data. (K3)
3. Illustrate the integration of Visualization tools with Hadoop. (K3)
4. Design visualization dashboard to support the decision-making on large scale data. (K3)
5. Match the knowledge gained with the industries latest technologies and ability to create and interpret plots using R/Python. (K3)
6. Understand the characteristics and methods that are needed for the visualization of geospatial data. (K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	1	2	1	-	1	-	3	1	1	2
CO2	3	3	3	3	2	2	2	1	1	-	3	2	1	2
CO3	3	3	3	3	3	2	2	1	3	1	3	2	-	2
CO4	3	3	3	3	3	2	2	1	3	1	3	1	-	2
CO5	3	3	3	3	-	1	2	2	-	-	3	3	1	3
CO6	3	3	3	-	2	-	-	-	-	-	-	-	1	1

PROFESSIONAL ELECTIVE - IV

20CJEL804 SDG NO. 3,4,5,8, 10	ADVANCED MACHINE LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce advanced concepts and methods of Machine Learning.
- To develop an understanding of the role of machine learning in massive scale automation.
- To know about the Pattern Recognition and Machine Learning including specific algorithms for classification, regression, clustering and probabilistic modeling.
- To design and implement various machine learning algorithms in a range of real-world applications.

UNIT I KEY CONCEPTS 9

Supervised/Unsupervised Learning - Loss functions and generalization - Probability Theory - Parametric vs Non-parametric methods - Elements of Computational Learning Theory Ensemble Learning - Bagging, Boosting - Random Forest.

UNIT II BAYESIAN LEARNING 9

Probability theory and Bayes rule - Naive Bayes learning algorithm - Bayes nets - Perceptron - Cost Function - Gradient Checking - Multi-layer perceptron and backpropagation Algorithm - Neural network - Random Initialization - Support Vector Machines, Kernel Ridge Regression.

UNIT III DECISION TREES 9

Representing concepts as Decision Trees - Recursive Induction of Decision Trees - Best splitting attribute - Entropy and Information Gain - Searching for simple trees and computational complexity - Overfitting - Noisy Data and Pruning.

UNIT IV REINFORCEMENT LEARNING 9

Reinforcement Learning through feedback network - Function Approximation - Canonical Variates - Feature Selection vs Feature Extraction - Recent trends in supervised and unsupervised Learning Algorithm - Dimensional Reducibility.

UNIT V FILTER METHODS **9**

Bagging - Boosting - Stacking and Learning with Ensembles - Sub-space Approaches - Embedded methods - Low-Rank Approaches - Recommender Systems - Application areas - Security - Business.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Tom Mitchell, Machine Learning, McGraw Hill, 1997.
2. Jeeva Jose, Introduction to Machine Learning, Khanna Book Publishing 2020.
3. Ethem Apaydin, Introduction to Machine Learning, 2e. The MIT Press, 2010.
4. Kevin P. Murphy, Machine Learning: a Probabilistic Perspective, The MIT Press, 2012.

ONLINE REFERENCES:

1. https://courses.ceu.edu/courses/2023-2024/advanced-machine-learning
2. https://www.coursera.org/courses?query=machine%20learning&productDifficultyLevel=Advanced

REFERENCES:

1. Understanding Machine Learning: From Theory to Algorithms - Shai Shalev - Shwartz, and Shai Ben - David, Published 2014, Cambridge University Press.
2. Molnar, Christoph, Interpretable machine learning, Lulu Press, 2019.
3. Hall, Patrick, and Navdeep Gill, An Introduction to Machine Learning interpretability. O'Reilly Media, Incorporated, 2019.
4. Machine Learning Algorithms, 2nd Edition, Giuseppe Bonaccorso, Packt Publication
5. TensorFlow Machine Learning, Nick McClure, Packt Publication

OUTCOMES:

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

1. Understand Key concepts, tools and approaches for pattern recognition on complex data sets. (K2)
2. Apply Kernel methods for handling high dimensional and non-linear patterns. (K2)
3. Understand State-of-the-art algorithms such as Support Vector Machines and Bayesian networks. (K3)

4. Understand Solve real-world machine learning tasks: from data to inference. (K3)
5. Apply Theoretical concepts and the motivations behind different learning frameworks. (K2)
6. Apply Filter Methods for Embedded Method and Recommender Systems. (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	2	-	3	3	2	2	3	2
CO2	3	3	3	3	3	2	2	-	3	3	2	2	3	2
CO3	3	3	3	3	3	2	2	-	3	3	2	2	3	2
CO4	3	3	3	3	3	2	2	-	3	3	2	2	3	2
CO5	3	3	3	3	3	2	2	-	3	3	2	2	3	2
CO6	2	2	2	1	2	1	-	-	-	-	1	2	2	2

PROFESSIONAL ELECTIVE - IV

20CJEL805 SDG NO. 4 & 11	DATA ANALYTICS WITH PYTHON	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Implement the required type of data analytics and data visualization tools for real world applications.
- Analyze and fit some basic types of statistical models.
- Analyze and visualize different types of data with Python language.
- Understand for statistical programming, computation and modeling.

UNIT I Introduction to Python **9**

Introduction to python - Environment setup & start programming - Python Conditional Statements, Loops and File Handling - Core Objects and Advanced Data Structures; Functions and Lambdas -The Object Oriented Side of it - Introduction to Data Analysis with Python -What is data analysis-Overview of Python and its data analysis libraries (NumPy, pandas, Matplotlib, Seaborn) - Setting up your Python environment

UNIT II Data Preprocessing and Cleaning 9

Importing data from various sources (CSV, Excel, SQL)-Exploring and understanding the dataset -Handling missing data: imputation techniques -Dealing with outliers and anomalies-Data transformation: normalization, standardization- Data integration and manipulation using pandas Exploratory Data Analysis (EDA): Descriptive statistics: mean, median, mode, variance, etc. -Histograms, box plots, scatter plots -Correlation analysis and heatmaps -Univariate and bivariate analysis -Data visualization using Matplotlib and Seaborn

UNIT III Data Visualization and statistical analysis 9

Advanced data visualization techniques: bar plots, line plots, pie charts, etc.-Interactive visualizations using Plotly -Geospatial visualization-Effective data storytelling and communication -Sampling techniques and the Central Limit Theorem -Hypothesis testing: t-tests, chi-square tests, ANOVA- Confidence intervals and p-values-Interpreting statistical results

UNIT IV Machine Learning algorithms for Data Analysis 9

Introduction to machine learning -Feature engineering and selection -Linear regression: simple and multiple regression -Logistic regression for classification -Decision trees and random forests -Model evaluation metrics: R-squared, MAE, RMSE, accuracy, precision, recall, F1-score -Model assumptions and diagnostics

UNIT V Time Series Analysis 9

Introduction to time series data -Time series components: trend, seasonality, noise -Decomposition techniques -Time series forecasting methods: moving average, ARIMA, exponential smoothing -Implementing time series analysis in Python - Dimensionality reduction techniques (PCA, t-SNE) Clustering algorithms (K-means, hierarchical clustering) Advanced statistical techniques (non-parametric tests, ANCOVA)

TOTAL: 45 PERIODS

TEXT BOOKS:

1. McKinney, W. (2012). Python for data analysis: Data wrangling with Pandas, NumPy, and IPython. " O'Reilly Media, Inc.".
2. Swaroop, C. H. (2003). A Byte of Python. Python Tutorial.
3. Ken Black, sixth Editing. Business Statistics for Contemporary Decision Making. “John Wiley & Sons, Inc”.
4. Anderson Sweeney Williams (2011). Statistics for Business and Economics. “Cengage Learning”.

REFERENCES:

1. Douglas C. Montgomery, George C. Runger (2002). Applied Statistics & Probability for Engineering. "John Wiley & Sons, Inc"
2. Jay L. Devore (2011). Probability and Statistics for Engineering and the Sciences. "Cengage Learning".
3. David W. Hosmer, Stanley Lemeshow (2000). Applied logistic regression (Wiley Series in probability and statistics). "Wiley-Interscience Publication".
4. Jiawei Han and Micheline Kamber (2006). Data Mining: Concepts and Techniques. "
5. Leonard Kaufman, Peter J. Rousseeuw (1990). Finding Groups in Data: An Introduction to Cluster Analysis. "John Wiley & Sons, Inc".

OUTCOMES:

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

1. Understand fundamental Python programming concepts and Master data manipulation with Python libraries – NumPy and Pandas.(k2)
2. Have insights about data analytics and the importance of it.(k3)
3. Analyze various approaches to solve problems.(k3)
4. Understand machine learning basics and algorithms(k2)
5. Analyze data patterns, distributions, and correlations. Extract valuable insights from data. (k4)
6. Implementing time series analysis in Python (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	2
CO2	3	3	3	1	3	-	-	-	-	3	-	-	2	2
CO3	3	3	3	3	3	-	-	-	2	3	1	2	3	2
CO4	3	3	3	3	3	-	-	-	-	-	-	-	3	2
CO5	3	3	3	3	3	-	-	-	-	2	2	2	3	2
CO6	3	3	3	3	3	-	-	-	-	2	2	3	3	2

PROFESSIONAL ELECTIVE - IV

20ITEL803 SDG NO. 4 & 9	INTRUSION DETECTION SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To Compare alternative tools and approaches for Intrusion Detection through quantitative analysis
- To determine the best tool or approach to reduce risk from intrusion.
- To Identify and describe the parts of all intrusion detection systems and characterize new
- To merge IDS technologies according to the basic capabilities all intrusion detection systems share.

UNIT I INTRODUCTION **9**

The state of threats against computers, and networked systems-Overview of computer security solutions and why they fail-Vulnerability assessment, firewalls, VPN's -Overview of Intrusion Detection and Intrusion Prevention, Network and Host-based IDS

UNIT II CLASSES OF ATTACKS AND ITS LAYERS **9**

Classes of attacks - Network layer: scans, denial of service, penetration Application layer:software exploits, code injection-Human layer: identity theft, root access-Classes of attackers-Kids/hackers/sopHesitated groups-Automated: Drones, Worms, Viruses

UNIT III IDS MODELS **9**

A General IDS model and taxonomy, Signature-based Solutions, Snort, Snort rules, Evaluation of IDS,Cost sensitive IDS

UNIT IV DETECTION SYSTEMS AND VULNERABILITIES **9**

Anomaly Detection Systems and Algorithms-Network Behaviour Based Anomaly Detectors (ratebased)-Host-based Anomaly Detectors-Software Vulnerabilities-State transition, Immunology, PayloadAnomaly Detection

UNIT V ATTACKS AND THREATS **9**

Attack trees and Correlation of alerts- Autopsy of Worms and Botnets-Malware detection -Obfuscation,polymorphism- Document vectors.Email/IM security issues-Viruses/Spam-From signatures to thumbprints to zero day

detection-InsiderThreat issues-Taxonomy-Masquerade and Impersonation Traitors, Decoys and Deception-Future:Collaborative Security

TOTAL: 45 PERIODS

TEXT BOOKS:

1. 1. Peter Szor, "The Art of Computer Virus Research and Defense", Symantec Press,2005
2. Markus Jakobsson and Zulfikar Ramzan, "Crimeware, Understanding New Attacks and Defenses",2008

REFERENCES:

1. Saiful Hasan, "Intrusion Detection System, Kindle Edition",2018
2. Ankit Fadia, "Intrusion Alert: An Ethical Hacking Guide to Intrusion Detection",2007
3. Ali A. Ghorbani, Wei Lu, " Network Intrusion Detection and Prevention:Concepts and Techniques", Springer, 2010.
4. Carl Enrolf, Eugene Schultz, Jim Mellander, "Intrusion detection and Prevention", McGraw Hill, 2004
5. Paul E. Proctor, "The Practical Intrusion Detection Handbook ",Prentice Hall , 2001.

WEB REFERENCES:

1. https://www.intechopen.com/books/intrusion-detection-systems/
2. https://www.sans.org/course/intrusion-detection-in-depth
3. https://www.cybrary.it/skill-certification-course/ids-ips-certification-training-course

OUTCOMES:

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

1. Understand fundamental knowledge of Cyber Security.[K2]
2. Analyze various vulnerability and its implementation.[K2]
3. Understand basic and fundamental risk management principles as it relates to Cyber Security and Mobile Computing.[K2]
4. Implement safer computing to safeguard information using Digital Forensics. [K3]
5. Describe basic technical controls in use today, such as firewalls and Intrusion Detection Systems. [K2]
6. Illustrate legal perspectives of Cyber Crimes and Cyber Security.[K3]

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	-	3	2	-	-	-	-	-	2	3	3
CO2	2	2	2	2	3	1	-	-	-	-	-	2	3	3
CO3	2	2	2	2	3	1	-	-	-	-	-	2	3	3
CO4	2	2	2	2	3	2	-	-	-	-	-	2	3	3
CO5	2	2	2	2	3	2	2	2	1	-	-	2	3	3

PROFESSIONAL ELECTIVE - V

20CSEL706 SDG NO. 4 & 9	MULTI-CORE ARCHITECTURES AND PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the need for Multi-core processors and their architectures
- To understand the challenges in Parallel and Multi-threaded programming
- To learn about the various Parallel Programming paradigms
- To develop Multi-core programs and design parallel solutions

UNIT I MULTI-CORE PROCESSORS 9

Single core to Multi-core Architectures - SIMD and MIMD SystemsInterconnection Networks-Symmetric and Distributed Shared Memory Architectures- Cache Coherence - Performance Issues - Parallel Program Design.

UNIT II PARALLEL PROGRAM CHALLENGES 9

Performance - Scalability - Synchronization and Data Sharing – Data Races - Synchronization Primitives (Mutexes, Locks, Semaphores, Barriers) - Deadlocks and LiveLocks - Communication between Threads (Condition Variables - Signals - Message Queues and Pipes).

UNIT III SHARED MEMORY PROGRAMMING WITH OpenMP 9

OpenMP Execution Model - Memory Model - OpenMP Directives - Work Sharing Constructs - Library functions - Handling Data and Functional Parallelism - Handling Loops - Performance Consideration.

UNIT IV DISTRIBUTED MEMORY PROGRAMMING WITH MPI 9

MPI Program Execution - MPI Constructs - Libraries - MPI Send and Receive - Point-to-Point and Collective Communication - MPI Derived Data Types - Performance Evaluation.

UNIT V PARALLEL PROGRAM DEVELOPMENT 9

Case studies - n-body Solvers - Tree Search - OpenMP and MPI Implementations and Comparison.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publications, First Edition, 2015.1. Peter S. Pacheco, "An Introduction to Parallel Programming", MorganKauffman/Elsevier, 2011.

2. 2. Darryl Gove, "Multicore Application Programming for Windows, Linux, and Oracle Solaris", Pearson, 2011 (Unit 2).

REFERENCES:

1. Michael J Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill, 2003.
2. Shameem Akhter and Jason Roberts, "Multi-core Programming", Intel Press, 2006.
3. Yan Solihin, "Fundamentals of Parallel Multicore Architecture" CRC press, 2015.
4. John L. Hennessey and David A. Patterson, " Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier, 5th edition, 2012.
5. Richard Y. Kain, "Advanced Computer Architecture a Systems Design Approach", Prentice Hall, 2011.

WEB REFERENCES:

1. https://swayam.gov.in/nd1_noc19_cs45/preview

ONLINE RESOURCES:

1. https:// youtube.be/FauseE2FtUsY
2. https://slideplayer.com/slide/7106313/&9784375

OUTCOMES:

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

1. Understand the basics of Multi-core Architectures. (K2)
2. Understand the challenges in Parallel and Multithreaded programming. (K2)
3. Explain about the various Parallel Programming paradigms and solutions.(K2)
4. Identify the issues in programming Parallel Processors.(K2)
5. Write programs using Open MP and MPI. (K3)
6. Compare and contrast programming for Serial Processors and programming for Parallel Processors.(K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	2	1	2	-	1	2	-	1	3	1
CO2	2	3	1	2	2	1	2	-	1	2	-	1	3	1
CO3	2	1	2	2	2	1	1	1	1	1	2	2	3	1
CO4	3	2	1	1	2	1	-	-	1	2	2	3	3	1
CO5	2	2	1	2	2	1	-	-	1	2	2	3	3	1
CO6	2	2	-	1	2	1	-	-	1	2	2	3	3	1

PROFESSIONAL ELECTIVE - V

20PCNEL308 SDG NO. 4	INFORMATION STORAGE MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand the storage architecture and technologies in Information management
- Learn to establish and manage a data center
- Learn various storage technologies for the required application
- Apply security measures to the data center

UNIT I STORAGE TECHNOLOGY 9

Review data creation - Amount of data being created - Understand the value of data to a business - Challenges in data storage and data management - Solutions vailable for data storage - Core elements of a data center infrastructure - Role of each element in supporting business activities.

UNIT II STORAGE SYSTEM ARCHITECTURE 9

Hardware and software components of the host environment - Key protocols and concepts used by each component - Physical and logical components of a connectivity environment - Major physical components of a disk drive and their function - Logical constructs of a physical disk - Access characteristics - Performance Implications - Concept of RAID and its components - Different RAID levels and their suitability for different application environments - Compare and contrast integrated and modular storage systems - High-level architecture and working of an intelligent storage system.

UNIT III INTRODUCTION TO NETWORKED STORAGE 9

Evolution of networked storage - Architecture - Components - Topologies of FC-SAN - NAS - IP-SAN - Benefits of the different networked storage options - Understand the need for long-Term archiving solutions - Describe how CAS fullfill the need - Understand the appropriateness - Different networked storage options - Different application environments.

UNIT IV INFORMATION AVAILABILITY, MONITORING & MANAGING DATA CENTERS 9

List reasons for planned or unplanned outages - Impact of downtime - Business continuity (BC) - Disaster recovery (DR) - RTO - RPO - Identify single points of failure - List solutions to mitigate failures - Architecture of backup/recovery - Different backup or recovery topologies - Replication technologies - Role in ensuring information availability and business continuity - Remote replication technologies - Role in providing disaster recovery and business continuity capabilities - Identify key areas to monitor in a data center - Industry standards for data center monitoring and management - Key metrics - Key management tasks.

UNIT V SECURING STORAGE AND STORAGE VIRTUALIZATION 9

Information security - Critical security attributes - Storage security domains - List and analyze the common threats in each domain - Virtualization technologies - Block-level and file-level virtualization technologies and processes.

TOTAL: 45 PERIODS

REFERENCES:

1. EMC Corporation, "Information Storage and Management: Storing, Managing, and Protecting Digital Information", Wiley, India, 2010.
2. Marc Farley, “Building Storage Networks”, Tata McGraw Hill” ,Osborne, 2001.
3. Robert Spalding, “Storage Networks: The Complete Reference”, Tata McGraw Hill, Osborne, 2003.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106108058/

ONLINE RESOURCES:

1. https://dokumen.tips/engineering/cp7029-information-storage-management-notes-58f9ada4e0e17.html

OUTCOMES:

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

1. Understand the basics of storage management for Information maintenance.
2. Study the requirements and strategies for the data center.
3. Learn various storage technologies for the required application.
4. Apply security measures to data center.
5. Analyze Quality of Service in Storage.

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	1	-	-	-	2	2	2
CO2	3	2	2	-	-	-	-	2	-	-	-	2	2	2
CO3	3	3	3	-	-	-	-	1	-	-	-	-	2	2
CO4	3	3	3	-	-	-	-	1	-	-	-	-	2	2
CO5	3	3	3	-	-	-	-	1	-	-	-	-	2	2

PROFESSIONAL ELECTIVE - V

20CSEL802 SDG NO. 4 & 9	DEEP LEARNING PRINCIPLES & PRACTICES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study the concepts of Deep Learning
- To introduce Dimensionality Reduction techniques
- To illustrate Deep Learning techniques to support Real-time applications
- To examine the case studies of Deep Learning techniques

UNIT I INTRODUCTION **9**

Introduction to Machine Learning-Linear Models - SVMs – Perceptrons - Logistic Regression -Introduction to Neural Networks - Shallow Network - Training a Network - Loss Functions - Back Propagation and Stochastic Gradient Descent-Neural Networks as Universal Function.

UNIT II CONCEPTS OF DEEP LEARNING **9**

History of Deep Learning - Probabilistic Theory of Deep Learning - Back Propagation –Regularization –Batch Normalization-VC Dimension - Neural

Networks-Deep Vs Shallow Networks- Convolutional Networks-Generative Adversarial Networks (GAN) - Semi-supervised Learning.

UNIT III METRIC LEARNING **9**

Principle Component Analysis – Linear Discriminant Analysis- Manifolds - Metric Learning -Auto Encoders -Dimensionality Reduction in Networks - Introduction to Convolution Network - Architectures –AlexNet – Visual Geometry Group –Inception– Residual Network.

UNIT IV OPTIMIZATION **9**

Optimization in Deep Learning–Non-Convex Optimization for Deep Networks- Stochastic optimization-Generalization in Neural NetworksSpatial Transformer Networks-Recurrent networks – Long Short Term Memory - Recurrent Neural Network Language Models-Word Level.

UNIT V ADVANCED TECHNIQUES **9**

ImageNet - Object Detection - Audio WaveNet - Natural Language Processing - Word2Vec Model -Joint Detection-Bio Informatics-Face Recognition-Scene Understanding-Gathering Image Captions

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Cosma Rohilla Shalizi, “Advanced Data Analysis from an Elementary Point of View”, Carnegie Mellon University, Cambridge University Press (March 21, 2021); eBook.
2. Deng and Yu, “Deep Learning: Methods and Applications”, Now Publishers, 2013.

REFERENCES:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.
2. Michael Nielsen, “Neural Networks and Deep Learning”, Determination Press, 2015.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106105215/
2. https://nptel.ac.in/courses/106106201/
3. https://www.coursera.org/specializations/deep-learning

ONLINE RESOURCES:

1. https://www.simplilearn.com/deep-learning-tutorial
2. https://www.tutorialspoint.com/machine_learning/deep_machine_learning.htm

OUTCOMES:

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

1. Differentiate various learning approaches and to interpret the concepts of Machine Learning. (K2)
2. Understand the history of Deep Learning and theory behind Deep Learning techniques and analyze it.(K2)
3. Compare the different Dimensionality Reduction techniques and study about Convolution network technique.(K2)
4. Illustrate the working of Optimization techniques in Deep Learning.(K3)
5. Identify the case studies in Deep Learning and identify its applicability in real life problems.(K3)
6. Examine advanced techniques in Deep Learning like image detection, Bioinformatics-Face Recognition.(K3).

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	1	-	2	-	-	-	2	1	-	3	3	1
CO2	2	-	1	-	3	-	-	-	2	1	-	2	3	1
CO3	3	-	1	-	2	-	-	-	2	1	-	3	3	1
CO4	3	-	1	-	2	-	-	-	2	1	-	2	3	1
CO5	3	-	1	-	3	-	-	-	2	1	-	2	3	1
CO6	3	-	1	-	2	-	-	-	2	1	-	2	2	1

PROFESSIONAL ELECTIVE - V

20CJEL806 SDG NO. 4 & 9	ADVANCED COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the basic concepts in Router and switch.
- To Learn techniques for optimizing network performance, including traffic
- To understand the concepts and principles behind SDN and NFV.
- To Understand the principles behind network acceleration and optimization for multimedia content and real-time applications.

Unit I High Performance Switching And Routing 9

High Performance Switching And Routing: Introduction, Architecture of the Internet: Present and Future, Router Architectures , Commercial Core Router Examples , Design of Core Routers, Ip Network Management, IP Address Lookup: Overview , Algorithms For IP Address Lookup And Optimization , Trie-Based Algorithms, Hardware-Based Schemes, IPv6 Lookup.

Unit II Packet Classification & QOS 9

Introduction, Need for packet classification and methods for packet classification, Trie-Based Classifications, Geometric Algorithms, Heuristic Algorithms, Quality of Service: QoS, Integrated Services ,Differentiated Service, Traffic Polishing, Traffic Shaping, Packet Scheduling, Buffer Management.

Unit III Network Softwarization & SDN 9

Network Softwarization – Introduction, Software Defined Networking (SDN): Introduction, OpenFlow, The Minnet, Components and Architecture of SDN, Controller Plane, Openflow Basics, Differences of OpenFlow Switch v Conventional Switch, Mininet, Future Work, SDN Tree Topology Implementation using Minniet: Introduction, Simulation, Future plan of SDN.

Unit IV Network Function Virtualization (NFV) 9

Network Function Virtualization (NFV) - Architecture and Concepts, Building Blocks, Example System, Micro segmentation, Basic Architecture, Switch OS: P4 Runtime, gNMI and gNOI, SONiC Programmable Networks - Introduction to P4, SmartNICS and P4 switches.,Network OS.

Unit V Information-Centric Networks 9

Data Center Networking (DCN) – Introduction, Deep Dive, Content Distribution On The Internet, Information-Centric Networks, Content Naming, Content Or Name-Based Routing, Content Caching, Main Icn Architectures, Content-Based Networking/Combined Broadcast And Content-Based, Data-Oriented Network Architecture, Content-Centric Networking/Named-Data Networking, Publish-Subscribe Internet Routing Paradigm/Publish-Subscribe Internet Technologies, Content-Centric Inter-Network Architecture, Icn Challenges.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. High Performance Switches and Routers, H. Jonathan Chao, Bin Liu, 2007, John Wiley & Sons, Inc. ISBN-10: 0-470-05367-4
2. Information-Centric Networks: A New Paradigm for the Internet (Focus Series in Networks and Telecommunications), Gabriel M. de Brito, Pedro B. Velloso, Igor M. Moraes, Wiley-ISTE; 1st edition, 2013, ISBN: 9781848214491
3. Information-Centric Networking (ICN): Content Centric Networking (CCNx) and Named Data Networking (NDN) Terminology, B. Wissingh, C. Wood, A. Afanasyev, L. Zhang, D. Oran and C. Tschudin, RFC 8793, June 2020
4. Software-Defined Networks: A Systems Approach, Peterson, Cascone, O'Connor, Vachuska, and Davie, Online Free Reference Book available at https://sdn.systemsapproach.org/index.html
5. Cloud Networking: Understanding Cloud-based Data Centre Networks, Gary Lee (Author), Morgan Kaufmann (Publisher), 2014,ISBN-139780128007280

ONLINE RESOURCES:

1. https://www.coursera.org/learn/illinois-tech-computer-networking
2. https://www.udemy.com/topic/computer-network/

OUTCOMES:

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

1. Demonstrate advanced knowledge of routing and switching concepts, including multicast routing, policy-based routing, and advanced switching technologies. (K2)
2. Analyze and optimize network performance using advanced techniques, such as traffic engineering, Quality of Service (QoS), and network optimization algorithms (k3)
3. Demonstrate proficiency in SDN and NFV concepts, including the implementation and configuration of SDN controllers and virtualized network functions. (K2)

4. Understand the benefits of network virtualization and programmability. (K2)
5. Develop skills in evaluating the performance of ICN architectures(K3)
6. Analyze and compare various Information-Centric Networking architectures.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	2
CO2	3	3	3	1	3	-	-	-	-	3	-	-	2	2
CO3	3	3	3	3	3	-	-	-	2	3	1	2	3	2
CO4	3	3	3	3	3	-	-	-	-	-	-	-	3	2
CO5	3	3	3	3	3	-	-	-	-	2	2	2	3	2
CO6	3	3	3	3	3	-	-	-	-	2	2	3	3	2

PROFESSIONAL ELECTIVE - V

20HSMG601 SDG NO. 4,8,9, 10&12	PRINCIPLES OF ENGINEERING MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Enable the students to study the evolution of Management
- Study the functions and principles of management
- Learn the application of the principles in an organization.

UNIT I INTRODUCTION MANAGEMENT AND ORGANIZATIONS 9

Management – Science or Art – Manager Vs Entrepreneur – types of managers – Engineers as Managers. Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization – Sole proprietorship, partnership, company-public and private sector enterprises – Organization culture and Environment – Current issues and future trends in Management; Industry 4.0 – Engineering management in modern business.

UNIT II PLANNING 9

Planning, Technology Planning - Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies –

Planning premises – MBO – process - Principles and functions of engineering management – Planning Tools and Techniques – Decision making steps and process

UNIT III ORGANISING **9**

Nature and purpose – Formal and informal organization – organization chart-organization structures-types- Line and staff authority-departmentalization – delegation of authority – centralization and decentralization – Job Design – Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management

UNIT IV DIRECTING AND CONTROLLING **9**

Foundations of individual and group behavior – Motivation – theories and techniques–Leadership – Level 5 leadership - theories – Leadership as a determinant of Engineering management - Communication – process and barriers – effective communication – Communication and IT - System and process of controlling – budgetary and non-budgetary control techniques.

UNIT V INNOVATION AND TECHNOLOGY MANAGEMENT **9**

Innovation management of Product and Services, Role of R & D in Entrepreneurship, Breakthrough Innovation, Disruptive Innovation – Modern approaches in Engineering management – Green management, Lean management, Managing diversity. IPR – Principles of Ethics for Engineering Managers.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. ATripathy PC and Reddy PN, Principles of Management, Tata McGraw Hill, 1999

REFERENCES:

1. Stephen P. Robbins and Mary Coulter, Management, Prentice Hall (India) Pvt. Ltd., 10th Edition, 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert Management, Pearson Education, 6th Edition, 2004.
3. Stephen A. Robbins and David A. Decenzo and Mary Coulter, Fundamentals of Management Pearson Education, 7th Edition, 2011.
4. Robert Kreitner and MamataMohapatra, Management, Biztantra, 2008.
5. Harold Koontz and Heinz Weihrich Essentials of management Tata McGraw Hill,1998.

WEB RESOURCES:

1. https://www.managementstudyguide.com/organizationmanagement.htm
2. https://nptel.ac.in/courses/110/105/110105034/
3. https://courses.lumenlearning.com/boundless-management/chapter/principles-of-management/

ONLINE RESOURCE:

1. https://nptel.ac.in/courses/110/105/110105033/

OUTCOMES:

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

1. Understand the evolution and basic concepts of engineering management. (K2)
2. Demonstrate the planning concepts for an effective decision making process. (K2)
3. Describe the basic concepts of organization and its function. (K2)
4. Describe the ability to direct, leadership and communicate effectively. (K2)
5. Apply the concepts of innovation and technology management.(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	1	2	3	3	2	1	1	1	-	1
CO2	3	2	-	2	1	3	-	1	1	1	1	1	-	1
CO3	3	1	-	1	1	1	1	-	1	1	1	1	-	1
CO4	3	2	-	1	1	1	1	-	1	1	1	1	-	1
CO5	3	1	-	1	-	-	1	-	1	1	1	1	-	1

PROFESSIONAL ELECTIVE - V

20CJEL807 SDG NO. 4	APPLIED CRYPTOGRAPHY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the Basics of Number Theory.
- To be able to secure a message over an insecure channel by various means.
- To use a variety of public key cryptosystems and authentication methods.
- To gain a better understanding of the different security applications.
- To acquire a deeper insight of quantum computing on cryptography and security.

UNIT I INTRODUCTION 9

Introduction to Cryptography: Elementary number theory, Pseudo-random bit generation, Elementary cryptosystems. Basic security services: confidentiality, integrity, availability, non-repudiation, privacy.

UNIT II SYMMETRIC KEY ENCRYPTION 10

Stream Cipher: Basic Ideas, Hardware and Software Implementations, Examples with some prominent ciphers: A5/1,Grain family, RC4, Salsa and ChaCha, HC128, SNOW family, ZUC; Block Ciphers: DES, AES and Modes ofOperation.

UNIT III PUBLIC KEY CRYPTOSYSTEM 8

Public Key Cryptosystems: RSA, ECC; Digital signatures; Hash Functions; Authentication.

UNIT IV SECURITY APPLICATIONS 9

Electronic commerce (anonymous cash, micro-payments), Key management, Zero-knowledge protocols, Cryptology inContact Tracing Applications.

UNIT V QUANTUMCRYPTANALYSIS 9

Quantum cryptography, quantum encryption, Issues related to Quantum Cryptanalysis. Post-Quantum Cryptography: Lattice-based cryptography : NTRU, Hash-based cryptography : SPHINCS, Multivariate cryptography: Rainbow

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Douglas R. Stinson, "Cryptography, Theory and Practice", CRC Press, 3rd Edition, 2018.
2. A. Menezes, P. Van Oorschot and S. Vanstone, "Handbook of Applied Cryptography", CRC Press, 5th printing,2001.
3. Stallings William, "Cryptography and Network Security - Principles and Practice", Pearson, Seventh Edition,2017.

REFERENCES:

1. Neal Koblitz, "A course in number theory and cryptography", GTM, Springer.
2. Ross Anderson, "Security Engineering", Wiley, 3rd Edition, 2020.
3. http://theory.caltech.edu/~preskill/ph229/

OUTCOMES:

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

1. Understand and apply the various concepts of basics of Number Theory.(K3)
2. Manipulation of Secure a message over an insecure channel by numerous symmetric key cryptosystem.(K3)
3. Apply diverse Public Key Cryptosystem & Authentication.(K3)
4. Implement varied security applications.(K3)
5. Describe the implications of quantum computing on cryptography and security.(K2)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	-	-	-	-	-	-	1	1	2	2
CO2	2	2	2	2	-	-	-	-	=	-	1	1	2	2
CO3	2	3	1	2	-	-	-	-	=	-	1	1	2	2
CO4	2	2	2	2	-	-	-	-	=	-	1	1	2	2
CO5	2	2	1	2	-	-	-	-	=	-	1	1	2	2

PROFESSIONAL ELECTIVE - V

20CJEL808 SDG NO. 4 & 9	SERVICE ORIENTED ARCHITECTURE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the fundamentals of XML
- To implement API using XML, JSON and REST l
- To understand the basic principles of Service Oriented Architecture
- To study about web services technology elements of SOA

UNIT I INTRODUCTION TO XML 9

XML Document Structure – Well Formed and Valid documents – Name Spaces – DTD – XML Schema – X-Files - Parsing XML using DOM - SAX – XML Transformation and XSL – XSL Formatting – Modeling Databases in XML.

UNIT II DESIGN OF API USING JSON AND REST 9

Introduction to JSON - REST- Comparison of XML , JSON and REST - HTTP Methods using RESTful Services - REST Architectural Constraints - Richardson Maturity Model - JSON and REST Based Service Provider and Requestor API Examples..

UNIT III SERVICE ORIENTED ARCHITECTURE 9

Characteristics of SOA - Comparing SOA with Client/Server and Distributed Architectures – Beneits of SOA - Principles of Service Orientation – Service Layers.

UNIT IV WEB SERVICES 9

Service Descriptions – WSDL – Messaging with SOAP – Service Discovery – UDDI – Message Exchange Patterns – Orchestration – Choreography –WS Transactions.

UNIT V BUILDING SOA APPLICATIONS 9

Service Oriented Analysis and Design – Service Modeling – Design Standards and Guidelines - Composition – WS-BPEL – WS-Coordination – WS-Policy – WS-Security – SOA support in J2EE.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Ron Schmelzer et al. " XML and Web Services", Pearson Education,2002
2. Thomas Erl, "Service Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2005.

REFERENCES:

1. Frank P.Coyle, "XML, Web Services and the Data Revolution", PearsonEducation,2002.
2. Eric Newcomer, GregLomow, "Understanding SOA with Web Services", Pearson Education, 2005.
3. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 20044.
4. James McGovern, Sameer Tyagi, Michael E.Stevens, Sunil Mathew, "Java Web. Services Architecture", Morgan Kaufmann Publishers,2003.
5. Thomas Erl,"Service-oriented Architecture: Concepts, Technology, and Design",2016

WEB REFERENCES:

1. https://www.coursera.org/learn/service-oriented-arhitecture
2. https://restfulapi.net/json-schema/
3. https://www.w3schools.com/js/js_json_intro.asp

ONLINE RESOURCES:

1. https://nptel.ac.in/conten/storage2/nptel_data3/html/mhrd/ict/text/106105167/lec10.pdf

OUTCOMES:

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

1. Demonstrate the basic concepts of XML and XML based applications. (K3)
2. Construct the design of API using JSON & REST. (K3)
3. Discuss the basics concepts of SOA, its Principles and Benefits. (K2)
4. Interpret the Web services using technology elements. (K2)
5. Analyze the SOA based applications for intra-enterprise and inter enterprise applications. (K4)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	1	-	-	-	-	1	-	1	1	1	2
CO2	3	3	-	1	1	-	-	-	1	1	1	2	1	2
CO3	3	2	-	-	-	-	-	-	-	-	3	1	-	1
CO4	3	3	1	-	-	-	-	-	-	1	1	1	1	1
CO5	2	3	1	1	1	-	-	-	1	1	1	2	1	2

PROFESSIONAL ELECTIVE - V

20CJEL809 SDG NO. 4 & 9	RECONFIGURABLE COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the need for reconfigurable computing
- To expose the students to various device architectures
- To examine the various reconfigurable computing systems
- To understand the different types of compute models for programming reconfigurable architectures
- To expose the students to HDL programming and familiarize with the development environment
- To expose the students to the various placement and routing protocols To develop applications with FPGAs

UNIT I DEVICE ARCHITECTURE 9

General Purpose Computing Vs Reconfigurable Computing – Simple Programmable Logic Devices – Complex Programmable Logic Devices – FPGAs – Device Architecture - Case Studies.

UNIT II RECONFIGURABLE COMPUTING ARCHITECTURES AND SYSTEMS 9

Reconfigurable Processing Fabric Architectures – RPF Integration into Traditional Computing Systems – Reconfigurable Computing Systems – Case Studies – Reconfiguration Management.

UNIT III PROGRAMMING RECONFIGURABLE SYSTEMS 9

Compute Models - Programming FPGA Applications in HDL – Compiling C for Spatial Computing – Operating System Support for Reconfigurable Computing.

UNIT IV MAPPING DESIGNS TO RECONFIGURABLE PLATFORMS 9

The Design Flow - Technology Mapping – FPGA Placement and Routing – Configuration Bitstream Generation – Case Studies with Appropriate Tools.

UNIT V APPLICATION DEVELOPMENT WITH FPGAS 9

Case Studies of FPGA Applications – System on a Programmable Chip (SoPC) Designs.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Maya B. Gokhale and Paul S. Graham, "Reconfigurable Computing: Accelerating Computation with Field-Programmable Gate Arrays", Springer, 2005.

REFERENCES:

1. Scott Hauck and Andre Dehon (Eds.), "Reconfigurable Computing – The Theory and Practice of FPGA-Based Computation", Elsevier / Morgan Kaufmann, 2008.
2. Christophe Bobda, "Introduction to Reconfigurable Computing – Architectures, Algorithms and Applications", Springer, 2010

WEB RESOURCES:

1. http://www.gstitt.ece.ufl.edu/courses/fall15/eel4720_5721/syllabus.pdf
2. https://sndcoe.ac.in/wp-content/uploads/2022/06/ME-ETC-2017.pdf

OUTCOMES:

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

1. Identify the need for reconfigurable architectures (K2)
2. Discuss the architecture of FPGAs (K2)
3. Point out the salient features of different reconfigurable architectures (K2)
4. Build basic modules using any HDL (K3)
5. Develop applications using any HDL and appropriate tools (K3)
6. Design and build an SoPC for a particular application (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	1	2	2	1	2	1	1	1	-	1
CO2	2	2	-	2	1	3	-	1	1	1	1	1	-	1
CO3	3	1	-	1	2	3	2	-	1	1	1	1	-	1
CO4	2	2	-	1	1	1	-	-	2	2	2	1	-	1
CO5	3	1	-	1	-	-	1	-	1	1	1	1	-	1
CO6	3	2	-	2	-	-	1	-	1	1	1	1	-	1

PROFESSIONAL ELECTIVE - V

20CSEL801 SDG NO. 4 & 10	GREEN COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the fundamentals of Green Computing
- To analyze the Green computing Grid Framework
- To understand the issues related with Green compliance
- To study and develop various case studies

UNIT I FUNDAMENTALS **9**

Green IT Fundamentals: Business - IT and the Environment – Green Computing: Carbon FootPrint - Scoop on Power – Green IT Strategies - Drivers - Dimensions and Goals – Environmentally Responsible Business - Policies - Practices and Metrics

UNIT II GREEN ASSETS AND MODELING **9**

Green Assets: Buildings - Data Centers - Networks and Devices – Green Business Process Management - Modeling - Optimization and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems - Design and Development Models

UNIT III GRID FRAMEWORK **9**

Virtualization of IT systems – Role of Electric Utilities - Telecommuting - Teleconferencing and Teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework

UNIT IV GREEN COMPLIANCE **9**

Socio cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols - Standards and Audits – Emergent Carbon Issues - Technologies and Future.

UNIT V CASE STUDIES **9**

The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home - Hospital - Packaging Industry and Telecom Sector

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Bhuvan Unhelkar "Green IT Strategies and Applications" Using Environmental Intelligence, CRC Press, June 2014.

2. Woody Leonhard, Katherine Murray "Green Home computing for dummies", August 2012.

REFERENCES:

1. Alin Gales, Michael Schaefer, Mike Ebbers, "Green Data Center: steps for the Journey '', Shroff IBM/rebook, 2011.
2. John Lamb, " The Greening of IT" Pearson Education, 2009.
3. Jason Harris "Green Computing and Green ITBest Practices on regulations & industry", Lulu.com, 2008
4. Carl Speshocky "Empowering Green Initiatives with IT" John Wiley & Sons, 2010.
5. Wu Chun Feng (editor) "Green computing: Large Scale energy efficiency", CRC Press

WEB REFERENCES:

1. https://www.tutorialspoint.com/environmental_studies/environmental_studies_towards_sustainable_future.htm
2. https://www.javatpoint.com/green-computing

OUTCOMES:

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

1. Understand green computing fundamentals to minimize negative impacts on the environment (K2)
2. Discuss Green Assets, Green Process Management towards optimization and collaboration (K2)
3. Develop models that can reduce paper waste and carbon footprint for Green Information System (K3)
4. Explain different ways towards green PC, green Data Centre and green Grid (K2)
5. Summarize cultural aspects, protocols and standards of green computing (K2)
6. Apply Green IT Strategies to various sectors to create green society (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	1	1	-	-	1	1	2	3	2
CO2	2	3	1	2	-	1	2	-	1	2	1	1	2	2
CO3	3	3	2	2	-	1	1	-	1	2	2	3	2	1
CO4	3	2	1	-	-	1	1	-	2	1	1	1	2	2
CO5	2	1	2	1	-	1	-	-	2	2	1	2	1	1
CO6	3	3	2	1	-	1	1	-	2	1	2	1	3	2

PROFESSIONAL ELECTIVE - V

20CSEL804 SDG NO. 4 & 9	SOFTWARE QUALITY ASSURANCE	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Understand the basic tenets of software quality and quality factors.
- Be exposed to the Software Quality Assurance (SQA) architecture and the details of SQA components.
- Understand how the SQA components can be integrated into the project life cycle.
- Be familiar with the software quality infrastructure and exposed to the management components of software quality.

UNIT I INTRODUCTION TO SOFTWARE QUALITY & ARCHITECTURE 9

Need for Software quality – Quality Challenges – Software Quality Assurance (SQA) – Definition and Objectives – Software Quality Factors- McCall's Quality Model – SQA System and Architecture – Software Project Life Cycle Components – Pre Project Quality Components – Development and Quality Plans.

UNIT II SQA COMPONENTS AND PROJECT LIFE CYCLE 9

Software Development Methodologies – Quality Assurance Activities in the Development Process- Verification & Validation – Reviews – Software Testing – Software Testing Implementations – Quality of Software Maintenance – Pre-Maintenance of Software Quality Components – Quality Assurance Tools – CASE Tools for Software Quality – Software Maintenance Quality – Project Management.

UNIT III SOFTWARE QUALITY INFRASTRUCTURE 9

Procedures and work instructions – Templates – Checklists – 3S Developmenting – Staff Training and Certification Corrective and Preventive Actions – Configuration Management – Software Change Control – Configuration Management Audit - Documentation Control – Storage and Retrieval.

UNIT IV SOFTWARE QUALITY MANAGEMENT & METRICS 9

Project Process Control – Computerized Tools - Software Quality Metrics – Objectives of Quality Measurement – Process Metrics – Product Metrics – Implementation – Limitations of Software Metrics – Cost of Software Quality – Classical Quality Cost Model – Extended Model – Application of Cost Model.

UNIT V STANDARDS, CERTIFICATIONS & ASSESSMENTS 9

Quality Management Standards – ISO 9001 and ISO 9000-3 – Capability Maturity Models – CMM and CMMI Assessment Methodologies - Bootstrap Methodology – SPICE Project – SQA Project Process Standards – IEEE st 1012 & 1028 – Organization of Quality Assurance – Department Management Responsibilities – Project Management Responsibilities – SQA Units and Other Actors in SQA Systems.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Daniel Galin, "Software Quality Assurance", Pearson Publication, 2009.
2. Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press, 1997.

REFERENCES:

1. Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press, 1997.
2. Milind Limaye, "Software Quality Assurance", TMH ,New Delhi, 2011
3. Claude Y. Laporte , Alain April, "Software Quality Assurance" , Wiley-IEEE Computer Society Pr, 1st Edition (January 4, 2018)
4. G. Gordon Schulmeyer, James I. McManus, "Handbook of Software Quality Assurance", Prentice Hall, 3rd Edition (8 September 1998).
5. R. Chopra , "Software Quality Assurance: A Self-Teaching Introduction" , Mercury Learning & Information, Illustrated Edition (13 April 2018)

WEB REFERENCES:

1. https://nptel.ac.in/courses/110105039/
2. https://nptel.ac.in/courses/106105087/

ONLINE RESOURCES :

1. http://www.softwareqatest.com/
2. https://www.tutorialride.com/software-testing/software-quality-assurance.html

OUTCOMES:

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

1. Utilize the concepts in software development life cycle.(K3)
2. Demonstrate their capability to adopt quality standards.(K2)
3. Estimate the quality of software products.(K3)
4. Apply the concepts in preparing the quality plan & documents.(K3)
5. Understand standards and certifications.(K2)
6. Apply techniques of quality assurance for typical applications(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	1	2	-	-	-	-	2	2	3	2
CO2	3	1	3	2	2	2	-	-	-	1	2	2	2	2
CO3	3	1	2	2	1	2	-	-	1	1	1	2	3	2
CO4	3	1	2	2	2	2	-	-	-	-	2	2	3	3
CO5	2	1	2	2	2	2	-	-	1	2	2	3	3	2
CO6	2	1	2	2	2	2	-	-	-	-	2	2	3	3

PROFESSIONAL ELECTIVE - V

20CJEL810 SDG NO. 4	FUZZY LOGIC AND NEURAL NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

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

UNIT I FUNDAMENTALS OF FUZZY LOGIC 9

Basic concepts: fuzzy set theory- basic concept of crisp sets and fuzzy sets-complements- unionintersection- combination of operation- general aggregation operations- fuzzy relations-compatibility relations-orderings-morphisms- fuzzy relational equations-fuzzy set and systems

UNIT II ARCHITECTURE OF NEURAL NETWORKS 9

Architectures: motivation for the development of natural networks-artificial neural networks-biological neural networks-area of applications-typical Architecture-setting weights-common activations functionsBasic learning rules- Mcculloch-Pitts neuron- Architecture, algorithm, applications-single layer net for pattern classification- Biases and thresholds, linear separability - Hebb'srule- algorithm -perceptron - Convergence theorem-Delta rule

UNIT III BASIC NEURAL NETWORK TECHNIQUES 9

Back propagation neural net:standard back propagation-architecture algorithm- derivation of learning rulesnumber of hidden layers--associative and other neural networks- hetro associative memory neural net, auto associative net- Bidirectional associative memory-applications-Hopfield nets-Boltzman machine

UNIT IV COMPETITIVE NEURAL NETWORKS 9

Neural network based on competition: fixed weight competitive nets-Kohonenself organizing maps and applications-learning vector quantization-counter propagation nets and applications adaptive resonance theory: basic architecture and operation-architecture, algorithm, application and analysis of ART1 & ART2

UNIT V SPECIAL NEURAL NETWORKS 9

Cognitron and Neocognitron - Architecture, training algorithm and application-fuzzy associate memories, fuzzy system architecture- comparison of fuzzy and neural systems.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. T1. Kliryvan- Fuzzy System & Fuzzy logic Prentice Hall of India, First Edition.
2. Lawrence Fussett- fundamental of Neural network Prentice Hall , First Edition.

REFERENCE BOOKS:

1. Bart Kosko, —Neural network and Fuzzy System|| - Prentice Hall-1994.

2. J.Klin and T.A.Folger, —Fuzzy sets|| University and information- Prentice Hall -1996.
3. J.M.Zurada, —Introduction to artificial neural systems||-Jaico Publication house,Delhi 1994.
4. VallusuRao and HayagvnaRao , —C++ Neural network and fuzzy logic||-BPB and Publication, New Delhi,1996.
5. Intelligent Systems and Control-http://nptel.ac.in/courses/108104049/16

OUTCOMES:

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

1. Apply the knowledge of fuzzy set theory. (K3)
2. Apply the concept of fuzziness involved in various systems.(K3)
3. Understand basics of Artificial Neural of theory and programming of Microprocessors(K2)
4. Design fuzzy logic control and adaptive fuzzy logic and using algorithms. (K2)
5. Apply knowledge of application of fuzzy logic control to real time systems.(K3)
6. Analyze various techniques in feedback and feed forward Neural networks(K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	1	2	-	1	2	2
CO2	2	3	3	2	3	2	-	1	3	1	2	2	3	2
CO3	3	3	2	2	-	-	-	1	2	1	3	2	1	1
CO4	3	3	1	-	3	-	-	2	1	1	-	1	2	1
CO5	2	2	1	-	1	1	-	-	-	-	1	1	2	2
CO6	2	2	2	2	-	-	-	1	2	1	2	1	2	2

PROFESSIONAL ELECTIVE - V

20CSEL702 SDG NO. 4	SOFTWARE DEFINED NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To appreciate the need for Software Defined Networks
- To learn working of Software Defined Networking
- To know the Open Flow Specifications
- To know the applications of Software Defined Networking in Data Centers

UNIT I INTRODUCTION **9**

Basic Packet Switching Terminology - The Modern Data Center - Traditional Switch Architecture - Autonomous and Dynamic Forwarding Tables - Open Source and Technological Shifts - SDN - Evolution of Switches - Control Planes - Cost - SDN Implications for Research and Innovation - Data Center Innovation - Data Center Needs.

UNIT II THE GENESIS OF SDN **9**

The Evolution of Networking Technology - Sustaining SDN Interoperability - Open Source Contributions - Legacy Mechanisms Evolve Toward SDN - Network Virtualization - Fundamental Characteristics of SDN - SDN Operation - SDN Devices - SDN Controller - SDN Applications - Alternate SDN Methods.

UNIT III THE OPENFLOW SPECIFICATION **9**

OpenFlow Overview - OpenFlow 1.0-1.1-1.2-1.3 - OpenFlow - Limitations - Alternative Definitions of SDN - Potential Drawbacks of Open SDN - SDN via APIs - SDN via Hypervisor - Based Overlays - SDN via Opening Up the Device - Network Functions Virtualization - Alternatives Overlap and Ranking.

UNIT IV SDN IN THE DATA CENTER **9**

Data Center Definition - Data Center Demands - Tunneling Technologies for the Data Center, Path Technologies in the Data Center - Ethernet Fabrics in the Data Center - SDN Use Cases in the Data Center - Open SDN versus Overlays in the Data Center - Real-World Data Center Implementations. SDN IN OTHER ENVIRONMENTS: Consistent Policy Configuration - Global Network View - Wide Area Networks - Service Provider and Carrier Networks - Campus Networks - Hospitality Networks - Mobile Networks - In-Line Network Functions - Optical Networks - SDN vs P2P/Overlay Networks.

UNIT V SDN APPLICATIONS **9**

Reactive versus Proactive Applications - Reactive SDN Applications - Proactive SDN Applications - Analyzing Simple SDN Applications - Creating Network Virtualization Tunnels - Offloading Flows in the Data Center - Access Control for the Campus - Traffic Engineering for Service Providers. SDN FUTURES: Potential Novel Applications of Open SDN - Applying Programming Techniques to Networks - Security Applications - Hiding IP Addresses - Segregating IPSec Traffic in Mobile Networks - Roaming in Mobile

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Paul Goransson, Chuck Black, “Software Defined Networks - A Comprehensive Approach”, Elsevier, 2014.
2. Siamak Azodolmolky, “Software Defined Networking with Open Flow”, Second Edition, Packt Publishing, 2013.

REFERENCES:

1. Thomas D.Nadeau & Ken Gray, "SDN Software Defined Networks", O'Reilly publishers, First edition, 2013.
2. Sreenivas Voruganti, Sriram Subramanian, “Software Defined Networking (SDN) with Open Stack”, First Edition, Packt Publishing, 2016.
3. William Stallings, “Foundations of Modern Networking”, First Edition, Pearson education limited, 2016.
4. Vivek Tiwari, “SDN and Open Flow for Beginners”, Amazon Digital Services, Inc., 2013.
5. Fei Hu, Editor, “Network Innovation through Open Flow and SDN: Principles and Design”, Chemical Rubber Company Press, 2014.

WEB REFERENCES:

1. https:// users. cs. f iu. edu/ ~fortega/ storage/ tcn 6430 / SDN_ 9780124166844.pdf
2. https://www.cs.rutgers.edu/~sn624/552-F18/papers/p4.pdf
3. https://www.cs.rutgers.edu/~sn624/552-F18/papers/road.pdf

ONLINE RESOURCES:

1. https://sdn.ieee.org/outreach/resources
2. https://www.coursera.org/learn/sdn

OUTCOMES:

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

1. Explain the key benefits of SDN by the separation of data and control planes (K1)
2. Interpret the SDN data plane devices and Openflow Protocols. (K2)
3. Implement the operation of SDN control plane with different controllers. (K2)
4. Apply techniques that enable applications to control the underlying network using SDN. (K3)
5. Appreciate the applications of Software Defined Networking in Data Centers (K2)
6. Describe Network Functions Virtualization components and their roles in SDN (K3)

CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	3	2	-	2	2	2	3	3	3	3	3	-
CO2	1	3	1	2	-	1	-	3	1	-	1	1	1	3
CO3	3	3	3	3	1	-	-	-	3	1	3	3	3	3
CO4	3	3	3	3	3	2	-	2	2	1	3	2	3	3
CO5	3	3	3	3	3	1	-	-	1	1	3	2	3	3
CO6	3	3	3	2	3	2	-	2	2	1	3	2	3	3

Imagine the Future and

Make it happen!

Together let's build a better world where there is NO POVERTY and ZERO HUNGER.

We have GOOD HEALTH AND WELL BEING QUALITY EDUCATION and full GENDER EQUALITY everywhere.

There is CLEAN WATER AND SANITATION for everyone. AFFORDABLE AND CLEAN ENERGY

which will help to create DECENT WORK AND ECONOMIC GROWTH. Our prosperity shall be fuelled

by investments in INDUSTRY, INNOVATION AND INFRASTRUCTURE that will help us to

REDUCE INEQUALITIES by all means. We will live in SUSTAINABLE CITIES AND COMMUNITIES.

RESPONSIBLE CONSUMPTION AND PRODUCTION will help in healing our planet.

CLIMATE ACTION will reduce global warming and we will have abundant,

flourishing LIFE BELOW WATER, rich and diverse LIFE ON LAND.

We will enjoy PEACE AND JUSTICE through STRONG INSTITUTIONS

and will build long term PARTNERSHIPS FOR THE GOALS.

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