JERUSALEM COLLEGE OF ENGINEERING

(An Autonomous Institution)

Approved by AICTE & Affiliated to Anna University
Accredited by NAAC with 'A' Grade
Chennai – 600 100

DEPARTMENT OF COMPUTER SCIENCE

AND ENGINEERING

CURRICULUM

REGULATION 2023
CHOICE BASED CREDIT SYSTEM

JERUSALEM COLLEGE OF ENGINEERING

(AN AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI)

B.E. COMPUTER SCIENCE AND ENGINEERING

REGULATION 2023

CHOICE BASED CREDIT SYSTEM

COURSE SUMMARY SHEET

S.No	Category	Credits as per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HS	4	4	-	-	-	1	2	-	11
2	BS	10	9	3	3	3	-	-	-	28
3	ES	8	3	-	-	-	-	-	-	11
4	PC	-	5	17	12	14	12	-	10	70
5	PE	-	-	-	3	3	6	6	-	18
6	OE	-	-	-	3	3	3	3	-	12
7	EEC	-	2		3	2	3	6	-	16
TOTAL (B.E)		22	23	20	24	25	25	17	10	166

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SEMESTER 1

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1	JHS2121	English for Communicative Competence	I	HS	4	2	0	2	3
2	JGE2102	Heritage of Tamils	T	HS	1	1	0	0	1
3	JMA2121	Matrices and Calculus	I	BS	4	2	0	2	3
4	JPH2101	Engineering Physics 1	T	BS	3	3	0	0	3
5	JCY2101	Engineering Chemistry	T	BS	3	3	0	0	3
6	JGE2101	Basic Engineering	T	ES	3	3	0	0	3
7	JCS2121	Programming in C	I	ES	5	3	0	2	4
8	JPC2111	Engineering Physics and Chemistry Laboratory	P	BS	2	0	0	2	1
9	JGE2111	Basic Engineering Laboratory	P	ES	2	0	0	2	1
TOTAL					**27**	**17**	**0**	**10**	**22**

SEMESTER 2

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1	JHS2221	English for Science and Technology	I	HS	4	2	0	2	3
2	JGE2202	Tamils and Technology	T	HS	1	1	0	0	1
3	JMA2221	Statistics for Engineers	I	BS	4	2	2	0	3
4	JPH2201	Engineering Physics 2	T	BS	3	3	0	0	3
5	JCY2201	Environmental Science and Sustainability	T	BS	2	2	0	0	2
6	JGE2221	Engineering Graphics	I	ES	4	2	0	2	3
7	JCS2201	Python Programming	T	PC	3	3	0	0	3
8	JPC2211	Engineering Physics and Environmental Science Laboratory	P	BS	2	0	0	2	1
9	JCS2211	Python Programming Laboratory	P	PC	4	0	0	4	2
10	JGE2241	Gaming and Crafts studio	P	EEC	4	0	0	4	2
TOTAL					**31**	**15**	**2**	**14**	**23**

SEMESTER 3

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1	JMA2302	Mathematical Foundations for Computer Science	T	BS	4	2	2	0	3
2	JIT2301	Object Oriented Programming	T	PC	3	3	0	0	3
3	JCS2301	Data Structures and Algorithms	T	PC	3	3	0	0	3
4	JAL2301	Data Science	T	PC	3	3	0	0	3
5	JIT2321	Digital Principles and Computer Organization	I	PC	5	3	0	2	4
6	JNC2361	Non-Credit Mandatory Course 1	T	NCM	3	3	0	0	-
7	JCS2311	Data Structures and Algorithms Laboratory	P	PC	4	0	0	4	2
8	JIT2311	Object Oriented Programming Laboratory	P	PC	4	0	0	4	2
9	JPT2041	Soft Skills and Aptitude	P	EEC	2	0	0	2	*
TOTAL					**31**	**17**	**2**	**12**	**20**

***Only Internal Assessment**

SEMESTER 4

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1	JMA2402	Applied Linear Algebra	T	BS	4	2	2	0	3
2	JCS2401	Database Management Systems	T	PC	3	3	0	0	3
3	JIT2421	Operating Systems	I	PC	5	3	0	2	4
4	JCS2402	Design and Analysis of Algorithms	T	PC	3	3	0	0	3
5	-	Professional Elective 1	T	PE	3	3	0	0	3
6	-	Open Elective 1	T	OE	3	3	0	0	3
7	JCS2411	Database Management Systems Laboratory	P	PC	4	0	0	4	2
8	JPT2041	Soft Skills and Aptitude	P	EEC	2	0	0	2	1
9	JGE2442	Advanced IT Infrastructure Laboratory	P	EEC	4	0	0	4	2
TOTAL					**27**	**17**	**2**	**12**	**24**

SEMESTER 5

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1	JMA2501	Optimization Techniques	T	BS	4	2	2	0	3
2	JCS2501	Computer networks	T	PC	3	3	0	0	3
3	JCS2502	Software Engineering and Design	T	PC	3	3	0	0	3
4	JCS2521	Automata Theory and Compiler Design	I	PC	5	3	0	2	4
5	-	Professional Elective 2	T	PE	3	3	0	0	3
6	-	Open Elective 2	T	OE	3	3	0	0	3
7	JCS2511	Computer networks Laboratory	P	PC	4	0	0	4	2
8	JCS2512	Software Engineering and Design Laboratory	P	PC	4	0	0	4	2
9	JPT2042	Technical Skills and Aptitude	P	EEC	2	0	0	2	*
10	JGE2542	MERN Stack Development Laboratory	P	EEC	4	0	0	4	2
TOTAL					**33**	**17**	**2**	**14**	**25**

***Only Internal Assessment**

SEMESTER 6

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1	JCS2621	Internet and web Programming	I	PC	5	3	0	2	4
2	JCS2601	Cryptography and Network security	T	PC	3	3	0	0	3
3	JCS2602	Cloud Computing	T	PC	3	3	0	0	3
4	-	Professional Elective 3	T	PE	3	3	0	0	3
5	-	Professional Elective 4	T	PE	3	3	0	0	3
6	-	Open Elective 3	T	OE	3	3	0	0	3
7	JHS2541	Professional Communication	P	HS	2	0	0	2	1
8	JCS2611	Cryptography and Network security Laboratory	P	PC	4	0	0	4	2
9	JPT2042	Technical Skills and Aptitude	P	EEC	2	0	0	2	1
10	JGE2642	Computational Intelligence Laboratory	P	EEC	4	0	0	4	2
TOTAL					**32**	**18**	**0**	**14**	**25**

SEMESTER 7

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1	-	Professional Elective 5	T	PE	3	3	0	0	3
2	-	Professional Elective 6	T	PE	3	3	0	0	3
3	-	Open Elective 4	T	OE	3	3	0	0	3
4	JNC2761	Non-Credit Mandatory Course 2	T	NCM	3	3	0	0	-
5	JHS2741	Universal Human values	I	HS	3	1	0	2	2
6	JGE2751	Entrepreneurship Development	I	EEC	4	2	0	2	3
7	JCS2741	Comprehension and Technical Seminar	P	EEC	2	0	0	2	1
8	JCS2742	Internship	P	EEC	-	-	-	4**	2
TOTAL					**20**	**15**	**0**	**4**	**17**

**** Internship of one month must be undertaken in industry through semester 4, 5 and 6 leading to 2 credit in semester 7**

SEMESTER 8

S. No	COURSE CODE	COURSE TITLE	T/P/I	CATEGORY	CONTACT PERIODS	L	T	P	C
1	JCS2831	Project Work	P	PC	20	0	0	20	10
TOTAL					**20**	**0**	**0**	**20**	**10**

OPEN ELECTIVES

OPEN ELECTIVES – I

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	JCS9201	Fundamentals of Data Structures	OE	3	3	0	0	3
2.	JCS9202	Fundamentals of Software Engineering	OE	3	3	0	0	3

OPEN ELECTIVES – II

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	JCS9203	Basics of Python Programming	OE	3	3	0	0	3
2.	JCS9204	Operating System Essentials	OE	3	3	0	0	3

OPEN ELECTIVES – III

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	JCS9205	Foundations of Cryptography	OE	3	3	0	0	3
2.	JCS9206	Foundations of Artificial Intelligence	OE	3	3	0	0	3

OPEN ELECTIVES – IV

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	JCS9207	Basics of Software Testing	OE	3	3	0	0	3
2.	JCS9208	Cyber Law and Ethics	OE	3	3	0	0	3

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I **Data Science**	**Vertical II** **Creative Media**	**Vertical III** **Cyber Security**	**Vertical IV** **IoT**	**Vertical V** Artificial Intelligence and Machine Learning	**Vertical VI** **Automation Tools**
JCS2001 Foundation of Data science	JCS2009 Principles of Multimedia	JCB2001 Cyber Security Fundamentals and Practices	JIT2009 Internet of Things: Architecture Protocols And Applications	JAL2401 Principles of Artificial Intelligence	JAD2001 Agile Methodology
JCS2002 Big data analytics	JCS2010 3D Modeling and Rendering	JCB2002 Cryptography and Cryptanalysis	JIT2010 Programming For IOT Boards	JAL2501 Machine Learning	JIT2004 Devops
JCS2003 Recommender systems	JCS2011 Augmented reality and Virtual reality	JCB2003 Cyber Forensics	JIT2011 Industrial IoT 4.0	JAL2001 Cognitive Science	JAD2003 Software Testing using Selenium
JCS2004 Web and Speech Analysis	JCS2012 Digital Marketing and Commerce	JCB2004 Intrusion Detection and Prevention	JIT2012 IoT in HealthCare	JAL2002 Knowledge Representation and Reasoning	JAD2004 Pandas For Data Analysis
JCS2005 Social media analytics	JCS2013 Computer Graphics and Animation	JCB2005 Hardware Security	JIT2013 Robotics in IOT	JAL2003 Time Series Analysis and Prediction	JAD2005 Data Visualization Using Tableau
JCS2006 Data exploration and visualization	JCS2014 Video processing and Analytics	JCB2006 Cloud Security	JIT2014 Mobile Application Development For IOT	JAL2601 Neural Networks and Deep Learning	JAD2006 Jenkins Automation for Server
JCS2007 Health care analytics	JCS2015 Game Development	JCB2007 Ethical Hacking	JIT2015 Cognitive IOT	JAL2602 Natural Language Processing	JAD2007 Cloud Computing Tools
JCS2008 Image and video Analytics	JCS2016 Media Security	JCB2008 Web Application Security	JIT2016 Privacy Security for IOT	JAL2004 Robotic Process Automation Tool	JAD2008 Infrastructure Build Tool Using Terraform

CURRICULUM 2023 - REGULATION 2023

SEMESTER 1 (COMMON TO ALL BRANCHES)

S.No.	Course Code	Course Title	T/P/I	Category	Contact Period	L	T	P	C
1	JHS2121	English for Communicative Competence	I	HS	4	2	0	2	3
2	JMA2101	Matrices and Calculus	T	BS	4	2	2	0	3
3	JPH2101	Engineering Physics 1	T	BS	3	3	0	0	3
4	JCY2101	Engineering Chemistry	T	BS	3	3	0	0	3
5	JGE2101	Basic Engineering	T	ES	3	3	0	0	3
6	JCS2121	Programming in C	I	ES	5	3	0	2	4
7	JGE2102	Heritage of Tamils	T	HS	1	1	0	0	1
8	JPC2111	Engineering Physics and Chemistry Laboratory	P	BS	2	0	0	2	1
9	JGE2111	Basic Engineering Laboratory	P	ES	2	0	0	2	1
TOTAL					**27**	**17**	**2**	**8**	**22**

JHS2121	ENGLISH FOR COMMUNICATIVE COMPETENCE	L	T	P	C
		2	0	2	3

Course Objectives:

- To enable the students of Engineering to develop their reading and other language skills
- To facilitate the learners to reflect and share their ideas effortlessly
- To develop their skills to communicate thoughts effectively in social contexts
- To expose them to different genres to develop their understanding and expression
- To train the students to improve their writing skills for efficient communication

UNIT I Analytical Grammar and Information Sharing **12**

Parts of speech – Functional units – Tenses – Affixes; Reading comprehension: short general passages for skimming and scanning

Language Practice

Reading: Biographical essays, short stories; **Speaking:** Self-introduction, peer introduction; **Listening:** Inspiring speeches, newscasts; **Writing:** Journal writing

UNIT II Foundational Grammar and Expressing Thoughts **12**

Framing questions – Prepositions – Compound nouns – Contextual meaning; Letter writing (informal letters)

Language Practice

Reading: Travelogues; **Speaking:** Small talks, Just A Minute (JAM); **Listening:** Anecdotes, stories, podcasts; **Writing:** Fill in the blanks in short dialogues

UNIT III Functional Grammar and Social Communication **12**

Articles – Subject-verb agreement – Synonyms and antonyms – Email etiquette; Dialogue writing

Language Practice

Reading: Adverts; **Speaking:** Role play, storytelling / completion; **Listening:** Messages from social network; **Writing:** Writing messages for social network / emails

UNIT IV Structural Grammar and Visual Communication **12**

Modal verbs – Simple, complex and compound sentences – Discourse markers – Correction of errors; Interpretation of posters on social issues

Language Practice

Reading: Excerpts from literature; **Speaking:** Asking for / giving directions - Picture description; **Listening:** Talks on English and language skills; **Writing:** Reporting on events / incidents

UNIT V - Transformational Grammar and Written Communication **12**

Degrees of comparison – Reported speech – Connotations – One-word substitutes (general); Essay writing: narrative / descriptive / expository / argumentative

Language Practice

Reading: Newspaper articles, social media messages (educational contexts); **Speaking:** Group discussions (general topics); **Listening:** Formal and informal talks, Ted talks; **Writing:** Writing short stories / poems (guided)

TOTAL: 60 PERIODS

Course Outcomes:

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

- To comprehend reading passages and express themselves
- To communicate their thoughts confidently and skillfully
- To participate in activities of daily life using appropriate communicative strategies
- To be creative and critical in expressing themselves
- To write effectively and persuasively and produce different types of writing

Text Books:

1. Department of English, Anna University, English for Engineers & Technologists, Volume 2, Orient BlackSwan Private Limited, Chennai, 2022.
2. Dhanavel, SP. English and Communication Skills for Students of Science and Engineering. Orient BlackSwan Private Limited, Chennai, 2011.
3. Interact English: Lab Manual for Undergraduate Students. Orient BlackSwan Private Limited, Chennai, 2017.

Reference Books:

1. Chellammal, V. Learning to Communicate. Allied Publishing House, New Delhi, 2004.
2. Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practices. Oxford University Press, New Delhi. 2015.
3. Regional Institute of English. English for Engineers. Cambridge University Press, New Delhi. 2008.
4. Rizvi M, Ashraf. Effective Technical Communication, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2017.

Web Links:

1. www.esl-lab.com
2. www.englishgrammar.org
3. www.englishclub.com
4. www.usingenglish.com
5. www.esl.about.com
6. www.bbc.co.uk/learningenglish/
7. https://esl-bits.net/
8. https://elt.oup.com/
9. https://learnenglish.britishcouncil.org
10. https://quizizz.com/

Mapping of PO with CO

PO/CO	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	1	-	1	1	1	3	-	1
CO2	-	-	-	1	-	1	1	1	3	-	1
CO3	-	-	-	1	-	1	1	1	3	-	1
CO4	-	-	-	1	-	1	1	1	3	-	1
C05	-	-	-	1	-	1	1	1	3	-	1
AVG	-	-	-	1	-	1	1	1	3	-	1

JMA2101	MATRICES AND CALCULUS	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To equip students with the knowledge of matrices required for applications in engineering.
- To enable students understand the concepts of multivariable calculus.
- To introduce concepts of integral calculus as tools required for applications in engineering.
- To familiarize students in the concepts of vector calculus and its applications.
- To help students understand theory of analytic functions and provide knowledge of Cauchy Residue theorem and its applications.

UNIT I MATRICES **12**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Reduction of a quadratic form to canonical form – Nature of quadratic forms.

UNIT II FUNCTIONS OF SEVERAL VARIABLES **12**

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

UNIT III APPLICATIONS OF INTEGRAL CALCULUS **12**

Double integrals in Cartesian coordinates – Change of order of integration – Area enclosed by plane curves – Triple integrals – Volume of solids.

UNIT IV VECTOR CALCULUS **12**

Gradient and directional derivative – Divergence and curl – Irrotational and Solenoidal vector fields.

Green's theorem, Gauss' divergence theorem, Stoke's theorem – Verification and evaluation in simple problems.

UNIT V COMPLEX ANALYSIS **12**

Analytic functions – Cauchy-Riemann equations – Milne-Thomson rule (given real or imaginary part) – Bilinear transformation.

Residues – Application of Cauchy's Residue theorem for evaluation of real integrals (Circular contour and semi-circular contour only).

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able

- To apply matrix method in reducing quadratic form to canonical form.
- To solve simple optimization problems through differential calculus.
- To evaluate multiple integrals required for solving area and volume

problems.

- To apply vector calculus for verifying Green's, Gauss' and Stoke's theorems.
- To solve problems arising in analytic functions and solve real integrals through Cauchy Residue theorem.

TEXT BOOKS:

1. Grewal B S, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, New Delhi, 10th Edition, 2016.
3. Anuradha P and Sudhakar V, "Matrices and Calculus", Scitech Publications, 1st Edition, Chennai, 2019.

REFERENCES:

1. Anton H, Bivens I and Davis S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R K and Iyengar S R K, "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 8th Edition, 2022.
3. Srimantha Pal and Bhunia S C, "Engineering Mathematics" Oxford University Press, 1st Edition, 2015.
4. Weir, M D and Joel Hass, "Thomas Calculus", 15th Edition, Pearson India, 2022.

WEB REFERENCES:

1. https://nptel.ac.in/courses/111107112
2. https://nptel.ac.in/courses/111108157
3. https://nptel.ac.in/courses/111107108
4. https://nptel.ac.in/courses/111106141
5. https://nptel.ac.in/courses/111103070

CO-PO MAPPINGS:

PO/CO	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	1	2	3	-	-	2	-	-	1
CO2	2	1	1	2	3	-	-	2	-	-	1
CO3	2	1	1	2	3	-	-	2	-	-	1
CO4	2	1	1	2	3	-	-	2	-	-	1
C05	2	1	1	2	3	-	-	2	-	-	1
AVG	2	1	1	2	3	-	-	2	-	-	1

JPH2101	ENGINEERING PHYSICS-1	L	T	P	C
		3	0	0	3

OBJECTIVES:

To enable the students to understand the basics of Properties of Matter To
expand their knowledge about thermal properties of materials
To enhance their understanding of Photonics
To familiarize the students with the principles of quantum mechanics
To enrich their knowledge on Solid State of Materials

UNIT I - PROPERTIES OF MATTER **9**

Elasticity – Stress-strain diagram and its uses - factors affecting elastic moduli and tensile strength - Torsion pendulum: theory and experiment - Bending of beams - stress due to bending in beams - bending moment – Cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment.

UNIT II - THERMAL PHYSICS **9**

Fundamentals of thermal energy - expansion joints – Bimetallic strips - Thermal conductivity, conductions in solids, Differential equation of one dimensional heat flow – Forbes's and Lee's disc method - Conduction through compound media- Solar heater

UNIT III - LASERS AND FIBER OPTICS **9**

Spontaneous and stimulated emission-Population inversion -Einstein's A and B coefficients derivation – Laser Principle – Nd:YAG and Semiconductor lasers (homojunction & heterojunction) Principle and propagation of light in optical fiber, Derivation of Numerical aperture and Acceptance angle – Fiber optical communication (Block diagram) – Active and passive sensors – Medical endoscope.

UNIT IV - BASIC QUANTUM PHYSICS **9**

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

UNIT V - SOLID STATE PHYSICS **9**

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

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able

- To apply their knowledge in analyzing the elastic property of any materials
- To assess the thermal properties of materials
- To use modern optical fiber communication systems and tools in reallife situations
- To compute problems in Quantum Physics
- To comprehend the structure of solid materials

TEXT BOOKS:

1. Dr. Beula Shanthi John, Dr.P.Mani, "Engineering Physics-I", DhanamPublications, First Edition,2019.
2. Bhattacharya, D.K. & Poonam, T. "Engineering Physics- I". Oxford University Press, 2015.
3. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
4. S. O. Pillai, "Solid State Physics", New Age International Publications, Revised Edition.
5. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.
6. Kittel, C. ―Introduction to Solid State Physics‖. Wiley, 2005.

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning,2010.
3. Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics'.
4. Rajendran V, "Engineering Physics", Tata McGraw Hill, 2009.
5. Arumugam M, "Materials Science", Anuradha Publications, 2015.
6. Willam F Smith, "Material Science and Engineering", Tata McGraw - Hill Publications, 2008.
7. John D.Cutnell, "Cutnell and Johnson Physics", Willey Publications, 2018.

Website References

1. https://archive.nptel.ac.in/courses/115/104/115104109/
2. https://archive.nptel.ac.in/courses/105/105/105105177/
3. https://archive.nptel.ac.in/courses/102/105/102105090/
4. https://archive.nptel.ac.in/courses/115/104/115104096/
5. https://archive.nptel.ac.in/courses/108/104/108104113/

CO-PO Mapping

PO/CO	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	-	-	1	1	1	-	-	1
CO2	3	2	1	-	-	1	-	-	-	-	1
CO3	3	2	1	-	-	-	-	-	-	-	1
CO4	3	2	1	-	-	-	-	-	-	-	1
C05	3	2	1	-	-	-	-	-	-	-	1
AVG	3	2	1	-	-	1	1	1	-	-	1

JCS2121	PROGRAMMING IN C	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES

- To understand the concepts of C Language.
- To implement programs using basic constructs of C
- To develop C programs using Arrays and Strings
- To develop modular applications in C using functions and Pointers.
- To be able to use File operations and Structures in C.

UNIT I INTRODUCTION TO C PROGRAMMING **9**

Introduction to programming paradigms - Simple model of Computer - Algorithms and Flowcharts - Structure of C program - Applications of C Language - Data Types – Constants
- Enumeration - Keywords – Number System.

UNIT II OPERATOR AND EXPRESSIONS **9**

Data Input and Output statements – Operators: Arithmetic Operators, Relational Operators, Logical Operators, Increment and Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation – Decision Making and Branching – Looping statements.

UNIT III ARRAYS AND STRINGS **9**

Arrays – Initialization – Declaration – One dimensional array – Two dimensional arrays - String - String operations: length, compare, concatenate, copy – Arrays of strings - Simple programs: Sorting, Searching and Matrix operations.

UNIT IV FUNCTIONS AND POINTERS **9**

Function – Definition of function – Function Prototypes - Pass by value - Pass by reference - Recursion. Pointers: Definition- Initialization -Pointer Arithmetic- Pointers and Arrays.

UNIT V STRUCTURES, UNION AND FILES **9**

Structure - Structure Definition - Structure Declaration - Nested structures - Array of structures - Union - Storage Classes - Files - Types of file processing: Sequential access, Random access - Sequential access file - Random access file - Command line arguments.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Usage of Basic Linux commands.
2. C Programming using Simple I/O Statements, operators and expressions.
3. C Programming using decision making and looping.
4. Simple programming for one dimensional and two dimensional arrays.
5. Solving problems using Strings.

6. C Programming using user defined functions (Pass by value and Pass by reference).
7. C Programming using Recursion.
8. C Programming using Pointers and Array of Pointers.
9. C Programming using structures and union.
10. C Programming using storage classes.
11. C Programming using Files.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

- Develop efficient algorithms for solving a problem.
- Develop simple applications using various operators in C.
- Design and Implement applications using Array and Strings.
- Develop applications using Functions and Pointers.
- Design and Develop applications using Structures and Files.

TEXT BOOKS

1. Paul J. Deitel, Harvey M. Deitel, "C: How to Program", 9th Edition, Prentice Hall.
2. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
3. E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education.
4. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 16th edition 2017.

REFERENCE BOOKS

1. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
2. Kernighan B.W and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
3. Jacqueline A Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9.
4. PradipDey, ManasGhosh, "Programming in C - As per the latest AICTE syllabus", First Edition, Oxford University Press, 2018.
5. Byron S Gottfried, "Programming with C", Schaum's Outlines, Third Edition, McGraw- Hill, 2010.

WEBSITE REFERENCES

1. http://elearning.vtu.ac.in/econtent/courses/video/BS/14CPL16.html
2. https://nptel.ac.in/courses/106/105/106105171/
3. https://www.w3resource.com/c-programming-exercises/
4. https://www.programiz.com/c-programming/c-structures-pointers

5. https://www.sitesbay.com/cprogramming/c-applications

CO-PO MAPPING

PO,PSO /CO	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	2	2	-	-	3	2	2	-	2	3	1	1
CO2	3	3	3	3	-	-	3	3	3	-	3	3	1	1
CO3	3	3	3	3	-	-	3	3	3	-	3	3	1	2
CO4	3	3	3	3	-	-	3	3	3	-	3	3	2	2
C05	3	3	3	3	-	-	3	3	3	-	3	3	1	-
AVG	**2.8**	**2.8**	**2.8**	**2.8**	**-**	**-**	**3**	**2.8**	**2.8**	**-**	**2.8**	**3**	**1.2**	**1.2**

JCY2101	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To inculcate the significance of water quality parameters and water treatment techniques.
- To acquaint the properties and applications of industrial polymers.
- To acquire knowledge in corrosion of material and its prevention.
- To import knowledge over energy conversion methodsand of energy storage devices.
- To acquire knowledge on the basics of nanomaterials and its preparatory methods.

UNIT 1 WATER AND ITS TREATMENT 9

Water quality parameters (pH, TDS, DO, BOD, COD) - Hardness - Types and estimation(EDTA method). Alkalinity – Types and estimation. Water softening methods- Limesoda Process (Cold and Hot methods) - Zeolite Process - Ion exchange process. Desalination of brackish water –reverse osmosis. Municipal water treatment- Primary treatment and Disinfection (UV, Ozonation, Chlorination) - Break point chlorination.

UNIT 2:POLYMER AND COMPOSITES 9

Classification of polymers – Functionality – Types of polymerisation (addition & condensation) – Mechanism of addition polymerisation (free radical, cationic, anionic) - Degree of polymerization - Thermoplastic and Thermosetting. Bio degradable polymer- Polylactic acid, Polyvinyl acetate- Preparation – Properties – applications. Conducting polymer – types – Mechanism – application - Polymer composites – types – properties and application.

UNIT 3 CORROSION AND ITSPREVENTION 9

Corrosion - chemical, electrochemical corrosion, galvanic corrosion and differential aeration corrosion. Factors influencing the rate of corrosion. Corrosion control - material selection, design aspects, cathodic protection, Corrosion inhibitors - Electroplating (copper) and electroless plating (nickel) – Organic coating (Paints – Constituents and function).

UNIT 4 ENERGY SOURCES AND STORAGE DEVICES 9

Nuclear energy- critical masslight water nuclear power plant and Breeder reactor. Principle, working and applications of solar energy and wind energy. Primary battery (dry cell and alkaline battery). Secondary

battery (lead acid, nickel-cadmium and lithium-ion-battery). H_2-O_2 fuel cell.

UNIT 5 NANOCHEMISTRY 9

Distinction between molecules, nanomaterials and bulk materials - Size-dependent properties - Types of nanomaterials - Nanoparticle, nanocluster, nanorod, nanowire and nanotube. Synthesis of nanomaterials - solvothermal, laser ablation, chemical vapour deposition and electrochemical deposition - General applications of nanomaterial.

TOTAL: 45 PERIODS

COURSE OUTCOMES

- To identify water quality and propose suitable methods to treat water.
- To analyze the compatibility of polymeric materials for biomedical and electronic applications.
- To recognize the nature of corrosive environment and implement preventive methods of corrosion.
- To design different forms of energy sources for suitable applications.
- To identify suitable synthetic method of nanomaterialsfor specific applications.

TEXT BOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008. S.S. Dara, "A Text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.
3. A.Ravikrishnan, "Engineering Chemistry" Sri Krishna Hitech Publishing CompanyPvt.Ltd., 22nd edition, 2023

REFERENCES:

1. ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
2. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
3. B.R.Puri, L.R.Sharma, Madan S.Pathana, Principle of physical chemistry, 47th edition, Vishal

publishing Co, 2017.

4. S. Ananda Kumar (Editor)"Eco-friendly Nano-hybrid materials for Advanced Engineering Applications" CRC Press, USA. (2016)
5. O.G. Palanna, “Engineering Chemistry” McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
6. Dara S.S, Umare S.S, “Engineering Chemistry”, S. Chand & Company Ltd., New Delhi 2013.

Website reference:

1. https://nptel.ac.in/courses/113/101/113101098/
2. https://nptel.ac.in/courses/113/106/113106093/

CO-PO Mapping

PO/CO	Program Outcomes										
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	1	1	2	3	1	3	2	1	1	-	1
CO2	1	1	1	2	1	3	1	-	1	-	1
CO3	1	1	2	2	1	2	-	-	1	-	1
CO4	1	1	2	2	1	2	1	1	1	-	1
C05	1	1	1	2	1	-	-	-	1	-	1
AVG	**1**	**1**	**1.6**	**2.2**	**1**	**2.5**	**1.33**	**1**	**1**	**-**	**1**

JGE2101	BASIC ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide students with illustrations about mechanical engineering to satisfy societal needs
- To provide them knowledge on refrigeration, air-conditioning and power plants
- To help students acquire knowledge in the basics of surveying and building materials
- To impart knowledge on the electric circuits and working principles of Electrical Machines.
- To provide the knowledge on the Principles and characteristics of various electronic devices and measuring instruments.

UNIT I – BASICS OF MECHANICAL ENGINEERING 9

Introduction to the concepts of Mechanization and Automation, Robotics - Manufacturing methods - casting, machining, forming operations. Introduction to IC Engine - Working principles of four stroke petrol and diesel engines. Electric vehicle Technology- Layout, components and control.

UNIT II–REFRIGERATION, AIR CONDITIONING SYSTEM AND POWER PLANT 9

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner. Classification of power plant and working principle of Thermal and Hydel power plant.

UNIT III - BASICS OF CIVIL ENGINEERING 9

Introduction to Civil Engineering, Types of buildings, Components of a residential building, Building Materials. Surveying: Objects – Classification – Principles – Measurements of Distances and angles. Rain Water Harvesting, Solid Waste Management

UNIT IV ELECTRIC CIRCUITS AND ELECTRICAL MACHINES 9

Basic circuit components - Ohms Law - Kirchhoff's Law – Introduction to AC circuits - Power and power factor –Construction, Principle of operation and characteristics of DC machines ,Transformers and Induction machines.

UNIT V ELECTRONIC DEVICES & INSTRUMENTATION 9

Types of Materials - N type and P type materials - Principle of operation and Characteristics: PN Junction diode , Zener Diode, BJT, MOSFET. Elements of generalized measurement system -– Operating forces– Principle of operation of moving coil and moving iron instruments -Errors in measurement - Standards of Measurement.

COURSE OUTCOMES: At the end of the course, the student will be able

- To be acquainted with the concepts in mechanical engineering and vehicle concept.
- To understand the fundamentals of refrigeration, air-conditioning and power plant.
- To summarise the surveying, planning of building, infrastructure and building materials.
- Apply the basic concepts of electric circuits and working principles of electrical machines.
- Gain knowledge on the basics of electronics and choose appropriate instruments for electrical measurement for a specific application.

TEXT BOOKS:

1. G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education; First edition, 2018.

2. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2018.

3. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, Mc Graw Hill, 2015.

4. D P Kothari and I.J Nagarath, , “ Electrical Machines - Basic Electrical and Electronics Engineering” , Third Reprint , Mc Graw Hill Education (India) Private Limited, , 2016.

5. A.K.Sawhney, “ A Course in Electrical & Electronic Measurements & Instrumentation” , Dhanpat Rai and Co, 2010.

6. S Salivahanan , N Suresh Kumar, "Electronic Devices And Circuits ", fifth Edition, Mc Graw Hill, 2022.

REFERENCE BOOKS:

1. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co.(P) Ltd, 2013.

2. Ali Emadi, "Advanced Electric Drive Vehicles", CRC Press, First edition 2017.

3. Thereja. B.L., " Fundament also f Electrical Engineering and Electronics" , S. Chand &Co.Ltd., 2008.
4. H.S.Kalsi, "Electronic Instrumentation " , Tata Mc Graw-Hill, 2010.

WEB SITE REFERENCE:

1. **https://archive.nptel.ac.in/courses/112/103/112103262/**
2. **https://archive.nptel.ac.in/courses/112/105/112105129/**
3. **https://archive.nptel.ac.in/courses/105/106/105106201/**
4. **https://archive.nptel.ac.in/courses/105/106/105106201/**
5. **https://youtu.be/LPcQYXjPdIQ?list=PLp6ek2hDcoNCANsWM2mw3qi0387BhfLyV**
6. **https://www.youtube.com/playlist?list=PLMYtBmvT7X7QaLu0b0Jn1QQD4EOuT CA**
7. **https://youtu.be/5ZNeDxfgYAEhttps://youtu.be/36j6hCtL0E**

CO-PO MAPPING

PO/CO	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	1	1	1	1	-	-	-	-	-	-
CO2	1	1	1	1	1	-	-	-	-	-	-
CO3	1	1	1	1	1	-	-	-	-	-	-
CO4	1	1	1	1	1	-	-	-	-	-	-
C05	1	1	1	1	1	-	-	-	-	-	-
AVG	1	1	1	1	1	-	-	-	-	-	-

JGE2111	BASIC ENGINEERING LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES

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

GROUP A

I CIVIL ENGINEERING

PRACTICE BUILDINGS:

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

PLUMBING WORKS:

a) Study of pipe line joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.

b) Hands-on-exercise: Basic pipe connections - Mixed pipe material connection Pipe connections with different joining components.

II MECHANICAL

ENGINEERING PRACTICE

WELDING AND DRILLING

(a) Preparation of but joints, lap joints and T-joints by Shielded metal arc welding.

(b) Drilling Practice

TWO WHEELER DISMANTLING AND DIAGNOSIS

a. Brake Adjustment and Replacing
b. Chain Adjustment and lubrication
c. Air Filter and Spark plug Cleaning
d. Engine oil Replacement and Carburetor Tuning

STUDY AND DEMONSTRATION ON:

(a) Study of Lathe Machine, tools and components, Safety aspects

(b) Study of Sheet Metal work, tools and components, Safety aspects

GROUP B

I ELECTRICAL ENGINEERING PRACTICE

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

II ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipment's - 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.

COURSE OUTCOMES:

At the end of the course, students will be able

- To fabricate carpentry components and pipe connections including plumbing works.
- To weld various joints in steel plates using arc welding work.
- To understood various mechanism involved in automobiles.
- To illustrate on lathe machine and sheet metal work.
- Carry out basic home electrical works and appliances.
- Measure the electrical quantities.
- Elaborate on the components, gates, soldering practices.

WEBSITE REFERERENCE:

1. https://nptel.ac.in/courses/107106088
2. www.vikaspublishing.com/engineering-practices-lab
   https://archieve.org/mechanicalengineeeringworkshoplaboratory

CO – PO MAPPING

PO/CO	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	1	1	1	1	-	-	-	-	-	-
CO2	1	1	1	1	1	-	-	-	-	-	-
CO3	1	1	1	1	1	-	-	-	-	-	-
CO4	1	1	1	1	1	-	-	-	-	-	-
C05	1	1	1	1	1	-	-	-	-	-	-
AVG	1	1	1	1	1	-	-	-	-	-	-

HERITAGE OF TAMILS

L	T	P	C
1	0	0	1

UNIT I LANGUAGE AND LITERATURE **3**

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

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

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

UNIT III FOLK AND MARTIAL ARTS **3**

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

UNIT IV THINAI CONCEPT OF TAMILS **3**

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

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

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

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

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

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தமிழர் மரபு

L T P C
1 0 0 1

அலகு I **மொழி மற்றும் இலக்கியம்**: **3**

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II **மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை**: **3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III **நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்**: **3**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV **தமிழர்களின் திணைக் கோட்பாடுகள்**: **3**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால

நகரங்களும் Fளற முகங்களும் – சங்ககொலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி –

கடல்கடந்த நொடுகளில் கசொழர்களின் தவற்றி.

அலகு V இந்திய கதசிய இயக்கம் மற்றும் இந்திய பைபொட்டிற்குத் தமிழர்களின பஙகளிபபு: **3**

இந்திய விடுதளலப்கபொரில் தமிழர்களின் பங்கு – இந்தியொவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பொட்டின் தொக்கம் – சுயமரியொளத இயக்கம் – இந்திய மருத்Fவத்தில், சித்த மருத்Fவத்தின் பங்கு – கல்தவட்டுகள், ளகதயழுத்Fப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலொறு.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலொறு – மக்களும் பண்பொடும் – கக.கக. பிள்ளள (தவளியீடு: தமிழ்நொடு பொடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முளனவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – ளவளக நதிக்களரயில் சங்ககொல நகர நொகரிகம் (ததொல்லியல் Fளற தவளியீடு)
4. தபொருளந – ஆற்றங்களர நொகரிகம். (ததொல்லியல் Fளற தவளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

	Program Outcomes										
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	2	-	-	-	3	3	2	2	-	2
CO2	2	2	-	-	-	3	3	2	2	-	2
CO3	2	2	-	-	-	3	3	3	2	-	2
CO4	2	2	-	-	-	3	3	3	3	-	2
CO5	2	2	-	-	-	3	3	3	3	-	3
AVG	**2**	**2**	**0**	**0**	**0**	**3**	**3**	**2.6**	**2.4**	**0**	**2.2**

JPC2111	ENGINEERING PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

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

LIST OF EXPERIMENTS

1. Determination of Young's Modulus for the given Uniform bar by Uniform Bending method
2. Determination of Moment of Inertia of the given Circular disc and Rigidity Modulus of thin metal wire using Torsional Pendulum
3. Determination of Planck' constant using different color filters
4. Determine the Wavelength of Mercury Spectrum using Spectrometer.
5. Determine the Thermal conductivity of a Bad conductor using Lee's Disc
6. Determination of Wavelength of the Diode Laser and hence determine the Size of the coated powder particle
7. Estimation of Alkalinity of Water Sample.
8. Estimation of Total, Temporary and Permanent Hardness of Water by EDTA method.
9. Determination of Molecular Weight of a Polymer by Viscosity Average method
10. Estimation of Amount of an Acid by Conductometric Titration
11. Estimation of Ferrous ions by Potentiometric Titration
12. Estimation of Amount of Hydrochloric Acid using p H Meter.

TOTAL: 30 PERIODS

OUTCOMES:

Students will be able

1. To evaluate elasticity of a linear body.
2. To discriminate different wavelengths of optical spectrum and the behavior of particles and waves at the atomic scale.
3. To identify the materials which are utilized for thermal insulation.
4. To estimate and analyse the amount of hardness and alkalinity in water for domestic consumption.
5. To apply the principles of conductivity and viscosity of substances in aqueous solutions for quantitative analysis using analytical instruments.

REFERENCES:

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

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2. https://vlab.amrita.edu/index.php?sub=1&brch=280&sim=1518&cnt=1
3. https://vlab.amrita.edu/?sub=1&brch=281&sim=851&cnt=2
4. http://sites.iiserpune.ac.in/~bhasbapat/phy221_files/Lee%27s%20Method.pdf
5. https://edisciplinas.usp.br/pluginfile.php/4212400/mod_resource/content/0/Dunniv ant%2021.pdf
6. https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_A_Molecular _Approach_(Tro)/17%3A_Aqueous_Ionic_Equilibrium/17.04%3A_Titrations_and_pH _Curves

CO-PO Mapping

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

SEMESTER 2

JHS2221	ENGLISH FOR SCIENCE AND TECHNOLOGY (COMMON TO ALL BRANCHES)	L T P C 2 0 2 3

COURSE OBJECTIVES:

- To enable the students of Engineering to comprehend technical texts
- To improve their technical writing skill for better transmission of messages
- To help them acquire language skills required in academic and workplace contexts
- To facilitate them to hone their skills to prepare effective reports
- To equip them with effective communicative skills to meet their future needs

UNIT I COMMUNICATING TECHNICAL INFORMATION 12

Definitions – Conditional clauses – Technical vocabulary; Comprehension of short technical passage and note-making

Language Practice
Reading: Short technical texts / excerpts; **Speaking:** Interviewing on social or global issues; **Listening:** Talks on science, engineering, medicine / interviews of achievers; **Writing:** Sentence Completion, gap filling, verbal aptitude: sentence correction

UNIT II GRAPHICALANALYSIS AND INTERPRETATION 12

Purpose statements – Numerical adjectives – Collocation; Process Description - Interpretation of Graphs and Charts

Language Practice
Reading: Emails, invitations; **Speaking:** Describing charts and tables; **Listening:** Process descriptions; **Writing:** Paraphrasing – Developing outlines

UNIT II PERSUASIVE WRITING & INFORMATION DISSEMINATION 12

Cause and effect – Voice (active, personal and impersonal passive) – Words used as nouns and verbs; Instructions – Recommendations

Language Practice
Reading: User manuals, gadget reviews; **Speaking**: Presentation on social / technical topics; **Listening:** Announcements, instructions; **Writing:** Instructions – Recommendations

UNIT IV REPORT WRITING AND GROUP INTERACTION 12

Determiners – Editing - Initialisms and acronyms; Report writing: survey, accident – Minutes of meeting

Language Practice
Reading: Notices, reviews; **Speaking:** Group discussions (technical topics) and debates; **Listening:** IELTS and TOEFL; **Writing:** Writing profiles of personalities and industries

UNIT V CAREER AND BUSINESS COMMUNICATION 12

Adverbials – Misspelt words – Formal and informal English; Letter writing – Job application and resume by mail and email – Inviting and sending quotations and placing orders

Language Practice
Reading: Email invitations to job interviews; **Speaking:** About future / career; **Listening:** Talks by entrepreneurs; **Writing:** Career objective, short-term and long-term goals, tagline

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- To read and understand different types of technical texts
- To write procedural texts logically and sequentially in English
- To communicate effectively in academic and professional contexts
- To prepare effective reports and participate in group activities
- To use language precisely and accurately in business relations

TEXT BOOKS:

1. Department of English, Anna University, English for Engineers & Technologists, Volume 2, Orient BlackSwan Private Limited, Chennai, 2022.
2. Dhanavel, SP. English and Communication Skills for Students of Science and Engineering. Orient BlackSwan Private Limited, Chennai, 2011.
3. Interact English: Lab Manual for Undergraduate Students. Orient BlackSwan Private Limited, Chennai, 2017.

REFERENCE BOOKS:

1. Chellammal, V. Learning to Communicate. Allied Publishing House, New Delhi, 2004.
2. Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practices. Oxford University Press, New Delhi. 2015.
3. Regional Institute of English. English for Engineers. Cambridge University Press, New Delhi. 2008.
4. Rizvi M, Ashraf. Effective Technical Communication, Tata McGraw-Hill Publishing Company

Limited, New Delhi, 2017.

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- www.esl-lab.com
- www.englishgrammar.org
- www.englishclub.com
- www.usingenglish.com
- www.esl.about.com
- www.bbc.co.uk/learningenglish/
- https://esl-bits.net/
- https://elt.oup.com/
- https://learnenglish.britishcouncil.org
- https://quizizz.com/

Mapping of CO with PO

PO/CO	Program Outcomes										
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	-	-	-	1	-	1	1	1	3	-	1
CO2	-	-	-	1	-	1	1	1	3	-	1
CO3	-	-	-	1	-	1	1	1	3	-	1
CO4	-	-	-	1	-	1	1	1	3	-	1
C05	-	-	-	1	-	1	1	1	3	-	1
AVG	**-**	**-**	**-**	**1**	**-**	**1**	**1**	**1**	**3**	**-**	**1**

JGE2202	TAMILS AND TECHNOLOGY	L T P C 1 0 0 1

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

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

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

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

UNIT III MANUFACTURING TECHNOLOGY 3

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

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

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

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

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

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL — (in print)
2. Social Life of the Tamils - The Classical Period (Dr.S.SingaraveIu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Publish by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.VaIarmathi) (Published by:International Institute of Tamil Studies.)
5. Keeladi - _Sangam City C ivilization on the banks of river Vaigai‘ (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
8. Journey ofCivilization Industo Vaigai (R.BaIakrishnan) (Published by: RMRL) — Reference Book.

Mapping of CO with PO

	Program Outcomes										
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	2	-	-	2	3	3	2	2	-	2
CO2	2	2	-	-	2	3	3	3	2	-	2
CO3	2	2	-	-	2	3	3	3	2	-	2
CO4	2	2	-	-	2	3	3	3	2	-	2
CO5	2	2	-	-	3	3	3	3	3	-	3
AVG	**2**	**2**	**0**	**0**	**2.2**	**3**	**3**	**2.8**	**2.2**	**0**	**2.2**

JMA2201	STATISTICS FOR ENGINEERS	L T P C 2 2 0 3

COURSE OBJECTIVES:

- To provide basic concepts of discrete, continuous random variables and moments.
- To acquaint students in the concepts and problems of standard distributions.
- To familiarize students in problems of correlation and regression.
- To provide students knowledge of testing of hypothesis and its applications.
- To introduce Design of Experiments for practical problem solving.

UNIT I RANDOM VARIABLES 9+3

Discrete and continuous random variables – Moments – Moment generating functions

UNIT II STANDARD DISTRIBUTIONS 9+3

Discrete distributions: Binomial distribution – Poisson distribution – Geometric distribution
Continuous distributions: Uniform distribution – Exponential distribution – Normal distribution

UNIT III STATISTICAL CORRELATION AND REGRESSION 9+3

Correlation coefficient – Rank correlation – Correlation for bivariate data – Regression coefficients – Lines of regression

UNIT IV TESTING OF HYPOTHESIS 9+3

Normal tests for mean and difference of means – t tests for mean and difference of means – Chi-square test for goodness of fit – Chi-square test for independence of attributes

UNIT V DESIGN OF EXPERIMENTS 9+3

ANOVA classification – Completely Randomized Design – Randomized Block Design – Latin Square Design

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- To solve problems of discrete and continuous type random variables for finding mean and variance.
- To apply standard probability distributions in solving real time problems.
- To solve correlation problems and to use regression analysis for predicting values of variables. · To apply hypothesis testing for making statistical inferences in large and small sample real life problems.
- To compare and contrast various design of experiments methods and use them in problems.

TEXT BOOKS:

1. Gupta S C and Kapoor V K, ―Fundamentals of Mathematical Statistics‖, Sultan Chand and Sons, 12th Edition, 2020.
2. Ibe O C, "Fundamentals of Applied Probability and Random Processes", Elsevier, 2nd Edition, 2014.
3. Johnson R A, ―Miller & Freund‘s Probability and Statistics for Engineers‖, Pearson Education, Asia, 9th Edition, 2018.

REFERENCES:

1. Hwei Hsu, "Schaum_s Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 3rd Edition 2014.
2. Trivedi K S, "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, 2nd Edition, 2016.

WEB REFERENCES:

- https://nptel.ac.in/courses/117105085
- https://nptel.ac.in/courses/111105041
- https://nptel.ac.in/courses/102101056
- https://nptel.ac.in/courses/102106051

Mapping of CO with PO

	Program Outcomes										
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	1	1	2	3	-	-	2	1	-	1
CO2	2	1	1	2	3	-	-	2	1	-	1

CO3	2	1	1	2	3	-	-	2	1	-	1
CO4	2	1	1	2	3	-	-	2	1	-	1
CO5	2	1	1	2	3	-	-	2	1	-	1
AVG	**2**	**1**	**1**	**2**	**3**	**-**	**-**	**2**	**1**	**-**	**1**

JPH2201	**ENGINEERING PHYSICS – 2**	**L T P C** **3 0 0 3**

COURSE OBJECTIVES:

- To enlighten the students on the principles of semiconductor materials and Electron transport properties
- To acquaint them with the applications of magnetic materials
- To impart knowledge on superconducting materials
- To help them acquire a basic understanding of dielectric materials
- To introduce the basic principles in nano electronic devices

UNIT I SEMICONDUCTING MATERIALS 9

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors - Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Hall Effect- Hall Coefficient in N-type and P type semiconductors.

UNIT II MAGNETIC MATERIALS 9

Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism Domain theory – Hysteresis – Soft and Hard magnetic materials– Ferrites and its applications – Memory devices-ROMs and RAMs(R/W)

UNIT III SUPERCONDUCTING MATERIALS 9

Properties of Superconductors – Josephson junction - Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) – High Tc superconductors - Applications – SQUIDS. Cryotron and Maglev train.

UNIT IV DIELECTRIC MATERIALS 9

Polarization mechanisms in dielectrics– dielectric loss – internal field – Clausius-Mosotti relation-dielectric loss and dielectric breakdown – high-k dielectrics – Types of dielectrics – Applications in transformers and capacitors.

UNIT V NANOELECTRONIC MATERIALS 9

Size dependence of Fermi energy– quantum confinement – quantum structures - Density of states in quantum well, quantum wire and quantum dot structures - Single electron phenomena and Single Electron Transistor.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- To be familiar with the functioning of semiconductors
- To assess the magnetic properties of materials
- To make use of superconductors in real life situations
- To understand the nuances of advanced solid state physics
- To recognize the uses of Nano electronic materials

TEXT BOOKS:

1. Dr.P.Mani, ―Engineering Physics – II‖, DhanamPublications, First Edition,2019.
2. Dr.G.Senthil Kumar ―Engineering Physics – II‖, VRB Publications, Revised Edition 2018.
3. Gaur, R.K. & Gupta, S.L. ―Engineering Physics‖. Dhanpat Rai Publishers, 2012
4. S.O.Pillai, ―Solid State Physics‖, New Age International Publications, Revised Edition.
5. Bhattacharya, D.K. & Poonam, T. ―Engineering Physics‖. Oxford University Press,2015.
6. Pandey, B.K. & Chaturvedi, S. ―Engineering Physics‖. Cengage Learning India,2012.

REFERENCES:

1. R. Murugeshan, ―Modern Physics‖, Sultan chand & sons, 2021. 2.Halliday,
2. D., Resnick, R. & Walker, J. ―Principles of Physics‖. Wiley, 2020.
3. Serway, R.A. & Jewett, J.W. ―Physics for Scientists and Engineers‖. Cengage Learning,2017.
4. Tipler, P.A. & Mosca, G. ―Physicsfor Scientists and Engineers with ModernPhysics‘.

5. Willam F Smith, ―Material Science and Engineering‖, Tata McGraw - HillPublications, 4th Edition.

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CO-PO Mapping

PO/CO	Program Outcomes										
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	1	-	-	1	-	1	-	-	1
CO2	3	2	1	-	-	2	-	-	-	-	1
CO3	3	2	1	-	-	-	-	-	-	-	1
CO4	3	2	1	-	-	-	-	-	-	-	1
C05	3	21	1	-	-	1	-	-	-	-	1
AVG	**3**	**2**	**1**	**-**	**-**	**1.33**	**-**	**1**	**-**	**-**	**1**

JCY2201	**ENVIRONMENTAL SCIENCES AND SUSTAINABILITY**	**L T P C** **2 0 0 2**

COURSE OBJECTIVES:

- To study the inter-relationship between living organisms and environment.
- To learn causes, effects and preventive methods of environmental pollution.
- To import knowledge on the needs of renewable and new energy sources.
- To acquire broad knowledge on sustainable development and its values on society.
- To expertise sustainability practices of sustainable habitat, sustainable energy and Green engineering.

UNIT 1 ENVIRONMENT AND BIODIVERSITY 6

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Biodiversity – Types and values. India as a mega diversity nation – hot-spots of biodiversity - endangered and endemic species of India - threats to biodiversity – conservation of biodiversity - In-situ and ex-situ - Field visit

UNIT 2 ENVIRONMENTAL POLLUTION 6

Causes, Effects and preventive measures of water, air, soil and thermal pollution. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection acts - Field visit

UNIT 3 RENEWABLE SOURCES OFENERGY 6

Energy management and conservation – Need of new energy sources - Applications of Hydrogen energy - Ocean energy resources - Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT 4 SUSTAINABLE DEVELOPMENT 6

Sustainability- concept, needs and challenges- economic and social aspects of sustainability - millennium development goals and protocols- Sustainable Development Goals - targets, indicators and intervention areas. Climate change - Global, Regional and local environmental issues and possible solutions - case studies. Concept of carbon credit and carbon footprint.

UNIT 5 SUSTAINABILITY PRACTICES 6

Zero waste and 3R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energyefficiency and sustainable transports. Sustainable energy: Energy Cycles - carbon cycle, emission and sequestration. Green Engineering: Sustainable urbanization - Socio-economic and technological change.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

- Recognize the function of ecosystem and contribute to conservation of biodiversity.
- Identify the causes and effects of environmental pollution and practice the preventive measures.
- Recognize various types of new renewable sources of energy and their potential applications.
- Apply the sustainable development goals for technological advancement and societal development.
- Adopt sustainability practices for energy efficiency and sustainable urbanization.

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik‘s ―Perspectives in Environmental Studies‖, 6th Edition,New Age International Publishers ,2018.
2. Benny Joseph, _Environmental Science and Engineering‘, Tata McGraw-Hill, New Delhi,2016.
3. Sanjay K Sharma, Green Corrosion Chemistry and Engineering: Opportunities and challenges, Wiley-VCH Verlag GmbH & Co. KGaA, Germany (2011)
4. Gilbert M.Masters, _Introduction to Environmental Engineering and Science‘, 2nd edition,Pearson Education, 2004.

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3. Dharmendra S. Sengar, _Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, _Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5. Erach Bharucha ―Textbook of Environmental Studiesfor Undergraduate Courses‖ Orient Blackswan Pvt. Ltd. 2013.

Related Links

1. https://www.hzu.edu.in/bed/E%20V%20S.pdf
2. https://catalogimages.wiley.com/images/db/pdf/9781119582052.excerpt.pdf
3. https://ncert.nic.in/textbook/pdf/keec109.pdf

CO-PO Mapping

PO/CO	Program Outcomes										
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	1	-	-	1	-	1	-	-	1
CO2	1	1	2	-	-	3	2	-	1	-	1
CO3	1	1	1	-	-	3	2	-	1	-	1
CO4	1	1	2	-	-	3	2	-	1	-	1
C05	1	1	2	-	-	3	2	-	1	-	1
AVG	1	1	1	-	-	3	2	-	1	-	1

JGE2221	ENGINEERING GRAPHICS	L T P C 2 0 2 3

COURSE OBJECTIVES:

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

UNIT I CONIC SECTIONS AND SPECIAL CURVES 12

Conics - Construction of ellipse, Parabola and hyperbola by eccentricity method, Rectangle method- Drawing of tangents and normal to the above curves. Special curves: Cycloid-Involute-Drawing of tangents and normal to the curves.

UNIT II PROJECTION PLANE SURFACES & ORTHOGRAPHIC PROJECTIONS 12

Introduction to Points, Lines (Only theory not for Exam Practice) – Projection of Plane Surfaces-Projection of polygonal surface and circular lamina inclined to both reference planes.
Representation of Three Dimensional objects - General principles of orthographic projection – Need for importance of multiple views and their placement - First angle projection - layout views - Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT III- PROJECTION OF SOLIDS **12**

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

UNIT IV DEVELOPMENT OF SURFACES

12

Introduction to Section of Solids (Only theory not for Exam Practice) Development of lateral surfaces of simple and truncated solids - Prisms, pyramids, cylinders and cones

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS **12**

Principles of isometric projection – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Conversion of orthographic views into Isometric Drawing (Simple Objects) - Perspective projection of prisms and pyramids by visual ray method.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- To be familiar with the fundamental and standards of engineering graphics.
- To perform free hand sketching of basic geometrical constructions and multiple views of object.
- To project orthographic projections of lines and plane surfaces.
- To draw projection of solids and development of surfaces.
- To interpret isometric and perspective view of objects.

TEXT BOOKS:

1. Natrajan K.V., ―A text book of Engineering Graphics‖, Dhanalakshmi Publishers, Chennai, 2018.

2. Venugopal K and Prabhu Raja V., ―Engineering Graphics‖, New Age International (P) Limited,2016.

REFERENCES:

1. Bhatt N.D. and Panchal V.M., ―Engineering Drawing‖, Charotar Publishing House, 53rdEdition, 2019. 2. Gopalakrishna K.R., ―Engineering Drawing‖ (Vol. I & II combined), Subhas Stores, Bangalore,2017..

3. Shah M.B and Rana B.C., ―Engineering Drawing‖, Pearson, 2nd Edition, 2009.

4. Publication of Bureau of Indian Standards(BIS):

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

Website References:

1. www.pdfdrive.com/engineering drawing-books.html
2. https://freevideolectures.com
3. https://nptel.ac.in/courses

CO-PO MAPPINGS:

	Program Outcomes										
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	1	1	1	1	-	-	-	-	-	-	-
CO2	1	1	1	1	-	-	-	-	-	-	-
CO3	1	1	1	1	-	-	-	-	-	-	-
CO4	1	1	1	1	-	-	-	-	-	-	-
CO5	1	1	1	1	-	-	-	-	-	-	-
AVG	1	1	1	1	-	-	-	-	-	-	-

JCS2201	**PYTHON PROGRAMMING**	**L T P C** **3 0 0 3**

COURSE OBJECTIVES

- To provide a basics Python programming concept
- To understand the control structures and string concepts
- To learn different Python collections
- To acquire knowledge on functions, modules and packages
- To comprehend the file and exception handling concepts and GUI

UNIT 1 INTRODUCTION TO PYTHON PROGRAMMING 9

History of Python, Features, Installing Python, Demo Of Interactive and script mode, Identifiers, Reserved Words, Indentation, Comments, Variables, Data Types and its Conversion, Operators and its precedence, Expressions, Input and Print functions. Command-Line arguments.

UNIT 2 CONTROL STRUCTURES AND STRINGS 9

Selective statements – if, if-else, nested if, if –elif ladder statements. Iterative statements - while, for, Nested loops, else in loops, break, continue and pass statement. Strings: Formatting, Comparison, Slicing, Splitting, Stripping, Negative indices, String functions.

UNIT 3 COLLECTIONS 9

List: Create, Access, Slicing, Negative Indices, List Methods, and comprehensions. Tuples: Create, Indexing and Slicing, Operations on tuples. Dictionary: Create, add, and replace values, operations on dictionaries. Sets: Create and operations on set.

UNIT 4 FUNCTIONS, MODULES AND PACKAGES 9

Functions: Types, parameters, arguments: positional arguments, keyword arguments, parameters with default values, functions with arbitrary arguments, Scope of variables: Local and global scope, Recursion and Lambda functions. Date and Time Methods. Modules and Packages.

UNIT 5 FILES, EXCEPTIONS, GRAPHICS AND GUI 9

Files: Open, Read, Write, Append and Close. Tell and seek methods. Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, Exception Chaining, User defined Exceptions, Defining Clean-Up actions. Simple graphics: simple 2D drawing shapes and coloring. GUI using Tkinter.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- To write basic python programs
- To develop program using control structure and simple string processing.

To create a code for different collection types and can differentiate them and to compose the code for functions, modules and packages.

- To learn how to handle file and exception.
- To design an user interface using Tkinter.

TEXTBOOKS

1. Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming 2nd Edition, No Starch Press, 2019.
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python Shroff O‘Reilly Publishers,2016 (http://greenteapress.com/wp/thinkpython/)
3. Alan D. Moore, Python GUI Programming with Tkinter - Develop Responsive and Powerful GUI Applications with Tkinter, Packt Publishing, First Edition, 2018.

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1. John V Guttag, ―Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Interdisciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, ―Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.,

2015.
4. Kenneth A. Lambert, ―Fundamentals of Python: First Programs‖, CENGAGE Learning, 2012.
5. Paul Gries, Jennifer Campbell and Jason Montojo, ―Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic Programmers, LLC, 2013.

WEB SITE REFERENCES

- https://www.w3schools.com/python/python_reference.asp
- https://www.pythonforbeginners.com/basics/python-websites-tutorials
- https://www.programiz.com/python-programming/methods/built-in/list
- https://www.geeksforgeeks.org/python-convert-dictionary-to-list-of-tuples/
- https://www.javatpoint.com/python-exception-handling

CO-PO Mapping

PO,PSO /CO	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	-	-	-	-	-	-	-	-	3	1	-
CO2	3	3	3	-	-	-	-	-	-	-	-	3	2	1
CO3	3	3	3	-	-	-	-	-	-	-	-	3	2	2
CO4	3	3	3	-	-	-	-	-	-	-	-	3	1	2
C05	3	3	3	-	-	-	-	-	-	-	-	3	2	2
AVG	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**1.6**	**1.8**

JPC2211	**ENGINEERING PHYSICS AND ENVIRONMENTAL SCIENCE LABORATORY**	**L T P C** **0 0 2 1**

OBJECTIVES:

- To provide students the first hand experience of verifying various concepts learnt intheory courses.

LIST OF EXPERIMENTS:

1. Determination of Numerical Aperture of the giver Fiber and Estimate the Linearityof the Laser Source.
2. Determine the Dispersive power of a given Prism using Spectrometer
3. Determination of Thickness of the given thin Wire by forming Interference fringesusing air-wedge setup
4. Analysis of I-V Characterization of Solar cell
5. Determination of Energy gap of the given Semiconductor Diode by

plotting thegraph between current and temperature.

6. Determination of Young's Modulus for the given bar by Nonuniform Bending method.
7. Determination of Dissolved oxygen by Winkler's method
8. Estimation of amount of chloride in water.
9. Estimation of the amount of mixture of acids in water
10. Estimation of Iron content in water by Spectrophotometeric method
11. Estimation of acetic acid adsorbed on charcoal.
12. Determination of per capita energy consumption and carbon footprint.

TOTAL: 30 PERIODS

COURSE OUTCOMES

At the end of the course, the students will able

- To lucid the effective communication system and to scrutiny the required wavelength.
- To quantify micro sized linear objects and to ascertain band gap of semiconducting materials.
- To configure solar power system as close as possible to its maximum peak power point.
- To quantify the degree of pollution of water samples by measuring water qualityparameters.
- To carry out energy audit and practice energy conservation methods.

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1. D. Bailey and E. Wright, Practical Fiber Optics, Newnes publications, 2003.
2. Fretter W.B. -Introduction to Experimental Physics UCL Press, 2005
3. Gurdeep R.Chatwal, Sham K. Anand, Instrumental methods of chemicalanalysis, Himalaya Publishing House, 2007.

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2. https://anilpangantiwar.tripod.com/expt10.htm
3. https://praxilabs.com/en/3d-simulations/i-v-characteristics-of-solar-cell-I-physics-simulation 4. https://vlab.amrita.edu/?sub=2&brch=193&sim=575&cnt=1
5. https://jigyasa-csir.in/neeri/n32-t1-a2/

CO-PO Mapping

PO/CO	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	1	2	2	1	1	-	2	1	-	1
CO2	1	1	2	2	1	1	-	2	1	-	1

CO3	1	1	2	2	1	1	-	2	1	-	1
CO4	1	1	2	2	1	2	-	2	1	-	1
C05	1	1	2	2	1	2	-	2	1	-	1
AVG	**1**	**1**	**2**	**2**	**1**	**1.4**	**-**	**2**	**1**	**-**	**1**

JGE2241	**GAMING AND CRAFTS STUDIO**	**L T P C** **0 0 4 2**

OBJECTIVES:

- Understand the fundamental principles of game development and the Unity interface.
- Analyse various game design principles to enhance gameplay experience.
- Evaluate and integrate audio and visual assets to create immersive game environments.
- Create a complete game project that incorporates learned techniques and personalized creative elements.
- Reflect on the game development process and critique peer projects to foster a collaborative learning environment.

UNIT I The World of Game Development and Gaming Fundamentals 12 Introduction to Game Development & Unity , Understanding the core elements of gameplay, such as mechanics, dynamics, and aesthetics.Interactive tutorial on Unity, exploring the interface and

project setup. Navigate Unity and set up a basic project.

UNIT II Game Design Principles, Visual and Audio Design 12 Game Design Principles & Basic Scripting - implementing basic game mechanics.- implement simple player controls and game mechanics using C#.- create responsive player controls using various input methods.- Player Control and Game Technologies - Hands-on scripting for player controls.

UNIT III Game Mechanics, Technology, and Development 12 Creating Game Assets- modelling and texturing basic game assets.- Physics and Interactions - Practical exercises adding physics and collisions to objects.- UI & Menus - UI development sessions for creating intuitive game menus.- Audio and Visual Effects - Implementing background music and particle effects.

UNIT IV Critical Analysis, Feedback, and Ethical Considerations 12 Coding challenges to implement state machines and level progression.- Testing and Debugging - Debugging tools and techniques- Refine gameplay and fix issues, Optimisation

UNIT V Game Project & Presentation 12 Students will work in groups of 4-5 to design and develop a functional video game prototype- The game should incorporate concepts and mechanics from at least two different Genres- A GDD (Game Design Document) will be required as part of this project- Students will present their game prototype and GDD to the class and receive feedback from peers and instructors.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- navigate Unity and set up a basic project, implement simple player controls and game mechanics using C#.
- create responsive player controls using various input methods and import custom assets into Unity.

- Integrate Unity's Physics engine into their game projects and develop functional game menus and UI elements.
- enhance their games with audio cues and visual effects.
- use advanced scripting to manage game states and progression and perform debugging to refine gameplay and fix issues.

WEB RESOURCES:

- hΣps://www.youtube.com/watch?v=XtQMytORBmM
- hΣps://www.youtube.com/watch?v=AmGSEH7QcDg
- hΣps://www.youtube.com/watch?v=AmGSEH7QcDg
- hΣps://www.youtube.com/watch?v=HAvfA1F3qTo
- hΣps://www.youtube.com/playlist?list=PLĬbBaEcybmg WnFoWDxgSIatmrzBRWSQ

· hΣps://www.youtube.com/watch?v=ldP0c2o1FJI

· hΣps://www.youtube.com/watch?v=ldP0c2o1FJI

CO-PO Mapping

	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	3	1	3	1	1	2	2	1	2	3	2	2
CO2	3	2	3	2	3	1	1	2	2	1	2	3	2	2
CO3	3	2	3	2	3	2	1	2	2	1	2	3	2	3
CO4	3	2	3	2	3	2	1	2	2	1	2	3	2	3
CO5	3	3	3	3	3	1	1	2	2	1	3	3	3	3
AVG	**3**	**2.2**	**3**	**2**	**3**	**1.4**	**1**	**2**	**2**	**1**	**2.2**	**3**	**2.2**	**2.6**

JGE3171	**PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

COURSE OBJECTIVES

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

LIST OF EXPERIMENTS:

1. Write a python program using simple data types. Get the input from the keyboard. (Do not use built-in functions).
   a) To find the square and cube of a number
   b) To find the roots of a quadratic equation
   c) To find the square root and cube root of a number
   d) To calculate Simple Interest

2. Using command line arguments get the value from user. (Do not use built-in functions). a) To convert Celsius to Fahrenheit
   b) Exchange the value of two variables
   c) To find the area and perimeter of a circle
   d) To convert inch into meter

3. Exercise programs on conditional statements.
   a) Write a program to find the grade of a student. Get student name, marks for 20 students.
   b) Write a code to get the age of a person and print an age group. (Infant, Children, Adolescents, Adults , Older adults)

4. Exercise programs on basic control structures & loops.
   a) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
   b) Write a Python Program to Check the Prime Number using While Loop.
   c) Write a python program to print Pascal triangle using for loop.
   d) Write a program to print the multiplication table of the number entered by the user.

5. Programs using strings.
   a) Make a program that displays your favorite actor/actress and print the word _lucky‘ inside the string.
   b) Print the day, month, year in the form ―Today is 2/2/2016‖.
   c) Write a program that asks console input and searches for a query.
   d) Given an article, split it based on phrases.

6. Do the program using python collections.
   a) Create a dictionary containing names of students and marks obtained by them in three subjects. Write a program to replace the marks in three subjects with the total in three subjects, and average marks. Also report the topper of the class.
   b) Suppose a list contains several words. Write a program to create another list that contains first character of each word present in first list. Also, for the given first letter display the corresponding word from the list along with index.

c) Suppose a date is represented as a tuple (d, m, y). Write a program to create two date tuples and find the number of days between the two dates.

d) Write a program to create a set containing 10 randomly generated numbers in the range 15 to 45. Count how many of these numbers are less than 30. Delete all numbers which are greater than 35.

7. Do program using function and recursive function.

a) A string is entered through the keyboard. Write a recursive function that checks whether the string is a palindrome or not.

b) Write a recursive function to obtain length of a given string.

c) Get the height and weight value of five persons. Write a function BMI_Calc( ) to calculate the BMI. (BMI = weight/height2) using all four prototypes.

8. Programs using files and exception.

a) Write a program to read a file and display its contents along with line numbers before each line. Also, handle EOF error.

b) Suppose a file contains student‘s records with each record containing name and age of a student. Write a program to read these records and display them in sorted order by name. How will you handle if file is not found.

9. Draw simple drawings using turtle and fill it with color.
10. Using DateTime method, Get current local time, UTC time,GMT time, ISO time and Get current time in the specific time zone.
11. Create a simple registration form using Tkinter.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Use Python lists, tuples, dictionaries for representing compound data.
- Develop Python programs step-wise by defining functions and calling them Implement file operations and also draw basic 2D diagrams

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE REQUIREMENTS

· PYTHON3 and above

HARDWARE REQUIREMENTS

· Standalone desktops (or) Server supporting 30 terminals or more

TEXTBOOKS:

1. Allen B. Downey, ―Think Python : How to Think like a Computer Scientist‖, 2nd Edition, O‘Reilly Publishers, 2016.

2. Karl Beecher, ―Computational Thinking: A Beginner's Guide to Problem Solving and Programming‖, 1st Edition, BCS Learning & Development Limited, 2017.
3. Alan D. Moore, Python GUI Programming with Tkinter - Develop Responsive and Powerful GUI Applications with Tkinter, Packt Publishing, First Edition, 2018.

REFERENCES:

1. Paul Deitel and HarveyDeitel, ―Python for Programmers‖, Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, ―Computational Thinking: A Primer for Programmers and Data Scientists‖, 1st Edition, Notion Press, 2021.

WEB SITE REFERENCE:

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

CO-PO Mapping

PO,PSO /CO	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	3	2	3	-	-	3	2	1	2	3	1	-
CO2	3	3	3	3	3	-	-	3	3	2	2	3	2	1
CO3	3	3	3	3	3	-	-	3	3	2	3	3	2	1
CO4	3	3	3	3	3	2	-	3	3	3	3	2	3	2
C05	3	3	3	3	3	2	-	3	3	3	3	2	3	3
AVG	3	2.8	3	2.8	3	2	-	3		2.2	2.6	2.8	1.4	1

JMA2302	MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE	L T P C 2 2 0 3

COURSE OBJECTIVES:

- To equip students with the ability to deal with abstraction by teaching propositional logic.
- To familiarize students in combinatorial problems with applications.
- To outline the basics of graph theory and algorithms.
- To explain concepts of number theory and its applications.
- To conceptualize congruence, its applications and standard classical theorems.

UNIT I LOGIC 9+3

Propositional logic – Propositional equivalences – Normal forms – Predicates and uantifiers – Rules of inference

UNIT II COMBINATORICS 9+3

Mathematical induction – Pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations using Generating functions – Inclusion and exclusion principle

UNIT III GRAPHS 9+3

Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton graphs

UNIT IV DIVISIBILITY THEORY AND CANONICAL DECOMPOSITION 9+3

Division algorithm – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM – Linear Diophantine equations

UNIT V CONGRUENCES AND CLASSICAL THEOREM 9+3

Congruences – Linear Congruences – Modular exponentiation – Chinese remainder theorem (without proof) – Wilson‘s theorem (without proof) – Fermat‘s little theorem (without proof) – Euler‘s theorem (without proof) – Euler‘s Phi functions

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Apply propositional logic in practical problems.
- Solve combinatorial problems using counting principle and mathematical induction.
- Demonstrate efficient use of graph theory in solving connectivity and shortest path problems.
- Apply divisibility theory and canonical decompositions in problems.
- Solve practical problems using classical theorems of number theory.

TEXT BOOKS:

1. Rosen K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.
2. Tremblay J.P. and Manohar R., "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 1st Edition, 2017.
3. Koshy. T., "Elementary Number Theory with Applications", Elsevier Publications, New Delhi, 2nd Edition, 2007.

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1. Grimaldi R.P., "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007.
2. Niven I, Zuckerman H.S. and Montgomery. H.L., "An Introduction to Theory of Numbers", John Wiley and Sons, Singapore, 2004.

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- https://nptel.ac.in/courses/111106155/
- https://nptel.ac.in/courses/111106102/
- https://nptel.ac.in/courses/111101137/
- https://nptel.ac.in/courses/111103020/

Mapping of CO with PO

PO,PSO /CO	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	2	3	-	-	2	-	-	1	3	2	-
CO2	3	2	1	2	3	-	-	2	-	-	1	3	2	-
CO3	3	2	1	2	3	-	-	2	-	-	1	3	3	1
CO4	3	2	1	2	3	-	-	2	-	-	1	3	2	-
C05	3	2	1	2	3	-	-	2	-	-	1	3	2	1
AVG	3	2	1	2	3	-	-	2	-	-	1	3	2.2	1

JIT2301	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the basic concepts of OOP and getting started with C++
- To study the properties and usage of inheritance and polymorphism in C++
- To understand file and exception handling and exploring on templates
- To learn the OOP principles of JAVA and creation of package
- To learn interface and thread concept. Also, to learn the design of an GUI based application using JavaFX

UNIT I BASICS OF C++ 9

Object Oriented Programming: Concepts of Object-Oriented Programming - Origins of C++ -– Keywords - Classes and Objects – Constructors – Destructors – Static Data Members - Static Member Functions – Arrays Fundamentals – String Operations.

UNIT II INHERITANCE AND POLYMORPHISM 9

Inheritance: Single, Multi-Level, Multiple, Hierarchical and Hybrid – Abstract Classes - Polymorphism- Function Overloading: Overloading Constructor Functions - Copy Constructors Operator Overloading: Unary Operators – Binary operators.

UNIT III FILES, TEMPLATES AND EXCEPTION HANDLING 9

Files: File Stream Operations - File Pointers Manipulation-Templates: Function templates – Class Templates – Exception handling: Try, Catch and Throw- Handling Derived-Class Exceptions - Exception Handling Options.

UNIT IV FUNDAMENTALS OF JAVA AND PACKAGES 9

An Overview of JAVA: Three OOP Principles – Java Class – Simple Program - This Keyword - Finalize Method- Inheritance: Basics- Using Super- Method Overriding- Using Final- Packages: Defining Package – Access Protection - Importing Packages

UNIT V INTERFACES , THREADS AND GUI 9

Interfaces: Design and Implementation – Default Interface Methods - Thread Model: Creating a Thread – Synchronization – Interthread Communication – Multithreading - JavaFX: Basic Concepts – JavaFX Controls - Application Development.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Design a C++ programs with classes, objects and static member functions. ·
- Develop a C++ program using inheritance and polymorphism concept.
- Work with files and can handle exceptions. Also, design a program using template.
- Develop a simple Java Program and can create and import a package.

- Design an interface, synchronize various tasks and develop an GUI using JavaFX.

TEXT BOOKS:

1. Herbert Schildt, C++: The Complete Reference, 4th Edition, McGraw Hill Education, 2017.
2. Herbert Schildt, Java:The Complete Reference, 11th Edition, McGraw Hill Education, 2019.
3. J. F. DiMarzio, JavaFX A Beginners Guide, McGraw Hill Professional, 2011.

REFERENCE BOOKS:

1. Bjarne Stroustrup, The C++ Programming Language, 4th Edition, Addison-Wesley, 2013 2. E.Balagurusamy, Object Oriented Programming with C++, 8th Edition, McGraw Hill, 2020. 3. E.Balaguruswamy, Programming with JAVA - A Primer, Third Edition, McGraw-Hill Professionals, 2014.
4. R. Nageswara Rao and Kogent Solutions Inc., Core Java: An Integrated Approach, Dreamtech Press, 2008.

WEB REFERENCES:

1. Java Tutorial - GeeksforGeeks
2. C++ Programming Language - GeeksforGeeks
3. C++ Tutorial | Learn C++ Programming Language - Scaler Topics
4. Java Tutorial | Learn Java Programming - Scaler Topics
5. Learn Java Programming (programiz.com)
6. JavaFX Tutorial (tutorialspoint.com)

Mapping of CO with PO/PSO

PO,PSO /CO	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	1	3	1	1	2	2	1	2	3	2	1
CO2	3	2	3	1	3	1	1	2	2	1	2	3	2	1
CO3	3	2	3	2	3	1	1	2	2	1	2	3	2	1
CO4	3	2	3	2	3	1	1	2	2	1	2	3	2	1
C05	3	2	3	1	3	1	1	2	3	2	2	3	2	1
AVG	3	2	3	1.4	3	1	1	2	2.2	1.2	2	3	2	1

JCS2301	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the concepts of ADTs
- To design linear data structures – lists, stacks, and queues
- To learn the non–linear data structure trees and its types.
- To understand the concepts of graphs and its applications.
- To understand sorting, searching, and hashing algorithms

UNIT I ABSTRACT DATATYPE 9

Introduction to Data structures- Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation – Singly linked lists- Doubly-linked lists -Circularly linked lists– Applications -Polynomial Manipulation

UNIT II LINEAR STRUCTURE 9

Stack ADT–Implementation- Array and Linked List- Applications- Queue ADT– Implementation – Array and Linked List –Applications- Infix to Postfix conversion- Evaluating arithmetic expressions.

UNIT III TREE STRUCTURE 9 Tree ADT – Terminologies- Tree traversals - Binary Tree ADT – Complete and Full Binary Tree Expression trees- Binary search trees – AVL trees – Heaps – Priority Queue using Heap- B Tree.

UNIT IV GRAPH STRUCTURES 9 Graph ADT – Representations of graph – Types of graph- Graph traversals – Topological ordering – Applications- Shortest path: Dijikstra's algorithm– Minimum spanning trees: Prim's and Kruskal's algorithm.

UNITV SORTING AND SEARCHING 9 Sorting: Bubble sort – selection sort – insertion sort – merge sort – quick sort – Searching: linear search – binary search – Hashing: hash functions – Separate Chaining, Open addressing- Rehashing.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Explain abstract data types
- Design, implement, and analyze linear data structures, such as lists, queues and stacks, according to the needs of different applications.
- Explore deeper into algorithms that operate on trees such as tree traversals and tree balancing concepts

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

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

TEXT BOOKS

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures & Algorithms in Python", An Indian Adaptation, John Wiley & Sons Inc., 2021. 2. Devraj Ganguly,"Introduction to Data Structures and Algorithms": A Conceptual Guide. Paperback – 19 May 2021

REFERENCES:

1. Lee, Kent D., Hubbard, Steve, "Data Structures and Algorithms with Python" Springer Edition2015
2. Rance D. Necaise, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011
3. Aho, Hopcroft, and Ullman, "Data Structures and Algorithms", Pearson Education,1983.
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", Second Edition, McGraw Hill,2002.
5. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education,2014.

WEB REFERENCES:

1. https://dl.acm.org/doi/10.5555/577958
2. https://www.javatpoint.com/data-structure-tutorial
3. https://www.javatpoint.com/data-structures-and-algorithms-in-c-set-1
4. https://www.w3schools.in/data-structures/intro

CO- PO MAPPING:

	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**1**	**-**	**2**	**3**	**2**	**-**
CO2	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**1**	**2**	**1**	**2**	**3**	**3**	**1**
CO3	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**2**	**3**	**3**	**1**
CO4	**3**	**3**	**3**	**3**	**3**	**1**	**-**	**1**	**2**	**1**	**2**	**3**	**3**	**2**
CO5	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**1**	**2**	**1**	**2**	**3**	**3**	**2**

AVG	**3**	**2.8**	**2.8**	**2.6**	**2.8**	**1**	**-**	**1**	**1.8**	**1**	**2**	**3**	**2.8**	**1.5**

JAL2301	DATA SCIENCE	L T P C 3 0 0 3

COURSE OBJECTIVES:

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

UNIT I INTRODUCTION TO DATA SCIENCE 9

Data Science: Benefits and uses – Facets of data - Data Science Process - The big data ecosystem and data science - Overview of the data science process – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – Build the models – Presenting findings and building applications - Basic Statistical descriptions of data.

UNIT II DESCRIPTIVE STATISTICS - DESCRIBING DATA 9

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

UNIT III DESCRIPTIVE STATISTICS - DESCRIBING RELATIONSHIPS 9

Correlation – Scatter plots – Correlation coefficient for quantitative data – Computational formula for correlation coefficient. Regression – A regression line – Least squares regression line – Standard error of estimate – Interpretation of r2 – Multiple regression equations – Regression towards the mean.

UNIT IV PYTHON LIBRARIES FOR DATA WRANGLING 9

Basics of NumPy arrays – Aggregations – Computations on arrays – Comparisons, masks, boolean logic – Fancy indexing – Sorting arrays - Structured data.
Data manipulation with Pandas – Data indexing and selection – Operating on data – Handling missing data – Hierarchical indexing – Combining datasets – Pivot tables.

UNIT V DATA VISUALIZATION 9

Importing Matplotlib – Line plots – Scatter plots – Visualizing errors – Density and contour plots – Histograms – Plot legends – Colorbars – Subplots – Text and annotation – Three-dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Define the data science process.
- Understand different types of data description for data science process.
- Gain knowledge on relationships between data.
- Use the Python Libraries for Data Wrangling.
- Apply visualization libraries in Python to interpret and explore data.

TEXT BOOKS

1. Davy Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016.
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.
3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.

REFERENCE BOOKS

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.
2. Erick Thompson, "Python for Data Science Books in 1. A Practical Beginner's Guide to Learn Python Programming, Introducing Into Data Analytics, Machine Learning, Web Development, with Hands-on Projects", 2020, ISBN: 9798554509728

WEBSITE REFERENCES

- https://www.analyticsvidhya.com/blog/2016/02/complete-tutorial-learn-data-science-scratch/ ·
- https://www.edureka.co/blog/learn-python-for-data-science/
- https://towardsdatascience.com/fundamentals-of-statistics-for-data-scientists-and-data-analysts 69d93a05aae7
- https://machinelearningmastery.com/data-visualization-in-python-with-matplotlib-seaborn-and bokeh/

CO-PO MAPPING

	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	3	3	2	-	-	2	1	2	3	2	1
CO2	3	3	2	2	2	-	-	-	2	-	2	3	2	-
CO3	3	3	3	3	3	1	-	-	1	1	2	3	3	2

CO4	3	2	3	2	3	1	-	-	2	1	2	3	2	2
CO5	3	2	2	2	2	1	-	-	2	-	2	3	2	2
AVG	**3**	**2.6**	**2.4**	**2.4**	**2.6**	**1.25**	**-**	**-**	**1.8**	**1**	**2.0**	**3.0**	**2.2**	**1.75**

JIT2321	DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION	L T P C 3 0 2 4

COURSE OBJECTIVES:

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To understand the basic structure and operation of a digital computer.
- To study the design of the data path unit, and control unit for the processor and to familiarize with the hazards.
- To understand the concept of various memories and I/O interfacing.

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9

Number Systems — Arithmetic Operations — BinaryCodes- Boolean Algebra and Logic Gates — Properties of Boolean Algebra — Boolean Functions — Canonical and Standard Forms — Simplification of Boolean Functions using Karnaugh Map — Logic Gates

UNIT II COMBINATIONAL LOGICS 9

Combinational Circuits –Binary Adder – Subtractor – Decimal Adder — Binary Multiplier - Magnitude Comparator – Decoder – Encoder – Multiplexers – De-multiplexer

UNIT III COMPUTER FUNDAMENTALS 9

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction types– Addressing Modes

UNIT IV PROCESSOR 9

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

UNIT V MEMORY AND I/O 9

Memory Concepts and Hierarchy – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O

TOTAL: 45 PERIODS

List of Experiments

1. Verification of Boolean theorems using logic gates.
2. Design and implementation of combinational circuits using gates for arbitrary functions.
3. Implementation of 4-bit binary adder circuits
4. Implementation of 4-bit binary Subtractor circuits.
5. Implementation of code converters.
6. Implementation of BCD adder.
7. Implementation of encoder and decoder circuits.
8. Implementation of functions using Multiplexers
9. Implementation of functions using Demultiplexers.
10. Simulator based study of Computer Architecture.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

- Simplify Boolean functions using KMap
- Design combinational circuits and analyze the design procedures
- State the fundamentals of computer systems and analyze the execution of an instruction
- Analyze different types of control design and identify hazards
- Identify the characteristics of various memory systems and I/O communication

TEXT BOOKS:

1. M. Morris Mano, Michael D. Ciletti, "Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog", Sixth Edition, Pearson Education, 2018.

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

REFERENCES:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Tenth Edition, Pearson Education, 2016.
3. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.

WEB REFERENCES:

- https://www.geeksforgeeks.org/difference-between-multiplexer-and-demultiplexer/
- https://www.geeksforgeeks.org/introduction-of-sequential-circuits/
- https://www.geeksforgeeks.org/microarchitecture-and-instruction-set-architecture/
- NPTEL :: Com https://archive.nptel.ac.in/courses/106/105/106105163/
- Difference bet https://www.geeksforgeeks.org/difference-between-serial-port and-parallel-ports/

Mapping of CO with PO/PSO

	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**1**	**-**	**2**	**3**	**2**	**-**
CO2	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**1**	**1**	**1**	**2**	**3**	**2**	**1**
CO3	**3**	**2**	**2**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**2**	**3**	**2**	**1**
CO4	**3**	**3**	**3**	**3**	**3**	**1**	**-**	**1**	**2**	**1**	**2**	**3**	**3**	**2**
CO5	**3**	**2**	**2**	**2**	**3**	**1**	**-**	**-**	**2**	**1**	**3**	**3**	**3**	**2**
AVG	**3**	**2.6**	**2.4**	**2.4**	**2.8**	**1**	**-**	**1**	**1.6**	**1**	**2.2**	**3**	**2.4**	**1.5**

		L	T	P	C
JCS2311	**DATA STRUCTURES AND ALGORITHMS LABORATORY**	**0**	**0**	**4**	**2**

COURSE OBJECTIVES

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

LIST OF EXCERCISES

1. List ADT using Python with insert, delete, search and modify operations
2. Implementation of Singly linked list.
3. a. Stack ADT using arrays
   b. Stack ADT using linked list
4. a. Queue ADT using arrays
   b. Queue ADT using linked list
5. Infix to Post fix conversion
6. Binary Search Trees
7. AVL Trees
8. Implement graph traversal techniques BFS and DFS.
9. Bubble sort, Selection sort, Insertion sort
10. Linear search and Binary search
11. Hashing-Linear Probing and Quadratic Probing

TOTAL:60 PERIODS

COURSE OUTCOMES:

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

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

TEXT BOOKS:

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

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE: Ubuntu C / Python

HARDWARE: Standalone desktops 30 Nos. (or) Server supporting 30 terminals or more

WEBSITE REFERENCES:

- **https://www.geeksforgeeks.org/data-structures/**
- **https://www.worldscientific.com/worldscibooks/10.1142/5256**
- **https://www.programiz.com/dsa**
- **https://www.youtube.com/watch?v=8hly31xKli0**
- **https://www.codechef.com/certification/data-structures-and algorithms/prepare**

Mapping of CO with PO/PSO

	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	2	-	-	-	1	-	2	3	2	1
CO2	3	2	3	2	3	-	-	1	2	1	2	3	3	2
CO3	3	3	3	3	3	-	-	1	2	1	2	3	3	2
CO4	3	3	3	2	3	-	-	1	2	1	2	3	3	2
CO5	3	3	3	3	3	-	-	1	2	1	3	3	3	2
AVG	3	2.8	2.8	2.4	2.8	-	-	1	1.8	1	2.2	3	2.8	1.8

JIT2311	OBJECT ORIENTED PROGRAMMING LABORATORY	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To understand basics of Object-Oriented Programming with C++ and Java programming language
- To know the principles of polymorphism and templates
- To define exceptions and use of inheritance
- To develop a java application with threads and interfaces
- To design and build Graphical User Interface Application using JAVAFX

LIST OF EXCERCISES

1. a) Develop a C++ code to create a class and object and print the member variables.

   b) Develop a C++ program to show the working of default constructor, parametrized constructor and copy constructor and destruct any object.
2. Implement a C++ code to demonstrate the concept of static member function.
3. Develop a menu driven C++ program to find area of two-dimensional objects (any three) using function overloading.
4. (a) Develop a C++ code to overload the unary operators using operator function
   (b) Develop a C++ code to overload binary operators using operator function
5. (a) Implement a C++ code to swap any two values using function template.
   (b) Implement a C++ code to find the maximum of any three values using a class template.
6. Develop a C++ code to handle division-by-zero and out-of-range exception.
7. a) Implement a Java code to print the sum, multiply, subtract, divide and remainder of two

numbers. Get the input from the user.

(b) Develop a Java program to print and return the current class instance using this keyword.

8. Develop an application with Employee class with Emp_name, Emp_id, Address, Mail_id,Mobile no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
9. Develop a Java program to create a 'Geometry' package with relevant classes (For e.g. Circle/ Square/ Polygon and so on.) and export it.
10. Create an interface for 'Playable' with classes Football, Volleyball and basketball.
11. Develop a Java code to implement the concept of Thread.
12. Design and develop an application using JavaFX.

TOTAL :60 Periods

COURSE OUTCOMES

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

- Apply the concepts of classes and objects to solve simple problems
- Develop programs using polymorphism and templates
- Handle the exceptions and inherit a class
- Build Java applications with thread models and interfaces
- Develop an GUI based application in JavaFX using event handling concept and controls

TEXTBOOKS

1. Herbert Schildt, "C++: The Complete Reference", 4th Edition, McGraw Hill Education, New Delhi, 2017.
2. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, New Delhi, 2019.
3. Herbert Schildt, "Introducing JavaFX 8 Programming", 1st Edition, McGraw Hill Education, New Delhi, 2015.

WEBSITE REFERENCES

1. C++ Programming | Neso Academy
2. cplusplus.com/doc/tutorial/
3. C++ Tutorial (w3schools.com)
4. Introduction to Java (w3schools.com)
5. Java Tutorials for Beginners (tutorialspoint.com)

Mapping of CO with PO/PSO

	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	2	3	-	-	1	1	1	2	3	2	1

CO2	3	3	3	2	3	-	-	1	2	1	2	3	3	2
CO3	3	3	3	3	3	-	-	1	2	1	2	3	3	2
CO4	3	2	3	2	3	1	-	1	2	1	3	3	3	3
CO5	3	3	3	2	3	1	-	2	2	1	3	3	3	3
AVG	**3**	**2.6**	**2.8**	**2.2**	**3**	**1**	-	**1.2**	**1.8**	**1**	**2.4**	**3**	**2.8**	**2.2**

JNC2361	**DISASTER RISK REDUCTION AND MANAGEMENT**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVE

• To impart knowledge on concepts related to disaster, disaster risk reduction, disaster management

• To acquaint with the skills for planning and organizing disaster response

UNIT I HAZRADS, VULNERABILITY AND DISASTER RISKS 9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Types of Disasters: Natural, Human induced, Climate change induced –Earthquake, Landslide, Flood, Drought, Fire etc – Technological disasters- Structural collapse, Industrial accidents, oil spills -Causes, Impacts including social, Economic, political, environmental, health, psychosocial, etc.- Disaster vulnerability profile of India and Tamil Nadu - Global trends in disasters: urban disasters, pandemics, Complex emergencies, - Inter relations between Disasters and Sustainable development Goals

UNIT II DISASTER RISK REDUCTION (DRR) 9

Sendai Framework for Disaster Risk Reduction, Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community Based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Early Warning System – Advisories from Appropriate Agencies.- Relevance of indigenous Knowledge, appropriate technology and Local resources.

UNIT III DISASTER MANAGEMENT 9

Components of Disaster Management – Preparedness of rescue and relief, mitigation, rehabilitation and reconstruction- Disaster Risk Management and post disaster management – Compensation and Insurance- Disaster Management Act (2005) and Policy - Other related policies, plans, programmers and legislation - Institutional Processes and Framework at State and Central Level- (NDMA – SDMA-DDMA-NRDF- Civic Volunteers)

UNIT IV TOOLS AND TECHNOLOGY FOR DISASTER MANAGEMENT 9

Early warning systems -Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment. - Elements of Climate Resilient Development –Standard operation Procedure for disaster response – Financial planning for disaster Management

UNIT V DISASTER MANAGEMENT: CASE STUDIES 9

Discussion on selected case studies to analyse the potential impacts and actions in the contest of disasters-Landslide Hazard Zonation: Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.- Field work-Mock drill -

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Taimpo (2016), Disaster Management and Preparedness, CRC Publications
2. Singh R (2017), Disaster Management Guidelines for earthquakes, Landslides, Avalanches and tsunami, Horizon Press Publications
3. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN- 13: 978-9380386423
4. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]

REFERENCES

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005. 2. Government of India, National Disaster Management Policy, 2009. 3. Shaw R (2016), Community based Disaster risk reduction, Oxford University Press

COURSE OUTCOME:

CO1: To impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction (DRR)

CO2: To enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction

CO3: To develop disaster response skills by adopting relevant tools and technology CO4: Enhance awareness of institutional processes for Disaster response in the country and

CO5: Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity

Mapping of CO with PO/PSO

	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	-	-	-	2	2	1	-	2	1	-	-	2
CO2	2	3	1	-	-	3	3	2	1	2	1	-	2	3
CO3	2	2	-	-	-	3	3	2	1	3	2	-	2	3
CO4	2	2	2	3	2	2	2	-	-	2	2	-	1	3
CO5	2	3	2	2	-	3	3	2	-	2	1	-	1	3
AVG	**2.2**	**2.4**	**1.66**	**2.5**	**2**	**2.6**	**2.6**	**1.75**	**1**	**2.2**	**1.4**	**-**	**1.5**	**2.8**

JPT2041	**SOFT SKILLS AND APTITUDE**	**L**	**T**	**P**	**C**
		0	**0**	**2**	*****

OBJECTIVE:

1. To make students analyze and solve problems in technical as well as aptitude. Enhance the technical skills and basics of programming language
2. To make the students understand how to apply the practical knowledge with real time applications.
3. To make the students think and draw a conclusion from different scenarios.
4. To help the students understand C programming concepts

UNIT-I **SOFT SKILLS AND APTITUDE – I** **6**

Synonyms - Antonyms - Odd Words - Idioms and Phrases - Error Spotting - Interpersonal Communication- Sentence Correction - Resume Writing Skills - Interview Skills.

UNIT-II **SOFT SKILLS AND APTITUDE-II** **6**

Reading Comprehension - Sentence Improvement - Jumbled Sentences - Parts of speech - Fact, Inference, Judgements - . Paragraph formation -Fill in the Blanks - Group Discussion - Mock Interview Sessions.

UNIT III QUANTITATIVE APTITUDE 6

Number Theory - Divisibility rule - LCM and HCF - Simplification - Surds and Indices - Average - Percentage

UNIT IV LOGICAL REASONING 6

Number and letter Series - Coding and Decoding - Ranking and Ordering - Odd man out - Image Based Relationships

UNIT V TECHNICAL APTITUDE IN C-I 6

Pointers - Pointer dereferencing - Functions - Call by value, Call by reference - Structures - Structure Pointers - Arrays - One Dimensional, Two Dimensional, Multi Dimensional - Sorting - Time Complexity - Strings - String Methods.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

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

TEXT BOOKS:

1. Dr.RS Aggarwal, "Quantitative Aptitude", S Chand Publishing, 2020

2. Dr.R.S Aggarwal. "A Modern Approach To Verbal Reasoning",S. Chand Publishing, 2017

3. Dr. R. S. Aggarwal, "A Modern Approach to Non-Verbal Reasoning". S. Chand Publishing, 2017

4. Pradip Dey, ManasGhosh, "Fundamentals of Computing and Programming in C. First

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1. Data Communications and Networks- 2nd edition -Achyut S Godbole- and AtulKahate Tata McGraw-Hill, 2017.

2. Computer Networking - James F. Kurose & Keith W. Ross- PEARSON, 6th EDITION, 2017.

3. Computer Communications and Networking Technologies - Michael A. Gallo & William M. Hancock- BROOKS&COLE, 2001.

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- https://m4maths com placement-puzzles php
- www.freshersworld.com

Mapping of CO with PO/PSO

PO,PSO /CO	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	-	-	3	3	3	3	-	-	2
CO2	2	2	2	-	-	-	-	3	3	3	3	-	-	2
CO3	2	3	2	2	2	-	-	3	3	3	3	-	-	3
CO4	2	3	2	2	2	-	-	3	3	3	3	-	-	3
C05	3	3	2	2	3	-	-	3	3	3	3	-	-	3
AVG	2.2	2.6	2	2	2.2	-	-	3	3	3	3	-	-	2.6

JMA2402	APPLIED LINEAR ALGEBRA	L T P C 2 2 0 3

COURSE OBJECTIVES:

- To impart knowledge of consistency of system of equations through Rouche-Capelli theorem.
- To familiarize students in the concepts of vector spaces, bases and dimension.
- To enable students understand concepts of linear transformation, Eigenvalues, Eigenvectors and Diagonalizability.
- To introduce inner product spaces, orthogonalization and least square proximations.

UNIT I MATRICES AND SYSTEM OF LINEAR EQUATIONS 9+3

Matrices – Row Echelon form – Rank – Non-homogeneous system of linear equations – Homogeneous system of linear equations – Rouche-Capelli theorem (without proof) – Consistency – Gauss Jordan method – Gauss Seidel method

UNIT II VECTOR SPACES 9+3

Definition of field – Vector spaces – Subspaces – Properties – Linear combinations – Linear independence and linear dependence – Span – Bases and dimensions

UNIT III LINEAR TRANSFORMATION 9+3

Linear transformation – Properties – Kernel and Range – One-to-One correspondence – Rank and Nullity – Dimension theorem

UNIT IV DIAGONALIZATION 9+3

Matrix representations of linear transformations – Eigenvalues and eigenvectors – Diagonalizability

UNIT V INNER PRODUCT SPACES 9+3

Inner products and norms – Gram Schmidt orthogonalization process – Least square approximation

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Apply Rouche-Capelli theorem for solving system of equations.
- Solve problems occurring in vector spaces and subspaces.
- Conceptualize linear transformation and use it in real-time problems.
- Demonstrate efficient use of matrix representations and diagonalization.
- Solve problems using orthogonalization process and use least square approximations.

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2021.
2. Kreyszig Erwin., "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
3. Friedberg. A.H., Insel. A.J. and Spence. L., "Linear Algebra", Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Kumaresan. S., "Linear Algebra – A Geometric Approach", Prentice – Hall of India, New Delhi, Reprint, 2010.
2. 4. Lay D.C., "Linear Algebra and its Applications", 5th Edition, Pearson Education, 2015.

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- https://nptel.ac.in/courses/111106135/
- https://nptel.ac.in/courses/111108157/

Mapping of CO with PO

PO,PSO /CO	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	-	-	2	-	-	1	3	2	-
CO2	3	2	2	2	3	-	-	2	-	-	1	3	2	-
CO3	3	2	2	2	3	-	-	2	-	-	1	3	3	1

CO4	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**2**	**-**	**-**	**1**	**3**	**3**	**2**
C05	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**2**	**-**	**-**	**1**	**3**	**3**	**2**
AVG	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**2**	**-**	**-**	**1**	**3**	**2.6**	**1.6**

JCS2401	**DATABASE MANAGEMENT SYSTEMS**	**L T P C** **3 0 0 3**

COURSE OBJECTIVES:

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

UNIT I DATA MODELS AND QUERYING 9

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

UNIT II DESIGN AND NORMALIZATION 9

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

UNIT III TRANSACTION PROCESSING 9

Transaction Concepts–ACID Properties– Schedules–Ser ializability–Concurrency Control– Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery- SavePoints –Isolation Levels–SQL Facilities for Concurrency and Recovery.

UNIT IV DATA ORGANIZATION AND QUERY OPTIMIZATION 9

RAID – File Organization – Organization of Records in Files – Indexing and Hashing Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview–Query optimization.

UNIT V ADAVANCED DATABASES 9

OODBMS- - Object-Based Databases - OO Data Model - OO Languages – Object Relational Databases - ODMG Object Model - XML – Structure of XML - Temporal Databases – Mobile Databases – Spatial Databases.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

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

TEXTBOOKS

1. Abraham Silberschatz, HenryF. Korth, S.Sudharshan, "Database System Concepts", Seventh Edition, TataMcGraw Hill,2020
2. Ramez Elmasri, Shamkant B.Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2017.

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

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- https://www.mygreatlearning.com/academy/learn-for-free/courses/database-management systems-dbms
- https://www.w3schools.in/dbms/
- https://sqlzoo.net/wiki/SQL_Tutorial

Mapping of CO with PO/PSO

PO,PSO /CO	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	3	2	3	1	1	2	2	1	1	3	2	2
CO2	3	2	3	1	2	1	1	1	2	1	1	3	2	2
CO3	3	3	2	2	2	1	1	2	2	1	1	3	2	2
CO4	3	2	3	2	3	1	1	2	2	1	1	3	2	2
C05	3	2	2	2	3	2	2	1	2	1	1	2	3	2
AVG	**3**	**2.2**	**2.6**	**1.8**	**2.6**	**1.2**	**1.2**	**1.6**	**2**	**1**	**1**	**2.8**	**2.2**	**2**

JCS2402	DESIGN AND ANALYSIS OF ALGORITHMS	L T P C 3 0 0 3

COURSE OBJECTIVES:

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

UNIT I INTRODUCTION 9

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

UNIT II FUNDAMENTALS OF THE ANALYSIS OF ALGORITHM EFFICIENCY 9

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

UNIT III ANALYSIS OF SORTING AND SEARCHING ALGORITHM 9

Brute Force Strategy: Selection Sort and Bubble Sort, Brute-force string matching,Exhaustive search- Knapsack problem, Assignment problem, Travelling Salesman Problem-Divide and conquer: general method-Masters theorem-Merge sort, Quick Sort, Binary Search.

UNIT IV ANALYSIS OF GRAPH ALGORITHMS 9

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

UNIT V NP COMPLETE AND NP HARD PROBLEMS 9

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

TOTAL:45 HOURS

COURSE OUTCOMES:

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

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

TEXT BOOKS

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

REFERENCES

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

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- https://www.javatpoint.com/daa-tutorial

Mapping of CO with PO/PSO

PO,PSO /CO	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	1	1	1	1	1	2	3	2	1
CO2	3	3	2	3	2	1	1	1	1	1	2	3	3	1
CO3	3	3	2	2	2	1	1	1	1	1	2	3	3	1
CO4	3	3	3	2	2	1	1	1	1	1	2	3	3	2
C05	3	3	3	3	2	1	1	1	1	1	2	3	3	2
AVG	**3**	**2.8**	**2.4**	**2.2**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**3**	**2.8**	**1.4**

JIT2421	OPERATING SYSTEMS	L T P C 3 0 2 4

COURSE OBJECTIVES:

- To understand the basics and functions of operating systems.
- To analyze scheduling algorithms and process synchronization.
- To interpret various memory management schemes.
- To classify and familiar with storage management and file systems.
- To be familiar with the basics of virtual machines and Mobile OS

PREREQUISITE:

Computer Architecture

UNIT I COMPONENTS OF AN OS 9

Computer System - Elements and organization; Operating System Overview - Objectives and Functions - Evolution of Operating System; Operating System Structures – Operating System Services - User Operating System Interface - System Calls – System Programs .

UNIT II PROCESS MANAGEMENT 9

Processes - Process Concept - Process Scheduling- Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms; Process Synchronization - The Critical-Section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization - Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III MEMORY MANAGEMENT 9

Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames –Thrashing.

UNIT IV STORAGE MANAGEMENT 9

Mass Storage system – Disk Structure - Disk Scheduling and 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

UNIT V VIRTUAL MACHINES AND MOBILE OS 9

Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization; Mobile OS - iOS and Android Architecture , SDK Frameworks.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS:

1.Basics of UNIX commands

2.Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, open dir, read dir

3.Write C programs to simulate UNIX commands like cp, ls, grep, etc.

4.Write C programs to implement the various CPU Scheduling Algorithms

5.Bankers Algorithm for Dead lock Avoidance

6.Implementation of Dead lock Detection Algorithm

7.Implementation of the following Memory Allocation Methods for fixed partition a)FirstFit b)WorstFit c)BestFit

8.Implementation of Paging Technique of Memory Management

9.Implementation of the following Page Replacement Algorithms a)FIFO b)LRU c)LFU

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

· Classify operating system components and system calls based on functionality

· Analyze and evaluate CPU scheduling algorithms and assess the solutions for synchronization problems and dead lock prevention

· Familiarize in memory management and storage management techniques

· Analyze the File System Interface, Directory Structure

· Compare iOS and Android Operating Systems.

TEXT BOOKS:

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

REFERENCES:

1. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Addison Wesley, 2014.
2. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, TataMcGraw Hill Education, 2018.
3. D M Dhamdhere, “Operating Systems: A Concept-Based Approach”, Second Edition, Tata McGraw Hill Education

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

Mapping of CO with PO/PSO

	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	1	2	1	1	1	1	1	2	3	2	1
CO2	3	3	3	3	2	2	2	2	2	1	2	3	3	2
CO3	3	2	3	2	2	1	1	1	1	1	2	3	3	2
CO4	3	2	2	2	2	1	1	1	1	1	2	3	2	2
CO5	3	2	2	2	2	2	2	2	2	2	2	3	2	2
AVG	**3**	**2.2**	**2.4**	**2**	**2**	**1.4**	**1.4**	**1.4**	**1.4**	**1.2**	**2**	**3**	**2.4**	**1.8**

JCS2411	DATABASE MANAGEMENT SYSTEMS LABORATORY	L T P C 0 0 4 2

COURSE OBJECTIVES:

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

PREREQUISITE:

- Basics of Programming Concepts

LIST OF EXPERIMENTS

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements.
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins.
3. Creation of Views, Sequences, Indexes, Savepoint and commit constraints.
4. Database Programming: Implicit and Explicit Cursors with PL/SQL block. 5. Creation of PL/SQL Procedures and Functions.
6. Creation of PL/SQL Triggers.
7. Exception Handling.
8. Database Design using ER modeling, Normalization and Implementation for any application.
9. Database Connectivity with Front End Tools
10. Mini project (Application Development) in one of the following systems
    a) Student database system
    b) Inventory Control System
    c) Online Library Management
    d) Hospital Management System
    e) Railway Reservation System
    f) Personal Information System
    g) Online Course registration and maintenance System
    h) Attendance Management System

i) Hotel Management System
j) E-commerce portal
k) Online auction system

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

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

REFERENCE BOOKS

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, Tata McGraw Hill, 2020.

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- https://www.tutorialspoint.com/python/python_database_access.html
- https://sqlzoo.net

Mapping of CO with PO/PSO

	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	1	3	1	1	1	1	1	1	3	1	1
CO2	3	3	2	2	3	1	1	1	1	1	1	3	2	1
CO3	3	2	3	2	3	1	1	2	2	1	1	3	2	2
CO4	3	2	3	2	3	1	1	2	2	1	1	3	2	2

CO5	3	2	3	2	3	1	1	2	3	2	1	3	2	2
AVG	**3**	**2.2**	**2.6**	**1.8**	**3**	**1**	**1**	**1.6**	**1.8**	**1.2**	**1**	**3**	**1.8**	**1.6**

JGE2442	**ADVANCED IT INFRASTRUCTURE LABORATORY**	**L T P C** **0 0 4 2**

COURSE OBJECTIVES:

- Equip students with a strong foundation in network design, implementation, and troubleshooting.
- Develop skills in managing servers and data storage in enterprise environments.
- Provide comprehensive knowledge and skills to secure IT infrastructure.
- Train students in deploying and managing virtualized environments and automating IT tasks.
- Prepare students for designing, implementing, and managing cloud infrastructure

LIST OF MODULES

Module 1:

Networking Lab: Setting up a basic network, IP Address, VLAN and Routing Configurations

- Introduction to OSI and TCP/IP models, IP addressing.
- Subnetting and IP configuration exercises.
- Introduction to VLANs and Routing Protocols (OSPF, BGP).
- Network Performance tools and introduction to QoS.
- Fundamentals of SDN and network troubleshooting.

Module 2:

Server and Storage Lab: Hands-on installation of server operating systems, Server configuration exercises Including Setting up Storages.

- Server architectures and installation of server OS (Windows and Linux).
- Configuration and management of Windows and Linux servers.
- Introduction to Data Storage Technologies (DAS, NAS, SAN).
- Understanding RAID levels and implementation.
- Exploring advanced storage solutions (Storage virtualization and flash storage).

Module 3:

Security Lab: Configuring Firewalls, Penetration Techniques and Tools, Security Audit and Compliance Checks

- Basics of encryption, firewalls, and VPNs.
- Setting up and managing IDS/IPS.
- Ethical hacking basics and security auditing.
- Advanced security practices and compliance.
- Incident response and introduction to digital forensics.

Module 4:

Virtualization & Automation Lab: Creating Virtual Machines, Managing Containers, Ansible Playbook and CICD Pipelines Using Jenkin.

- Introduction to virtualization technologies and setting up VMs.
- Containerization with Docker and Kubernetes basics.
- Managing containers.
- Introduction to automation with Ansible and PowerShell.
- Implementing CI/CD pipelines and Infrastructure as Code.

Module 5:

Cloud Computing Lab: AWS or Azure Cloud – Services Deployment, AI and Machine Learnings on Cloud

- Cloud service models and initial setup in AWS, Azure, or Google
- Cloud.
- Cloud architecture and scalable systems design.
- Multi-cloud and hybrid cloud strategies.
- Serverless computing and cloud-native technologies.
- AI and machine learning integration in cloud environments.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Design networking and perform troubleshooting
- Managing data storage in enterprise environments
- Implement security in IT infrastructure
- Understand virtualization
- Implement cloud infrastructure

Mapping of CO with PO/PSO

PO,PSO /CO	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	3	2	2	2	2	2	2	3	2	2
CO2	3	2	3	2	3	2	2	2	2	2	2	3	2	2
CO3	3	2	2	2	3	3	3	2	2	2	2	3	2	3
CO4	3	2	2	2	3	2	2	1	1	1	2	3	2	2
C05	3	3	3	3	3	2	2	2	2	2	2	3	3	3
AVG	**3**	**2.4**	**2.6**	**2.4**	**3**	**2.2**	**2.2**	**1.8**	**1.8**	**1.8**	**2**	**3**	**2.2**	**2.4**

JPT2041	SOFTSKILLS AND APTITUDE	L T P C 0 0 4 2

OBJECTIVES:

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

UNIT - I SOFT SKILLS AND APTITUDE-III 5

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

UNIT - II SOFT SKILLS AND APTITUDE-IV 5

Importance of Time – Time Management techniques – The art of prioritizing and scheduling – Stress – Positive and Negative Stress - Stress Management techniques – SWOT Analysis

UNIT III QUANTITATIVE APTITUDE 6

Profit and Loss and Discount – Simple and Compound interest - Ratio and Proportions – Allegations and Mixtures – Problem on Ages

UNIT IV LOGICAL REASONING 6

Directions – Blood Relation – Linear and Circular Arrangement – Cross variables – Set Theory

UNIT V **TECHNICAL APTITUDE IN C-II 8**

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

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

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

TEXT BOOKS:

1. Dr. R.S Agrawal, “Quantitative Aptitude” and Non Verbal Reasoning published in 2000.
2. S.Chand – A Modern Approach to Logical Reasoning Published in 2000.
3. Pradip Dey, ManasGhosh, "Fundamentals of Computing and Programming in C. First

WEBSITES:

- **https://www.indiabix.com/aptitude/questions-and-answers/**
- **https://m4maths.com/placement-puzzles.php**
- **www.freshers world.com**
- **www.careerride.com**
- **www.youtube.com/watch/python**
- **www.youtube.com/watch/concepts of python**
- **https://stackoverflow.com/**
- **https://www.w3schools.com/**
- **https://www.geeksforgeeks.org/**

Mapping of CO with PO/PSO

PO,PSO	Program Outcomes

/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	-	-	3	3	3	3	-	-	2
CO2	2	2	2	-	-	-	-	3	3	3	3	-	-	2
CO3	2	3	2	2	2	-	-	3	3	3	3	-	-	3
CO4	2	3	2	2	2	-	-	3	3	3	3	-	-	3
C05	3	3	2	2	3	-	-	3	3	3	3	-	-	3
AVG	2.2	2.6	2	2	2.2	-	-	3	3	3	3	-	-	2.6

SEMESTER 5

JMA2501	OPTIMIZATION TECHNIQUES	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To enable students understand linear programming problems.
- To impart knowledge of duality in linear programming problems and build concepts in transportation and assignment problems.
- To outline various methods for solving non-linear programming problems.
- To introduce problem solving using dynamic programming and game theory.
- To familiarize students in Markovian and Non Markovian queue models.

UNIT I LINEAR PROGRAMMING 9+3

Formulation – Types of Solutions of an LPP – Graphical solution – Simplex method – Big M method – Two phase method

UNIT II ADVANCED LINEAR PROGRAMMING 9+3

Duality in linear programming problems – Dual Simplex method – Transportation and Assignment problems

UNIT III NON-LINEAR PROGRAMMING 9+3

Lagrangian method – Kuhn-Tucker conditions – Wolfe's method – Beale's method

UNIT IV DYNAMIC PROGRAMMING AND GAME THEORY 9+3

Bellman's principle of optimality – Forward and Backward recursion – Capital budgeting problem – Reliability improvement problem – Cargo loading problem
Game Theory – Two person Zero sum games – Saddle point – Dominance Rule – Method of matrices – Graphical solution

UNIT V QUEUEING MODELS 9+3

Markovian queues (without proof) – Single and multiple server, Infinite and finite queueing models – Little's formula
Non-Markovian queues – M/G/1 queue – Pollaczek Khinchine formula (without proof) – M/D/1 model

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Solve linear programming problems through simplex and other methods.
- Demonstrate efficient use of duality in linear programming problems and solve transportation and assignment problems.
- Solve non-linear programming problems through standard methods.
- Conceptualize dynamic programming and game theory and use it in real-time problems.
- Apply Little's formula for finding standard parameters of Markovian and Non Markovian queue problems.

TEXT BOOKS:

1. Paneerselvam R., "Operations Research", Prentice Hall of India, Fourth Print, 2016.
2. Hamdy A Taha "Introduction to Operations Research", Prentice Hall India, 10th Edition, 2019.
3. Gross D., and Harris C.M., "Fundamentals of Queueing Theory", Wiley Student 4th Edition, 2014

REFERENCES:

1. G. Srinivasan., "Operations Research – Principles and Applications", 2nd Edition, PHI, 2010.
2. Bernard. W.Taylor., "Introduction to Management Science", Pearson Publications, 12th Edition, 2016.

WEB REFERENCES:

- https://nptel.ac.in/courses/111104027/
- https://nptel.ac.in/courses/110105082/
- https://nptel.ac.in/courses/111105100/
- https://nptel.ac.in/courses/110101133/
- https://nptel.ac.in/courses/111103159/

Mapping of CO with PO

PO,PSO /CO	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	-	-	2	-	-	1	3	2	-
CO2	3	2	2	2	3	-	-	2	-	-	1	3	2	-
CO3	3	2	2	2	3	-	-	2	-	-	1	3	2	-
CO4	3	2	2	2	3	-	-	2	-	-	1	3	3	2

C05	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**2**	**-**	**-**	**1**	**3**	**3**	**2**
AVG	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**2**	**-**	**-**	**1**	**3**	**2.4**	**2**

JCS2501	**COMPUTER NETWORKS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To learn the basic concepts of layered approach in Computer Networks and different transmission media of physical layer.
- To know functions of Data link layer and Media access layer.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of Transport layer.
- To familiarize the application layer services.

Prerequisite : Digital Principles and Computer Organization

UNIT 1 INTRODUCTION AND PHYSICAL LAYER 9

Building a network-Layered Network Protocol Architectures- Telecommunications and Cellular Networks overview- Design issues- OSI Model- TCP/IP protocol suite- Physical layer-Basics of communications- Transmission Media-Performance.

UNIT 2 DATA-LINK LAYER & MEDIA ACCESS 9

Link layer Services - Framing - Error control - Flow control - Media access control (TDMA, FDMA, CSMA, CSMA/CD)- Ethernet IEEE 802.3 - Wireless LAN IEEE 802.11 -Bluetooth -Performance analysis: related protocols such as ICMP, NAT, ARP and RARP.

.

UNIT 3 NETWORK LAYER 9

Network layer – Hierarchical network architecture-IPv4 and IPv6 addressing- Routing protocols: Distance-vector and Link-state approaches (RIP, OSPF, BGP) – Multicast Addressing– Multicast routing protocols (DVMRP, PIM).

UNIT 4 TRANSPORT LAYER 9

Overview of Transport layer-Reliable end- to- end transmission protocols- UDP, TCP- Connection management-Flow control- Retransmission-TCP Congestion control-Congestion avoidance(DEC bit, RED)-QoS.

UNIT 5 APPLICATION LAYER 9

Socket Interface and Socket programming, Example protocols: DNS, SMTP, FTP, HTTP-Electronic Mail (POP3, IMAP, MIME)-HTTP-web services.

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

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

TEXTBOOKS:

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

REFERENCES:

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

WEB REREFERENCES:

1. https://www.geeksforgeeks.org/physical-layer-in-osi model/
2. https://www.tutorialspoint.com/medium-access-control-sublayer-mac-sublayer
3. https://www.cse.iitk.ac.in/users/dheeraj/cs425/lec12.html
4. https://www.gatevidyalay.com/tcp-congestion-control-tcp-protocol-tcp/
5. https://w3.cs.jmu.edu/kirkpams/OpenCSF/Books/csf/html/Sockets.html

Mapping of CO with PO/PSO

PO,PSO /CO	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	2	3	2	2	1	1	1	2	3	2	2
CO2	3	3	2	2	3	2	2	1	1	1	2	3	2	2
CO3	3	3	3	3	3	2	2	1	1	1	2	3	3	2
CO4	3	2	2	2	3	2	2	1	1	1	2	3	2	2
C05	3	2	2	1	3	2	2	1	1	1	2	3	2	2
AVG	**3**	**2.4**	**2.2**	**2**	**3**	**2**	**2**	**1**	**1**	**1**	**2**	**3**	**2.2**	**2**

JCS2502	SOFTWARE ENGINEERING AND DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

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

Prerequisite : Database Management System

UNIT I SOFTWARE PROCESS AND AGILE DEVELOPMENT 9

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models –Introduction to Agility-Agile Process-Extreme programming-XP Process

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION 9

Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification– Object modelling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Data Flow Diagram

UNIT III SOFTWARE DESIGN 9

Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns – Model-view-controller – Publish-subscribe – Adapter – Command – Strategy – Observer – Proxy – Facade

UNIT IV SOFTWARE TESTING AND MAINTENANCE 9

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

UNIT V PROJECT MANAGEMENT 9

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

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

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

TEXT BOOKS:

1. Roger S. Pressman, Object-Oriented Software Engineering: An Agile Unified Methodology, First Edition, Mc Graw-Hill International Edition, 2014.
2. Bernd Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering: Using UML, Patterns and Java", Third Edition, Pearson Education, 2009.

REFERENCES:

1. Len Bass, Ingo Weber and Liming Zhu, "DevOps: A Software Architect's Perspective", Pearson Education, 2016
2. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd edition, PHI Learning Pvt. Ltd., 2010.
3. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.
4. Rajib Mall, Fundamentals of Software Engineering, 3rd edition, PHI Learning Pvt. Ltd., 2009.

5. Stephen Schach, Object-Oriented and Classical Software Engineering, 8th ed, McGraw-Hill, 2010.

WEB REFERENCES:

- https://www.javatpoint.com/software-engineering-object-oriented-design
- https://www.geeksforgeeks.org/software-engineering

Mapping of CO with PO/PSO

PO,PSO /CO	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	2	1	-	-	-	2	3	3	2	2
CO2	3	3	2	2	2	1	-	-	-	3	2	3	2	2
CO3	3	3	2	3	3	-	-	-	-	-	2	3	3	2
CO4	3	3	3	3	3	-	-	-	2	-	2	3	3	2
C05	3	3	3	3	3	1	-	-	2	2	3	3	3	2
AVG	**3**	**3**	**2.4**	**2.6**	**2.6**	**1**	**-**	**-**	**2**	**2.3**	**2.4**	**3**	**2.6**	**2**

JCS2521	AUTOMATA THEORY AND COMPILER DESIGN	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To understand automata theory and to construct regular expressions.
- To design context free grammar and push down automata.
- To learn the various phases of compiler and parsing techniques.
- To understand intermediate code generation.
- To learn code generator and code optimization.

Prerequisite :Mathematical Foundation of Computer Science

UNIT I AUTOMATA AND REGULAR EXPRESSIONS 9

Need for Automata Theory – FiniteAutomata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) –Finite Automata with Epsilon Transitions – Conversionof NFA into DFA – Regular Expressions –Finite Automata and Regular Expressions– Minimization of DFA

UNIT II CONTEXT FREE GRAMMAR AND PUSH DOWN AUTOMATA 9

Context-Free Grammar (CFG) – Constructing Parse Trees – Ambiguous Grammars – PushDown Automata (PDA) – Definition – Languages – Equivalenceof PDAs to CFGs – CFGto PDA– PDAto CFG – Deterministic PDA – Normal Forms for CFGs

UNIT III LEXICAL ANALYSIS AND SYNTAX ANALYSIS 9

The Structure of a Compiler – LexicalAnalysis – Role of Lexical Analyzer–Specification ofTokens – Lex – Syntax Analysis – Roleof Parser – Top-Down Parsing –RecursiveDescentParser – PredictiveParser for LL(1) Grammar – Bottom-Up Parsing – Shift-Reduce Parser – LRParser – LR (0)Items – Simple LR –LR(1) Items – Canonical-LR – Lookahead-LR –Yacc

UNIT IVSYNTAX DIRECTED TRANSLATION AND INTERMEDIATE CODE GENERATION 9

Syntax-Directed Definitions – Evaluation Orders for SDDs – Applications of Syntax-Directed Translation – Intermediate-Code Generation – Directed Acyclic Graph – Three-Address Code – Types and Declarations – Translationof Expressions– TypeChecking –Backpatching

UNIT V CODE GENERATION AND CODE OPTIMIZATION 9

Issues in the Design of a Code Generator – The Target Language – Basic Blocks and Flow Graphs– A Simple Code Generator – PrincipalSources of Optimization– Optimization of Basic Blocks – Peephole Optimization–Introduction to Data-Flow Analysis

TOTAL: 45 PERIODS

LIST OF EXERCISES

1. Construct a Finite Automata using C
2. Develop C program to validate the Regular Expression.
3. Write a program in LEX to recognize different tokens: Keywords, Identifiers, Constants, Operators and Punctuations.
4. Write a program to implement a Recursive Descent Parsing with back tracking.
5. Use YACC to generate Three-Address code for a given expression.
6. Write a C program to implement code optimization techniques.
7. Develop a C program to convert intermediate code into target code.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

- Construct finite automata.
- Write regular expressions and design context free grammar and pushdown automata.

- Understand the different phases of a compiler, design a lexical analyser for a samplelanguage and apply different parsing algorithms.
- Understand semantics rules (SDT) and intermediate code generation.
- Implement code generation and apply code optimization techniques.

TEXT BOOKS:

1. Hopcroft J.E., Motwani R., Ullman J.D., "Introduction to Automata Theory, Languages andComputations", 3rdEdition, Pearson Education, 2007.
2. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniquesand Tools", Second Edition, Pearson Education, 2007.

REFERENCES:

1. Harry R Lewis and Christos H Papadimitriou, "Elements of the Theory of Computation", 2ndEdition, Prentice Hall of India, 2015.
2. John C Martin, "Introduction to Languages and the Theory of Computation", 4th Edition, TataMcGraw Hill, 2011.
3. K.L.P.Mishra and N.Chandrasekaran, "Theory of Computer Science: Automata Languages andComputation", 3rdEdition, Prentice Hall of India, 2006.
4. Allen I. Holub, "Compiler Design in C", Prentice-Hall Software Series, 1993.
5. Keith D Cooper and Linda Torczon, "Engineering a Compiler", Morgan Kaufmann Publishers, Elsevier Science, 2004.
6. V. Raghavan, "Principles of Compiler Design", Tata McGraw Hill Education Publishers, 2010.

WEB LINKS:

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2. https://onlinecourses.nptel.ac.in/noc21_cs83/preview
3. https://onlinecourses.nptel.ac.in/noc25_cs70/preview
4. https://nitw.ac.in/tlc/cdlab/
5. https://nptel.ac.in/courses/106108113
6. https://onlinecourses.nptel.ac.in/noc25_cs13/preview

CO-PO MAPPING:

PO,PSO /CO	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	-	-	-	2	3	2	-
CO2	3	3	2	2	2	-	-	-	-	-	2	3	2	-
CO3	3	3	3	2	3	-	-	-	-	-	2	3	3	-
CO4	3	3	2	2	3	-	-	-	-	-	2	3	3	-
C05	3	3	3	2	3	-	-	-	-	-	2	3	3	2

AVG	**3**	**3**	**2.4**	**2**	**2.6**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2.6**	**2**

JCS2511	**COMPUTER NETWORKS LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

COURSE OBJECTIVES:

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

LIST OF EXERCISES :

1. Learn to use terminal commands like tcpdump, netstat, if config, ns look up and trace route.
2. Write a code to implement ARP/RARP protocols.
3. Write a Simulation program for Congestion Control Algorithms
4. Write a Simulation program for Distance Vector and Link State Routing algorithm.
5. Write a Simulation program forError correction code CRC.
6. Write a socket program for HTTP web page upload and download.
7. Write a socket program for Echoclient and echo server.
8. Write a socket program for Chat.
9. Write a socket program for File transfer.

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

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

TEXTBOOKS:

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

REFERENCES:

1. James F.Kurose, Keith W.Ross, "Computer Networking: A Top-Down Approach", Seventh Edition, Pearson Education, 2017
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.

3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4. Ying-DarLin,Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.
5. AndrewS.Tanenbaum, David Wetherall, "Computer Networks", Fifth Edition, Pearson Education, 2013.

WEB SITE REFERENCE:

1. **https://www.youtube.com/watch?v=ZAjYDHpVplg**
2. **https://www.linuxjournal.com/article/5929**

Mapping of CO with PO/PSO:

PO,PSO /CO	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	1	1	2	2	1	2	3	2	2
CO2	3	2	2	1	3	1	1	2	2	1	2	3	2	2
CO3	3	3	2	3	3	2	2	2	2	1	2	3	3	2
CO4	3	2	2	2	3	1	1	2	2	1	2	3	2	2
C05	3	3	3	3	3	2	2	2	2	1	2	3	3	2
AVG	3	2.4	2.4	2.2	3	1.4	1.4	2	2	1	2	3	2.4	2

JCS2512	SOFTWARE ENGINEERING AND DESIGN LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

Discuss and analyze how to develop software requirements specifications for a given problem.

- To understand Software development as a process.
- To implement various software designs, data flow models and UML diagrams.

- To apply various testing techniques like white box testing & black box testing techniques.
- To have hands on experience in developing a software project by using various software engineering principles and methods.

LIST OF EXERCISES:

Apply the following exercises for any four projects given in the list of sample projects:

1. Development of Problem Statements.
2. Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.
3. Preparation of Software Configuration Management and Risk Management related documents.
4. Study and usage of any Design phase CASE tool
5. Performing the Design by using any Design phase CASE tools.
6. Develop test cases for unit testing and integration testing
7. Develop test cases for various white box and black box testing techniques.

Sample Projects:

1. Passport automation System
2. Book Bank
3. Online 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: 60 PERIODS

COURSE OUTCOMES:

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

- Ability to translate end-user requirements into system and software requirements
- Ability to generate a high-level design of the system from the software requirements
- Implement and solve testing problems and will be able to develop a simple testing report.
- Understand and develop various structural and behavioral UML diagrams.
- Explain the knowledge of project management tool

TEXT BOOKS:

1. Roger S. Pressman, Object-Oriented Software Engineering: An Agile Unified Methodology, First Edition, Mc Graw-Hill International Edition, 2014.
2. Bernd Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering: Using UML, Patterns and Java", Third Edition, Pearson Education, 2009.

REFERENCES:

1. Len Bass, Ingo Weber and Liming Zhu, "DevOps: A Software Architect's Perspective", Pearson Education, 2016
2. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd edition, PHI Learning Pvt. Ltd., 2010.
3. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.
4. Rajib Mall, Fundamentals of Software Engineering, 3rd edition, PHI Learning Pvt. Ltd., 2009.
5. Stephen Schach, Object-Oriented and Classical Software Engineering, 8th ed, McGraw-Hill, 2010.

WEB REFERENCES:

- https://www.javatpoint.com/software-engineering-object-oriented-design
- https://www.geeksforgeeks.org/software-engineering

Mapping of CO with PO/PSO:

PO,PSO /CO	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	2	-	-	-	2	2	2	3	2	-
CO2	3	3	3	2	2	-	-	-	-	2	2	3	2	-

CO3	3	3	2	2	3	-	-	-	3	2	2	3	3	-
CO4	3	3	3	2	3	-	-	-	2	2	2	3	2	-
C05	2	2	2	2	3	-	-	-	3	3	2	2	3	2
AVG	**2.8**	**2.8**	**2.4**	**2**	**2.6**	**–**	**–**	**–**	**2.5**	**2.2**	**2**	**2.8**	**2.4**	**2**

JGE2542	**MERN STACK DEVELOPMENT LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

COURSE OBJECTIVES:

- To understand the concepts of automata Full Stack Development.

- To learn and execute NoSQL Databases and MongoDB
- To learn and setup Express.js and Node.js.
- To learn React.js Development and to build Interactive User Interfaces.
- To learn about Integrating MERN Stack Applications

UNIT I Introduction To Full Stack Development 12

Understanding Web Development Architecture -Overview of Frontend, Backend, and Database Systems -Introduction to MERN Stack

UNIT II Mongodb Essentials 12

Introduction to NoSQL Databases -CRUD Operations with MongoDB -Designing Data Models and Schemas

UNIT III Express.js and Node.js Fundamentals 12

Setting up Node.js Environment -Building RESTful APIs with Express.js -Middleware and Routing Concepts

UNIT IV React.js Development 12

Introduction to React Framework - Components, Props, and State Management -Building Interactive User Interfaces

UNIT IV Integrating MERN Stack Applications 12

Connecting Frontend to Backend APIs - Managing Authentication and Authorisation (JWT) - Deployment and Hosting Best Practices

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Complete understanding on Web Development Architecture.

- Implement CRUD Operations with MongoDB .
- Understand the steps in Setting up Node.js Environment and Building RESTful APIs with Express.js
- Understand and Building Interactive User Interfaces
- Integrating various MERN Stack Applications

Mapping of CO with PO/PSO:

PO,PSO /CO	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	2	2	-	-	-	-	-	2	3	2	2
CO2	3	3	2	2	3	-	-	-	-	-	2	3	3	2
CO3	3	3	3	2	3	-	-	-	2	-	2	3	3	2
CO4	3	2	3	2	3	-	-	-	3	-	2	3	3	3
C05	3	3	3	2	3	-	-	-	3	2	2	3	3	3
AVG	**3**	**2.6**	**2.6**	**2**	**2.8**	**–**	**–**	**–**	**2.66**	**2**	**2**	**3**	**2.8**	**2.4**

JPT2042	**TECHNICAL SKILLS AND APTITUDE**	**L**	**T**	**P**	**C**
		0	**0**	**2**	*****

OBJECTIVE:

1. To make students analyze and solve problem in technical as well as aptitude. Enhance the Technical skills and basics of programming language
2. To make the students understand how to apply the practical knowledge with real time applications.
3. To make the students think and draw a conclusion from different scenarios.
4. To help the students understand OOPS and python programming concepts
5. To help the students understand concepts and problems in OOPS and python.

UNIT – 1: FUNDAMENTALS OF C++: 6

Introduction to C++ - Data Types and Operators - Control Structures - Functions in C++ - Arrays and Strings - Structures and Unions - File Handling

UNIT – 2: OBJECT-ORIENTED PROGRAMMING (OOP) & ADVANCED C++ 6

Object-Oriented Programming (OOP) - Inheritance & Polymorphism - Operator Overloading - Templates and Exception Handling - Standard Template Library (STL) - Multi-threading & Advanced Topics

UNIT- 3: PYTHON BASICS & FUNDAMENTALS 6

Introduction to Python - Data Types & Variables - Operators & Expressions - Control Flow Statements - Functions & Modules - File Handling - Exception Handling

UNIT- IV: QUANTITATIVE APTITUDE 6

Time and work – Pipes and Cistern – Time and Distance – Problems on Trains – Boats and streams – Arithmetic and Geometric progression

UNIT - V: LOGICAL REASONING 6

Syllogism: Statement and Conclusion – Clocks - Inequalities – Non Verbal Reasoning – Logical Sequence, Inferred Meaning

TOTAL 30 PERIODS

COURSE OUTCOMES

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

CO1 To enhance their knowledge in OOPS concepts
CO2 To enhance knowledge in PYTHON programming
CO3 To gain knowledge in Coding the concepts of python programming.
CO4 To solve the complex Arithmetic problems practically with real time application problems

CO5 To think logically in solving problems enhance their decision making for difficult situations.

TEXTBOOKS:

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

WEBSITES:

- https://www.indiabix.com/aptitude/questions-and-answers/
- https://m4maths.com/placement-puzzles.php
- www.freshers world.com
- www.careerride.com
- www.youtube.com/watch/python
- www.youtube.com/watch/concepts of python
- https://stackoverflow.com/
- https://www.w3schools.com/
- https://www.geeksforgeeks.org/

PO,PSO /CO	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	2	3	-	-	2	2	2	3	2	2	3
CO2	3	3	3	3	3	-	-	2	2	2	3	2	2	3
CO3	3	3	3	3	3	-	-	2	2	2	3	2	2	3
CO4	3	3	3	3	3	-	-	2	2	2	3	2	3	3
C05	3	3	3	3	3	-	-	3	3	3	3	2	3	3
AVG	**3**	**3**	**3**	**2.8**	**3**	-	-	**2.2**	**2.2**	**2.2**	**3**	**2**	**2.4**	**3**

JCS2621	INTERNET AND WEB PROGRAMMING	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

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

Prerequisite :Object Oriented Programming

UNIT I WEBSITE BASICS - HTML 5, CSS 3, WEB 2.0 9

HTML5 - Control elements, Semantic elements, Drag and Drop, Audio, Video controls; CSS3 - Inline, embedded and external style sheets — Rule cascading — Inheritance — Backgrounds — Border Images — Colors — Shadows — Text — Transformations — Transitions — Animations; Web 2.0 - User-Generated Content (UGC) - Social Media & Networking - Web Applications - Analytics & User Behavior - Identity & Access; SEO Basics.

UNIT II CLIENT-SIDE PROGRAMMING 9

Java Script: Introduction to JavaScript – JavaScript DOM Model - Date and Objects - Regular Expressions - Exception Handling –Validation - Built-in objects - Event Handling – Event Fetches & call back - Array Methods-Map Filter Reduce- String Manipulations

UNIT III SERVER-SIDE PROGRAMMING 9

Servlets: Java Servlet Architecture-Servlet Life Cycle-Form GET and POST actions-Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example-JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL) - Creating HTML forms by embedding JSP code – MVC pattern. Introduction Spring Boot.

UNIT IV PHP , XML and REACT 9

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions Form Validation- Regular Expressions - File handling – Cookies – PHP and connectivity. Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers

and Validation, React-js Introduction, React features, App "Hello World" Application, Introduction to JSX, Simple Application using JSX

UNIT V INTRODUCTION TO AJAX and WEB SERVICES 9

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

TOTAL: 45 PERIODS

LIST OF EXCERSISES:

1. Build a Responsive Personal Portfolio Website
2. Dynamic Form with JavaScript Validation and DOM Manipulation
3. Student Registration System using JSP, Servlets & JDBC
4. Contact Form with PHP, Validation, and XML Handling
5. Create a Simple React App to Display User Information
6. AJAX-Based Weather Fetcher with Java Web Service Integration
7. Blog Website with Web 2.0 Features (UGC, Social Sharing) and SEO Optimization

TOTAL: 30 PERIODS

OUTCOMES:

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

- Construct a basic website using HTML5 and Cascading Style Sheets3.
- Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
- Develop server side programs using Servlets and JSP.
- Integrate APIs and manage data flow in React applications.
- Use AJAX and web services to develop interactive web applications.

TEXT BOOK:

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

REFERENCES:

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

WEB REFERENCES:

- https://www.w3schools.com/REACT/react_intro.asp
- https://www.tpointtech.com/spring-boot-tutorial
- https://www.tutorialspoint.com/mvc_framework/mvc_framework_introduction.htm

Mapping of CO with PO/PSO

PO,PSO /CO	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	-	2	-	-	-	-	-	-	-	3	2
CO2	3	3	3	-	2	-	-	-	-	-	-	-	3	2
CO3	3	3	3	2	3	-	-	-	-	-	-	-	2	3
CO4	3	2	3	-	3	-	-	-	-	-	-	-	3	3
C05	3	3	3	2	3	-	-	-	-	-	-	-	2	3
AVG	3	2.6	3	1.2	2.6	-	-	-	-	-	-	-	2.6	2.6

JCS2601	CRYTOGRAPHY AND NETWORK SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the basics of security and classical encryption algorithms
- To learn the mathematics concepts in symmetric key cryptography and algorithms
- To acquire knowledge and fundamental ideas of public-key cryptography
- To understand the principles of Message Authentication, integrity and related algorithms
- To understand necessary approaches and techniques to build protection mechanisms to secure computer networks

Prerequisite :Matrices and Calculus , Applied Linear Algebra

UNIT I INTRODUCTION 9

Security trends - Legal, Ethical and Professional Aspects of Security, 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- cryptanalysis.

UNIT II SYMMETRIC KEY CRYPTOGRAPHY 9

Modular arithmetic-Euclid‟s algorithm- Congruence and matrices - Groups, Rings, Fields-Finite fields- SYMMETRIC KEY CIPHERS- SDES –DES–Differential and linear crypt analysis- Block cipher mode of operation–AES–Advanced Encryption Standard- RC4 Key distribution.

UNIT III PUBLIC KEY CRYPTOGRAPHY 9

Prime numbers –Primality Testing –Factorization – Euler‟s totient function, Fermat‟s and Euler‟s Theorem - Chinese Remainder Theorem–Exponentiation and logarithm-ASYMMETRIC KEYCIPHERS: RSA cryptosystem– Key distribution and management– Diffie Hellman key exchange-ElGamal cryptosystem–Elliptic curve cryptography–Honeypot using KF Sensor

UNIT IV MESSAGE AUTHENTICATION AND INTEGRITY 9

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

UNIT V SECURITY PRACTICE AND SYSTEM SECURITY 9

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

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Understand the fundament also f networks security, security architecture, threats and vulnerabilities
- Apply the different cryptographic operations of symmetric cryptographic algorithms
- Apply the different cryptographic operation so f public key cryptography
- Apply the various Authentication schemes to simulate different applications.

- Understand various Security practices and System security standards.

TEXT BOOKS:

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

REFERENCES:

1. C K Shyamala, N Harini and Dr.TR Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd, 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, ISBN 0-13-046019-2. 2019
4. Sullivan, Bryan, and Vincent Liu.Web Application Security, A Beginner's Guide. McGraw Hill Professional, 2011.

WEB REFERENCES:

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

Mapping of CO with PO/PSO

PO,PSO /CO	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	1	1	1	2	2	3	2	2
CO2	3	2	3	1	3	2	1	1	1	2	2	3	2	2
CO3	3	2	3	1	3	2	1	1	1	2	2	3	2	2
CO4	3	2	3	2	3	3	2	2	1	2	2	3	2	3
C05	3	2	2	1	2	3	1	1	1	2	2	3	2	3
AVG	3	2	2.6	1.4	2.6	2.6	1.2	1.2	1	2	2	3	2	2.4

JCS2602	CLOUD COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

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

Prerequisite : Computer Networks

UNIT I INTRODUCTION TO CLOUD COMPUTING 9

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

UNIT II VIRTUALIZATION 9

Basics of Virtualization – Virtualization Platforms & Techniques – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.

UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE 9

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

UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 9

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

UNIT V CLOUD TECHNOLOGIES AND ADVANCEMENTS 9

Hadoop – MapReduce in Google Cloud Platform– Virtual Box -- Google App Engine – Programming Environment for Google App Engine – Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Describe the main concepts, key technologies, strengths and limitations of cloud computing.
- Classify the key and enabling technologies that help in the development of cloud.
- Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.

- Explain the core issues of cloud computing such as resource management and security.
- Recognize various Cloud Technologies and Advancements

TEXT BOOKS:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. SunilkumarManvi, Gopal K. Shyam,"Cloud Computing: Concepts and Technologies", CRC Press, Taylor & Francis Publishers, 2021.

REFERENCES:

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

WEB REFERENCES:

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

Mapping of CO with PO/PSO

PO,PSO /CO	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	2	2	-	1	-	-	3	3	2	2
CO2	3	3	2	2	3	-	-	-	-	-	3	3	3	2
CO3	3	3	3	2	3	1	-	1	-	2	3	3	3	2
CO4	3	3	2	3	3	2	2	1	-	-	3	3	3	2
C05	3	2	2	2	3	2	2	1	1	1	3	3	3	2
AVG	**3**	**2.8**	**2.2**	**2.2**	**2.8**	**1.75**	**2**	**1**	**1**	**1.5**	**3**	**3**	**2.8**	**2**

JCS2611	**CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

COURSE OBJECTIVES:

- To learn different classical encryption techniques
- To implement various symmetric key cryptosystems.
- To implement various public key cryptosystems.
- To create digital signatures for authentication
- To use network security tools and vulnerability assessment tools

LIST OF EXCERSISES:

1. Perform encryption, decryption using the following substitution techniques
    i. Ceaser cipher,
    ii. Playfair cipher
    iii. Hill Cipher
    iv. Vigenere cipher
2. Perform encryption and decryption using following transposition techniques
    i. Rail fence
    ii. Row & Column Transformation
3. Apply DES algorithm for practical applications.
4. Apply AES algorithm for practical applications.
5. Implementing Block Cipher using OpenSSL in C/C++
6. Implement RSA Algorithm using HTML and JavaScript
7. Calculate the message digest of a text using the SHA-1 algorithm.
8. Implement the SIGNATURE SCHEME - Digital Signature - Kleopatra
9. Demonstrate intrusion detection system (ids) using Kf Sensor

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

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

TEXTBOOKS:

1. Bart Preneel , Christof Paar, Jan Pelzl, Understanding Cryptography: A Textbook for Students and Practitioners, Springer, 2014.
2. Wade Trappe, Lawrence Washington ,Introduction to Cryptography with Coding Theory,Pearson publication May 2020

REFERENCES:

1. WilliamStallings, CryptographyandNetworkSecurity:PrinciplesandPractice,PHI 8th Edition, 2019
2. BehrouzA.Foruzan,Debdeep Mukhopadhyay, CryptographyandNetworkSecurity, 3rd edition ,TataMcGrawHill2015.

WEB SITE REFERENCE:

1. https://opensource.com/article/19/6/cryptography-basics-openssl-part-1
2. https://kevinsguides.com/guides/security/software/pgp-encryption/
3. https://www.kfsensor.net/kfsensor/help/

Mapping of CO with PO/PSO:

PO,PSO /CO	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	-	-	-	-	-	2	3	2	1
CO2	3	3	3	2	3	-	1	-	-	-	2	3	3	2
CO3	3	3	2	2	3	1	2	-	-	-	2	3	3	2
CO4	3	3	2	3	3	1	3	1	-	1	2	3	3	2
C05	3	2	3	3	3	2	2	2	2	2	3	3	3	3
AVG	3	2.8	2.4	2.4	3	1.33	2	1.5	2	1.5	2.2	3	2.8	2

JHS2541	PROFESSIONAL COMMUNICATION	L	T	P	C
		0	0	2	1

Course Objectives:

- To enhance reading comprehension and oral communication through self-reflection and peer feedback

- To improve listening and speaking skills through exposure to diverse accents and group discussions
- To develop professional writing and critical thinking through email composition and career-related tasks
- To refine presentation skills and job application writing for effective workplace communication
- To build interview confidence and problem-solving abilities through simulations and case analysis

List of Experiments and Activities:

1. Reading: 21st Century Skills

Activity: Read an article or infographic on 21st-century skills, summarize key skills and conduct a quiz.

2. Speaking: Self-introduction

Activity: Deliver a 2 to 3-minute self-introduction or elevator pitch and receive peer feedback on content and delivery.

3. Listening: Accents in English

Activity: Listen to English audio clips in British, American, and Indian accents and answer comprehension questions based on the content.

4. Speaking: Group Discussion Dynamics

Activity: Participate in a formal group discussion on a current or technical topic and observe turn-taking, assertiveness, and relevance.

5. Writing: Working in Virtual Teams

Activity: Conduct a virtual team-based design challenge, simulate and record a remote meeting, and complete a reflective report on communication effectiveness.

6. Reading: Career Planning and Research Proposals

Activity: Read and analyse a sample career plan or research proposal, extract key points and compare effectiveness.

7. Speaking: Presentation Skills

Activity: Prepare and deliver a 4 to 5-minute oral or PPT presentation on a technical or career-related topic and receive peer and instructor feedback.

8. Writing: Job Application and Resume Writing

Activity: Prepare a tailored cover letter and resume—both by mail and email—for a specific job description, emphasizing clarity, proper formatting, and relevance.

9. Speaking: Interview Skills

Activity: Participate in mock interviews in pairs or with instructors, practice behavioural questions and receive structured feedback.

10. Listening: Professional Challenges

Activity: Listen to workplace case studies based on real-life experiences shared by friends or relatives, identify challenges and discuss possible solutions and ethical considerations.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

- To demonstrate improved reading and speaking through summarization and structured self-introductions
- To apply listening and discussion strategies by interpreting diverse accents and engaging in collaborative dialogues
- To produce professional emails and analyse career-related documents with clarity
- To deliver concise presentations and craft effective job applications tailoring to contexts
- To show interview readiness and ethical awareness by engaging in mock interviews and analysing workplace challenges.

TEXT BOOKS:

1. Meenakshi Raman & Sangeeta Sharma, Technical Communication: Principles and Practice Oxford University Press, 2022.
2. Pushp Lata & Sanjay Kumar, Communication Skills, Oxford University Press, 2011

REFERENCES:

1. Alex, K, 2019, Soft Skills: Know Yourself and Know the World, New Delhi: S. Chand & Company Limited.
2. Butterfield, Jeff, 2015, Soft Skills for Everyone. New Delhi: Cengage Learning.
3. Dhawan, Erica. (2021). Digital Body Language: How to Build Trust and Connection, No Matter the Distance. New York: St. Martin's Press.
4. Gallo, Carmine. (2014). Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds. New York: St. Martin's Press.
5. Interact English Lab Manual for Undergraduate Students, 2016, Hyderabad: Orient BlackSwan.

6. Mitra, Barun K, 2016, Personality Development and Soft Skills, New Delhi: Oxford University Press.
7. Raman, Meenakshi and Sangeeta Sharma, 2022, Professional Communication, Oxford: Oxford University Press.
8. Rizvi, Ashraf, M, 2018, Effective Technical Communication, Chennai: McGraw-Hill Education.

WEB LINKS:

1. https://www.coursera.org/learn/english-for-career-development
2. https://owl.purdue.edu/
3. https://www.mindtools.com/
4. https://www.toastmasters.org/resources/public-speaking-tips
5. https://www.ted.com/topics/communication
6. https://learnenglish.britishcouncil.org/skills
7. https://www.indeed.com/career-advice/resumes-cover-letters
8. https://www.skillsyouneed.com/

Mapping of CO with PO

PO,PSO /CO	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	3	3	3	3	-	-	2
CO2	2	2	-	-	-	2	2	3	3	3	3	-	-	2
CO3	2	2	-	-	-	2	3	3	3	3	3	-	-	2
CO4	2	2	-	-	-	2	3	3	3	3	3	-	-	2
C05	2	2	-	-	-	2	3	3	3	3	3	-	-	2
AVG	2	2	-	-	-	2	2.6	3	3	3	3	-	-	2

JPT2042	TECHNICAL SKILLS AND APTITUDE	L	T	P	C
		0	0	2	*

OBJECTIVE:

1. To make students analyze and solve problem in technical as well as aptitude. Enhance the technical skills and basics of programming language
2. To make the students understand how to apply the practical knowledge with real time applications.
3. To make the students think and draw a conclusion from different scenarios.
4. To help the students understand JAVA programming concepts
5. To help the students understand concepts and develop new Applications in JAVA.

UNIT - 1: OBJECT-ORIENTED & ADVANCED PYTHON 6

Object-Oriented Programming (OOP) - Advanced Data Structures & Algorithms - Decorators & Closures - Regular Expressions & String Manipulation - Multi-threading & Multiprocessing

UNIT - 2: JAVA FUNDAMENTALS 6

Introduction to Java - Data Types & Variables - Operators & Control Statements - Functions & Methods - Arrays & Strings

UNIT-3: OBJECT-ORIENTED PROGRAMMING (OOP) & ADVANCED JAVA 6

Object-Oriented Programming (OOP) Basics - Exception Handling - Inheritance & Polymorphism - Collections Framework - File Handling & Serialization

UNIT- IV: QUANTITATIVE APTITUDE 6

Permutation and combination: Letter, Number and circular permutation – Probability – Logarithm – Mensuration – Data sufficiency

UNIT V: LOGICAL REASONING 6

Calendar – Visual Reasoning – Mirror Image and Water Image – Picture analogy – Pattern completion – Data Interpretation – Selection decision table

TOTAL 30 PERIODS

COURSE OUTCOMES

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

CO1 To enhance their knowledge in JAVA concepts
CO2 To enhance knowledge in JAVA programming
CO3 To gain knowledge in Coding the concepts of JAVA programming
CO4 To solve the complex Arithmetic problems practically with real time application problems
CO5 To think logically in solving problems enhance their decision making for difficult situations.

CO6 To enhance their employability skills and well prepared to face the MNCs Campus interviews.

TEXTBOOK

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

WEBSITES:

- https://www.indiabix.com/aptitude/questions-and-answers/
- https://m4maths.com/placement-puzzles.php
- www.freshers world.com
- www.careerride.com
- www.youtube.com/watch/python
- www.youtube.com/watch/concepts of python
- https://stackoverflow.com/
- https://www.w3schools.com/
- https://www.geeksforgeeks.org/

Mapping of CO with PO

PO,PSO /CO	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	-	-	2	2	2	3	2	2	3
CO2	3	3	3	3	3	-	-	2	2	2	3	2	2	3
CO3	3	3	3	3	3	-	-	2	2	2	3	2	2	3
CO4	3	3	3	3	3	-	-	2	2	2	3	2	3	3
C05	3	3	3	3	3	-	-	3	3	3	3	2	3	3
AVG	3	3	3	2.8	3	-	-	2.2	2.2	2.2	3	2	2.4	3

JGE2642	COMPUTATIONAL INTELLIGENCE LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- Introduce students to real-world tools and platforms used in the tech industry.
- Provide knowledge in information security
- Impart skills related to AR & VR
- Build hands-on skills in security testing, immersive technology development, and AI/ML workflows.
- Enable mini-projects or prototypes aligning with current trends.

UNIT I FUNDAMENTALS 12

Recap of basic programming knowledge (preferably Python and C/C++), Linux and CLI-Internet access and version control (Git/GitHub)M - Basics of networking, OS concepts - Basic 3D geometry, Unity or Unreal fundamentals -Linear algebra, probability, Python, NumPy, Pandas

UNIT II INFORMATION SECURITY 12

Introduction to Cybersecurity - Footprinting, reconnaissance, and VM setup (Kali Linux) - Vulnerability Assessment - Network scanning with Nmap, Nessus, and Wireshark -Web Application Security - OWASP Top 10, SQL Injection, XSS using DVWA

UNIT III AR & VR 12

Intro to AR/VR Platforms - Unity basics, setting up AR/VR environments -Augmented Reality - ARCore or Vuforia: AR object placement, interaction -Virtual Reality - Unity with Oculus or Google Cardboard: 3D world navigation

UNIT IV MACHINE LEARNING & DEEP LEARNING 12

ML Basics with Scikit-learn - Train/test models: classification (e.g., spam detection) -Deep Learning with TensorFlow/Keras - Build an image classifier using CNN -Transfer Learning - Use pre-trained models (e.g., MobileNet, ResNet)

UNIT V MINI PROJECT 12

Password & Access Controls - Hash cracking using John the Ripper, Rainbow Tables -Create an AR/VR prototype (e.g., virtual showroom, AR guide) -Deploy a model in a web app (e.g., using Flask/Streamlit)

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Learned fundamentals of basic programming knowledge.
- Gained knowledge on ethical hacking fundamentals and tools
- Programming Knowledge and skills related to AR & VR
- Enhanced their vison on machine learning and deep learning
- use advanced scripting and programming to develop mini-projects and prototypes aligning with current trends.

Tools:

- Kali Linux, Metasploit, Burp Suite, Wireshark
- Unity3D, Vuforia/ARCore/ARKit, Oculus SDK or Cardboard SDK
- Jupyter, TensorFlow/Keras, Scikit-learn, Google Colab

LAB REQUIREMENTS

Hardware:

- PCs with minimum 8GB RAM, i5 processor, GPU recommended for DL module
- Android devices/AR-capable phones or VR headsets (Oculus Rift/Quest or Google Cardboard)

Software:

- VirtualBox/Vagrant (for cybersecurity labs)
- Unity3D (latest version)
- Python (3.10+), Anaconda
- TensorFlow, Scikit-learn, OpenCV
- GitHub Classroom or GitLab for submissions

JHS2741	UNIVERSAL HUMAN VALUES	L	T	P	C
		1	0	2	2

COURSE OBJECTIVES:

The objective of the course is four-fold:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Module I: Introduction (3L, 6P)

Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration– Its content and process; 'Natural acceptance' and Experiential Validation- as the process for self-exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Practical Session: *Include sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking*

Module II: Harmony in the Human Being (3L, 6P)

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health.

Practical Session: *Include sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.*

Module III: Harmony in the Family and Society (3L, 6P)

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Practical Session*: Include sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives*

Module IV: Harmony in the Nature and Existence (3L, 6P)

Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence.

Practical Session: *Include sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.*

Module V: Implications of Harmony on Professional Ethics (3L, 6P)

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations, Sum up.

Practical Session: *Include Exercises and Case Studies will be taken up in Sessions E.g. To discuss the conduct as an engineer or scientist etc.*

TOTAL: 45 (15 Lectures + 30 Practicals) PERIODS

COURSE OUTCOMES:

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

- Become more aware of themselves, and their surroundings (family, society, nature);
- Have more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- Have better critical ability.
- Become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- Apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

REFERENCES:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 3rd revised edition, 2023.
2. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4. The Story of Stuff (Book).
5. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
6. Small is Beautiful - E. F Schumacher.
7. Slow is Beautiful - Cecile Andrews.
8. Economy of Permanence - J C Kumarappa
9. Bharat Mein Angreji Raj – PanditSunderlal
10. Rediscovering India - by Dharampal
11. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
12. India Wins Freedom - Maulana Abdul Kalam Azad
13. Vivekananda - Romain Rolland (English)
14. Gandhi - Romain Rolland (English)

Web URLs:

1. Class preparations: https://fdp-si.aicte-india.org/UHV-II%20Class%20Note.php
2. Lecture presentations: https://fdp-si.aicte-india.org/UHV-II_Lectures_PPTs.php
3. Practice and Tutorial Sessions: https://fdp-si.aicte-india.org/UHV-II%20Practice%20Sessions.php

Mapping of CO with PO

PO,PSO /CO	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	-	-	-	2	1	3	-	-	3	-	-	1
CO2	-	-	-	-	-	2	1	3	-	-	3	1	2	2
CO3	-	-	-	-	-	3	2	3	-	1	3	2	2	2
CO4	-	-	-	-	-	3	2	3	-	1	3	1	1	1
C05	-	-	-	-	-	3	3	3	-	2	3	1	1	1
AVG	**-**	**-**	**-**	**-**	**-**	**2.6**	**1.8**	**3**	**-**	**1.33**	**3**	**1.25**	**1.5**	**1.4**

JGE2751	ENTREPRENEURSHIP DEVELOPMENT	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- Learn basic concepts in entrepreneurship, develop mind-set and skills necessary to explore entrepreneurship
- Apply process of problem - opportunity identification and validation through human centred approach to design thinking in building solutions as part of engineering projects
- Analyse market types, conduct market estimation, identify customers, create customer persona, develop the skills to create a compelling value proposition and build a Minimum Viable Product
- Explore business models, create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture ideas & solutions built with domain expertise
- Prepare and present an investible pitch deck of their practice venture to attract stakeholders

MODULE – I: ENTREPRENEURIAL MINDSET 4L, 8P

Introduction to Entrepreneurship: Definition – Types of Entrepreneurs – Emerging Economics – Developing and Understanding an Entrepreneurial Mindset – Importance of Technology Entrepreneurship – Benefits to the Society.

Case Analysis: Study cases of successful & failed engineering entrepreneurs - Foster Creative Thinking: Engage in a series of Problem-Identification and Problem-Solving tasks

MODULE – II: OPPORTUNITIES4L, 8P

Problems and Opportunities – Ideas and Opportunities – Identifying problems in society – Creation of opportunities – Exploring Market Types – Estimating the Market Size, - Knowing the Customer and Consumer - Customer Segmentation - Identifying niche markets – Customer discovery and validation; Market research techniques, tools for validation of ideas and opportunities

Activity Session: Identify emerging sectors / potential opportunities in existing markets - Customer Interviews: Conduct preliminary interviews with potential customers for Opportunity Validation - Analyse feedback to refine the opportunity.

MODULE – III: PROTOTYPING & ITERATION 4L, 8P

Prototyping – Importance in entrepreneurial process – Types of Prototypes - D ifferent methods – Tools &Techniques.

Hands-on sessions on prototyping tools (3D printing, electronics, software), Develop a prototype

based on identified opportunities; Receive feedback and iterate on the prototypes.

MODULE – IV: BUSINESS MODELS & PITCHING 4L, 8P

Business Model and Types - Lean Approach - 9 block Lean Canvas Model - Riskiest assumptions to Business Models – Using Business Model Canvas as a Tool – Pitching Techniques: Importance of pitching - Types of pitches - crafting a compelling pitch – pitch presentation skills – using storytelling to gain investor/customer attention.
Activity Session: Develop a business model canvas for the prototype; present and receive feedback from peers and mentors - Prepare and practice pitching the business ideas- Participate in a Pitching Competition and present to a panel of judges - receive & reflect feedback

MODULE – V: ENTREPRENEURIAL ECOSYSTEM 4L, 8P
Understanding the Entrepreneurial Ecosystem – Components: Angels, Venture Capitalists, Maker Spaces, Incubators, Accelerators, Investors. Financing models – equity, debt, crowdfunding, etc, Support from the government and corporates. Navigating Ecosystem Support: Searching & Identifying the Right Ecosystem Partner – Leveraging the Ecosystem - Building the right stakeholder network
Activity Session: Arrangement of Guest Speaker Sessions by successful entrepreneurs and entrepreneurial ecosystem leaders (incubation managers; angels; etc), Visit one or two entrepreneurial ecosystem players (Travel and visit a research park or incubator or makerspace or interact with startup founders).

TOTAL: 60 PERIODS

COURSE OUTCOMES:
Upon the successful completion of the course, students will be able to:
CO1: Develop an Entrepreneurial Mind-set and Understand the Entrepreneurial Ecosystem Components and Funding types
CO2: Comprehend the process of opportunity identification through design thinking, identify market potential and customers
CO3: Generate and develop creative ideas through ideation techniques
CO4: Create prototypes to materialize design concepts and conduct testing to gather feedback and refine prototypes to build a validated MVP
CO5: Analyse and refine business models to ensure sustainability and profitability Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders

REFERENCES:
1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition
2. Ries, E. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business
3. Blank, S. G., &Dorf, B. (2012). The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company. K&S Ranch
4. Roy, R. (2017). Indian Entrepreneurship: Theory and Practice. New Delhi: Oxford University Press

5. Osterwalder, A., &Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley &Sons

Mapping of CO with PO

PO,PSO /CO	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	-	-	-	1	-	-	-	-	2	-	-	-
CO2	2	2	1	-	-	-	-	-	-	-	2	-	-	-
CO3	2	3	2	2	1	-	-	-	-	-	2	-	-	-
CO4	1	2	3	2	2	-	-	-	2	2	2	-	-	-
C05	1	2	1	-	-	3	2	1	2	-	3	-	-	-
AVG	**1.6**	**2**	**1.75**	**2**	**1.5**	**2**	**2**	**1**	**2**	**2**	**2.2**	**-**	**-**	**-**

JCS2741	COMPREHENSION AND TECHNICAL SEMINAR	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To revamp the knowledge gained in the semester and prepare the students to face interview both at the academic and the Industrial Sector
- To encourage the students to study about the recent developments in the field
- To prepare and present technical reports
- To encourage the students to use various teaching aids such as power point presentation and demonstrative models

METHOD OF EVALUATION:

COMPREHENSION:

One period is allotted for comprehension. During this period, a test with objective type questions from competitive exams is conducted in identified technical courses. The evaluation is purely internal. Average of all the test marks shall be calculated, a weightage of 50 marks is awarded to the comprehension component.

TECHNICAL SEMINAR:

Three periods are allotted for the technical seminar. During the seminar session each student is expected to prepare and present a technical topic for duration of 10 minutes.

Each student is expected to make presentation at least twice during the semester and the student is evaluated based on various parameters such as topic chosen, content delivery, communication skills and presentation. A faculty guide is allotted who shall guide and monitor the progress and attendance of all the students. Equal weightage is considered for the two seminar sessions for a total weightage of 50 marks.

The total mark awarded for the course shall be the sum of marks scored out of 50 each for the two components. Evaluation is purely internal.

EVALUATION:

Technical Seminar (50)	Comprehension (50)	Total (100)	Internal Marks (50)	Internal Marks (100)

TOTAL : 30 PERIODS

COURSE OUTCOMES:

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

- Consolidate all the engineering concepts acquired in the course of study.
- Enrich their technical knowledge.
- Prepare and present technological developments.
- Communicate effectively the concepts related to the various topics.
- Face the interviews with confidence during the placement drives.

Mapping of CO with PO

PO,PSO /CO	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	2	2	1	2	2	2	3	3	2	3
CO2	3	3	2	2	3	1	1	2	2	1	3	3	3	3
CO3	2	2	3	2	2	1	1	2	3	2	2	2	2	2
CO4	1	1	1	1	2	1	1	2	3	1	2	2	1	2
C05	2	2	1	1	1	1	1	3	3	2	3	2	1	2
AVG	**2.2**	**2.2**	**1.8**	**1.6**	**2**	**1.2**	**1**	**2.2**	**2.6**	**1.6**	**2.6**	**2.4**	**1.8**	**2.4**

JCS2742	INTERNSHIP	L	T	P	C
		-	-	4	2

COURSE OBJECTIVES:

To enable the students to

- Get connected with reputed industry/ laboratory/academia / research institute
- Get practical knowledge on Product Development / Software Design and Development / Testing / Analytics/ research/ startups/ professionalism / business processes and insights / domain knowledge/ Industry Practices/ and other related aspects and develop skills to solve related problems
- Develop technical, soft, team skills to cater to the needs of the industry / academia / businesses / research / organizations in the core aspects of Automation, Digitalization

The students may undergo Industrial training for a period as specified in the Curriculum during summer/winter vacation. In this case the training has to be undergone continuously for the entire period.

In lieu of Industrial training, students may undergo Internship at Industry / Research organizations / University (after due approval from Head of the Department) during the IV,V or VI semester breaks for a continuous period of 30 days to an Industry / Organization / University and two credit is allotted in the Seventh semester based on a viva voce examination. The Industrial / Practical Training, Summer Project, Internship, shall carry 100 marks and shall be evaluated through internal assessment only.

At the end of Industrial/Practical Training/Internship/ Summer Project, the student shall submit an attendance certificate from the organization where he / she has undergone training and a brief report. The evaluation will be made based on this report and a viva-voce Examination, conducted internally by a three member Departmental Committee constituted by the Head of the Institution consisting of the course coordinator and two experts from the Department. The certificates (issued by the organization) submitted by the students shall be attached to the mark list sent by the Head of the

Institution to the Controller of Examinations.

EVALUATION :

Internship Report (40)	Presentation (30)	Viva Voce (30)	Total Marks (100)

Number of days :30

COURSE OUTCOMES:

On completion of the course, the student will know about

CO1: Industry Practices, Processes,Techniques, technology, automation and other core aspects of software industry

CO2: Analyze, Design solutions to complex business problems

CO3: Build and deploy solutions for target platform

CO4: Preparation of Technical reports and presentation.

CO5: Ability to acknowledge the value of continuing education for oneself and to stay up with technology advancements.

CO/PO MAPPING :

PO,PSO /CO	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	1	3	1	1	1	2	2	2	2	1	3
CO2	3	3	3	2	3	1	1	1	1	2	2	2	1	2
CO3	2	2	3	2	3	2	1	1	1	2	2	2	1	3
CO4	1	1	1	1	2	-	-	2	3	2	2	1	-	1
C05	1	1	1	1	2	1	1	1	2	1	3	1	1	2
AVG	1.8	1.8	2	1.4	2.6	1.25	1	1.2	1.8	1.8	2.2	1.6	1	2.2

JCS2831	PROJECT WORK	L	T	P	C
		0	0	20	10

COURSE OBJECTIVES:

- To develop the ability to solve a specific problem related to their subject expertise.
- To develop the methodology to solve the identified problem.
- To design, analyze and implement the chosen problem using the hardware components.
- To validate the simulation, hardware results with the theoretical results.
- To train the students in preparing project reports and to face reviews and viva-voce examination.

METHOD OF EVALUATION:

The students in a group of 3 to 4 work on a topic approved by the Head of the Department under the guidance of a faculty member, prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee is constituted by the Head of the Department. The project work is evaluated based on oral presentation and the project report, jointly by external and internal examiners.

PROJECT EVALUATION

ZEROTH REVIEW

Novelty/Problem Identification & Objectives (20)	Literature survey (30)	Methodology (10)	Guide (20)	PowerPoint Presentation (20)			Total (100)
				BL (5)	CS (5)	CP (10)	

FIRST REVIEW

Implementation of Methodology (20)	Design/ Analysis/ Testing/ Algorithm/Model(30)	Inferences (10)	Guide (20)	Power Point Presentation (20)			Total (100)
				BL (5)	CS (5)	CP (10)	

SECOND REVIEW

Progress (20)	Results (30)	Preparation of Conference Paper (10)	Guide (20)	Power Point Presentation (20)			Total (100)
				BL (5)	CS (5)	CP (10)	

THIRD REVIEW

Results & Discussions (30)	Conclusions (20)	Publications (10)	Guide (20)	Power Point Presentation (20)			Total (100)
				BL (5)	CS (5)	CPS (10)	

BL - Body Language, CS-Communication Skills, CP-Content of Presentation

TOTAL: 300 PERIODS

END SEMESTER EXAM

Project report (External Only) (30)	Result/Demonstration (30)		Power Point Presentation (20)		Viva (External Only) (20)	Total (100)
	Internal	External	Internal	External		

COURSE OUTCOMES:

On Completion of the project work, the student will be able to

- Apply the technical knowledge acquired for solving real world problems.
- Develop skills such as self-learning, critical thinking, problem solving, project management and finance.
- Apply modern tools and techniques for implementing the project.
- Work with team mates and collectively work towards the success of the project.
- Communicate effectively to present the outcomes of the project both in written and oral forms.

CO/PO MAPPING :

PO,PSO /CO	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	2	3	2	2	2	2	2	2	3	3	3
CO2	2	3	3	2	3	-	2	2	2	3	3	3	3	2
CO3	2	3	3	2	3	-	-	2	2	2	3	3	2	3
CO4	2	2	3	-	2	-	2	3	2	3	2	3	2	2
C05	2	2	2	-	2	-	2	3	3	3	3	3	2	2
AVG	**2.2**	**2.6**	**2.8**	**2**	**2.6**	**2**	**2**	**2.4**	**2.2**	**2.6**	**2.6**	**3**	**2.4**	**2.4**

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I **Data Science**	**Vertical II** **Creative Media**	**Vertical III** **Cyber Security**	**Vertical IV** **IoT**	**Vertical V** Artificial Intelligence and Machine Learning	**Vertical VI** **Automation Tools**
JCS2001 Foundation of Data science	JCS2009 Principles of Multimedia	JCB2001 Cyber Security Fundamentals and Practices	JIT2009 Internet of Things: Architecture Protocols And Applications	JAL2401 Principles of Artificial Intelligence	JAD2001 Agile Methodology
JCS2002 Big data analytics	JCS2010 3D Modeling and Rendering	JCB2002 Cryptography and Cryptanalysis	JIT2010 Programming For IOT Boards	JAL2501 Machine Learning	JIT2004 Devops
JCS2003 Recommender systems	JCS2011 Augmented reality and Virtual reality	JCB2003 Cyber Forensics	JIT2011 Industrial IoT 4.0	JAL2001 Cognitive Science	JAD2003 Software Testing using Selenium
JCS2004 Web and Speech Analysis	JCS2012 Digital Marketing and Commerce	JCB2004 Intrusion Detection and Prevention	JIT2012 IoT in HealthCare	JAL2002 Knowledge Representation and Reasoning	JAD2004 Pandas For Data Analysis
JCS2005 Social media analytics	JCS2013 Computer Graphics and Animation	JCB2005 Hardware Security	JIT2013 Robotics in IOT	JAL2003 Time Series Analysis and Prediction	JAD2005 Data Visualization Using Tableau
JCS2006 Data exploration and visualization	JCS2014 Video processing and Analytics	JCB2006 Cloud Security	JIT2014 Mobile Application Development For IOT	JAL2601 Neural Networks and Deep Learning	JAD2006 Jenkins Automation for Server
JCS2007 Health care analytics	JCS2015 Game Development	JCB2007 Ethical Hacking	JIT2015 Cognitive IOT	JAL2602 Natural Language Processing	JAD2007 Cloud Computing Tools
JCS2008 Image and video Analytics	JCS2016 Media Security	JCB2008 Web Application Security	JIT2016 Privacy Security for IOT	JAL2004 Robotic Process Automation Tool	JAD2008 Infrastructure Build Tool Using Terraform

VERTICAL I - DATA SCIENCE

JCS2001	FOUNDATION OF DATA SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the data science process and the different roles involved in data science.
- To understand the concept of correlation and regression.
- To develop skills in creating line plots, scatter plots, density plots, contour plots, and histograms.
- To learn data manipulation techniques using Numpy and Pandas.
- To learn techniques for visualizing segmentations and representing trees as sets of rules.

PREREQUISITE: Database Management System

UNIT-I INTRODUCTION TO DATA SCIENCE PROCESS AND R PROGRAMMING 9

Data science process, roles, stages in data science project, working with data from files, working with relational databases, exploring data, managing data, cleaning and sampling for modeling Introduction to R: Introduction to various data types, numeric, character, date, data frame, array, matrix etc., reading and writing datasets, working with different file types .txt, .csv, outliers, R functions and loops.

UNIT-II DESCRIBING RELATIONSHIPS 9

Correlation–Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r2 –multiple regression equations –regression towards the mean

UNIT-III DATA VISUALIZATIONS 9

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

UNIT-IV PYTHON LIBRARIES FOR DATA WRANGLING 9

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

UNIT-V PREDICTIVE MODELING **9**

Models, Induction, and Prediction-Visualizing Segmentations-Trees as Sets of Rules-Probability Estimation-Fitting a Model to Data: Classification via Mathematical Functions-Regression via Mathematical Functions-Class Probability Estimation and Logistic Regression

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At end of the course students will be able to:

- Gain a comprehensive understanding of the data science process, including its stages and key roles.
- Develop a clear understanding of correlation and regression and its significance in analyzing relationships between variables.
- Learn how to create line plots, scatter plots, density plots, contour plots, and histograms using appropriate tools and libraries.
- Learn how to perform data indexing, selection, and operations on datasets
- Understand how to visualize segmentations in data using appropriate techniques.

TEXT BOOKS:

1. Foster Provost & Tom Fawcett, “Data Science for Business”, Published by O’Reilly Media, 2013.
2. David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2018
3. Robert Kabacoff, "R in Action: Data Analysis and Graphics with R", Manning Publications, 2015

REFERENCES:

1. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016
2. Matt Harrison, “Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization , O’Reilly, 2016.
3. Joel Grus, “Data Science from Scratch: First Principles with Python”, O’Reilly Media, 2015.
4. Tania Moulik, “Applied Data Visualization with R and ggplot2”, September 2018. 5. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017.

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1. https://rdrr.io/cran/IPSUR/f/inst/doc/IPSUR.pdf
2. https://www.oreilly.com/library/view/applied-data-visualization
3. https://www.oreilly.com/library/view/doing-data-science/9781449363871/
4. https://pg-p.ctme.caltech.edu/data-science-course-certification
5. https://www.mygreatlearning.com/srm-mtech-data-science

MAPPING WITH CO-PO

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11
CO1	3	3	-	-	-	-	-	3	-	2	**3**
CO2	3	3	2	3	-	-	-	3	-	2	**3**
CO3	3	-	3	3	-	-	-	-	-	-	**3**
CO4	3	3	-	3	-	-	-	3	-	2	-
CO5	3	2	-	-	2	-	-	3	-	3	-
AV G	3	2.7	2.5	3	2	-	--	3	-	2.2	**3**

JCS2002	**Big Data analytics**	L	T	P	C
		3	**0**	**0**	**3**

COURSE OBJECTIVES

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

UNIT-I INTRODUCTION TO BIGDATA 9 Evolution of Bigdata-Best Practices for Bigdata Analytics-Bigdata characteristics– Validating the Promotion of the Value of Big Data - Use Cases-Characteristics of Big Data Applications - Perception and Quantification of Value-Understanding BigData Storage.

UNIT-II CLUSTERING AND CLASSIFICATION 9 Overview of Clustering - K-means - Use Cases -Overview of the Method- Determining the Number of Clusters - Classification: Decision Trees - Overview - Algorithms-Evaluation-NaïveBayes Bayes'Theorem-NaïveBayesClassifier.

UNIT-III ASSOCIATION AND RECOMMENDATION SYSTEM 9 Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Finding Association & finding similarity - Recommendation System: Collaborative Recommendation- Content Based Recommendation - Knowledge Based Recommendation- Hybrid Recommendation.

UNIT-IV HADOOP FILE SYSTEM AND MAP-REDUCE 9 Hadoop Architecture, Internals of Hadoop File Systems. Map-Reduce Programming: Developing Distributed Programs and issues, Developing Map-Reduce programs in Java, Reduce works on HDFS, Examples: Running simple word count Map-Reduce program on the cluster, analyze call data records.

UNIT-V NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION

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

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Work with big data tools and its analysis techniques.
- Analyze data by utilizing clustering and classification algorithms.
- Apply different mining algorithms and recommendation systems for large volumes of data.
- Perform on Hadoop and Map reduce programming.
- Explore NoSQL databases and management.

TEXT BOOKS

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

REFERENCES

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

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2. https://www.studocu.com/in/document/tata-institute-of-social-sciences/big-data analysis/unit-4-unit-4-notes/11465883
3. https://www.analyticssteps.com/blogs/what-big-data-analytics-definition-advantag s and-types

MAPPING WITH CO-PO

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	–	-	-	-	-	-	-	**1**
CO2	2	2	2	1	1	-	-	-	-	-	**1**
CO3	2	2	2	1	1	-	-	-	-	-	**1**
CO4	2	2	2	1	1	-	-	-	-	-	**1**
CO5	2	2	2	1	1	-	-	-	-	-	**1**
AVG	5	2	2	1	1	-	-	-	-	-	**1**

JCS2003	RECOMMENDER SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the foundations of the recommender system.
- To learn the significance of content-based Recommender systems.
- To learn about collaborative filtering.
- To make students learn about attacks in the recommender system.
- To learn on Evaluation techniques for Recommender systems.

PREREQUISITE: Database Management System

UNIT-I INTRODUCTION TO RECOMMENDER SYSTEMS **9**

Introduction and basic taxonomy of recommender systems - Traditional and non-personalized Recommender Systems - Overview of data mining methods for recommender systems similarity measures- Dimensionality reduction – Singular Value Decomposition (SVD)

UNIT-II CONTENT-BASED RECOMMENDATION SYSTEMS **9**

High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.

UNIT-III COLLABORATIVE FILTERING **9**

A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based and item based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection

UNIT-IV ATTACK-RESISTANT RECOMMENDER SYSTEMS **9**

Introduction – Types of Attacks – Detecting attacks on recommender systems – Individual attack – Group attack – Strategies for robust recommender design - Robust recommendation algorithms

UNIT-V EVALUATING RECOMMENDER SYSTEMS **9**

Evaluating Paradigms – User Studies – Online and Offline evaluation – Goals of evaluation design – Design Issues – Accuracy metrics – Limitations of Evaluation measures

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At end of the course students will be able to:

- Understand the basic concepts of recommender systems.
- Implement content-based recommender systems for various data sets.
- Implementation of Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics.
- Design and implement an attack-resistant simple recommender system.
- Learn about evaluation of recommender system

TEXT BOOKS:

1.Charu C. Aggarwal, “Recommender Systems: The Textbook”, Springer, 2016.
2.Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich , “Recommender Systems: An Introduction”, Cambridge University Press, 2011.

REFERENCES:

1. Francesco Ricci , Lior Rokach , Bracha Shapira , “Recommender Systems Handbook”, Springer , 2011.
2. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, “Mining of massive datasets”, 3rd edition, Cambridge University Press, 2020.

WEBSITE REFERENCES:

1. https://www.coursera.org/specializations/recommender-systems
2. https://towardsdatascience.com/introduction-to-recommender-systems-c66cf15ada?gi=4c414b90d766
3. https://builtin.com/data-science/recommender-systems

MAPPING WITH CO-PO

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	–	-	-	-	-	-	-	**1**
CO2	2	2	2	1	1	-	-	-	-	-	**1**
CO3	2	2	2	1	1	-	-	-	-	-	**1**
CO4	2	2	2	1	1	-	-	-	-	-	**1**
CO5	2	2	2	1	1	-	-	-	-	-	**1**
AVG	5	2	2	1	1	-	-	-	-	-	**1**

JCS2004	WEB AND SPEECH ANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To recall the basics of www and textual data in web.
- To familiarize the processing of textual data such as tokenization, phrase recognition, Document matching
- To apply relevant models for contextual information retrieval
- To understand speech recognition process
- To explain the processes involved in information extraction using sentimental analysis.

PREREQUISITE: Python Programming, Web Technology

UNIT- I INTRODUCTION TO WEB **9**

History of Web and Internet, Web analysis, Text analysis, Types of problems solved using text analysis, Document classification and information retrieval, Clustering and organizing documents, Information extraction, Prediction and Evaluation

UNIT- II NLP BASED PREDICTION **9**

A Document Tokenization- Lemmatization, Vector Generation and Prediction, Boundary determination, Phrase Recognition, Parsing, Feature generation -Term-Document Matrices (TDMs) from the Corpus, Problem specific novel patterns finding CO2 C Keyword search, Nearest Neighbor Methods, Similarity measures, Web based document search, Document matching,

UNIT-III TEXT INFORMATION RETRIEVAL **9**

Introduction to Text information retrieval -A Clustering methods for similarity Cluster Label Mean Patterns and Entities-Co-reference and relationship extraction- Template Filling - Applications: Information retrieval- commercial extraction systems-criminal justice- Intelligence

UNIT- IV SPEECH RECOGNITION **9**

Introduction to speech recognition -Speech representation and feature extraction -Hidden Markov Models (HMM) for speech recognition-Building a basic speech recognition system-Introduction to speech sentiment analysis -Pre-processing speech data for sentiment analysis-Feature extraction for speech sentiment analysis-Developing a basic speech sentiment analysis system.

UNIT-V SPEECH SENTIMENT ANALYSIS **9**

Speech Analysis: Rhetorical Devices and Persuasive Strategies-Introduction to speech analysis and its relevance- Identifying and analyzing rhetorical devices- Understanding persuasive strategies -Speech Analysis: Delivery Techniques and Nonverbal Communication-Analyzing delivery styles -Assessing nonverbal communication cues and their impact-Case studies of speeches with effective delivery techniques.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At end of the course students will be able to:

- To discuss the basics of www and textual data in web.
- To analyse tokenization, phrase recognition, Document matching in text data processing
- To build relevant models for contextual information retrieval
- To explain speech recognition process
- To discuss the basic concepts involved in information extraction using sentimental analysis.

TEXT BOOKS

1. GregoryC. Burdea & Philippe Coiffet, John, “VirtualReality Technology” 2nd Edition, Wiley & Sons, 2013
2. D. Yu and L. Deng ,"Automatic Speech Recognition: A Deep Learning Approach", Springer, 2015

REFERENCES:

1. Bing Liu , “Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data”, Springer, 2011

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3.https://online.lsu.edu/newsroom/articles/how-virtual-reality-changing-education/
4. https://www.analyticssteps.com/blogs/5-applications-virtual-reality-education

MAPPING WITH CO-PO

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	–	-	-	-	-	-	-	**1**
CO2	2	2	2	1	1	-	-	-	-	-	**1**
CO3	2	2	2	1	1	-	-	-	-	-	**1**
CO4	2	2	2	1	1	-	-	-	-	-	**1**
CO5	2	2	2	1	1	-	-	-	-	-	**1**
AVG	5	2	2	1	1	-	-	-	-	-	**1**

JCS2005	SOCIAL MEDIA ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand basics ofsocial media related simple applications.
- To understand data structures in social media analysis
- To recall the basics of social networks
- To explain the data extraction and mining ofsocial networks
- To describe the processing and visualization in web analytics

PREREQUISITE: Computer Networks

UNIT 1 INTRODUCTION TO SOCIAL MEDIA ANALYTICS **9**

Introduction, History of Social media Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Types of social networks: friend, user-generated,

content, affiliation, etc., Sociograms, Sociometric studies Basics of Social Media and Business Models, Basics of Web Search Engines and Digital Advertising., Application of SMA in different areas

UNIT 2 GRAPH AND MATRICES **9**

The Adjacency Matrix, Paths and Connectivity, Distance and Breadth-First Search, Network Datasets: An Overview Nodes, ties and influencers, Making connections: Link analysis. Paths Random graphs and network evolution. telephone call graph, Weighted Networks, Hypergraph

UNIT 3 NETWORK FUNDAMENTALS **9**

Network structures: equivalence, homophile, clustering, Snowball Sampling, Contact Tracing, And Random Walks, Ego-centered network, dominance hierarchies, Third-Party Records, affiliation network, Citation Networks, Peer-To- Peer Networks, Recommender Networks, Biological Networks, Genetic Regulatory Networks, Neural Networks

UNIT 4 SOCIAL NETWORK AND MODELING **9**

Social contexts: Affiliation and identity. social capital, structural holes, Structural balance, Predictive modeling, Descriptive modeling: community/anomaly detection Diffusion in Networks : information cascades, social ,influence, market experiments, Geospatial social data mining, Privacy in a Networked World, Predicting the future with social media Facebook Analytics: Introduction, parameters, demographics. Analysing page audience. Reach and Engagement analysis. Google analytics.

UNIT 5 PROCESSING, VISUALIZATION AND WEB ANALYTICS **9**

Processing and Visualizing Data, Influence Maximization, Link Prediction, Collective Classification, Applications in Advertising and Game Analytics, Collecting and analysing social media data; visualization and exploration, Social network and web data and methods, Clickstream analysis, A/B testing, online surveys, Web crawling and Indexing. Natural LanguageProcessing Techniques for Micro-text Analysis, Trend: social influences on judgments, opinion spread, sentiment.

TOTAL:45 PERIODS

COURSE OUTCOMES:

At end of the course students will be able to:

- Develop simple social media related simple applications
- Explain the data structures in Social Networking
- Discuss the basics of networking.
- Explain the data extraction and mining ofsocial networks
- Discuss the processing and visualization in web analytics

TEXT BOOK:

1. Peter Mika, "Social Networks and the Semantic Web, First Edition, Springer 2007.
2. BorkoFurht, "Handbook of Social Network Technologies and Application, Springer, 2010.
3. David Easley, Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning about a Highly Connected World‖, First Edition, Cambridge University Press, 2010.

REFERENCE BOOKS:

1. Easley D. Kleinberg J., "Networks, Crowds, and Markets – Reasoning about a Highly Connected World‖, Cambridge University Press, 2010.
2. Jackson, Matthew O., "Social and Economic Networks", Princeton University Press, 2008.
3. GuandongXu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking Techniques and applications", First Edition, Springer, 2011.
4. Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.

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1. https://www.coursera.org/learn/social-media-analytics-introduction
2. https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fcarey.jhu.edu%2Fuploads%2Fdocuments%2F450.765_AY19-20.docx&wdOrigin=BROWSELINK
3. https://blog.hootsuite.com/what-is-social-media-analytic/

MAPPING WITH CO-PO

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	-	1	-	1	2	-	-	1	3
CO2	3	1	3	2	1	1	-	2	3	2	3
CO3	2	3	2	3	3	3	-	2	-	2	1
CO4	1	3	3	3	3	3	3	3	2	3	2
CO5	2	3	2	3	3	3	2	-	2	3	1
AVG	2.0	2.2	2.5	2.4	2.5	2.0	2.3	2.3	2.3	2.2	2

JCS2006	DATA EXPLORATION AND VISUALIZATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

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

PREREQUISITE: Probability and Statistics

UNIT I EXPLORATORY DATA ANALYSIS **9**

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

UNIT II VISUALIZING USING MATPLOTLIB **9**

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

UNIT III UNIVARIATE ANALYSIS **9**

Introduction to Single variable: Distributions and Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality - Smoothing Time Series.

UNIT IV BIVARIATE ANALYSIS **9**

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

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

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

TOTAL:45 PERIODS

COURSE OUTCOMES:

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

- Understand the fundamentals of exploratory data analysis.
- Implement the data visualization using Matplotlib.
- Perform univariate data exploration and analysis.
- Apply bivariate data exploration and analysis.
- Use Data exploration and visualization techniques for multivariate and time series data.

TEXT BOOKS:

1. Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with Python”, Packt Publishing, 2020. (Unit 1)
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", Oreilly, 1st Edition, 2016. (Unit 2)
3. Catherine Marsh, Jane Elliott, “Exploring Data: An Introduction to Data Analysis for Social Scientists”, Wiley Publications, 2nd Edition, 2008. (Unit 3,4,5)

REFERENCES:

1. Eric Pimpler, “Data Visualization and Exploration with R”, GeoSpatial Training service 2017.
2. Claus O. Wilke, “Fundamentals of Data Visualization”, O’reilly publications, 2019.
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, “Interactive Data Visualization: Foundations, Techniques, and Applications”, 2nd Edition, CRC press, 2015.

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1. Data Analysis and Visualization Foundations | Coursera
2. Data Analysis and Visualization Foundations Specialization (IBM) | Coursera
3. Data Analysis and Visualization – Shaheed Sukhdev College of Business Studies (du.ac.in)
4. Data Analysis and Visualization Syllabus - BCA Tribhuvan University(TU) - Bench Partner

MAPPING WITH CO-PO

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	3	3	-	-	-	2	3	3	3
CO2	2	2	2	1	1	-	-	3	2	3	1
CO3	2	1	2	1	1	-	-	-	1	2	1
CO4	2	2	2	1	-	-	-	1	2	1	3
CO5	3	1	1	2	1	-	-	3	2	1	2
AVG	2.4	1.4	2	1.6	1			2.25	2	2	2

JCS2007	HEALTH CARE ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Understand the health data formats, health care policy and standards
- Learn the significance and need of data analysis and data visualization
- Understand the health data management frameworks
- Learn the use of machine learning and deep learning algorithms in healthcare
- Apply healthcare analytics for critical care applications

PREREQUISITE: Database Management System and Artificial Intelligence UNIT I:

INTRODUCTION TO HEALTHCARE ANALYSIS 9

Overview - History of Healthcare Analysis Parameters on medical care systems- Health care policy- Standardized code sets – Data Formats – Machine Learning Foundations: Tree Like reasoning , Probabilistic reasoning and Bayes Theorem, Weighted sum approach.

UNIT II : ANALYTICS ON MACHINE LEARNING 9

Machine Learning Pipeline – Pre-processing –Visualization – Feature Selection – Training model parameter – Evaluation model: Sensitivity , Specificity , PPV,NPV, FPR ,Accuracy, ROC, Precision, Recall Curves , Valued target variables – Python: Variables and types, Data Structures and containers , Pandas Data Frame:Operations – Scikit –Learn : Pre-processing , Feature Selection.

UNIT III HEALTH CARE MANAGEMENT **9**

IOT- Smart Sensors – Migration of Healthcare Relational database to NoSQL Cloud Database – Decision Support System – Matrix block Cipher System – Semantic Framework Analysis – Histogram bin Shifting and Rc6 Encryption – Clinical Prediction Models – Visual Analytics for Healthcare.

UNIT IV HEALTHCARE AND DEEP LEARNING **9**

Introduction on Deep Learning – DFF network CNN- RNN for Sequences – Biomedical Image and Signal Analysis – Natural Language Processing and Data Mining for Clinical Data – Mobile Imaging and Analytics – Clinical Decision Support System.

UNIT V CASE STUDIES **9**

Predicting Mortality for cardiology Practice –Smart Ambulance System using IoT Hospital Acquired Conditions (HAC) program- Healthcare and Emerging Technologies – ECG Data Analysis.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

- Use machine learning and deep learning algorithms for health data analysis
- Apply the data management techniques for healthcare data
- Evaluate the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications
- Design health data analytics for real time applications
- Design emergency care system using health data analysis

TEXT BOOKS:

1. Chandan K.Reddy, Charu C. Aggarwal, “Health Care data Analysis”, First edition, CRC, 2015.
2. Vikas Kumar, “Health Care Analysis Made Simple”, Packt Publishing, 2018.

REFERENCES:

1. Nilanjan Dey, Amira Ashour , Simon James Fong, Chintan Bhatl, “Health Care Data Analysis and Management, First Edition, Academic Press, 2018.
2. HuiJang, Eva K.Lee, “HealthCare Analysis : From Data to Knowledge to Healthcare Improvement”, First Edition, Wiley, 2016.
3. Kulkarni , Siarry, Singh ,Abraham, Zhang, Zomaya , Baki, “Big Data Analyticsin HealthCare”, Springer, 2020.

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1. https://cpe.ucdavis.edu/sites/g/files/dgvnsk4886/files/2021-04/Intro%20to%20Healthcare%20Analytics%20Syllabus%20-%20HCA200
2. https://www.coursera.org/learn/healthcare-analytics-essentials
3. https://www.coursera.org/lecture/hi-five-clinical/introduction-to-healthcare-data analytics-overview-NAv03
4. https://www.business.rutgers.edu/masters-healthcare-analytics intelligence/curriculum

MAPPING WITH CO-PO

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	1	3	-	-	3	2	1	1
CO2	3	1	1	3	1	-	-	3	2	3	1
CO3	2	1	2	1	2	-	-	2	2	1	3
CO4	2	2	3	3	1	-	-	2	3	1	2
CO5	1	2	2	1	1	-	-	1	3	3	2
AVG	2.2	1.8	2.2	1.8	1.6	-	-	2.2	2.4	1.8	1.8

JCS2008	IMAGE AND VIDEO ANALYTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the basics of image processing techniques for computer vsion.
- To learn the techniques used for image pre-processing.
- To discuss the various object detection techniques.
- To understand the various Object recognition mechanisms.
- To elaborate on the video analytics techniques.

PREREQUISITE: Python Programming and Computer Graphics

UNIT I INTRODUCTION **9**

Computer Vision – Image representation and image analysis tasks - Image representations – digitization – properties – color images – Data structures for Image Analysis - Levels of image data representation - Traditional and Hierarchical image data structures.

UNIT II IMAGE PRE-PROCESSING **9**

Local pre-processing - Image smoothing - Edge detectors - Zero-crossings of the second derivative- Scale in image processing - Canny edge detection -Parametric edge models - Local pre processing in the frequency domain - Line detection by local pre- processing operators - Image restoration.

UNIT III OBJECT DETECTION USING MACHINE LEARNING **9**

Object detection– Object detection methods – Deep Learning framework for Object detection– bounding box approach-Intersection over Union (IoU) –Deep Learning Architectures-R-CNN Faster-R-CNN-You Only Look Once (YOLO)-Salient features-Loss Functions-YOLO architectures

UNIT IV FACE RECOGNITION AND GESTURE RECOGNITION **9**

Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition Deep Face solution by Facebook-FaceNet for Face Recognition- Implementation using FaceNet Gesture Recognition.

UNIT V VIDEO ANALYTICS **9**

Video Processing – use cases of video analytics-Vanishing Gradient and exploding gradient problem-RestNet architecture-RestNet and skip connections-Inception Network-GoogleNet architecture-Improvement in Inception v2-Video analytics-RestNet and Inception v3.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Discuss the basics of image processing techniques for computer vision and video analysis.
- Analyse the techniques used for image pre-processing.
- Develop various object detection techniques.
- Make use of various face recognition mechanisms for multiple applications.
- Elaborate on deep learning-based video analytics.

TEXT BOOKS

1. Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing, Analysis, and Machine Vision”, 4nd edition, Thomson Learning, 2013.
2. Vaibhav Verdhan,(2021, Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras,Apress 2021(UNIT-III,IV and V)

REFERENCES

1. Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer Verlag London Limited,2011.
2. Caifeng Shan, FatihPorikli, Tao Xiang, Shaogang Gong, “Video Analytics for Business Intelligence”, Springer, 2012.
3. D. A. Forsyth, J. Ponce, “Computer Vision: A Modern Approach”, Pearson Education, 2003. 4. E. R. Davies, (2012), “Computer & Machine Vision”, Fourth Edition, Academic Press.

WEBSITE REFERENCES

1.https://www.analyticsvidhya.com/blog/2018/09/deep-learning-video-classification-python/
2. https://www.toptal.com/machine-learning/machine-learning-video-analysis
3.https://tryolabs.com/guides/video-analytics-guide
4. https://www.simplilearn.com/image-processing-article
5. https://www.v7labs.com/blog/video-recognition-overview-and-tutorial

MAPPING WITH CO-PO

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	2	2	2	-	-	3	3	2	1
CO2	2	2	3	3	3	-	-	3	2	1	1
CO3	1	2	2	2	3	-	-	1	2	1	1
CO4	1	2	3	2	3	-	-	2	2	2	1
CO5	3	2	1	3	2	-	-	2	1	1	1
AVG	2	1.8	2.2	2.4	2.6	-	-	2.2	2	1.4	1

VERTICALS II – CREATIVE MEDIA

JCS2009	PRINCIPLES OF MULTIMEDIA	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To understand different forms of media in systems.
- To acquire knowledge in multimedia components.
- To acquire knowledge about multimedia tools and authoring.
- To acquire knowledge in the development of multimedia applications.
- To learn about the latest trends and technologies in multimedia.

COURSE PRE-REQUISITES: Basics of photoshop & Animation

UNIT I INTRODUCTION **9**

Introduction to Multimedia – Characteristics of Multimedia Presentation – Multimedia Components – Promotion of Multimedia Based Components – Digital Representation – Media and Data Streams – Multimedia Architecture – Multimedia Documents – Visual Display System.

UNIT II ELEMENTS OF MULTIMEDIA **9**

Text: Types, Font, Unicode Standard, Text Compression, File Formats , Image Processing, Standards, Specification, Device Independent Color Models, Gamma Correction, File Formats – Video: Video Signal Transmission, Signal Formats, Broadcasting Standards, Digital Video Standards, PC Video, Video File Formats – Audio: Acoustics, Characteristics of Sound Graphics: Components of Graphics System, Plotter – Introduction to 2D and 3D Graphics

UNIT III MULTIMEDIA SYSTEMS **9**

Compression Types and Techniques: CODEC, GIF Coding Standards, JPEG, MPEG –Multimedia Database System – User Interfaces – OS Multimedia Support – Hardware Support – Real Time Protocols – Play Back Architectures – Synchronization – Document Architecture – Hypermedia Concepts: Hypermedia Design – Digital Copyrights.

UNIT IV MULTIMEDIA TOOLS **9**

Authoring Tools – Features and Types – Card and Page Based Tools – Icon and Object Based Tools – Time Based Tools – Cross Platform Authoring Tools – Editing Tools – Painting and Drawing Tools – 3D Modeling and Animation Tools – Image Editing Tools – Sound Editing Tools – Digital Movie Tools.

UNIT V MULTIMEDIA APPLICATION DEVELOPMENT **9**

Software Life Cycle – ADDIE Model – Conceptualization – Content Collection – StoryBoard –Script –Authoring Metaphors – Testing – Report Writing – Documentation.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES: 15 PERIODS

1. Install tools like Flash, Photoshop, Blender.
2. Design a simple web page with animated web advertisement.
3. Creating visual effects by editing and mixing various media elements using tools like adobe premier pro.
4. Use Adobe after effects for creating lighting effects and shades.
5. Use Adobe audition for sound mixing.
6. Use Adobe media encoder for coding an audio.
7. Use Photoshop to create a button, banner and texture.
8. Use Photoshop to create morphing and animation.
9. Develop a full-fledge multimedia application.
10. Develop a digital story boarding and 3D animation as mini project.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Handle the multimedia elements effectively.
- Articulate the concepts and techniques used in multimedia applications.
- Develop effective strategies to deliver Quality of Experience in multimedia applications.
- Design and implement algorithms and techniques applied to multimedia objects.
- Design and develop multimedia applications following software engineering models.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE REQUIREMENTS

- Adobe Photoshop

HARDWARE REQUIREMENTS

- Standalone desktops (or) Server supporting 30 terminals or more

REFERENCES:

1. Ranjan Parekh, “Principles of Multimedia”, Second Edition, McGraw-Hill Education, 2017.
2. Tay Vaughan, “Multimedia: Making It Work”, Ninth Edition, McGraw-Hill, 2014. 3. Ralf Steinmetz, Klara Nahrstedt, “Multimedia: Computing, Communications and Applications”, Prentice Hall, 1995.
4. PaulDietel, HarveyDietel, AbbeyDietel, “Internet & World Wide Web How to Program”, Fourth Edition, Prentice Hall, 2008.
5. Fred Halsall, “Multimedia Communications: Applications, Networks, Protocols and

Standards", Pearson Education, 2002.

WEBSITE REFERENCES:

- https://www.geeksforgeeks.org/what-is-multimedia/
- https://www.britannica.com/technology/interactive-media
- https://visme.co/blog/multimedia-presentation/
- https://www.makeuseof.com/photoshop-3d-elements-alternatives/

Mapping with CO / PO

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

JCS2010	3D MODELING AND RENDERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the fundamentals of modeling and rendering.
- To know the working principles of objects in three-dimensional space.
- To acquire knowledge about the issues in Scene modelling.
- To learn rendering algorithms and application ofspecial effects to the modelled objects.
- To gain skill in designing real time movie and games.

COURSE PRE-REQUISITES: Computer Graphics

UNIT I MATHEMATICS FOR MODELING **9**

Overview of Graphics System: Video Display Devices, Raster System, Input Devices – Interactive Input Methods and Graphical User Interfaces –Vector Tools for Graphics: Dot Product, Cross Product, Representation of Key Geometric Objects, Intersection of lines and planes, Polygon Intersection.

UNIT II GEOMETRIC PRIMITIVES MODELING **9**

Transformation of Objects: 3D Affine Transformation, Geometric Transformation –2D and 3D Viewing –Modeling Shapes with Polygons Meshes–Curves and Surface Design –Color Models and Color Application.

UNIT III OBJECT MODELING **9**

Visual Surface Detection Methods –Illumination Models –Computer Animation –Hierarchical Modeling –Human Character Modeling –Applying Emotion for the Characters –Vehicle Modeling –Landscape Modeling.

UNIT IV SCRIPTING **9**

Physics: Collision Detection, Particles Systems, Rigid Bodies Motion, Deformable Bodies – Artificial Intelligent: Path Finding, Controlled Based Animation, Animation and Modeling: Key frame, Kinematics, Inverse Kinematics –Rigging –Bones –Adding Speech Movements to Characters –Skinning –Spatial Sorting –Level of Details.

UNIT V RENDERING AND SPECIAL EFFECTS **9**

Developing 2D and 3D Interactive Scene using OpenGL, Unity and Similar Tools –Advanced Tools in Rendering –Global Illumination –Shade Effects –Sound –Lighting –Video Post Interface –Atmospheric Effects: Fire, Water, Fog –Impact of Graphics and Animation on Film and Gaming Industry. **TOTAL: 45 PERIODS**

COURSE OUTCOMES

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

- Apply the knowledge related to concepts and techniques used in 3D Modeling.
- Understand the physics and basic movements of character.
- Conduct various experiments for effective modern interactive 3D Scene design.
- Design and implement algorithms and techniques applied to 3D Modeling and Rendering.
- Apply various tools and software related to three-dimensional modelling efficiently to uphold the professional and social obligation.

TEXT BOOKS:

1. Donald Hearn, M.Pauline Baker, "Computer Graphics with OpenGL", Third Edition, Pearson Education, 2012.
2. Micheal E.Mortenson, ' 3D Modeling, Animation and Rendering",2010.

REFERENCES:

1. F.S. Hill, Jr., Stephen Kelly, "Computer Graphics Using OpenGL", Third Edition Persons Education/PHI Learning, 2007.
2. AndyBeane, "3D Animation Essentials", John Wiley & Sons, 2012.
3. R.Stuart Ferguson, "Practical Algorithms for 3D Computer Graphics", Second Edition, CRC Press, 2013.
4. Kelly L.Murdock, "Auto Desk Maya 2016 Basic Guide", Auto Desk Maya,2016.

WEBSITE REFERENCES:

1. https://www.makeuseof.com/primitives-in-3d-modeling/
2. https://www.techopedia.com/definition/8635/object-model
3. https://www.turito.com/learn/math/mathematical-modeling
4. https://www.quora.com/3d-modeling-software

Mapping with CO / PO

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

CO-5	3	2	3	3	3	3	-	-	-	-	-
Avg	2.2	1.4	2.2	2.2	2.2	2.2	-	-	-	-	-

JCS2011	**AUGMENTED REALITY AND VIRTUAL REALITY**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES

- Learn the fundamental Computer Vision, Computer Graphics and Human-Computer. interaction Techniques related to VR.
- Review the Geometric Modeling Techniques.
- Review the Virtual Environment.
- Discuss and Examine VR/AR Technologies.
- Use of various types of Hardware and Software in Virtual Reality systems and it's applications.

COURSE PRE-REQUISITES: Computer Graphics

UNIT-I INTRODUCTION TO VIRTUAL REALITY 9

Virtual Reality and Virtual Environment, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark.

UNIT-II COMPUTER GRAPHICS AND GEOMETRIC MODELLING 9

The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, Color theory, Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modelling, 3D clipping, Illumination models, Reflection models, Shading algorithms, Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection.

UNIT-III VIRTUAL ENVIRONMENT 9

Input/Output Devices: Input ,Output , Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems, Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system.

Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft

UNIT-IV AUGMENTED REALITY **9**

Taxonomy, Technology and Features of Augmented Reality, AR Vs VR, Challenges with AR, AR systems and functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, Enhancing interactivity in AR Environments, Evaluating ARsystems.

UNIT-V DEVELOPMENT TOOLS, FRAMEWORKS & APPLICATIONS **9**

Human factors: Introduction, the eye, the ear, the somatic senses Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems

Software: Introduction, Modelling virtual world, Physicalsimulation, VR toolkits, Introduction to VRML.AR / VR Applications: Introduction, Engineering, Entertainment, Science, Training, Game Development.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Understand fundamental Computer Vision, Computer Graphics and Human Computer Interaction Techniques related to VR.
- Understand Geometric Modeling Techniques
- Understand the Virtual Environment
- Analyze and evaluate VR/AR Technologies
- Apply various types of Hardware, Software in Virtual Reality systems and Virtual/Augmented RealityApplications.

TEXT BOOKS

1. Coiffet, P., Burdea, G. C., (2003), "Virtual Reality Technology," Wiley-IEEE Press
2. Schmalstieg, D., Höllerer, T., (2016), "Augmented Reality: Principles & Practice," Pearson.

REFERENCES

1. Craig, A. B., "Understanding Augmented Reality, Concepts and Applications," Morgan Kaufmann, 2013
2. Craig, A. B., Sherman, W. R., Will, J. D., "Developing Virtual Reality Applications, Foundations of Effective Design," Morgan Kaufmann, 2009
3. Kim, G. J., "Designing Virtual Systems: The Structured Approach", 2005 4. Bimber, O., Raskar, "Spatial Augmented Reality: Merging Real and Virtual Worlds," CRC Press, 2005

5. O'Connell, K., “Designing for Mixed Reality: Blending Data, AR, and the Physical World,” O'Reilly, 2019
6. Sanni Siltanen, S, “Theory and applications of marker-based augmented reality,” Julkaisija –Utgivare Publisher, 2012

WEBSITE REFERENCES

- Manivannan, M., (2018), “Virtual Reality Engineering,” IIT Madras, https://nptel.ac.in/courses/121106013
- Misra, S., (2019), “Industry 4.0: Augmented Reality and Virtual Reality,” IIT Kharagpur, https://www.youtube.com/watch?v=zLMgdYI82IE
- Dube, A., (2020), “Augmented Reality - Fundamentals and Development,” NPTEL Special Lecture Series, https://www.youtube.com/watch?v=MGuSTAqlZ9Q • http://cambum.net/course-2.htm

MAPPING WITH CO / PO

	Program Outcomes										
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO-1	2	2	1	1	-	1	-	3	1	1	1
CO-2	2	2	1	1	-	1	-	3	2	2	2
CO-3	2	3	2	2	-	1	-	3	2	2	2
CO-4	2	1	3	2	3	2	2	3	2	2	2
CO-5	2	2	3	3	1	1	1	2	2	1	2
Avg	2	2	2	1.8	2	1.2	1.5	2.8	1.8	1.6	1.8

]

JCS2012	DIGITAL MARKETING AND COMMERCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the concept of digital marketing and strategy
- To explore on various search engine optimization strategies and marketing
- To know marketing through E-mail and Mobile
- To learn marketing through social media
- To know about the various digital transformation techniques

COURSE PRE-REQUISITES: Nil

UNIT I INTRODUCTION TO ONLINE MARKET **9**

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

UNIT II SEARCH ENGINE OPTIMISATION **9**

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

UNIT III E- MAIL MARKETING **9**

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

UNIT IV SOCIAL MEDIA MARKETING **9**

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

UNIT V DIGITAL TRANSFORMATION **9**

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

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- To examine and explore the role and importance of digital marketing in today's rapidly changing business environment..
- To focusses on how digital marketing can be utilised by organisations and how its effectiveness can measured.
- To know the key elements of a digital marketing strategy.
- To study how the effectiveness of a digital marketing campaign can be measured • To demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs.

TEXT BOOKS:

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia;Publisher: Pearson Education; First edition (July 2017);ISBN-10: 933258737X;ISBN-13: 978-9332587373.
2. Digital Marketing by Vandana Ahuja ;Publisher: Oxford University Press (April 2015). ISBN-10: 0199455449.
3. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler;Publisher: Wiley; 1st edition (April 2017); ISBN10: 9788126566938;ISBN13: 9788126566938.
4. Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited..
5. Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South-Western ,Cengage Learning.

CO-PO MAPPING:

	Program Outcomes										
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO-1	3	2	1	-	1	2	1	2	-	-	-
CO-2	3	3	1	-	2	2	1	2	-	-	-
CO-3	3	3	1	-	2	2	1	2	-	-	-
CO-4	3	3	1	-	1	2	1	2	-	-	-
CO-5	2	2	2	-	3	2	1	2	-	-	-
Avg	2.8	2.4	1.2	-	1.8	2	1	2	-	-	-

JCS2013	COMPUTER GRAPHICS AND ANIMATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the fundamentals of graphics.
- To gain and understand the acquired knowledge pertaining to 2D and 3D concepts in graphics.
- To familiarize the fundamental concepts of graphical color models.
- To understand the basic 3D modeling and rendering techniques.
- To know the working principles of animation tools.

COURSE PRE-REQUISITES: Data Structures and algorithm

UNIT-I FUNDAMENTALS OF COMPUTER GRAPHICS **9**

Attributes of Graphics Primitives, Implementation Algorithms for Graphics primitives and attributes-Line drawing: DDA, Bresenham's, Circle generation, Ellipse generation, Implementation style for fill styles: Scan line polygon filling algorithm, Boundary fill and Flood fill

UNIT-II 2D AND 3D TRANSFORMATION VIEWING **9**

2D transformation: Translation, Scaling, Rotation, Composite transformation, Reflection, Shearing, Raster Transformation - 2D Viewing: Pipeline, Normalization.

3D Transformation: Translation, Scaling, Rotation, Reflection, Shearing, 3D Viewing: Projection, Three-Dimensional Viewing concepts, 3D Viewing pipe line, Three-Dimensional viewing coordinate parameters, Projection transformation: Parallel projection, Orthogonal projection: oblique, Perspective projection, View volume.

UNIT-III COLOR MODELS AND ILLUMINATION **9**

Color Models: Chromaticity Diagram, RGB model, YIQ model, CMY model, CMYK model, HSV model, HLS model, Transformation between color models. Illumination models: Lighting Models, Basic Illumination models: Ambient Light, Diffusion Light, Specular reflection.

UNIT-IV VISIBLE SURFACE DETECTION AND SURFACE RENDERING **9**

Visible Surface Detection Methods: Back face detection, Depth buffer method, A-Buffer method, Scan-line method, Depth-sorting method, BSP-Tree method, Area-subdivision method, Octree method, Ray-casting method, Curve and Line frame detection, Polygon rendering method – Constant intensity, Gouraud surface rendering, Phong surface rendering and Fast Phong surface rendering.

UNIT-V COMPUTER ANIMATION **9**

Raster methods of Animation, Design of Animation sequence, traditional Animation sequence,

Key frame animation sequence, Key frame system, Motion Specification: Direct motion specification, Goal-Directed systems, Kinematics and Dynamics. Introduction to the flash interface, Setting stage dimensions, working with panels, panel layouts, Layers & Views, Shaping Objects – Overview of shapes, Drawing & Modifying Shapes, Bitmap Images & Sounds, Animation -Principles, Frame by frame animation, tweening, masks

TOTAL:45 PERIODS

COURSE OUTCOMES

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

- Understand the concepts of computer graphics primitives and various graphics algorithms.
- Design and demonstrate the 2D and 3D object transformation and viewing through graphics principles.
- Understand the various color models and comprehend the complexities of illumination in virtual scenes.
- Express their ability to model the hidden surface and render the respective 3D objects to project on the screen.
- Comprehend and apply animation techniques towards the formation of motion pictures.

TEXT BOOKS

1. Donald D. Hearn, Pauline Baker, Warren Carithers - Computer graphics with Open GL.- Pearson New International Edition, 4th Edition, Pearson Education Ltd., 2014.
2. Sumanta Guha, Computer Graphics Through OpenGL - From Theory to Experiments, 3rd Edition, CRC Press, 2019.
3. Robert R, Snow D, Flash CS4 Professional Bible, Wiley Publishing, 2011

REFERENCES

1. JungHyun Han, Introduction to Computer Graphics with OpenGL-ES, CRC Press, 2018.
2. Steve Marschner, Peter Shirley, Fundamentals ofComputer Graphics, Fourth Edition, CRC Press, 2016.
3. Edward Angel, Dave Shreiner, Interactive Computer Graphics - A Top-Down Approach with Shader-Based OPENGL, 6th Edition, Addison-Wesley, 2012.

WEBSITE LINKS

1. https://www.javatpoint.com/computer-graphics-tutorial
2. https://www.udemy.com/course/blender-basics-a-quick-intro-to-3d-modeling-and rendering/
3. https://www.tutorialboneyard.com/simple-flash-animation/

CO-PO MAPPING:

	Program Outcomes										
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO-1	2	1	1	-	1	2	-	-	2	-	-
CO-2	2	1	1	-	2	1	-	-	1	-	-
CO-3	2	1	-	1	1	2	-	-	2	-	-
CO-4	2	2	1	-	2	1	-	-	1	-	-
CO-5	2	1	1	2	3	3	-	-	2	-	2
Avg	2	1.2	1	1.5	1.8	1.8	-	-	1.6	-	2

JCS2014	**VIDEO PROCESSING AND ANALYTICS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

- To have a better knowledge about videos representation and its formats
- To know the fundamental concepts of data science and analytics
- To enrich students with video processing for analytics
- To understand the data analytics for processing video content
- To expose the student to emerging trends in video analytics

COURSE PRE-REQUISITES: Big data Analytics

UNIT I VIDEO FUNDAMENTALS **9**

Basic Concepts and Terminology – Analog Video Standards – Digital Video Basics – Analog-to Digital Conversion – Color Representation and Chroma Sub Sampling – Video Sampling Rate and Standards Conversion – Digital Video Formats –Video Features – Colour, Shape and Textural Features.

UNIT II MOTION ESTIMATION AND VIDEO SEGMENTATION **9**

Fundamentals of Motion Estimation – Optical Flow – 2D and 3D Motion Estimation – Block Based Point Correspondences – Gradient Based Intensity Matching – Feature Matching – Frequency Domain Motion Estimation – Video Segmentation.

UNIT III FUNDAMENTAL DATA ANALYSIS **9**

Exploratory Data Analysis – Collection of Data – Graphical Presentation of Data – Classification of Data – Storage and Retrieval of Data – Big Data – Challenges of Conventional Systems – Web Data – Evolution of Analytic Scalability – Analytic Processes and Tools – Analysis vs. Reporting.

UNIT IV MINING DATA STREAMS AND VIDEO ANALYTICS **9**

Introduction To Streams Concepts – Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Analytic Processes and Tools – Video shot boundary detection – Model Based Annotation and Video Mining – Video Database – Video Categorization – Video QueryCategorization

UNIT V EMERGING TRENDS **9**

Affective Video Content Analysis – Parsing a Video Into Semantic Segments – Video Indexing and Abstraction for Retrievals – Automatic Video Trailer Generation – Video In painting – Forensic Video Analysis.

TOTAL:45 PERIODS

PRACTICAL EXERCISES: 15 PERIODS

1. Choose appropriate features for video segmentation for given sample video.
2. Compute two dimension motion estimation using block based match technique.
3. Calculate the motion estimation based on Frequency domain.
4. Compare the video features extracted from a given video dataset using graphical representation.
5. Compute the number of distinct elements found in the given sample data stream.
6. Detect shot boundary for given sample video.
7. Parse the given sample video for indexing and faster retrieval.
8. Generate an automatic video trailer for given sample video.
9. Design simple application using video in painting technique.
10. Mini project for video categorization based on content analysis.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Discuss video processing fundamentals
- Analyze video features for segmentation purpose
- Derive numeric problems related to motion estimation
- Process video streams for analytics purpose
- Parse and index video segments
- Design applications for video analytics in current trend

REFERENCES:

1. Roy, A., Dixit, R., Naskar, R., Chakraborty, R.S., "Digital Image Forensics: Theory and Implementation", Springer, 2018.
2. Paul Kinley, "Data Analytics for Beginners: Basic Guide to Master Data Analytics", CreateSpace Independent Publishing Platform, 2016.
3. Henrique C. M. Andrade, Bugra Gedik, Deepak S. Turaga, "Fundamentals of Stream Processing: Application Design, Systems, and Analytics", Cambridge University Press, 2014.
4. Murat Tekalp, "Digital Video Processing" Second Edition, Prentice Hall, 2015.
5. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley, 2014.
6. Oges Marques, "Practical Image and Video Processing Using MATLAB", Wiley-IEEE Press, 2011.

MAPPING WITH PO /CO

	Program Outcomes										
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO-1	3	2	2	2	2	2	-	-	-	-	-
CO-2	2	1	2	2	2	2	-	-	-	-	-
CO-3	2	1	2	2	2	2	-	-	-	-	-
CO-4	2	1	2	2	2	2	-	-	-	-	-
CO-5	3	2	3	3	3	3	-	-	-	-	-
Avg	2.2	1.4	2.2	2.2	2.2	2.2	-	-	-	-	-

JCS2015	**GAME DEVELOPMENT**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES

- Understand the fundamentals of game development processes and workflows.
- Gain practical skills in game design, prototyping, and documentation.
- Develop proficiency in game programming and implementation of gameplay mechanics.
- Learn game art principles and techniques for asset creation.
- Gain experience in game testing, optimization, and deployment.

COURSE PRE-REQUISITES: Programing knowlege in C/c++/Java

UNIT-I INTRODUCTION TO GAME DEVELOPMENT 9

Overview of Game Development Process - History and Evolution of Game Development - Roles and Responsibilities in Game Development Teams - Introduction to Game Engines and Tools.

UNIT-II GAME DESIGN AND PROTOTYPING 9

Fundamentals of Game Design - Conceptualizing and Documenting Game Ideas - Paper Prototyping and Iterative Design - Game Design Documentation and Communication.

UNIT-III GAME PROGRAMMING AND DEVELOPMENT 9

Introduction to Game Programming Languages (e.g., C++, C#, Java) - Basics of Game Development Frameworks and APIs - Gameplay Programming and Mechanics Implementation - Asset Integration and Game Polishing.

UNIT-IV GAME ART AND ASSET CREATION 9

Principles of Game Art and Visual Design - 2D and 3D Asset Creation Techniques - Character Design and Animation - Environmental and Level Design.

UNIT-V GAME TESTING, DEPLOYMENT, AND POST-PRODUCTION 9

Quality Assurance and Testing in Game Development - Playtesting and Gathering User Feedback -Game Optimization and Performance Tuning - Game Publishing and Distribution.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Demonstrate a comprehensive understanding of the game development process.
- Design and prototype game ideas effectively.
- Implement gameplay mechanics using programming languages and frameworks.
- Create visually appealing game assets and environments.
- Test, optimize, and deploy games for different platforms.

TEXT BOOKS

1. Jesse Schell, "The Art of Game Design: A Book of Lenses", CRC Press, 2008. 2. Joe Hocking , "Unity in Action: Multiplatform Game Development in C#", Manning Publications, 2018.

REFERENCES

1. Alan Thorn, "Game Development Principles", Wiley, 2018.
2. Mike McShaffry , "Game Coding Complete", Cengage Learning, 2018. 3. Jeremy Gibson Bond , "Introduction to Game Design, Prototyping, and Development: From Concept to

Playable Game with Unity and C#" , Addison-Wesley Professional, 2017.

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- https://www.youtube.com/watch?v=7C92ZCnlmQo
- https://www.youtube.com/watch?v=U9vqzH65Zzw
- https://developer.android.com/games/agde
- https://www.youtube.com/watch?v=rJ1iA-33fss

Mapping of CO with PO

	Program Outcomes										
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO-1	3	2	1	2	3	1				2	2
CO-2	3	2	1	2	2	1				2	1
CO-3	3	2	2	2	2	1				2	2
CO-4	3	2	1	2	1	1				2	3
CO-5	2	2	1	2	2	1				2	1
Avg	2.8	2	1.2	2	2	1				2	1.8

JCS2016	**MEDIA SECURITY**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To understand the cryptanalysis on standard algorithms meant for confidentiality, integrity and authenticity.
- To know about Digital rights management.
- To know about the concepts of Digital Watermarking techniques.
- To understand the concept of Steganography
- To learn the privacy preserving techniques on Multimedia data.

COURSE PRE-REQUISITES: Cryptogrphy and Network Security

UNIT I CRYPTANALYSIS AND DIGITAL RIGHTS MANAGEMENT 9

Cryptanalysis Techniques – Encryption Evaluation metrics – Histogram Deviation – orthogonal Frequency Division Multiplexing – OFDM Model – OFDM Limitations – Introduction to DRM – DRM Products –DRM Laws

UNIT II DIGITAL WATERMARKING BASICS 9

Introduction – Basics Models of Watermarking – Basic Message Coding – Error Correction coding – MutualInformation and Channel Capacity – Designing a Good Digital Watermark – Information Theoretical Analysis of Digital Watermarking.

UNIT III DIGITAL WATERMARKING SCHEMES AND PROTOCOLS 9

Spread Spectrum Watermarking – Block DCT-domain Watermarking – Watermarking with Side Information – Dirty-paper Coding – Quantization Watermarking – buyer Seller Watermarking Protocol – Media Specific Digital Watermarking : Image WM , Video WM , Audio WM– Watermarking for CG-Models: Watermarking for Binary Images and 3D Contents – Data Hiding Through Watermarking Techniques.

UNIT IV STEGANOGRAPHY AND STEGANALYSIS 9

Steganographic Communication – Notation and Terminology – Information –Theoretic Foundations of Steganography – Cachin's Definition of Steganographic Security – Statistics Preserving Steganography – Model-Based Steganography – Masking Embedding as Natural Processing – Minimizing the Embedding Impact – Matrix Embedding –Nonshared Selection Rule – Steganalysis Algorithms: LSB Embedding and the Histogram Attack – Sample Pairs Analysis.

UNIT V MULTIMEDIA ENCRYPTION 9

Multimedia Processing in the Encryption Domain – Information Processing – Data Sanitization – Finger Printing – Digital Forensics: Intrusive and Non- Intrusive –Forgeries Detection– Privacy Preserving – Surveillance.

COURSE OUTCOMES:

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

- Analyze the security algorithms required by any computing system.
- Identify the security challenges and issues that may arise in any system.
- Implement the concepts of steganography, digital watermarking techniques, etc.
- Design secure applications using steganography and water marking schemes.
- Apply concepts on digital rights management while developing secure systems.
- Design any secure system by preserving privacy**.**

REFERENCES

1. Frank Shih, "Digital Watermarking and Steganography: Fundamentals and Techniques", CRC Press, 2014.

2. Fathi E. Abd El-Samie, HossamEldin H. Ahmed, Ibrahim F. Elashry, Mai H. Shahieen, Osama S. Faragallah, El-Sayed M. El-Rabaie, Saleh A. Alshebeili , “Image Encryption: A Communication Perspective”, CRC Press, 2013.
3. Douglas R. Stinson, “Cryptography Theory And Practice”, Third Edition, Chapman & Hall/CRC, 2006.
4. Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, 2006.
5. Ingemar Cox, Matthew Miller, Jeffrey Bloom, Jessica Fridrich and TonKalker, “Digital Watermarking and Steganography”, Second Edition, Elsevier, 2007.

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- https://www.geeksforgeeks.org/cryptanalysis-and-types-of-attacks/
- https://www.techopedia.com/definition/24927/digital-watermarking
- https://www.simplilearn.com/what-is-steganography-article

Mapping with CO / PO

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

VERTICAL IV - CYBER SECURITY

JCB2001	CYBER SECURITY FUNDAMENTALS AND PRACTICES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the difference between threat, risk, attack, and vulnerability.
- To learn about security in operating system and networks.
- To analyze the different security available in databases.
- To understand the concept of privacy and security in emerging technologies.
- To learn about management and risks in different technologies.

PREREQUISITE:

- Computer Programming
- Computer Networks

UNIT-I INTRODUCTION TO CYBER SECURITY 9 Introduction -Computer Security - Threats -Harm - Vulnerabilities - Controls - Authentication - Access Control and Cryptography –Web-User Side - Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data - Email Attacks

UNIT-II SECURITY IN OPERATING SYSTEM & NETWORKS 9 Security in Operating Systems - Security in the Design of Operating Systems – Root kit - Network security attack-Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.

UNIT-III DEFENCES SECURITY COUNTER MEASURES 9 Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity
- Database Disclosure - Data Mining and Big Data.

UNIT-IV PRIVACY IN CYBERSPACE 9 Privacy concepts –privacy principles and policies -authentication and privacy-Data mining – privacy on the Web - email Security - privacy Impacts of Emerging Technologies - where the Field Is Headed.

UNIT-V MANAGEMENT AND INCIDENTS 9 Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing with Disaster - Emerging Technologies - The Internet of Things - Economics - Electronic Voting - Cyber Warfare- Cyberspace and the Law - International Laws - Cyber crime - Cyber Warfare and Home Land Security.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

▪ Classify various types of attacks and learn the tools to launch the attacks ▪ Apply various tools to perform information gathering
▪ Analyze intrusion techniques to detect intrusion
▪ Apply intrusion prevention techniques to prevent intrusion
▪ Explain the basics of cyber security, cyber crime and cyber law

TEXT BOOKS:

1. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition, Pearson Education, 2015.
2. David Kim & Michael G. Solomon, "FOUNDATIONS" and Custom Edition 1 Jan 1, 2014.

REFERENCES:

1. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.
2. MarttiLehto, PekkaNeittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015
3. Nelson Phillips and EnfingerSteuart, ―Computer Forensics and Investigations‖, Cengage Learning, New Delhi, 2009.

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- https://www.javatpoint.com/cyber-security-tutorial
- https://www.edureka.co/blog/cybersecurity-fundamentals-introduction-to-cybersecurity/
- https://cnitarot.github.io/courses/fc_Fall_2022/2550_intro_history_pub_cnr.pdf

CO-PO MAPPINGS:

	Program Outcomes													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	2	3	2	3	1	1	1	2	3	2	2
CO2	3	2	2	2	3	2	3	1	1	1	2	3	2	2
CO3	3	3	2	3	3	2	3	1	1	1	2	3	3	2
CO4	3	2	3	2	3	2	3	2	2	2	2	3	2	3
CO5	3	2	2	1	2	3	3	1	1	1	2	3	2	3
AVG	**3**	**2.2**	**2.2**	**2**	**2.8**	**2.2**	**3**	**1.2**	**1.2**	**1.2**	**2**	**3**	**2.2**	**2.4**

JCB2002	CRYPTOGRAPHY AND CRYPTANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To study about the fundamentals of Cryptography
- To analyze Key Management techniques and importance of number Theory
- To understand the concept of Message Authentication Codes and Hash Functions
- To design a security solution for a given application
- To understand about cyber crimes and the different security practice.

PREREQUISITE:

Fundamentals of Mathematics

UNIT-I INTRODUCTION TO CRYPTOGRAPHY 9

Number theory – Algebraic Structures – Modular Arithmetic - Euclid‘s algorithm – Congruence and matrices – Group, Rings, Fields, Finite Fields-Symmetric Key Ciphers- SDES – Block Ciphers – DES – Strength of DES – Differential and linear cryptanalysis – Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Pseudorandom Number Generators – RC4 – Key distribution.

UNIT-II ASYMMETRIC CRYPTOGRAPHY 9

Primes – Primality Testing – Factorization – Euler’s totient function, Fermat’s and Euler’s Theorem – Chinese Remainder Theorem – Exponentiation and logarithm-Asymmetric Key Ciphers - RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange – Elliptic curve arithmetic – Elliptic curve cryptography.

UNIT-III MESSAGE AUTHENTICATION AND HASH FUNCTION 9

Authentication Requirements - Authentication Function- Message Authentication Codes - Hash Functions - Security of Hash Functions and MACs- Secure Hash Algorithm - Whirlpool, HMAC, CMAC -Digital Signatures - Authentication Protocol - Digital Signature Standard Authentication Applications- Kerberos -X.509 Authentication Service - Public-key infrastructure

UNIT-IV FIREWALLS AND CRYPTANALYSIS 9

Intruder – Intrusion detection system -Password Management-Virus and related threats Countermeasures- Firewall design principles- Trusted systems -Practical implementation of cryptography and security

UNIT-V CYBER CRIMES AND SECURITY 9

Cyber Crime and Information Security – classifications of Cyber Crimes – Tools and Methods –

Password Cracking, Keyloggers, Spywares, SQL Injection – Network Access Control – Cloud Security – Web Security – Wireless Security

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Understand the fundamentals of networks security
- Demonstrate the different cryptographic operations of symmetric cryptographic algorithms
- Develop the different cryptographic operations of public key cryptography.
- Explain the various Authentication schemes to simulate different applications.
- Understand various cyber-crimes and cyber security.

TEXT BOOKS:

1. Forouzan Mukhopadhyay “Cryptography and Network Security” McGraw Hill, 2nd Edition
2. William Stallings, "Cryptography and Network Security - Principles and Practice", Seventh Edition, Pearson Education, 2017.
3. Nina Godbole, Sunit Belapure, “Cyber Security: Understanding Cyber-crimes, Computer Forensics and Legal Perspectives”, First Edition, Wiley India, 2011.

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1. Behrouz A. Forouzan, DebdeepMukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata McGraw Hill, 2015.
2. Charles Pfleeger, Shari Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, New Delhi, 2015.

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- https://www.w3.org/TR/WebCryptoAPI/
- https://ukdiss.com/examples/web-based-crypto-analysis-learning-application.php
- https://developer.mozilla.org/en-US/docs/Web/API/Web_Crypto_API
- https://www.garykessler.net/library/crypto.html
- https://www.cryptomathic.com/news-events/blog/summary-of-cryptographic algorithms- according-to-nist

CO-PO MAPPINGS:

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

JCB2003	CYBER FORENSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the process of Digital Cyber Forensics.
- To be aware of the Cyber forensics Environments and standards.
- To study the data and evidence collection activities.
- To understand how to investigate digital evidence.
- To Explore advanced techniques in Cyber Forensics.

PREREQUISITE:

Cryptography and Cryptanalysis

UNIT-I DIGITAL FORENSICS PROCESS **9**

Computer forensic fundamentals - Applying forensic science to computers - Computer forensic services - Benefits of professional forensic methodology -Steps taken by computer forensic specialists, Forensic science, Digital forensics, Digital evidence, Digital forensics process – Identification, Collection, Examination, Analysis, Presentation Phases, Cyber Crime Law.

UNIT-II FORENSICS ENVIRONMENTS & STANDARDS **9**

Hardware and software environments – Storage devices - Operating system - File Systems – Metadata - Locating evidence in file systems - Password security – Encryption - Hidden files - Digital evidence.

UNIT-III DATA AND EVIDENCE COLLECTION **9**

Identification of Data: timekeeping - Forensic identification - Analysis of technical surveillance devices - Reconstructing past events - Useable file formats - Unusable file formats - Converting files - Investigating network intrusions - Cyber crime - Network forensics - Investigating logs - Network.

UNIT-IV INVESTIGATING DIGITAL EVIDENCE **9**

Applying forensic Science to computers – Preparation – Survey – Documentation – Preservation – examination – Reconstruction - Analyzing digital evidence - Locating digital evidence, Categorizing files - Eliminating superfluous files - Event analysis tool - Cloud analysis tool - Lead analysis tool - Volume shadow copy analysis tools.

UNIT-V ADVANCED CYBER FORENSICS **9**

Windows forensics evidence collection in linux - Network forensics packet capture using wire shark, t shark and tcp dump - Memory forensics virtual machine- Forensics use - Implementation -Virtual machines in forensic analysis- Cloud forensics analysis -Cloud storage - Data remnants.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Identify the need for cybercrime forensics.
- Examine the hardware, software components and standards responsible for seeking evidence.
- Apply techniques for collecting data and evidences.
- Analyze the methods for investigating digital evidences
- Examine advanced techniques for Cyber Forensics.

TEXT BOOKS:

1. Richard Boddingtons, Practical Digital Forensics, PACKT publishing, First Edition, 2016 ANDRÉ ÅRNES.
2. Marjie T.Britz, Computer Forensics and Cyber Crime: An Introduction, Third Edition, Prentice Hall, 2013

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1. Richard E.Smith, "Internet Cryptography", Third Edition, Pearson Education, 2008
2. Angus M.Marshall, "Digital forensics: Digital evidence in criminal investigation", John – Wiley and Sons, 2008.
3. John R.Vacca, "Computer Forensic"s, Second Edition, Cengage Learning, 2005.
4. John R. Vacca, Charles River Media "Computer Forensics: Computer Crime Scene Investigation", 2nd Edition, , 2005

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- https://www.studocu.com/in/document/dr-babasaheb-ambedkar-marathwada university/cyber-forensic/cyber-forensics-lecture-notes/34989994
- https://www.studocu.com/in/document/kannur-university/network forensics/cyber-forensics-unit1/17233533

CO-PO MAPPINGS:

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

JCB2004	INTRUSION DETECTION AND PREVENTION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand basic concepts of intrusion detection system.
- To learn about Intrusion Prevention Systems, Network IDs protocol and model forintrusion analysis.
- To analyze intrusion detection alerts and logs to distinguish attack types from false alarms
- To understand Intrusion Prevention Systems, Network IDs protocol and model forintrusion analysis.
- To learn agent development for intrusion detection and architectural models of IDs andIPs.

PREREQUISITE:

Foundations of Cyber Security

UNIT-I INTRODUCTION TO INTRUSION DETECTION **9**

History of intrusion detection, Audit, Concept and definition, Internal and external threats to data, Attacks, Need and types of IDS, Information sources, Host based information sources, Network based information sources.

UNIT-II THEORITICAL FOUNDATION OF DETECTION **9**

Intrusion prevention systems, Network Ids protocol based Ids, Hybrid Ids, Analysis schemes, Thinking about intrusion, Model for intrusion analysis, Techniques responses, Requirement of responses, Types of responses, Mapping responses to policy vulnerability analysis, Credential analysis, Non credential analysis

UNIT-III ARCHITECTURE AND IMPLEMENTATION **9**

Introduction to snort, Snort installation scenarios, Installing snort , Running snort on multiple network interfaces, Snort command line options, Step-by-step procedure to compile ,Install snort location of snort files, Snort modes snort alert modes

UNIT-IV SNORT CONCEPTS **9**

Working with snort rules, Rule headers, Rule options, Snort configuration file,Plugins, Preprocessors and output modules, Using snort with mysql

UNIT-V CASE STUDY **9**

Using ACID and snort snarf with snort, Agent development for intrusion detection, Architecture models of Ids and Ips

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Understand the basic concepts of intrusion detection system.
- Explain about Intrusion Prevention Systems, Network IDs protocol and model forintrusion analysis.
- Analyze when, where, how, and why to apply Intrusion Detection tools and techniques inorder to improve the security posture of an enterprise.
- Understand the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creation and evaluation of new Intrusion Detection Systems.
- Explain about agent development for intrusion detection and architectural models of IDs and IPs.

TEXT BOOK:

1. T. Fahringer, R. Prodan, "A Text book on Grid Application Development and Computing Environment". 6th Edition, Khanna Publishers, 2012
2. Rafeeq Rehman : " Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID," 1st Edition, Prentice Hall , 2003

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1. Christopher Kruegel, Fredrik Valeur, Giovanni Vigna: "Intrusion Detection and Correlation Challenges and Solutions", 1st Edition, Springer, 2005.
2. Carl Endorf, Eugene Schultz and Jim Mellander " Intrusion Detection & Prevention",1st Edition, Tata McGraw-Hill, 2004.
3. Stephen Northcutt, Judy Novak: "Network Intrusion Detection", 3rd Edition, New Riders Publishing, 2002.

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- https://www.knowledgehut.com/blog/security/intrusion-detection-system
- https://www.helixstorm.com/blog/types-of-intrusion-detection-systems/
- https://usemynotes.com/what-is-intrusion-detection-system/
- https://www.cs.colostate.edu/~massey/Teaching/cs356/RestrictedAccess/Slides/356lecture18.pdf

CO-PO MAPPINGS:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	1	2	-	3	-	1	1	-	-	-	1
CO-2	3	2	-	2	3	2	-	1	2	-	2
CO-3	3	1	-	1	2	1	-	2	1	-	1
CO-4	2	2	3	2	3	-	-	-	2	2	-
CO-5	1	2	2	2	2	2	1	1	2	1	2

JCB2005	HARDWARE SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To know basic components and fundamentals of hardware security.
- To develop an application using various services in security.
- To understand about different attacks and testing.
- To learn the basic and important concepts of hardware design.
- To understand the issues and solutions for hardware security and monitoring.

PREREQUISITE:

Cryptography and Cryptanalysis

UNIT-I INTRODUCTION **9**

Hardware security-Key threats-Security practices-Types-Fault attacks and countermeasures Hardware design cycle-Measuring hardware security-Secure platforms-Ciphers: historical; block (AES/DES), Stream, (Trivium) Public Key Ciphers (RSA. ECC), Hash Functions (SHA-1)

UNIT-II PRINCIPLES AND APPLICATIONS **9**

Physical unclonable functions:-Design-Principles and applications- Hardware random- Number generators: design-Principles and applications-Design and evaluate pufs - Random number generators on an FPGA

UNIT-III ATTACKS AND TESTING **9**

Side channels – Overview - Fault attacks and countermeasures Power attacks and countermeasures - Designing Fault attack - Evaluate a counter measure - VLSI testing: attacks and countermeasures, Scan attack on FPGA implementation of DES.

UNIT-IV HARDWARE ARCHITECTURE **9**

Hardware trojans-Overview-Attacks and defenses-Malicious 8051 Processor design-IP piracy Logic encryption-FPGA logic encryption of combinational logic-Reverse engineering: ic layout camouflaging, Gate level reversing, ESL reversing.

UNIT-V CASE STUDY **9**

Analysis of notable hardware security breaches - Study of hardware security vulnerabilities in commercial systems-Emerging hardware security technologies – Approaches - Ethical considerations - Hardware security research - Practice- Internet of Things (IoT) Security challenges- Hardware security - Autonomous systems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Demonstrate the main concepts of security, its characteristics, advantages, key technologies.
- Develop and design an application using various tools in hardware environment.
- Understand the basic and important design concepts and issues of attacks and testing.
- Explain about the concept, characteristics and the architecture of hardware.
- Analyze the issue of security and understand the applications of hardware security in various fields.

TEXT BOOK:

1. S. Bhunia and M. Tehranipoor, "Hardware Security: A Hand-on Training Approach, Morgan Kauffman", 2018
2. M. Tehranipoor and C. Wang (Eds.), Introduction to Hardware Security and Trust, Springer, 2011

REFERENCES:

1. Debdeep Mukhopadhyay, "Hardware Security: Design, Threats, and Safeguards", 1st edition, 2015.
2. Mohammad Tehranipoor and Cliff Wang, "Introduction to Hardware Security and Trust, by", kindle edition, 2012.

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- https://books.google.com/books/about/Introduction_to_Hardware_Security_and _Tr.html?id=bNiw9448FeIC
- https://tehranipoor.ece.ufl.edu/wp-content/uploads/2021/07/01-Intro-to-HW Security.pdf
- https://catalog.library.vanderbilt.edu/discovery/fulldisplay/alma9910436646396 03276/01VAN_INST:vanui

CO-PO MAPPINGS:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	3	-	2	1	2	-	-	-	-	1	1
CO-2	1	2	1	-	1	-	-	-	1	1	1
CO-3	1	2	1	1	1	1	-	-	1	2	-
CO-4	3	2	3	3	3	2	-	-	-	-	2
CO-5	2	3	-	1	3	1	-	-	2	1	-

JCB2006	CLOUD SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To know basic components and fundamentals of cloud computing.
- To develop an application using various services in cloud.
- To understand how to design the web application development in cloud.
- To understand the issues and solutions for cloud security and cloud monitoring.
- To learn the basic and important concepts of python to implement in an application.

PREREQUISITE:

- Data Communication and Networking
- Foundations of Cyber Security

UNIT-I INTRODUCTION **9**

Cloud fundamentals - Cloud service components - Cloud service, Deployment models - Cloud components - Guiding principle - Utilization, Security, Pricing - Application of cloud computing. Case Study: Open stack and AWS.

UNIT-II CLOUD BASED APPLICATIONS DEVELOPMENT **9**

Application architectures- Monolithic-Distributed, Micro Service fundamental - Cloud native applications - 12 factors app - Application integration process - APIfication process- API fundamental-Micro service - API management- Spring boot fundamental - Design of micro service- API tools.

UNIT-III WEB DEVELOPMENT TECHNIQUES **9**

Devops fundamentals - Devops role – responsibility - Tools - Containerization process and application-Evolution of app deployment- Docker fundamentals – architecture – Commands – Orchestration – Kubernetes - Docker container.

UNIT-IV CLOUD SECURITY AND MONITORING TOOL **9**

Cloud security- Shared responsibility architecture - Security by design principles-Identity - Access management - Cloud security layers illustration - Cloud network - Host - Data security concepts - Security operations - Major cloud service provider tools - Security compliance and regulations - Cloud monitoring - Benefits of cloud monitoring.

UNIT-V BUILDING AN APPLICATION USING PYTHON **9**

Developing - Deploying an application in the cloud- Building a python project based on design - Development testing - Deployment of an application using a development framework - Deployment Platform - Case study: python use case and python framework.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Demonstrate the main concepts of cloud, its characteristics, advantages, key technologies and its various delivery and deployment models.
- Develop and design an application using various tools in cloud environment.
- Acquire the basic and important design concepts and issues of web application development techniques in cloud.
- Structure simple python program for developing an application in cloud.
- Analyze the issue of cloud such as security, energy efficiency and interoperability, and provide an insight into future prospects of computing in the cloud monitoring.

TEXT BOOK:

1. Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, “Cloud Computing Concepts, Technology & Architecture”, Prentice Hall, 2013.
2. Guo Ning Liu, Qiang Guo Tong, Harm Sluiman, Alex Amies, "Developing and Hosting Applications on the Cloud", IBM Press, 2012.

REFERENCES:

1. Michael J. Kavis “Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)”, 1st Edition, Wiley, 2014.
2. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, “Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet”, First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.
3. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, “Cloud Computing: Principles and Paradigms”, Wiley, 2011

WEB REFERENCES:

- https://www.tutorialspoint.com/cloud_computing/cloud_computing_security.htm
- https://www.javatpoint.com/what-is-cloud-security
- https://www.ibm.com/topics/cloud-security
- https://www.box.com/resources/what-is-cloud-security
- https://cloud.google.com/learn/what-is-cloud-security

CO-PO MAPPINGS:

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

JCB2007	ETHICAL HACKING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To study about the fundamentals of hacking.
- To learn different types of hacking in web.
- To understand attacks in networking.
- To learn about wireless hacking, attacks and various agents in hacking.
- To understand about automation and authentication.

PREREQUISITE:

- Cryptography and Cryptanalysis

UNIT-I INTRODUCTION TO HACKING **9**

Introduction to hacking – Terminologies – Penetration test – Vulnerability assessments versus penetration test – Pre-engagement – Rules of engagement - Penetration testing methodologies – OSSTMM – Categories of penetration test – Types of penetration tests – Vulnerability assessment summary -Reports.

UNIT-II ETHICAL HACKING IN WEB **9**

Introduction to ethical hacking – Foot printing - Reconnaissance - Scanning networks - Enumeration - System hacking - Malware Threats – Sniffing- Social engineering - Denial of service - Session hijacking - Hacking web servers - Web applications – SQL Injection - Hacking wireless networks - Mobile platforms.

UNIT-III NETWORK ATTACKS **9**

Vulnerability data resources – Exploit databases –Promiscuous versus non promiscuous mode – MITM attacks – ARP attacks –SSL strip: stripping https traffic -DNS spoofing – ARP spoofing– DHCP Spoofing -Remote exploitation – Attacking network remote services – Overview of brute force attacks.

UNIT-IV WIRELESS HACKING **9**

Wireless hacking – Air crack- Cracking WEP – WPA/WPA2 wireless network using air crack – Evil twin attack –Log-in protection mechanisms – Captcha validation flaw – Captcha RESET flaw Manipulating user-Agents to bypass captcha.

UNIT-V CASE STUDY **9**

Authentication bypass attacks – Testing for vulnerability – Automating with burp suite – Sessionattacks – SQL injection attacks – XSS (Cross-Site Scripting) - Types of cross-Site scripting – Cross-site request forgery (CSRF) – SSRF attacks.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Understand the fundamentals of hacking and different methodologies in testing.
- Demonstrate the different types of hacking and various applications in web.
- Explain about different attacks, testing, and authentication in networking.
- Understand about wireless hacking, cracking and protection mechanisms.
- Explain the various Authentication schemes to simulate different applications.

TEXT BOOKS:

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, "Computer Forensicsand Investigations", Cengage Learning, India Edition, 2016.
2. CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2015.

REFERENCES:

1. Marjie T.Britz, "Computer Forensics and Cyber Crime: An Introduction", 3rd Edition,Prentice Hall, 2013.
2. Kenneth C.Brancik, "Insider Computer Fraud‖ ",Auerbach Publications Taylor & FrancisGroup–2008.
3. AnkitFadia , "Ethical Hacking‖", Second Edition, Macmillan India Ltd, 2006
4. John R.Vacca, "Computer Forensics", Cengage Learning, 2005

WEB REFERENCES:

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- https://www.hackittech.com/Resources%20pdf/hacking_resources/HackitTech_20210523130501.pdf
- https://www.javatpoint.com/ethical-hacking
- https://www.synopsys.com/glossary/what-is-ethical-hacking.html
- https://www.knowledgehut.com/blog/security/introduction-to-ethical-hacking

CO-PO MAPPINGS:

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CO-2	1	1	2	1	-	1	1	-	-	1	-	1
CO-3	-	2	1	-	1	-	-	2	2	-	1	2
CO-4	2	2	-	2	1	1	-	1	2	-	-	-
CO-5	1	1	1	2	1	-	3	1	-	2	-	-

JCB2008	WEB APPLICATION SECURITY	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES

- To reveal the underlying in web application.
- To identify and aid in fixing any security vulnerabilities during the web development process.
- To understand the security principles in developing a reliable web application.
- To learn about different industry tools in web security.
- To understand about various testing and security.

PREREQUISITE:

- Web Technology

UNIT-I INTRODUCTION TO WEB APPLICATIONS **9**

History of web applications interface -Web application Vs Cloud application -Security fundamentals- Input validation - Attack surface reduction rules of thumb- Classifying and prioritizing threats

UNIT-II WEBAPPLICATION SECURITY FUNDAMENTALS **9**

Origin policy - Exceptions to the same- Cross-site scripting and cross-site request forgery – Reflected XSS - HTML injection

UNIT-III WEB APPLICATION VULNERABILITIES **9**

Vulnerabilities in traditional client server application and web applications- Client state manipulation-Cookie based attacks, -SQL injection, Cross domain attack (XSS/XSRF/XSSI) -Http header injection - SSL vulnerabilities and testing - Proper encryption use in web application- Session vulnerabilities and testing -Cross-site request forgery.

UNIT-IV WEB APPLICATION MITIGATIONS **9**

Http request-Http response, rendering and events-Html image tags-Image tag security-Issue -Java script on error–Java script timing- Port scanning-Remote scripting-Running remote code -frame and iframe-Browser sandbox-policy goals, same origin policy-Library import Domain relaxation

UNIT-V SECURE WEBSITE DESIGN **9**

Introduction-Architecture and Design Issues for Web Applications –Deployment Considerations Input Validation–Authentication–Authorization-ConfigurationManagement Sensitive Data- Session Management – Cryptography - Parameter Manipulation - Exception Management.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Identify the vulnerabilities in the web applications.
- Identify the various types of threats and mitigation measures of web applications.
- Apply the security principles in developing a reliable web application.
- Use industry standard tools for web application security.
- Apply Penetration testing to improve the security of web application

TEXT BOOKS:

1. Sullivan, Bryan and Vincent Liu. Web Application Security, A Beginner's Guide .McGraw Hill Professional, 2011.

2. Stuttard, Dafydd and Marcus Pinto. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws. John Wiley Sons, 2011

REFERENCES:

1. Behrouz A. Ferouzan, DebdeepMukhopadhyay, "Cryptography and Network Security",3rd Edition, Tata McGraw Hill, 2015.
2. Charles Pfleeger,Shari Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, New Delhi, 2015.

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- Web Application Security: Exploitation and Counter measures for Modern Web...- Andrew Hoffman
- Google Booksamazon.com/Web-Application-Security-Beginners-Guide/dp/0071776168
- https://www.garykessler.net/library/crypto.html
- https://www.cryptomathic.com/news-events/blog/summary-of-cryptographic-algorithms according-to-nist

CO-POMAPPINGS:

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CO-2	2	2	2	2	2	-	-	-	2	1	1
CO-3	2	2	2	2	1	-	2	-	-	-	2
CO-4	2	-	-	2	-	-	1	-	1	2	1
CO-5	2	1	2	2	2	-	2	-	1	1	2

IoT:Internet Of Things

PREREQUISTE: Python Programming, Computer Networks,Mobile Computing,Internet Of Things

JIT2009	INTERNET OF THINGS: ARCHITECTURE PROTOCOLS AND APPLICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Understand the Architectural Overview of IoT
- To Understand the IoT Reference Architecture and Real World Design Constraints
- To Understand the various IoT Protocols.
- To Understand various IoT transport & session layer protocols.
- To Understand various IoT service layer protocols and security

UNIT-I OVERVIEW 9

IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

UNIT-II REFERENCE ARCHITECTURE 9

IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT-III IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS 9

PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN,6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP.

UNIT-IV TRANSPORT & SESSION LAYER PROTOCOLS 9

Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer
HTTP,CoAP, XMPP, AMQP, MQTT

UNIT-V SERVICE LAYER PROTOCOLS & SECURITY 9

Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 ,6LoWPAN, RPL, Application Layer

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 : Describe the basic concept and architecture of IOT systems

CO2 : Understand key skills employed in the IIoT & IoRT space building applications**.**

CO3 : Analyze various IoT Comprehend IOT protocols

CO4 : Analyze various IoT Comprehend IOT protocols

CO5 : Analyze various IoT service layer protocols and security

TEXT BOOKS:

1.JanHoller, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos,David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a NewAge of Intelligence", 1st Edition, Academic Press, 2014.

2.Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI

3.Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer

REFERENCES:

1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications

2. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on Approach)",1stEdition, VPT, 2014

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2.https://www.hindawi.com/journals/jece/2017/9324035
3. https://www.sciencedirect.com/science/article/pii/B9780128205815000134

CO-PO AND CO-PSO MAPPING:

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

JIT2010	PROGRAMMING FOR IOT BOARDS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce Internet of Things (IoT) environment and its technologies for designing smart systems
- To explore open-source computer hardware/software platform, development and debugging environment, programming constructs and necessary libraries
- To learn embedded programming constructs and real time systems
- To understand various options in programming languages
- To test, debug, and deploy and to solve real world problems.

UNIT-I : INTRODUCTION TO IOT BOARDS **9**

IoT- Introduction and Characteristics, Things, Architecture, Enabling Technologies, Challenges, Levels - Environment -board, IDE, shields; Programming - syntax, variables, types, operators, constructs and functions; sketch - skeleton, compile and upload, accessing pins; debugging - UART communicationprotocol and serial library

UNIT-II : INTERFACING WITH IOT BOARDS **9**

Circuits - design, wiring, passive components; sensors and actuators, interfacing, read and write; software libraries to handle complicated hardware; shields, interfacing and libraries

UNIT-III : Single Board Computers and Python Interfacing **9**

Board schematic, setup, configure and use, OS implications; linux - basics, file system and processes, shell CLI, GUI; python - basics, API's RPi.GPIO, PWM library to access pins, Tkinter Networking - Internet Connectivity, Standard Internet Protocols, MQTT, CoAP, Networking Socket Interface; Cloud - Public APIs and SDK's for accessing cloud services, Twitter API using Twython package; Interfacing - sensors and actuators, Pi Camera, Servo, A/D, D/A

UNIT-IV :Embedded Programming and RTOS **9**

MCU - GPIO, WDT, timers/counters, IO, A/D, D/A, PWM, Interrupts, Memory, serial communicationUART, I2C, SPI, Peripheral Interfacing OS - basics, types, tasks, process, threads (POSIX Threads),thread preemption, Preemptive Task Scheduling Policies, Priority Inversion, Task communication, Task Synchronization issues - racing and deadlock, binary and counting semaphores(Mutexexample),choosingRTOS

UNIT-V :Real World Projects 9

IoT Integrated Primary Health Care, Large Scale Face Detection by AI Powered Street Lights, Cloud IoT Systems for Smart Agriculture, Smart Home Gadgets, Autonomous Car Features – speed and horn intensity control.

TOTAL: 45 HOURS

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

CO1 : Understand basic circuits, sensors and interfacing, data conversion process and shield libraries to interface with the real world

CO2 : Program SBC for practical IoT devices using Python

CO3 : Explore protocols, data conversion process, Api and expansion boards for real world interaction

CO4 : Learn embedded programming constructs and constraints real time systems **CO5 :** Illustrate IoT prototyping for real world socio-economic problems

TEXT BOOKS:

1. Yamanoor, Sai, and Srihari Yamanoor. Python Programming with Raspberry Pi, 1st edition, Packt Publishing Ltd, 2017.
2. Donald Norris, The Internet of Things: Do-It-Yourself Projects with Arduino, Raspberry Pi, and BeagleBone Black, 1st edition,McGraw Hill Education, 2015

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1. Marco Schwartz, Home Automation with Arduino, 3rd edition, Open Home Automation 2014.

2.Schwartz, Marco. Internet of things with arduino cookbook, 1st edition, Packt Publishing Ltd,2016.

3. Kooijman, Matthijs. Building Wireless Sensor Networks Using Arduino, 1st edition, Packt Publishing Ltd, 2015.

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2. https://ict.iitk.ac.in/courses/learn-iot-through-arduino-and-raspberry-pi/
3. https://onlinecourses.swayam2.ac.in/arp20_ap03/preview

CO-PO AND CO-PSO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2				3						
CO2	3										
CO3	3		3	3							
CO4	3										
CO5		3									
AVG	3	3	3	3	3						

JIT2011	INDUSTRIAL IoT 4.0	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To develop knowledge in Industrial Internet of Things (IIoT) fundamentals.
- To understand the architecture, IOT and its protocols
- To Understand the various data analytics techniques
- To Understand the CPS for Industry 4.0
- To provide students with a good depth of knowledge of Designing Industrial IOT Systems for various applications

UNIT-I : Industrial IOT Introduction **9**

Introduction to IOT, IOT Vs. IIOT, History of IIOT, Components of IIOT - Sensors and Actuators for Industrial Processes, Role of IIOT in Manufacturing Processes. Challenges & Benefits in implementing IIOT**.**

UNIT-II: IIoT Architecture **9**

Industrial IoT: Business Model and Reference Architecture: IIoT-Business Models, Industrial IoT Layers: IIoT Sensing, IIoT Processing, IIoT Communication, IIoT Networking

UNIT-III : IIOT ANALYTICS **9**

Big Data Analytics and Software Defined Networks, Machine Learning and Data Science, Julia Programming, Data Management with Hadoop.

UNIT-IV : Industrial IoT: CYBER PHYSICAL SYSTEM **9**

Introduction to Cyber Physical Systems (CPS), Architecture of CPS- Components, Data science and technology for CPS, Emerging applications in CPS in different fields. Case study: Application of CPS in health care domain.

UNIT-V : Industrial IoT- Application Domains **9**

Industrial IoT- Application Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 : To understand the basics of industrial IoT (IIoT).
CO2 : To develop various applications using IIOT architectures
CO3 : Recognize the uses of cloud computing and data analytics
CO4 : Analyze privacy and security measures for industry standard solutions
CO5 : Design and implement IOT applications that manage various technology

TEXT BOOKS:

1. Veneri, Giacomo, and Antonio Capasso- Hands-on Industrial Internet of Things: Create a Powerful Industrial IoT Infrastructure Using Industry 4.0, 1stEd., Packt Publishing Ltd,2018
2. Alasdair Gilchrist- Industry 4.0: The Industrial Internet of Things, 1st Ed., Apress, 2017

REFERENCES:

1. Alasdair Gilchrist, Industry 4.0: The Industrial Internet of Things, 1st Edition, Apress, 2017
2. Aboul Ella Hassanien, Nilanjan Dey and Sureaka Boara, Medical Big Data and Internet of Medical Things: Advances, Challenges and Applications, 1st edition, CRC Press, 2019.

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2. **https://www.coursera.org/specializations/developing-industrial-iot#courses**
3. **https://www.coursera.org/learn/industrial-internet-of-things.**
4. **https://www.coursera.org/learn/internet-of-things-sensing-actuation**

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CO1	2										
CO2	3										
CO3	3		3								
CO4	3										
CO5		3									
AVG	3	3	3								

JIT2012	IoT in HealthCare	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To design products related to IoT based Health care applications
- To Understand and design multidisciplinary approach for design, development, • To simulate, and implement IoT health care systems.
- To Apply the monitored health parameter sensor output data for further computing, analyzation and visualization.
- To Identify and summarize remote health monitoring and Tele-health.

UNIT-I : INTRODUCTION TO IOT BASED HEALTH CARE 9

Introduction to IoT applications in smart healthcare& their distinctive advantages - Patient Health Monitoring System (PHMS), Tele-Health, TeleMedicine, Tele-Monitoring, Mobile Health Things (m health).

UNIT-II: IOT SMART SENSING HEATH CARE AND POWER CHALLENGE 9

Concept of Generic Biomedical sensors, Smart Sensors: Monitor health parameters, Wearable ECG sensors, IoT Data Acquisition System, Energy harvesting, Battery based systems, Power management.

UNIT-III : INTERNET OF MEDICAL THINGS 9

Data Confidentially, Data Integrity, Data Protection, Security awareness, Emergent threats: Autonomous, IoT heterogeneity and ubiquity, Physical environment.

UNIT-IV SECURITY AND PRIVACY 9

Security, Privacy and Ethical Issues Smart Health and well-being Applications Risk Analysis Cyber Physical-Social Systems, Machine Ethics, Physical Safety Software Quality, IT Security, Privacy, Risk of Technology Misuse

UNIT-V : WEARABLE TECHNOLOGIES – CASE STUDIES 9

Soft Skin simulation for Wearable Haptic Rendering, Design Challenges for real wearable computers, Collaboration with wearable computers. IoT Based Contactless Body Temperature Monitor.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 : Understand and design multidisciplinary approach for design, development, simulation, and implementation of IoT health care systems.

CO2 : Apply the monitored health parameter sensor output data for further computing,analyzation and visualization.

CO3 : Identify and summarize remote health monitoring and Tele-health

CO4 : Elaborate security, privacy and ethical issues in smart sensor health and well-being application

CO5 : Learn about the requirement's to design Frameworks for Wearable Computing

TEXT BOOKS:

1. Dac-Nhuong Le," Emerging Technologies for Health and Medicine: Virtual Reality, Augmented Reality, Artificial Intelligence, Internet of Things,Robotics, Industry 4.0," Wiley, 2019
2. S. Misra, A. Mukherjee, and A. Roy "Introduction to IoT". CambridgeUniversity Press, 2017

REFERENCES:

1. Qusay F. Hassan " Internet of Things A to Z Technologies and Applications,
2. Intelligent Data Sensing and Processing for Health and Well-being Applications, Miguel Antonio Wister Ovando, Pablo Pancardo Garcia,Francisco Diego Acosta Escalante, Jose Adan Hernandez Nolasco
3. Vankamamidi S. Naresh1,Suryateja S. Pericherla,Pilla Sita Rama Murty,SivaranjaniReddi, "Internet of Things in Healthcare: Architecture, Applications, Challenges, and Solutions",International Journal of Computer Systems Science &Engineering,vol 35 no 6 November 2020

WEBSITE REFERENCES :

1. **https://www.udemy.com/course/iot-based-emergency-health-care-system**
2. **https://skill-lync.com/medical-technology-courses/iot-healthcare**

CO-PO AND CO-PSO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2										
CO2	3										

CO3	3		3								
CO4	3										
CO5		3									
AVG	3	3	3								

JIT2013	Robotics in IOT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn basics of Internet of Things (IoT), and its execution using multiple robotic sensors
- To understand Internet of Robotic Things (IoRT) and its various implementations in industry and automation
- To implement IoT and Robotics application in autonomous driving and health care
- To Learn the design and analysis of Industry 4.0 systems for Energy and smart vehicular applications.
- To understand the Cloud Robotics and Industrial Automation

UNIT-I : Introduction to IoT and Vision systems 9

History and evolution of IoT, AI, ML, Machine Vision, optoelectronic sensors, 3D & 2D machine vision technologies, robot navigation, control schemes, motion controllers, intelligent algorithms and vision systems.

UNIT-II: Robotic Sensors 9

Optical sensors and actuators; Mechanical sensors and actuators; Acoustic sensors and actuators; Performance characteristics of sensors and actuators.

UNIT-III : Internet of Robotic Things 9

Communication architecture for IoRT; Decentralized and automated IoT infrastructure using Blockchain; IoRT Platforms Architecture, IoRT applications

UNIT-IV :Autonomous Vehicle Systems 9

Introduction to Autonomous Driving; Perception in Autonomous Driving; Robot Operating System (ROS) Overview - Client Systems for Autonomous Driving - Decision planning and control in autonomous vehicle systems - Cloud Platform for Autonomous Driving.

UNIT-V : Cloud Robotics and Industrial Automation 9

IoMT and Robotics in Healthcare IoMT Driven connected healthcare, Efficient design for IoMT based healthcare design, Robotics in healthcare, Components of Cloud Robotics; Limitations and challenges of Cloud Robotics; Applications:Autonomous mobile robots, Cloud medical robots, Industrial robots.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 : Understand IoT ecosystem in robotic paradigm

CO2 : Analyze IoT infrastructure and develop IoRT applications

CO3 : Apply IoT in robotics over different platforms

CO4 : Implement Cloud robotics in automations

CO5 : Implement automated applications using multiple robotic sensors

TEXT BOOKS:

1. Vermesan, Ovidiu, and Joël Bacquet, eds.,Cognitive Hyperconnected Digital Transformation: Internet of Things Intelligence Evolution, 1st edition, River Publishers, 2017.

2. A.K.Gupta, S.K.Arora, and J.Riescher, Industrial Automation and Robotics, 1st edition , Mercury Learning and Information LLC,2017

REFERENCES:

1. A.K Dubey, A.Kumar, and S.R Kumar., AI and IoT-based Intelligent Automation in Robotics, 1st edition. Wiley, 2020

2. . A.E.Hassanien, N.Dey, and S.Borra, Medical Big Data and Internet of Medical Things: Advances, Challenges and Applications, 1st edition ,Taylor & Francis Group,2019

3. S.Liu, L.Li and J.Tang, Creating Autonomous Vehicle Systems, Synthesis Lectures on Computer Science, 1st edition ,Morgan & Claypool,2018

4. Nathan Ida, Sensors, Actuators, and Their Interfaces: A multidisciplinary introduction, 2nd edition The Institution of Engineering and Technology, 2017

WEBSITE REFERENCES :

1. https://www.udemy.com/course/iot-robotics-hacking-nodemcu/

CO-PO AND CO-PSO MAPPING:

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

JIT2014	MOBILE APPLICATION DEVELOPMENT FOR IOT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the mobile application development for Internet of Things (IoT) devices
- To deploy various components of mobile devices and essential sensors for various application
- To understand architectures and models used in Mobile
- To understand analytics and security aspects of mobile applications in IoT platforms
- To apply the technologies for low power wireless devices.

UNIT-I : INTRODUCTION TO IOT ECOSYSTEM 9

IoT ecosystem; Industry 4.0; Application development platforms for IoT; IoT Data sources

UNIT-II: SENSOR FOR MOBILE AND HANDHELD DEVICES 9

Temperature sensors, Proximity sensor, IR sensors, Image sensors, Motion detection sensors, Accelerometer sensors, Gyroscope sensors, Optical sensors

UNIT-III: SENSOR DATA PROCESSING 9

Sensor Data-Gathering and Data-Dissemination Mechanisms; Sensor Database system architecture; Sensor data-fusion mechanisms; Data-fusion Architectures and models

UNIT-IV: PROGRAMMING FRAMEWORKS FOR INTERNET OF THINGS 9

IoT Programming Approaches: Node-Centric Programming - Database approach - ModelDriven Development - IoT Programming Frameworks: Android Things - ThingSpeak - IoTivity - Node-RED - DeviceHive - Contiki and Cooja – Zetta

UNIT-V: COMMUNICATION TECHNOLOGIES FOR LOW POWER WIRELESS INTERACTIONS 9

Wireless communications in product development – Bluetooth LE - Near Field Communications (NFC) – WiFi; Prototyping Bluetooth LE with Arduino Nano; Power management strategies and practices Case Study

TOTAL: 45 HOURS

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

CO1 : Outlines a fundamental full stack architecture for IoT
CO2 : Describes various development technologies in each IoT layer
CO3 : Develops IoT applications using standardized hardware and software platforms. **CO4** : Creates prototype using low power communication technologies.
CO5 : Explains IoT solution development from Product management perspective

TEXT BOOKS:

1. Kale, Vivek. Parallel Computing Architectures and APIs: IoT Big Data Stream Processing1st edition, CRC Press, 2019.
2. Lea, Perry. Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security, 1st edition,Packt Publishing Ltd, 2018.

REFERENCES:

1. Fadi Al-Turjman, Intelligence in IoT-enabled Smart Cities, 1st edition, CRC Press,2019
2. Giacomo Veneri, and Antonio Capasso, Hands-on Industrial Internet of Things: Create a powerful industrial IoT infrastructure using Industry 4.0, 1 st edition, Packt Publishing,2018

WEBSITE REFERENCES :

1. ttps://www.silabs.com/support/training/app-103-mobile-app-development-for-iot
2. https://www.classcentral.com/course/mobile-development-in-iot-73972

CO-PO AND CO-PSO MAPPING:

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

JIT2015	COGNITIVE IOT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Introduce cloud computing and enabling technologies
- To Explore the need for fog and edge computation
- To Impart the knowledge to log the sensor data and to perform further data analytics
- Impart the knowledge to log the sensor data and to perform further data analytics
- Make the students to apply Internet of Things (IoT) data for business solution in various domain in secured manner

UNIT-I : Cognitive IoT – Introduction 9

Cognitive IoT, Need for Cognitive IoT, Current and Future trends of IoT, Cognitive computing and applications. Data Analytics for IoT Regression, Data Analytics for IoT ANN Classification, Data Analytics for IoT Modern DNN's

UNIT-II: Secure Fog-Cloud of Things 9

Secure Fog-Cloud of Things: Architectures, Opportunities &Challenges IoT Architecture and Core IoT, Collaborative and Integrated Edge Security Architecture, A connected ecosystem, Threat and security in IoT.

UNIT-III : GPU Architecture 9 Introduction to GPU's Parallel programming for GPU, Parallel programming in CUDA, CNN Inference in GPU, CNN Training in GPU. FPGA for Internet of Things Benefits of FPGA, Interfacing FPGAs with IoT-based edge devices, IoT-FPGA based applications, Microsemi's SmartFusion2 SoC FPGA.

UNIT-IV : IoT Enabling Technologies and Devices 9

Big data, Digital twin, Cloud Computing, Sensors, Communications, Analytical software, Edge Devices.

UNIT-V : Security in Cognitive IoT 9

Security in Cognitive IoT, Security Issues in IoT, A hardware assisted approach for security, Architectural level overview for providing security, Security threats.IoT and Edge Security, Physical and hardware security, Shell security, Cryptography, Software-Defined Perimeter, Blockchains and cryptocurrencies in IoT, Government regulations and intervention.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 : Integrate the aspects of human cognitive processes in the system design

CO2 : Comprehend the underlying cognitive process can have many abstractions of a cognitive cycle such as 'Sense', 'Understand', 'Decide' and 'Act'.

CO3 : Detect any failures of system components and re-configure itself which provides a graceful degradation through self-healing.

CO4 : Accomplish knowledge about the application, system architecture, resources, system state and behavior.

CO5 : Analyze security issues in IoT applications

TEXT BOOKS:

1. Matin, Mohammad Abdul, ed. Towards Cognitive IoT Networks, 1st edition ,Springer International Publishing, 2020.
2. "IoT and Edge Computing for Architects" Perry Lea,"-second edition, Packt, March,2020.
3. "Secure EdgeComputing: Applications, Techniques and Challenges", Mohiuddin Ahmed (Editor), Paul Haskell-Dowland (Editor), CRC press, first edition, August 2021.

REFERENCES:

1. Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg, Sebastian Lange and Stefan Meissner, Enabling things to talk –Designing IoT solutions with the IoT Architecture Reference Model, 1st edition ,Springer Open, 2016
2. John Mutumba Bilay, Peter Gutsche, Mandy Krimmel and Volker Stiehl, SAP Cloud Platform Integration: The Comprehensive Guide, 2nd edition, Rheinwerg publishing.2019.
3. Mahalle, Parikshit Narendra, and Poonam N. Railkar, Identity management for internet of things, 1st edition , River Publishers, 2015.

WEBSITE REFERENCES :

1. **https://learn.microsoft.com/en-us/training/modules/run-cognitive-services-iot-edge/**

CO-PO AND CO-PSO MAPPING:

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

JIT2016	PRIVACY SECURITY FOR IoT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Realize IoT security requirements and management tools
- To know the state-of-the-art methodologies in Cyber Physical system.
- To impart knowledge on Model threats and countermeasures.
- To explore the Privacy Preservation and Trust Models in Internet of Things (IoT)
- To apply the concept of Internet of Things Security in the real world scenarios

UNIT-I : INTRODUCTION: SECURING THE INTERNET OF THINGS 9

Introduction – Security Requirements in IoT architectures – Security in Enabling Technologies – IoT Security Life Cycle – Cryptographic Fundamentals for IoT Security Engineering - Security Concerns in IoT Applications – Basic Security Practices.

UNIT-II: SECURITY ARCHITECTURE IN THE INTERNET OF THINGS 9

Introduction – Security Requirements in IoT – Insufficient Authentication/Authorization – nsecure Access Control – Threads to Access Control, Privacy, and Availability – Attacks Specific to IoT – Malware Propagation and Control in Internet of Things**.**

UNIT-III : PRIVACY PRESERVATION 9

Privacy Preservation Data Dissemination - Privacy Preservation for IoT used in SmartBuilding – Exploiting Mobility Social Features for Location Privacy Enhancement in Internet of Vehicles – Lightweight and Robust Schemes for Privacy Protection in Key personal IOT Applications: Mobile WBSN and Participatory Sensing.

UNIT-IV :TRUST, AUTHENTICATION AND DATA SECURITY 9

Trust and Trust Models for IoT – Emerging Architecture Model for IoT Security and Privacy – preventing Unauthorized Access to Sensor Data – Authentication in IoT – Computational Security for the IoT – Secure Path Generation Scheme for real-Time Green IoT – Security

Protocols for IoT Access Networks

UNIT-V: SOCIAL AWARENESS AND CASE STUDIES **9**

User Centric Decentralized Governance Framework for Privacy and Trust in IoT – Policy Based Approach for Informed Consent in IoT - Security and Impact of the IoT on Mobile Networks – Security Concerns in Social IoT – Security for IoT Based Healthcare – Smart cities.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 : Describe the basics of securing Internet of Things.
CO2 : Explain architecture and threats in IoT.
CO3 : Analyze various privacy schemes related to IoT
CO4 : Describe the authentication mechanisms for IoT security and privacy.
CO5 : Explain security issues for various applications using case studies

TEXT BOOKS:

1. Shancang Li, Li Da Xu, "Securing the Internet of Things," Syngress (Elsevier) publication, 2017, ISBN: 978-0-12-804458-2.

2. Fei Hu, "Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations," CRC Press (Taylor & Francis Group), 2016, ISBN:978-1-4987- 3190.

3. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A Hands-on approach," VPT Publishers, 2014, ISBN: 978-0996025515.

REFERENCES:

1. Alasdair Gilchris, "Iot Security Issues," Walter de Gruyter GmbH & Co, 2017. 2. Sridipta Misra, Muthucumaru Maheswaran, Salman Hashmi, "Security Challenges and Approaches in Internet of Things," Springer, 2016. 6. Brian Russell, Drew Van Duren, "Practical Internet of Things Security," Packet Publishing Ltd, 2016.

WEBSITE REFERENCES :

1. https://onlinecourses.nptel.ac.in/noc22_cs23/preview
2. https://www.coursera.org/lecture/m2m-iot-interface-design-embedded-systems/iot-ecurity/

CO-PO AND CO-PSO MAPPING:

CO/ PO,PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	2	-	3	1	-	-	2
CO2	3	3	3	2	2	-	-	1	1	2	3
CO3	3	3	2	3	1	-	-	1	-	1	2
CO4	3	3	3	2	2	-	-	1	1	2	3
CO5	3	3	3	3	2	1	1	2	-	2	2
AVG	3	3	3	2.0	2	-	2	1	1	2	2

VERTICAL
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	JAL2401	Principles of Artificial Intelligence	PE	3	3	0	0	3
2	JAL2501	Machine Learning	PE	3	3	0	0	3
3	JAL2001	Cognitive Science	PE	3	3	0	0	3
4	JAL2002	Knowledge Representation and Reasoning	PE	3	3	0	0	3
5	JAL2003	Time Series Analysis and Prediction	PE	3	3	0	0	3
6	JAL2601	Neural Networks and Deep Learning	PE	3	3	0	0	3
7	JAL2602	Natural Language Processing	PE	3	3	0	0	3
8	JAL2004	Robotic Process Automation Tool	PE	3	3	0	0	3

JAL2401	PRINCIPLES OF ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To enable students understand the various characteristics of a problem solving agents.
- To explain about the different searching strategies involved in problem solving.
- To describe about solving problems with various constraints.
- To specify the representation of knowledge and reasoning
- To outline the various applications of Artificial Intelligence.

PRE-REQUISITES: Data Structures

UNIT-I INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND AGENTS 9

Introduction - The Foundations of Artificial Intelligence - The History of Artificial Intelligence - The State of the Art - Risks and Benefits of AI - Intelligent Agents - Agents and Environments - Good Behavior: The Concept of Rationality - The Nature of Environments - The Structure of Agents.

UNIT-II PROBLEM SOLVING AND SEARCHING 9

Solving problems by searching - Problem-Solving agents - Example problems - Search algorithms - Uninformed search strategies - Informed (Heuristic) search strategies - Heuristic functions - Search in complex environments - Local search and optimization problems - Local search in continuous spaces - Search with nondeterministic actions - Search in partially observable environments - Online search agents and unknown environments.

UNIT-III CONSTRAINT SATISFACTION PROBLEMS AND GAME THEORY 9

Constraint satisfaction problems - Defining constraint satisfaction problems - Constraint propagation: inference in CSPs - Backtracking search for CSPs - Local search for CSPs - Structure of problems - Adversarial search and games - Game theory - Optimal decisions in games - Heuristic Alpha–Beta tree search - Monte Carlo tree search - Stochastic games - Partially observable games - Limitations of game search algorithms.

UNIT-IV KNOWLEDGE AND REASONING 9

First-Order Logic – Knowledge Representation - Syntax and Semantics of First-Order Logic - Using First-Order Logic - Knowledge Engineering in First-Order Logic - Inference in First-Order Logic - Propositional vs. First-Order Inference - Unification and First-Order Inference - Forward Chaining - Backward Chaining - Quantifying Uncertainty - Bayes' Rule and Its Use - Naive Bayes Model.

UNIT-V EXPERT SYSTEMS AND APPLICATIONS OF ARTIFICIAL INTELLIGENCE 9

Expert systems - Architecture of expert systems - Roles of expert systems - MYCIN - DART - XOON - Application Domains Of AI - Artificial Intelligence in Environmental Management - Artificial Intelligence in Systems Biology: Opportunities in Agriculture, Biomedicine, and Healthcare - Artificial Intelligence in Disease Diagnosis via Smartphone Applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Elaborate the various characteristics of a problem solving agents.
- Apply the different searching strategies involved in problem solving.
- Solve problems with constraints.
- Assess the representation of knowledge and reasoning.
- Develop applications using Artificial Intelligence.

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, 4th Edition, 2022.
2. Kaliraj, P., & Devi T, "Artificial Intelligence Theory, Models, and Applications", 1st edition, CRC Press, Taylor & Francis Group, Boca Raton, Auerbach Publications.

REFERENCES:

1. Elaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", Third Edition, Tata McGraw-Hill Education, 2008.
2. Dan W. Patterson - Introduction to Artificial Intelligence and Expert Systems, PHI, New Delhi, 2006.
3. Nilsson, Artificial Intelligence: A New Synthesis (1 ed.), Morgan-Kaufmann, 1998. ISBN 978-1558605350.
4. Dheepak Khemani, "A first course in Artificial Intelligence", McGraw Hill Education Pvt. Ltd., NewDelhi, 2013.
5. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", O'Reilly, 2009, https://www.nltk.org/book/.
6. Saroj Kaushik, Logic & Prolog Programming, New Age International, 1st edition, 2002.
7. Expert Systems: Principles and Programming,11 March 1998. Edition: 4th. ISBN: 9788131501672.

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1. http://nptel.ac.in/courses/106105079/2
2. https://cloudsek.com/blog/intelligent-searching-techniques-in-artificial-intelligence
3. https://www.aiforanyone.org/glossary/first-order-logic
4. https://www.javatpoint.com/knowledge-representation-in-ai
5. https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP
6. https://www.guru99.com/expert-systems-with-applications.html

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	2	1	1	1	-	-	1
CO2	2	2	2	2	2	1	-	-	-	-	2
CO3	3	3	1	2	3	-	-	-	-	-	1
CO4	2	3	1	2	2	1	1	-	1	2	2
CO5	3	3	3	3	3	2	2	2	1	2	3
AVG	**2.6**	**2.8**	**1.8**	**2.2**	**2.4**	**1.3**	**1.3**	**1.5**	**1**	**2**	**1.8**

JAL2501	MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To familiarize the basic concepts of machine learning.
- To enable building supervised learning models.
- To enable building unsupervised learning models.
- To inculcate knowledge on neural networks.
- To evaluate the machine learning algorithms.

PRE-REQUISITES: Linear Algebra, Data Structures

UNIT I INTRODUCTION TO MACHINE LEARNING 9

Review of Linear Algebra for machine learning; Introduction and motivation for machine learning; Examples of machine learning applications, Vapnik-Chervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning, Hypothesis spaces, Inductive bias, Generalization, Bias variance trade-off.

UNIT II SUPERVISED LEARNING 9

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

UNIT III ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING 9

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

UNIT IV NEURAL NETWORKS 9

Multilayer perceptron, activation functions, network, training – Gradient descent optimization – Stochastic gradient descent, error backpropagation, from shallow networks to deep networks – Unit saturation (aka the vanishing gradient problem) – ReLU, Hyperparameter tuning, Batch normalization, Regularization, Dropout.

UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS 9

Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – *t* test, McNemar's test, K-fold CV paired *t* test.

TOTAL 45 PERIODS

COURSE OUTCOMES

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

- Elaborate the basic concepts of machine learning.
- Implement supervised learning models.
- Implement unsupervised learning algorithms.
- Apply neural networks to make intelligent decisions.
- Evaluate and analyze machine learning algorithms.

TEXT BOOKS

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
2. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", Second Edition, CRC Press, 2014.

REFERENCES

1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
2. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.
3. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", Second Edition, MIT Press, 2018.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
5. Sebastain Raschka, Vahid Mirjalili, "Python Machine Learning", Packt publishing 3rd Edition, 2019.

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1. https://mitsloan.mit.edu/ideas-made-to-matter/machine-learning-explained
2. https://www.simplilearn.com/tutorials/machine-learning-tutorial/supervised-and-unsupervised-learning
3. https://www.investopedia.com/terms/n/neuralnetwork.asp
4. https://towardsdatascience.com/a-quick-guide-to-managing-machine-learning-experiments-af84da6b060b

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	2	-	-	-	-	-	1
CO2	3	2	3	2	3	-	-	-	-	-	1
CO3	3	3	3	3	3	-	-	1	-	1	2
CO4	3	3	3	2	3	-	-	1	-	1	2
CO5	3	3	3	3	3	2	2	3	3	1	1
AVG	**3**	**2.6**	**2.8**	**2.4**	**2.8**	**2**	**2**	**1.7**	**3**	**1**	**1.4**

JAL2001	COGNITIVE SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To explain cognitive computing and design principles.
- To distinguish between NLP and cognitive computing.
- To apply advanced analytics to cognitive computing.
- To discuss application of cognitive computing in business.
- To illustrate various applications of cognitive computing.

PRE-REQUISITES: Principles of Artificial Intelligence

UNIT I FOUNDATION & DESIGN PRINCIPLES 9

Foundation of Cognitive Computing: cognitive computing as a new generation - the uses of cognitive systems – what makes a system cognitive - gaining insights from data - Artificial Intelligence as the foundation of cognitive computing - understanding cognition. Design Principles for Cognitive Systems: Components of a cognitive system - building the corpus - bringing data into cognitive system - machine learning - hypotheses generation and scoring - presentation and visualization services.

UNIT II NLP IN COGNITIVE SYSTEM 9

Role of NLP in a cognitive system - Semantic web - Applying Natural language technologies to Business problems - Representing knowledge in Taxonomies and Ontologies: Representing knowledge - Defining Taxonomies and Ontologies - Knowledge representation - Models for knowledge representation - Implementation considerations.

UNIT III BIG DATA AND COGNITIVE COMPUTING 9

Dealing with human-generated data - Defining big data - Architectural foundation - Analytical data warehouses – Hadoop - Data in motion and streaming data - Applying Advanced Analytics to cognitive computing: Advanced analytics is on a path to cognitive computing - Key capabilities in advanced analytics - Advanced analytics to create value - Impact of open source tools on advanced analytics.

UNIT IV COGNITIVE COMPUTING IN BUSINESS 9

Meaning of knowledge in business - Difference with a cognitive systems approach - Meshing data together differently – Using business knowledge to plan for the future - Building business specific solutions - Making cognitive computing a reality - Cognitive application changing the market - IBM Watson as a cognitive system: Watson’s Software Architecture - Components of DeepQA Architecture.

UNIT V APPLICATIONS OF COGNITIVE SCIENCE 9

Process of building a cognitive application: Defining the objective and domain – Defining

questions and exploring insights - Training and testing- Building a cognitive health care application - Smarter cities - Requirements for the Next Generation Applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Explain cognitive computing and design principles.
- Distinguish between NLP and cognitive computing.
- Analyze advanced analytics to cognitive computing.
- Discuss application of cognitive computing in business.
- Illustrate and create various applications using cognitive computing.

TEXT BOOKS

1. Judith H Hurwitz, Marcia Kaufman, Adrian Bowles, “Cognitive computing and Big Data Analytics”, Wiley, 2015.
2. Min Chen and Kai Hwang, Big-Data Analytics for Cloud, IoT and Cognitive Computing Wiley Publication, 1st Edition, 2017.

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1. Vijay Raghvan, Venu Govindaraju, C.R. Rao, Cognitive Computing: Theory and Applications“, by Elsevier publications, North Holland Publication, 1st Edition, 2016.
2. Bernadette Sharp, Florence Sedes, Wieslaw Lubaszewski, Cognitive Approach to Natural Language Processing Hardcover, 1st Edition May 2017.
3. Arun Kumar Sangaiah, Arunkumar Thangavelu, et al., Cognitive Computing for Big Data Systems Over IoT: Frameworks, Tools and Applications: Lecture Notes on Data Engineering and Communications Technologies 1st edition 2018.
4. Mallick, Pradeep Kumar, Borah, Samarjeet," Emerging Trends and Applications in Cognitive Computing”, IGI Global Publishers, 2019.

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CO-PO MAPPING

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO1 1
CO1	3	2	2	2	2	-	-	1	2	-	3
CO2	3	3	3	2	2	-	-	2	2	2	3
CO3	3	3	2	2	2	-	-	1	2	2	3
CO4	3	2	2	2	2	-	-	2	2	2	3
CO5	3	3	3	3	2	1	2	2	2	2	3
AVG	**3**	**2.6**	**2.4**	**2.2**	**2**	**1**	**2**	**1.6**	**2**	**2**	**3**

JAL2002	KNOWLEDGE REPRESENTATION AND REASONING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To learn the concepts of First Order Logics.
- To understand the concepts of Knowledge Engineering and Resolution.
- To acquire the knowledge of Rules, Fames and Structured Description.
- To familiarize the fundamentals of uncertainty and degrees of belief.
- To understand the fundamental concepts of Planning.

PRE-REQUISITES: Principles of Artificial Intelligence

UNIT I INTRODUCTION **9**

Introduction: The Key Concepts, Need for Knowledge Representation and Reasoning - The Role of Logic. The Language of First-Order Logic: Introduction-The Syntax- The Semantics-The Semantics-Explicit and Implicit.

UNIT II EXPRESSING KNOWLEDGE AND RESOLUTION **9**

Expressing Knowledge: Knowledge Engineering – Vocabulary - Basic Facts -Complex Facts - Terminological Facts Entailments- Other Sorts of Facts. Resolution : The Propositional Case- Handling Variables and Quantifiers – Dealing with Computational Intractability - Backward Chaining - Forward Chaining.

UNIT III RULES, FRAMES AND STRUCTURED DESCRIPTION **9**

Rules in Production System: Basic Operation, Working Memory, Production Rules and examples- Conflict Resolution- Applications and Advantages. Frames: objects and frames - Basic frame formalism- Frame examples.

Structured Description: Descriptions- A Description Language- Meaning and Entailment- Computing Entailments- Taxonomies and Classification.

UNIT IV UNCERTAINTY AND DEGREES OF BELIEF **9**

Non-categorical Reasoning- Objective Probability- Subjective Probability- Vagueness. Explanation and Diagnosis: Diagnosis- Explanation- A Circuit Example.

UNIT V PLANNING **9**

Planning in the Situation Calculus - The STRIPS Representation- Planning as a Reasoning Task- Hierarchical Planning - Conditional Planning.

TOTAL 45 PERIODS

COURSE OUTCOMES:

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

- Apply the concept of First Order Logic for knowledge representation.
- Apply the concepts of unification and resolution to solve real time facts.
- Integrate the concepts of rules and frames for real world phenomena.

- Analyze the concept of uncertainty and degrees of belief to find the varying levels of knowledge and confidence level of real time facts.
- Explain the concepts of planning to find the difference between plan space and state space.

TEXT BOOKS

1. 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. Artificial Intelligence 77(2) , pp. 249-284, 1995.
4. John F. Sowa: Conceptual Structures: Information Processing in Mind and Machine Addison–Wesley Publishing Company, Reading Massachusetts, 1984.
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2. https://www.section.io/engineering-education/forward-and-backward-chaining-in-ai/
3. https://onlinecourses.nptel.ac.in/noc20_cs30/
4. https://edurev.in/studytube/Uncertainty-Knowledge-Representation/650044ce-8778-4ba2-b440-f37d21c821e6_p
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CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11
CO1	1	2	2	2	2	-	-	-	-	-	-
CO2	3	3	3	3	2	-	-	-	-	1	-
CO3	2	3	3	3	3	-	-	-	-	1	1
CO4	3	3	3	3	2	-	2	2	-	1	1
CO5	2	2	2	2	2	-	2	2	-	1	1
AVG	**2.2**	**2.6**	**2.6**	**2.6**	**2.2**	**-**	**2**	**2**	**-**	**1**	**1**

JAL2003	TIME SERIES ANALYSIS AND PREDICTION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basic concepts of time series analysis.
- To familiarize the basic statistical methods to modeling, analyzing, and forecasting time series data.
- To learn the application of regression models for forecasting.
- To explore Autoregressive Integrated Moving Average (ARIMA) Models.
- To introduce multivariate time series and forecasting models.

PRE-REQUISITES: Artificial Intelligence, Python tools

UNIT I INTRODUCTION TO TIME SERIES ANALYSIS AND FORECASTING 9

Time Series and Forecasting - Different types of data-Internal structures of time series - Models for time series analysis - Autocorrelation and Partial Autocorrelation - Examples of Time series- Nature and uses of forecasting – The Forecasting Process - Data for forecasting – Resources for forecasting.

UNIT II STATISTICS BACKGROUND FOR FORECASTING 9

Graphical Displays - Time Series Plots - Plotting Smoothed Data - Numerical Description of Time Series Data - Use of Data Transformations and Adjustments - General Approach to Time Series Modelling and Forecasting - Evaluating and Monitoring Forecasting Model Performance.

UNIT III REGRESSION ANALYSIS AND FORECASTING 9

Introduction - Least Squares Estimation in Linear Regression Models - Statistical Inference in Linear Regression - Prediction of New Observations - Model Adequacy Checking -Variable Selection Methods in Regression - Generalized and Weighted Least Squares- Regression Models for General Time Series Data.

UNIT IV AUTOREGRESSIVE INTEGRATED MOVING AVERAGE (ARIMA) MODELS 9

Linear models for stationary time series - Finite order moving average processes - Finite order autoregressive processes - Mixed autoregressive–moving average Processes – Non stationary processes - Time series model building forecasting ARIMA processes - Seasonal processes.

UNIT V MULTIVARIATE TIME SERIES MODELS AND FORECASTING METHODS 9

Multivariate Time Series Models and Forecasting - Multivariate Stationary Process - Vector ARIMA Models - Vector AR (VAR) Models - Neural Networks and Forecasting - Spectral Analysis – Bayesian Methods in Forecasting.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Explain the basic concepts in time series analysis and forecasting.
- Apply various time series models for forecasting.
- Analyze various time series regression models.
- Distinguish the ARIMA modelling of stationary and non-stationary time series.
- Compare with multivariate times series and other methods of applications.

TEXT BOOK(S)

1. Douglas C. Montgomery, Cheryl L. Jen - Introduction To Time Series Analysis and Forecasting, 2nd Edition, Wiley Series in Probability and Statistics (2015).
2. Dr. Avishek Pal, Dr. Pks Prakash - Master Time Series Data Processing, Visualization and Modeling Using Python (2017).

REFERENCE BOOKS

1. Soren Bisgaard Murat Kulahci - Time Series Analysis and Forecasting by Example, Technical University of Denmark, Copyright c2011 By John Wiley & Sons, Inc.
2. Peter J. Brockwell Richard A. Davis Introduction to Time Series and Forecasting Third Edition. (2016).
3. William W.S. - Multivariate Time Series Analysis and Applications Wei Department of Statistical Science Temple University, Philadelphia, PA, SA 2019 John Wiley & Sons Ltd 2019.

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3. https://b-ok.cc/book/1183901/9be7ed
4. https://www.coursera.org/learn/practical-time-series-analysis

CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	2	-	-	-	-	-	-
CO2	2	3	3	3	3	-	-	-	-	-	-
CO3	2	2	3	3	3	-	-	1	-	2	1
CO4	2	3	3	2	3	-	2	1	-	2	1
CO5	2	2	3	3	3	-	2	1	-	2	1
AVG	**2.2**	**2.4**	**2.8**	**2.6**	**2.8**	**-**	**2**	**1**	**-**	**2**	**1**

JAL2601	NEURAL NETWORKS AND DEEP LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To familiarize major deep neural network frameworks and issues in basic neural networks.
- To equip students with the ability to solve real-world applications using Deep Learning.
- To make students understand key concepts applied in building, training, and fine-tuning models for improved performance and generalization.
- To impart knowledge about the basics of Convolution Neural Networks and RNN.
- To equip students with a comprehensive understanding in advanced neural network architectures and deep learning techniques, Recursive Neural Networks and Transfer Learning.

PRE-REQUISITES: Machine Learning, Python Programming

UNIT I NEURAL NETWORKS **9**

Introduction of Artificial Neural Networks (ANN) - Functions in ANN – Activation function, Loss function - L1, L2 - Function approximation, classification / clustering problems – Applications.

UNIT II LEARNING IN DEEP NETWORKS **9**

Back propagation training, Learning the weights, Chain rule, Stochastic gradient descent, Sigmoid units and vanishing gradient, Rectified Linear Unit (ReLU) and its variants - Cross entropy for classification and activation, Batch learning.

UNIT III IMPROVING DEEP NEURAL NETWORKS **9**

Hyper-parameter tuning, Regularization - Dropouts, Minibatch gradient descent, Data Augmentation, Stratification, Generalization Gap – Under-fitting Vs Over-fitting - Optimization – Momentum, Learning rate schedules, AdaGrad, RMSProp and Adam optimization, Internal Co-variant and Batch Normalization, Initialization – weights, Bias.

UNIT IV CONVOLUTION NEURAL NETWORKS AND RECURRENT NETWORKS **9**

CNN Operations, Pooling, Basic architecture, Variants of the Basic Convolution Model – Advanced architectures: AlexNet, ResNet and others. Recurrent Neural Networks - Bidirectional RNNs, Encoder, Decoder, Sequence-to-Sequence Architectures, Deep Recurrent Networks, Auto encoders.

UNIT V RECURSIVE NEURAL NETWORKS AND TRANSFER LEARNING **9**

The Challenge of Long-Term Dependencies, Echo State Networks, Long Short-Term Memory and Other Gated RNNs, Optimization for Long-Term Dependencies, Explicit Memory, Transfer Learning strategy, GAN and their variants, R-CNN , YOLO and SSD.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Explain the fundamentals of Artificial Neural Networks, including activation and loss functions, and their role in solving classification and clustering problems.
- Apply backpropagation, gradient descent methods, and activation functions to effectively train deep neural networks.
- Implement regularization, optimization techniques, and hyperparameter tuning to enhance the performance of deep learning models.
- Describe the architectures of Convolutional Neural Networks and Recurrent Neural Networks and explain their applications in image and sequence data processing.
- Apply models that handle long-term dependencies, including gated RNNs, and utilize advanced methods such as transfer learning and object detection frameworks.

TEXT BOOK(S)

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville – "Deep Learning", MIT Press, 2017.
2. Michael Nielsen – "Neural Networks and Deep Learning", Determination Press.

REFERENCE BOOKS

1. N D Lewis – "Deep Learning Step by Step with Python", 2016.
2. Josh Patterson, Adam Gibson – "Deep Learning: A Practitioner's Approach", , O'Reilly Media, 2017.
3. Umberto Michelucci – "Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks", Apress, 2018.
4. Deep Learning with TensorFlow: Explore neural networks with Python, Giancarlo Zaccone, Md. RezaulKarim, Ahmed Menshawy, Packt Publisher, 2017.
5. Deep Learning with Keras, Antonio Gulli, Sujit Pal , Packt Publishers, 2017.
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2. https://www.kibin.com/essay-examples/the-objectives-of-deep-learning-KCApMkQ5
3. https://www.telusinternational.com/insights/ai-data/article/difference-between-cnn-and-rnn
4. https://datascience.stackexchange.com/questions/70333/recursive-transfer-learning

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	2	2	2	2	-	-	-	-	-	1
CO2	2	3	2	2	2	-	-	-	-	-	1
CO3	3	3	3	3	3	-	-	-	-	-	1
CO4	2	2	2	3	3	-	-	-	-	2	1
CO5	2	1	3	3	3	3	-	3	-	2	-
AVG	**2**	**2.2**	**2.4**	**2.6**	**2.6**	**3**	**-**	**3**	**-**	**2**	**1**

JAL2602	NATURAL LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce tagging a given text with basic language processing features, design an innovative application using NLP components.
- To implement a rule based system to tackle morphology/syntax of a language.
- To design a tag set to be used for statistical processing keeping an application in mind.
- To design a Statistical technique for a new application.
- To facilitate comparison and contrast the use of different statistical approaches for different types of applications.

PRE-REQUISITES: Principles of Artificial Intelligence

UNIT I BASICS OF LANGUAGE PROCESSING 9

Regular Expressions - Finite State Automata - Morphology – Finite state transducers -Probabilistic models - N-grams models.

UNIT II SYNTAX ANALYSIS 9

Word classes and Part-of-Speech - Context Free Grammars for English – parsing with context free grammar- Syntax-Features and Unification- Lexicalized and Probabilistic Parsing- Language and Complexity.

UNIT III SEMANTIC ANALYSIS 9

Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus - Representing Linguistically Relevant Concepts -Syntax-Driven Semantic Analysis -Semantic Attachments - Syntax-Driven Analyzer - Robust Analysis - Lexemes and their Senses - Internal Structure - Word Sense Disambiguation -Information Retrieval.

UNIT IV – PRAGMATICS 9

Discourse- Reference Resolution - Text Coherence -Discourse Structure - Dialog and Conversational Agents - Natural Language Generation- Machine Translation - Transfer Metaphor – Interlingua – Statistical Approaches.

UNIT V – INFORMATION EXTRACTION 9

Entity recognition - relation detection - temporal expression analysis and template - filling. Question Answering and Summarization: Information retrieval - factoid question answering, single document summarization - generic multiple document summarization - query - focused summarization.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Apply basic language processing techniques using regular expressions, automata, morphology, and n-gram models.
- Analyze syntactic structures using context-free grammars, parsing methods, and POS tagging.

- Develop semantic models for representing and interpreting natural language meaning.
- Examine language in context through discourse analysis, reference resolution, and language generation.
- Extract and summarize information using entity recognition, relation detection, and question-answering methods.

TEXT BOOK(S)

1. Daniel Jurafsky and James, H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing Computational Linguistics, and Speech Recognition", 2nd Edition Prentice-Hall, 2009.
2. Tanveer Siddiqui and U. S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
3. James Allen, "Natural Language Understanding", Benjamin / Cummings Publishing Co., 1995.

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1. Gros, Jones and Webber, "Readings in Natural Language Processing", Morgan Konfmann Publishers, 1986.
2. Popov, "Talking with computers in Natural Language"- Springer – Verlag – 1986.
3. E. Reiter and Robert Date, "Building Natural Language Generation Systems, Cambridge University Press, 2000.

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2. https://www.tutorialspoint.com/natural_language_processing/natural_language_processing_syntactic_analysis.htm
3. https://www.scaler.com/topics/nlp/elements-of-semantic-analysis/
4. https://www.codingninjas.com/codestudio/library/pragmatics-in-nlp
5. https://nanonets.com/blog/information-extraction/

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	2	3	-	-	-	1	-	2
CO2	3	3	2	3	2	-	-	-	1	-	2
CO3	3	3	2	3	3	-	1	-	1	1	2
CO4	2	3	2	3	2	1	1	2	2	1	3
CO5	2	3	3	3	3	2	2	3	2	3	3
AVG	**2.6**	**2.8**	**2**	**2.8**	**2.6**	**1.5**	**1.3**	**2.5**	**1.4**	**1.7**	**2.4**

JAL2004	ROBOTIC PROCESS AUTOMATION TOOL	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Prepare to become Junior RPA Developers.
- Learn the basic concepts of Robotic Process Automation.
- Develop familiarity and deep understanding of UiPath tools.
- Develop the ability to design and create robots for business processes independently.
- Develop skills required to pass UiPath RPA Associate v1.0 Exam.

PRE-REQUISITES: Principles of Artificial Intelligence

UNIT I ROBOTIC PROCESS AUTOMATION (RPA) BASICS 9

History of automation - Story of work - Introduction to RPA - RPA vs Automation - RPA and AI - RPA and emerging ecosystem - Industries best-suited for RPA - Processes best-suited for automation.

UNIT II INTRODUCTION TO UIPATH, VARIABLES AND ARGUMENTS 9

UIPath and its products - Robots and their types - Studio overview – Orchestrator - UiPath studio installation and updating - The user interface - Features of studio - Building 'Hello World' automation project - Variables and their types - Variables panel - Scope of a variable – Arguments - Arguments panel - Argument directions - Arguments vs. Variables.

UNIT III SELECTORS AND CONTROL FLOW 9

UI interactions - Input actions and input methods – Containers - Recording and its types - Selectors and their types – Anchors - Fine-tuning selectors – Sequences - Control flow and its types - Decision control – Loops - Other control flow activities – Flowcharts - Error handling.

UNIT IV DATA MANIPULATION AND AUTOMATION 9

Data manipulation and its importance - String manipulations – Data table manipulations – Collection - Types and manipulations - Extraction and its Techniques - Automation techniques.

UNIT V UIPATH ORCHESTRATOR 9

Orchestrator overview - Publishing a project to orchestrator - Orchestrator functionalities.

TOTAL 45 PERIODS

COURSE OUTCOMES

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

- Become Junior RPA Developers.
- Understand the basic concepts of Robotic Process Automation.
- Understand the UiPath tools.
- Design and create robots for business processes independently.
- Develop projects using UiPath.

TEXT BOOKS

1. Learning Robotic Process Automation: Create Software Robots and Automate Business Processes with the Leading RPA Tool – UiPath, Alok Mani Tripathi, Packt Publishing Ltd., 2018.
2. Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant Paperback, 2018.

REFERENCES

1. Robotic Process Automation Projects: Build real-world RPA solutions using UiPath and Automation Anywhere, Nandan Mullakara, Arun Kumar Asokan, Packt Publishing Ltd., 2020.
2. Tom Tauli, "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems" 1st Edition,

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2. https://www.soais.com/variables-and-arguments/
3. https://docs.uipath.com/studio/docs/control-flow-activities
4. https://www.uipath.com/learning/video-tutorials/data-manipulation-with-studio
5. https://www.simplilearn.com/tutorials/rpa-tutorial/uipath-orchestrator

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	2	2	2	-	-	-	-	2	-
CO2	2	2	2	2	2	-	-	-	-	-	1
CO3	3	3	3	3	3	-	-	-	1	-	1
CO4	2	3	3	3	3	-	-	-	1	-	2
CO5	3	3	3	3	3	-	-	-	1	-	1
AVG	**2.4**	**2.6**	**2.6**	**2.6**	**2.6**	**-**	**-**	**-**	**1**	**2**	**1.2**

AUTOMATION TOOLS

JAD2001	AGILE METHODOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basic concepts of Agile Software Process.
- To comprehend various Agile Methodologies.
- To develop Agile Software Process.
- To apply principles of Agile Testing.
- To understand metrics used in Agile.

Prerequisite: Software Engineering, Object Oriented Analysis and Design

UNIT-I : INTRODUCTION **9**

Software is new product development- Iterative and Evolutionary Methods- Agile Development – Case Study: Perform a comparative Study between Traditional / Heavy weight Methodologies with Agile Methodology.

UNIT-II : AGILE AND ITS SIGNIFICANCE **9**

Agile Story: Evolutionary delivery -Scrum Demo- Planning game, -Sprint back log- adaptive planning - Agile Motivation – Problems with The Waterfall - Research Evidence Scrum: Method Overview -Life cycle phases and Work product roles.

UNIT-III : AGILE METHODOLOGY **9**

Extreme Programming: Method Overview -Life cycle phases and Work product roles - Unified process: Method Overview -Life cycle phases and Work product roles- EVO: Method Overview -Life cycle phases and Work product roles -Case Study: Student group must collaborate and report together along with assigned batch members. Collect the requirements from the client and adopt the suitable agilepractice method.

UNIT-IV : AGILE PRACTICES **9**

Agile Project management - Agile Environment -. Agile Requirements - Case Study – Practices: At the end of each sprint of automated and acceptance tests

UNIT-V : AGILITY AND QUALITY ASSURANCE **9**

Agile product development – Agile Metrics – Feature Driven Development (FDD)- Agile approach to Quality Assurance -Test Driven Development – Agile approach in Global Software Development

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 : Differentiate agile methodologies and Non –agile methodologies

CO2 : Describe the various practices followed in Agile Software Process

CO3 : Select suitable agile approach for the projects.

CO4 : Understand Agile Environment.

CO5 : Apply agile metrics to projects.

TEXT BOOKS:

1. Craig Larman, “Agile and Iterative Development – A Manager’s Guide”, Pearson Education, 2006.

2. Elisabeth Hendrickson QualityTree Software Inc, “Agile Testing”, 2008.

REFERENCES:

1. Chetankumar Patel, MuthuRamachandran, Story Card Maturity Model (SMM): A Process Improvement Framework for Agile Requirements Engineering Practices, Journal of Software, Academy Publishers, Vol 4, No 5 (2009), 422-435, Jul 2009.E. Capriolo, D Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.

2. David J. Anderson; Eli Schragenheim, Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.

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

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2. https://www.udemy.com/course/introduction-to-agile/
3. https://www.infoworld.com/article/3237508/what-is-agile-methodology-modern-software-development explained.html
4. https://www.javatpoint.com/agile
5. https://www.nimblework.com/agile/agile-methodology/

CO-PO MAPPING:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1	2	-	-	1	1	3	2
CO2	2	3	1	1	1	-	-	2	2	1	2
CO3	2	2	1	3	1	-	-	1	3	1	2
CO4	2	1	3	2	1	-	-	1	1	1	2
CO5	2	2	1	3	1	-	-	1	3	2	1
AVG	2.2	2.2	1.6	2	1.2	-	-	1.2	2	1.6	1.8

JIT2004	DEVOPS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce DevOpsterminology, definition & concepts.
- To understand the different Version control tools.
- To understand the concepts of Continuous Integration and Testing.
- To understand Configuration management using Ansible.
- To illustrate the benefits and drive the ado ption of cloud-based Dev ops tools to solve real world problems

Prerequisite: C Programming, Java Programming

UNIT-I : INTRODUCTION TO DEVOPS 9 Devops Essentials - Introduction To AWS, GCP, Azure - Version controlsystems: Git and Github.

UNIT-II : COMPILE AND BUILD USING MAVEN & GRADLE 9

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

UNIT-III : CONTINUOUS INTEGRATION USING JENKINS 9 Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.

UNIT-IV : CONFIGURATION MANAGEMENT USING ANSIBLE 9

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

UNIT-V : BUILDING DEVOPS PIPELINES USING AZURE 9

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

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

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

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

CO3 : Ability to Perform Automated Continuous Deployment

CO4 : Ability to do configuration management using Ansible

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

TEXT BOOKS:

1. Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises", Second Edition, Kindle Edition, 2016.
2. Jason Cannon, "Linux for Beginners: An Introduction to the Linux Operating System and Command Line", Kindle Edition, 2014

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1. Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni

2. Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", First Edition, 2015.

3. David Johnson, "Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps", Second Edition, 2016.

4. Mariot Tsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide toVersion Control, Project Management, and Teamwork for the New Developer", Second Edition, 2019.

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1. https://www.jenkins.io/user-handbook.pdf
2. https://maven.apache.org/guides/getting-started/
3. https://www.atlassian.com/devops
4. https://en.wikipedia.org/wiki/DevOps
5. https://www.techtarget.com/searchitoperations/definition/DevOps

CO-PO MAPPING:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	-	-	-	-	-	3	-	2	**3**
CO2	3	3	2	3	-	-	-	3	-	2	**3**
CO3	3	-	3	3	-	-	-	-	-	-	**3**
CO4	3	3	-	3	-	-	-	3	-	2	**-**
CO5	3	2	-	-	2	-	-	3	-	3	**-**
AVG	3	2.7	2.5	3	2	-	--	3	-	2.2	**3**

JAD2003	SOFTWARE TESTING USING SELENIUM	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To studythe basics ofsoftware testing.
- To studyselenium web driver.
- To studythe test frameworks and test design.
- To studytest reporting and logging.
- To studydynamic web elements and automation for web services.

Prerequisite: Software Engineering, Software Testing.

UNIT-I : INTRODUCTION TO SOFTWARE TESTING & SELENIUM 9

Fundamentals of software testing - Testing lifecycle and methodologies - Role of automation in software testing Introduction to Selenium: Overview of Selenium and its features - Selenium WebDriver architecture - Setting up the Selenium environment

UNIT-II : SELENIUM WEBDRIVER 9

Selenium WebDriver Basics: Locating web elements using different techniques (e.g., ID, XPath, CSS selectors) - Interacting with web elements (e.g., clicking, typing, selecting) - Handling different types of web elements (e.g., text fields, checkboxes, dropdowns)

UNIT-III : TEST FRAMEWORKS AND TEST DESIGN 9

Introduction to test frameworks (e.g., TestNG, JUnit) - Creating test cases and test suites - Organizing tests and test data - Test design techniques (e.g., boundary value analysis, equivalence partitioning)Test Automation

UNIT-IV : TEST REPORTING AND LOGGING 9

Generating test reports and logs - Analyzing test results and debugging failures - Integration with Continuous Integration (CI) tools (e.g., Jenkins)Selenium Grid and Cross-Browser Testing: Introduction to Selenium Grid - Parallel test execution for improved efficiency

UNIT-V : ADVANCED TOPICS IN SELENIUM 9

Introduction to Test Automation for Web Services: Overview of testing web services - Introduction to tools/frameworks for web service testing (e.g., REST Assured) - Testing API endpoints and response validation.

TOTAL: 45 HOURS

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

CO1 : Understand the basics ofsoftware testing
CO2 : Learn the selenium web driver
CO3 : Understand Test frameworks and framework design.
CO4 : Learn test reporting and logging techniques.
CO5 : Learn dynamic web elements and automation for web services.

TEXT BOOKS:

1. PaulC , "Software. Testing. A Craftsman's Approach", CRC press, Fourth Edition, 2013.
2. Satya Avasarala, 'Selenium WebDriver Practical Guide", 2014.

REFERENCES:

1. Unmesh Gundecha, **"**Selenium Testing Tools Cookbook", 2nd Edition, 2015.
2. Zhimin Zhan, "Selenium WebDriver Recipes in C#", Apress publisher,2015.
3. Dima Kovalenko, "Selenium Design Patterns and Best Practices", Packt Publishing, 2018.
4. S BASU, "Selenium with Python Simplified For Beginners", Independently published 2020.

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1. https://www.tutorialspoint.com/software_testing/index.htm
2. https://www.javatpoint.com/software-testing-tutorial
3. https://www.javatpoint.com/selenium-webdriver
4. https://www.tutorialspoint.com/selenium/selenium_webdriver.htm
5. https://support.smartbear.com/testcomplete/videos/testcomplete-basics-logging-and reporting/

CO-PO AND CO-PSO MAPPING:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	3	2	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-
CO4	2	3	3	-	-	-	-	-	-	-	-
CO5	2	3	2	-	-	-	-	-	-	-	-
AVG	2.2	2.6	2	-	-	-	-	-	-	-	-

JAD2004	PANDAS FOR DATA ANALYSIS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the fundamentals of data analysis and its importance in various fields
- To utilize the pandas plotting subpackage for data visualization.
- To understand the process of building a Python package for data analysis.
- To learn techniques for preprocessing data before applying machine learning algorithms.
- To understand the process of hyperparameter tuning using grid search.

Prerequisite: Statistics and Probability, Database management systems.

UNIT-I: FUNDAMENTALS OF DATA ANALYSIS 9

Fundamentals of data analysis-Statistical foundations-Setting up a virtual environment-Pandas data structures-Bringing data into a Pandas DataFrames-Inspecting a DataFrame object-Grabbing subsets of the data-Adding and removing data

UNIT-II:USING PANDAS FOR DATA ANALYSIS 9

Data Wrangling with Pandas:Data Wrangling-Collecting temperature data-Cleaning up the data Restructuring the data-Handling duplicate, missing,or invalid data-Database-style operations on DataFrames- DataFrame operations-Aggregations with pandas and numpy-Time Series-plottingwith pandas-the pandas.plotting subpackage

UNIT-III: APPLICATIONS AND PLOTTING 9

Seaborn utility-Formatting-Customizing Visulaizations-Building a python package-Data extraction with pandas-Exploratory data analysis-Modeling performance-Simulating login attempts-Rule based anomaly detection.

UNIT-IV: MACHINE LEARNING WITH SCIKIT 9

Exploratory data analysis-prepocessing data-clustering –Regression-Classification

UNIT-V :METHODS TO OPTIMIZE DATA 9

Hyperparameter tuning with grid search-Ensemble methods-Inspecting classification prediction confidence-Addressing class imbalance-Regularization-Unsupervised methods-Supervisedmethods Online Learning

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 : Understand the fundamentals of data analysis.

CO2 : Able to perform various operations and aggregations using Pandas and NumPy.

CO3 : Able to perform exploratory data analysis on different datasets.

CO4 : Have a good understanding of classification techniques and algorithms.

CO5 : Have a good understanding of ensemble methods and their application.

TEXT BOOKS:

1. Stefanie Molin, “Hands-On Data Analysis with Pandas”, Packt Publishing Ltd, 2019.
2. Ashish Kumar, “A Complete Guide to Pandas, from Installation to Advanced Data Analysis Techniques”, 2nd Edition, 2019.

REFERENCES:

1. Alvaro Fuentes, “Become a Python Data Analyst”, Packt Publishing, 2018
2. Jacqueline Kazil, Katharine Jarmul, “Data Wrangling with Python”, O'Reilly Media, 2016.
3. Hannah Stepanek, “Thinking in Pandas” , Apress, 2020.

WEBSITE REFERENCES :

- https://www.google.co.in/books/edition/Thinking_in_Pandas/pZnpDwAAQBAJ?hl=egbp v=0
- https://www.google.co.in/books/edition/Hands_On_Data_Analysis_with_Pandas/buGlDwAAQBAJ?hl=en&gbpv=1&printsec=frontcover
- https://www.packtpub.com/product/hands-on-data-analysis-with-pandas-second edition/9781800563452
- https://www.goodreads.com/book/show/45861407-hands-on-data-analysis-with-pandas
- https://searchworks.stanford.edu/view/13489419

CO-PO AND CO-PSO MAPPING:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1	2	-	-	1	1	3	2
CO2	2	3	1	1	1	-	-	2	2	1	2
CO3	2	2	1	3	1	-	-	1	3	1	2
CO4	2	1	3	2	1	-	-	1	1	1	2
CO5	2	2	1	3	1	-	-	1	3	2	1
AVG	2.2	2.2	1.6	2	1.2	-	-	1.2	2	1.6	1.8

JAD2005	DATA VISUALIZATION USING TABLEAU	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To perceive in-depth knowledge on how to represent data with visual analytics as suits the target audience, task and data.
- To equip the students with knowledge of visual encoding design choices for arranging and representing data in an interactive and spatial form.
- To gain an insight into Data Visualization techniques and tools.
- To explore business insights and achieve business goals in the right direction
- To provide insight and training on designing visualization dashboard that would support decision making on large scale data

Prerequisite: Database Management Systems, Data Mining and Warehousing.

UNIT-I :INTRODUCTION **9**

Purpose of visualization, Data Abstraction: Data Types, Dataset types, Attribute types, Semantics, Preparing your Data, Survey Data, Compute descriptive Statistics, Explore the data visually,Design Standards: Chart Format, Color, Text and Labels Readability, Scales, data Integrity, chart Junk, data density, data richness, Attribution and Design Standard Checklist. Task Abstraction: Actions, Targets, Analyzing & Deriving – Example, Four levels for Validation, Marks and Channels, Analysis – Four levels of Validation.

UNIT-II :Data Manipulation with Pandas **9**

Introduction, Data Indexing and selection, operating on data, handling missing data, Hierarchical Indexing, combining dataset, Aggregation and Grouping, Pivot tables, String operation Visualization with Matplotlib: Line plots, Scatter Plots, Visualizing Errors, Density and Contour plots, Histogram, Customizing Plot legends, Color bars, Test and Annotation, Three dimensional Plotting, Geographic data with base map, visualization with sea born

UNIT-III : VISUALIZATION TECHNIQUES **9**

Arrange tables, Arrange Network and Trees, Map Color and other Channels, Manipulate Views, Facet, Reduce Items and Attributes: Filter, Aggregate, Time-Series Data visualization, Text data Visualization, Multivariate data visualization.

UNIT-IV :DATA VISUALIZATION USING TABLEAU **9**

Exploratory Data Analysis using Tableau Visualizations, Creating basic visualizations- Bar Chart, Geographic map, Crosstab Report, Scatter plot, Line Chart, Connecting to Data, Live Connection,

Extract Data, Combine data sources, Join tables, Blend data sources, cross- database join, filtering and sorting data, creating groups and hierarchies - Publishing to Tableau Server - Mapping

UNIT-V : Case Study **9**

Geographic Maps, Filled Maps, Mapping options Heat Map, Choropleth map and highlight table, Histograms, Dashboard Development -design Principles and Interactivity

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 : Understand the need for data abstraction and task abstraction and would be able to relate with the various data, datasets associated with different applications.

CO2 : Apply the various visual analytics techniques available for arranging the different types of data.

CO3 : Identify and apply appropriate data visualization techniques, given particular requirements imposed by the data.

CO4 : Employ best practices in data visualization to develop charts, maps tables and other visualrepresentations of data and would be able to identify the need for reducing and aggregating item-sets.

CO5 : Apply the different exploratory data analysis techniques on the datasets using Tableau.

TEXT BOOKS:

1. Sosulski K (2018), "Data Visualization made simple: Insights into Becoming Visual, New York: Routledge.
2. Jake VanderPlas "Python Data Science Handbook", November 2017.

REFERENCES:

1. TamaraMunzner, "Visualization Analysis and Design", December 2014.
2. Few, Stephen, "Show me the numbers: Designing Tables and Graphs to Enlighten" 2nd Edition. Analytics Press Publishers June 2012.
3. Mathew Ward, Georges Grinstein and Daniel Keim, "Interactive Data Visualization Foundations, Techniques, Applications" , 2010.
4. Stephen Few, "Information Dashboard Design: Displaying Data for At-a-glance Monitoring", Analytics Press, 2nd Edition, 2013.

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1. https://datavizproject.com/
2. https://app.rawgraphs.io/
3. https://www.datawrapper.de/
4. https://www.tableau.com/
5. https://www.tableau.com/learn/articles/data-visualization

CO-PO MAPPING:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3				3			3			
CO2	3	2	3		3					3	
CO3	3		3		3	2				3	3
CO4	3		3								3
CO5	3	3	3		3					3	
AVG	3	2.6	3		3	2		3		3	3

JAD2006	JENKINS AUTOMATION FOR SERVER	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Understand the automation tools and their application
- To Learn about Jenkins interface and its role in
- To Understand Version Control Integration for Jenkins
- To Learn about Continuous Delivery and Deployment with Jenkins
- To Learn about advanced server automation concepts.

Prerequisite: Operating Systems, Computer Network

UNIT-I : INTRODUCTION TO SERVER AUTOMATION TOOLS 9

Introduction-Overview of server automation- benefits-Introduction to popular server automation tools-Understanding infrastructure as code (IaC) principles,Ansible Automation-Introduction architecture- components and terminology-Chef Automation-Introduction to Chef: architecture, components, and terminology- Puppet Automation-Introduction to Puppet: architecture, components, and terminology-SaltStack Automation-Introduction to SaltStack: architecture, components, and terminology- Comparison and Selection of Automation Tools

UNIT-II : INTRODUCTION 9

Introduction to Jenkins-Overview of Jenkins and its role in software development and automation Installation and setup of Jenkins on a local machine or server-Familiarization with the Jenkins user interface and basic configuration options-Introduction to Jenkins jobs and their types (e.g., Freestyle, Pipeline)-Creating and configuring jobs using the Jenkins web interface -Parameterized builds and job triggering options

UNIT-III : VERSION CONTROL INTEGRATION 9

Version Control Integration- Integrating Jenkins with popular version control systems-Setting up build triggers on version control events-Configuring webhooks for automatic job triggering Continuous Integration with Jenkins- principles of continuous integration (CI)-Configuring Jenkins for automated build and unit testing-Running tests and generating test reports with Jenkins

UNIT-IV : CONTINUOUS DELIVERY AND DEPLOYMENT WITH JENKINS 9

Introduction to continuous delivery and deployment -Creating deployment pipelines in Jenkins Integrating Jenkins with deployment tools -Jenkins Pipeline Fundamentals-Understanding Jenkins pipelines and their advantages -Implementing Jenkins pipelines using the declarative syntax-Writing Jenkins files for defining and managing pipelines

UNIT-V : ADVANCED TOPICS IN SERVER AUTOMATION **9**

Configuration management with multiple environments -Integration of server automation tools with version control systems- Implementing advanced features like idempotence, conditional execution, and error handling-Advanced Jenkins Pipeline Concepts -Using Jenkins pipeline stages and steps Scripted pipeline syntax and advanced scripting techniques -Error handling, parallel execution, and agent configuration in Jenkins pipelines- Jenkins Plugin Ecosystem.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1:Apply the automation techniques
CO2:Apply server automation tools for server validation
CO3:Apply version control integration of various projects
CO4:Learn about Continuous delivery
CO5:Learn about advanced server automation tools

TEXT BOOKS:

1. "Intelligent Automation: Welcome to the world of Hyper automation", Pascal Bornet , World Scientific Publishing Co Pvt Ltd.,2020.

2. Arnon Axelrod," Complete Guide to Test Automation",Apress publications,2020

REFERENCES:

1. Walter de Gruyter ,"Robotic Process Automation Management, Technology, Applications", de Gruyter Publication,2021.

2. Bernd Ruecker ,"Practical Process Automation",OReilly media Publication,2021. 3. Mitesh Soni, "Hands-on Pipeline as YAML with Jenkins", BPB Publications, 2021. 4. Brent Laster, "Jenkins 2: Up and Running", O'Reilly Media, 2018.

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1. https://www.jenkins.io/
2. https://www.tutorialspoint.com/jenkins/jenkins_automated_testing.htm
3. https://www.testim.io/blog/jenkins-test-automation/
4. https://www.youtube.com/watch?v=PAKWqRE0aTk
5. https://www.youtube.com/watch?v=f4idgaq2VqA

CO-PO MAPPING:

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

JAD2007	CLOUD COMPUTING TOOLS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

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

Prerequisite: Computer Networks, Cloud computing

UNIT-I : Cloud Computing Overview **9**

Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self service, Broad network access, Location independent resource pooling, Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

UNIT-II : Cloud Insights **9**

Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability, simplicity, vendors, security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.

UNIT-III : Cloud Architecture- Layers and Models **9**

Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

UNIT-IV : Cloud Simulators- CloudSim and GreenCloud **9**

Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud

UNIT-V : Introduction to VMWare Simulator **9**

Basics of VMWare, advantages of VMware virtualization, using Vmware workstation, creating virtual machines-understanding virtual machines, create a new virtual machine on local host,cloning

virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 : Understand the design challenges in the cloud.
CO2 : Apply the concept of virtualization and its types.
CO3 : Experiment with virtualization of hardware resources and Docker.
CO4 : Develop and deploy services on the cloud and set up a cloud environment.
CO5 : Explain security challenges in the cloud environment.

TEXT BOOKS:

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010

2. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

3. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.

4. James Turnbull, "The Docker Book", O'Reilly Publishers, 2014

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1 Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,FernHalper, Wiley Publishing, Inc, 2010

2 Cloud Computing (Principles and Paradigms), Edited byRajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

3 James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.

4 Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy: an enterprise perspective on risks and compliance", O'Reilly Media, Inc., 2009.

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- https://www.cloudzero.com/blog/cloud-computing-tools
- https://www.knowledgehut.com/blog/cloud-computing/cloud-computing-tools
- https://mindmajix.com/cloud-computing-tools
- https://www.analyticssteps.com/blogs/top-cloud-computing-tools-market

CO-PO MAPPING:

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	PO10	PO11
CO1	**3**	**1**	**3**	**3**	**-**	**-**	**-**	**2**	**3**	**3**	**3**
CO2	**2**	**2**	**2**	**1**	**1**	**-**	**-**	**3**	**2**	**3**	**1**
CO3	**2**	**1**	**2**	**1**	**1**	**-**	**-**	**-**	**1**	**2**	**1**
CO4	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**2**	**1**	**3**
CO5	**3**	**1**	**1**	**2**	**1**	**-**	**-**	**3**	**2**	**1**	**2**
AVG	3	2	2	2	1			3	2	2	2

JAD2008	INFRASTRUCTURE BUILD TOOL USING TERRAFORM	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the principles and benefits of Infrastructure as Code.
- To gain proficiency in using Terraform as an infrastructure build tool.
- To learn to install and configure Terraform for various cloud providers.
- To develop the skills to write Terraform configurations to provision infrastructure resources.
- To acquire knowledge of advanced Terraform concepts like managing multiple environments and using plugins.

Prerequisite: Computer Networks, Cloud Computing

UNIT-I : INTRODUCTION TO INFRASTRUCTURE AS CODE AND TERRAFORM 9

Overview of Infrastructure as Code concepts - Introduction to Terraform and its benefits - Terraform ecosystem and components.

UNIT-II : TERRAFORM INSTALLATION AND CONFIGURATION 9

Installing Terraform on different platforms - Setting up the development environment - Configuring Terraform for various cloud providers.

UNIT-III : TERRAFORM BASICS 9

Understanding Terraform configuration files - Declaring and managing infrastructure resources - Working with variables and data types - Resource dependencies and ordering.

UNIT-IV : PROVISIONING INFRASTRUCTURE WITH TERRAFORM 9

Creating and managing AWS infrastructure with Terraform - Provisioning virtual machines, storage, and networking components - Leveraging Terraform modules for reusable infrastructure code - Handling Terraform state and remote backends.

UNIT-V : TERRAFORM ADVANCED CONCEPTS 9

Managing infrastructure across multiple environments: dev, staging, production - Using conditionals and loops in Terraform configurations - Terraform workspace and environment management - Terraform providers and plugins.

TOTAL: 45 HOURS

COURSE OUTCOMES:

At end of the course students will be able to:

CO1 : Explain the concept of Infrastructure as Code and its significance.

CO2 : Install and configure Terraform for infrastructure provisioning.

CO3 : Write Terraform configurations to define and manage infrastructure resources.

CO4 : Provision and manage infrastructure using Terraform across different cloud providers.

CO5 : Apply advanced Terraform techniques such as managing multiple environments and utilizing plugins.

TEXT BOOKS:

1. YevgeniyBrikman, "Terraform: Up & Running", O'Reilly Media, 2017.
2. Kief Morris, "Infrastructure as Code: Managing Servers in the Cloud", O'Reilly Media, 2016.

REFERENCES:

1. Stephane Jourdan, Thomas Peham, Eberhard Wolff, and Sergey Prysmak, "Infrastructure as Code Cookbook “, Packt Publishing, 2020.
2. Scott Winkler and Martin Atkins "Terraform in Action", Manning publications.
3. Mikael Krief , “Terraform Cookbook: Efficiently define, launch, and manage Infrastructure as Code across various cloud platforms”, Packt Publishing, 2020.
4. vgeniy Brikman , “Terraform: Up & Running: Writing Infrastructure as Code”, O'Reilly Media, 2nd Edition, 2019.

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1. https://k21academy.com/terraform-iac/terraform-beginners-guide/
2. https://developer.hashicorp.com/terraform/tutorials/aws-get-started/infrastructure-as-co
3. https://developer.hashicorp.com/terraform/intro
4. https://www.youtube.com/watch?v=3J3wSzKVJ2A
5. https://www.azuredevopslabs.com/labs/vstsextend/terraform/

CO-PO MAPPING:

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	PO10	PO11
CO1	3	2	1	3	2	2				2	3
CO2	3	2	2	2	2	1				1	2
CO3	2	2	2	3	3	1				2	2
CO4	2	2	3	3	2	2				2	2
CO5	2	2	3	3	2	2				2	2
AVG	2.4	2	2.2	2.8	2.2	1.6	0	0	0	1.8	2.2

JCS9201	FUNDAMENTALS OF DATA STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand linear data structures- Lists.
- To learn the concepts of Stack ADT and Queue ADT.
- To understand non- linear data structures- Trees.
- To learn the concepts of non-linear data structures- Graphs.
- To understand sorting, searching and hashing algorithms.

PREREQUISITE:

- Programming in C.

UNIT I LINEAR DATA STRUCTURES – LIST 9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list Implementation –singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES 9

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 III NON LINEAR DATA STRUCTURES – TREES 9

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 - GRAPHS 9

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – 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

COURSE OUTCOMES:

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

- Implement abstract data types of linear data structures
- Apply the different non-linear data structures to solve problems.
- Familiarize in different design techniques of Tree and Graph Algorithms.
- Implement various Searching and Sorting algorithms.

- Critically analyse the various sorting and hashing algorithms.

TEXT BOOKS:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education,2020.(Unit I to V)
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education Asia, 2012

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1. Reema Thareja, ―Data Structures Using C‖, Second Edition , Oxford University Press, 2014.
2. E.Balagurusamy , " Data Structures Using C", McGraw Hill Education; First edition 2017.
3. Jeri R. Hanly, Elliot B. Koffman, Problem Solving and Program Design in C,7th Edition, 2012, Prentice-Hall.
4. Sara Baase and Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", Pearson Education Asia, 2010.

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https://www.tutorialspoint.com/data_structures_algorithms/index.html
https://www.geeksforgeeks.org/algorithms-gq/analysis-of-algorithms-gq
https://www.javatpoint.com/daa-tutorial

Mapping of CO with PO

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

JCS9202	FUNDAMENTALS OF SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

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

UNIT I SOFTWARE PROCESS AND AGILE DEVELOPMENT 9

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

UNIT II REQUIREMENT ANALYSIS AND SPECIFICATION 9

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

UNIT III SOFTWARE DESIGN 9

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

UNIT IV TESTING METHODOLOGIES 9

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

UNIT V PROJECT AND RISK MANAGEMENT 9

Software Project Management – Estimation – LOC – FP Based Estimation – Make/Buy Decision COCOMO I & II Model – Project Scheduling – Earned Value Analysis Planning – RMMM – Plan.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Identify the key activities in managing a software project and compare different process models

- Apply concepts of Requirements Engineering and Analysis Modeling
- Apply systematic procedures in software design and systems
- Implement various Testing methodologies on the developed software.
- Manage the project and the risks involved .

TEXT BOOKS:

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

REFERENCES:

1. Rajib Mall, Fundamentals of Software Engineering, Third Edition, PHI Learning Private Limited,2009.
2. Pankaj Jalote, Software Engineering, A Precise Approach, Wiley India, 2010.
3. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007.

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- https://www.geeksforgeeks.org/software-engineering/
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- http://www.engppt.com/2011/12/pressman-software-engineering-ppt-pdf.html/

Mapping of CO with PO

	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	3	-	-	-	3	1	-	3
CO2	3	3	3	2	3	-	-	-	3	3	-	3
CO3	3	3	3	1	3	-	-	-	3	3	-	3
CO4	3	3	3	1	3	-	-	-	2	-	-	3
CO5	3	3	3	-	3	-	-	-	2	-	-	3
AVG	3	3	3	1.2	3	0	0	0	2.6	1.4	0	3

JCS9203	BASICS OF PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the python primitive data types and its conversion
- To explore on control structures and strings
- To learn various non-primitive data types
- To acquire knowledge on functions and its types
- To explore on working with file and handling an exceptions

PREREQUISITE:

- Programming in C

UNIT I PYTHON BASICS 9

History of Python, Features, Installing Python, Demo of Interactive and script mode, Identifiers, Reserved Words, Indentation, Comments, Variables, Data Types and its Conversion, Operators and its precedence, Expressions, Input and Print functions.

UNIT II CONTROL STRUCTURES AND STRINGS 9

Selective statements – if, if-else, nested if, if –elif ladder statements. Iterative statements - while, for, Nested loops, else in loops, break, continue and pass statement. Strings and its operations.

UNIT III NON-PRIMITIVE DATA TYPES 9

List: Create, Access, Slicing, Negative Indices, List Methods, and comprehensions. Tuples: Create, Indexing and Slicing, Operations on tuples. Sets: Create and operations on set.

UNIT IV FUNCTIONS 9

Functions: Types, parameters, arguments: positional arguments, keyword arguments, parameters with default values, functions with arbitrary arguments - Recursive and built-in functions.

UNIT V FILES AND EXCEPTIONS 9

Files: Open, Read, Write, Append and Close. Tell and seek methods. Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions – User-Defined Exceptions.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Write basic python programs
- Develop program using control structure and simple string processing

- Develop an application using non-primitive data types and strings
- Design an application which uses functions
- Write a code to handle files and exceptions.

TEXT BOOKS:

1. Eric Matthes, Python Crash Course: A Hands-On, Project-Based Introduction to Programming 2nd Edition, No Starch Press, 2019.
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016

REFERENCES:

1. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press, 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Interdisciplinary Approach", First Edition, Addison-Wesley Professional., 2015.
3. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2011.

WEB REFERENCES:

- Python Tutorial (w3schools.com)
- Learn Python Programming (programiz.com)
- Python Tutorial - PythonForBeginners.com

Mapping of CO with PO

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

JCS9204	OPERATING SYSTEM ESSENTIALS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

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

UNIT I OPERATING SYSTEM OVERVIEW 9

Operating system overview-objectives and functions, Evolution of Operating System.- Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.

UNIT II PROCESS MANAGEMENT 9

Processes — Process Concept, Process Scheduling, CPU Scheduling — Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling; Threads Overview, Multithreading models, Threading issues. Deadlock —Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, and Recovery from deadlock.

UNIT III STORAGE MANAGEMENT 9

Main Memory — Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Virtual Memory, Demand Paging, Page Replacement

UNIT IV FILE SYSTEMS 9

Mass Storage system — Overview of Mass Storage Structure, Disk Structure, Disk Scheduling, swap space management; File-System Interface — File concept, Access methods, Allocation Methods, Directory Structure, Directory organization.

UNIT V CASE STUDY 9

Linux System —Architecture, Design Principles, Kernel Modules, Mobile OS — iOS and Android — Architecture and SDK Framework.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Classify operating system components and system calls based on functionality
- Analyze and evaluate CPU scheduling algorithms and dead lock prevention • Familiarize in memory management and storage management techniques
- Analyze the File System Interface and Directory Structure

• Carryout case studies to generate and illustrate different aspects of various operating systems

TEXTBOOKS

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

REFERENCES

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

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

Mapping of CO with PO

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

JCS9205	FOUNDATIONS OF CRYPTOGRAPHY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

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

UNIT I INTRODUCTION 9

Security trends - Legal, Ethical and Professional Aspects of Security, Security attacks, services and mechanisms–OSI security architecture–Classical encryption techniques: substitution techniques, transposition techniques, steganography

UNIT II SYMMETRIC KEY CRYPTOGRAPHY 9

SDES – Block cipher Principles of DES – Strength of DES–-Block cipher design principles–Blockcipher mode of operation–Evaluation criteria for AES–Advanced Encryption Standard RC4 Key distribution

UNIT III PUBLIC KEY CRYPTOGRAPHY 9

Primes–Primality Testing –Factorization – Euler‘s totient function, Fermat‘s and Euler‘s Theorem RSA cryptosystem– Key distribution–Key Management–Diffie Hellman key exchange-ElGamal cryptosystem

UNIT IV MESSAGE AUTHENTICATION 9

Authentication requirement – Authentication function – MAC – Hash function – SHA –Digital signature and authentication protocols – DSS- Entity Authentication: Biometrics, Passwords, Authentication applications - Kerberos, X.509..

UNIT V SYSTEM SECURITY 9

Electronic Mail security–PGP, S/MIME-IP Security-Cutting Edge Web Application Security : Click jacking - Intruders–Malicious software – viruses – Firewalls - IoT attack, types of IoT attacks, Threats and Security Solutions.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Analyze the fundament also f networks security, security architecture, threats and vulnerabilities
- Familiarize the different cryptographic operation so f symmetric cryptographic

algorithms

• Analyze the different cryptographic operations of public key cryptography • Evaluate the various Authentication schemes to simulate different applications. • Understand various Security practices and System security standards.

TEXTBOOKS

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

REFERENCES

.

1. Behrouz A.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007. 2. Sullivan, Bryan, and Vincent Liu.Web Application Security, A Beginner's Guide. McGraw Hill Professional, 2011.

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- https://www.geeksforgeeks.org/cryptography-introduction/
- https://mindmajix.com/cryptography-tutorial
- https://www.academia.edu/35766751/Cryptography_tutorial
- https://www.vssut.ac.in/lecture_notes/lecture1428550736.pdf

Mapping of CO with PO

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

JCS9206	FOUNDATIONS OF ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To impart basic knowledge about Artificial Intelligence
- To learn the methods of solving problems using Artificial Intelligence
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing intelligent agents
- To understand the application of AI namely Robotics

PREREQUISITE:

- Basics of Mathematics Concepts

UNIT I INTRODUCTION 9

Introduction–Definition – Foundation and History of AI - Future of Artificial Intelligence – Characteristics of Intelligent Agents– Agents and Environments – Nature of Environments - Structure of Agents - Typical Intelligent Agents.

UNIT II PROBLEM SOLVING METHODS 9

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - 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.

UNIT III KNOWLEDGE REPRESENTATION 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 SOFTWARE AGENTS 9

Architecture for Intelligent Agents – Examples - Agent communication – Speech Acts – KQML-KIF - FIPA ACL - Argumentation among Agents – Trust and Reputation in Multiagent systems

UNIT V APPLICATIONS 9

AI applications – Language Models – Information Retrieval – Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware - Perception – Planning – Moving.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Implement basic AI Algorithms.
- Use appropriate search algorithms to solve AI based problems.
- Represent a problem using first order and predicate logic
- Implement Various intelligent systems.
- Gain knowledge on the functions of Robots.

TEXT BOOKS:

1. Russell S and Norvig P, "Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009.
2. Gerhard Weiss, - Multi Agent Systems , Second Edition, MIT Press, 2013.

REFERENCES:

1. Tim Jones M - Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, 2008.
2. Bratko I - Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
3. Kevin Night and Elaine Rich, Nair B., ―Artificial Intelligence (SIE)‖, Mc Graw Hill 2008.

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- https://www.coursera.org/
- https://www.udemy.com/
- https://microsoft.github.io/AI-For-Beginners/
- https://www.datacamp.com/blog/how-to-learn-ai

Mapping of CO with PO

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

JCS9207	BASICS OF SOFTWARE TESTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

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

UNIT I INTRODUCTION 9

Testing as an Engineering Activity - Testing as a Process – Testing axioms – Basic definitions – Software Testing Principles – The Tester‟s Role in a Software Development Organization,

UNIT II TEST CASE DESIGN STRATEGIES 9

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

UNIT III LEVELS OF TESTING 9

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

UNIT IV TEST MANAGEMENT 9

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

UNIT V TEST AUTOMATION 9

Software test automation – skills needed for automation – scope of automation – design and architecture for automation. Challenges in automation.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

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

TEXT BOOKS:

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

REFERENCES:

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

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- https://www.javatpoint.com/software-testing-tutorial
- https://www.guru99.com/software-testing.html
- https://artoftesting.com/software-testing-tutorial
- https://www.softwaretestinghelp.com/manual-testing-tutorial-1/

Mapping of CO with PO

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

JCS9208	CYBER LAW AND ETHICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Understand Cyber Space, Cyber Crime, Cyber Laws, Information Technology, Internet, Internet Services
- To Know Legal Aspects of Regulation concerned with Cyber Space, Technology and Forms of Cyber Crimes
- To Understand Computer Crimes and Cyber Crimes, Cyber Crime in Global and Indian Response.
- To Understand Criminal Liability, Cyber Crime implications and challenges
- Learn Precaution & Prevention of Cyber Crimes, Human Rights perspective of Cyber Crime

PREREQUISITE:

- Basic Knowledge of Internet

UNIT I TECHNOLOGY AND CYBER CRIMES 9

Introduction, Glimpses, Definition and Scope, Nature and Extent, Know no Boundaries, Rapid Transmission and Accuracy, Diversity and Span of Victimization, Cyber World, Inadequacy of Law, Influence of Teenagers Information Technology: Definition & Perspective, Growth & Future, Various Facets & Dimensions.

UNIT II COMPUTER AND FORMS OF CYBER CRIMES 9

Influence of Technology on Criminality, Forms of Cyber Crimes- A Criminological Analysis Computer Crimes and Cyber Crimes: Terminological Aspects, Opportunities to Cyber Criminals, Motives of Offenders, Problems Affecting Prosecution, Cyber Crimes: Challenges of Prevention and Control, Need and Prospects.

UNIT III CYBER CRIMES AND GLOBAL RESPONSE 9

Global Perspective, Country wise Legal Response, Country wise Analysis. Cyber Crimes and Indian Response: Introduction, The Indian Information Technology Act 2000, Preamble & Coverage, Nature of Offences and Penalties, Miscellaneous and Subsidiary Provisions Certain Shortcomings, Future Prospects and Needs.

UNIT IV DISCOVERY AND APPRECIATION OF EVIDENCES 9

Introduction, Law of Evidence, Evidences in Cyber Crimes : Challenges and Implications, Computer Generated Evidence and their Admissibility, Judicial Interpretation of Computer related Evidence

UNIT V HUMAN RIGHTS PERSPECTIVES CYBER CRIMES 9

Introduction, Ideological Aspects, Fundamental Rights and Civil Liberties, Various Issues and Challenges. Cyber Crimes : Precaution and Prevention: Introduction, Awareness and Law Reforms, Improving Criminal Justice Administration, Increasing International Cooperation,

Curricular Endeavors and Checking Kids' Net Addiction, Role of Guardians, Mobile Pornography

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Explain Understand Cyber Space, Cyber Crime, Information Technology, Internet & Services.
- Identify List and discuss various forms of Cyber Crimes.
- Explain Computer and Cyber Crimes
- Understand Cyber Crime at Global and Indian Perspective
- Describe the ways of precaution and prevention of Cyber Crime as well as Human Rights.

TEXT BOOKS:

1. Dr Pramod Kr.Singh, “Laws on Cyber Crimes[Along with IT Act and Relevant Rules]” Book Enclave Jaipur India
2. Craig B, “Cyber Law: The Law of the Internet and Information Technology”. Pearson Education.

REFERENCES:

1. K.Kumar,” Cyber Laws:Intellectual property&E Commerce, Security”, First Edition, Dominant Publisher, 2011.
2. Rodney D. Ryder, “Guide to Cyber Laws”, Second Edition, Wadhwa And Company, New Delhi, 2007.
3. Vakul Sharma, "Handbook of Cyber Laws" Macmillan India Ltd, Second Edition, PHI, 2003.

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Mapping of CO with PO/PSO

	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	1	2	1	1	1	1	2	1	2
CO2	3	3	1	2	2	1	1	2	2	2	1	2
CO3	3	3	2	3	2	2	2	2	2	3	3	2
CO4	3	3	3	2	2	2	2	2	2	3	3	2
CO5	3	3	3	3	2	2	2	2	2	3	3	2
AVG	**3**	**3**	**2.4**	**2.2**	**2**	**1.6**	**1.6**	**1.8**	**1.8**	**2.6**	**2.2**	**2**