MANAKULA VINAYAGAR
INSTITUTE OF TECHNOLOGY
An Autonomous Institution
Affiliated to Pondicherry University, Approved by AICTE, New Delhi,
Accredited by NAAC with 'A' Grade
Kalitheerthalkuppam, Puducherry- 605 107.

Curriculum and Syllabus

for

UG Degree Program

In

B.Tech CSE (Internet of Things and Cyber Security including Blockchain Technology)

R 2025

2025-26

HEAD OF THE DEPARTMENT
Department of CSE (Internet of Things and
Cyber Security Including Block Chain Technology)
Manakula Vinayagar Institute of Technology
Madagadipet, Puducherry-605 107.

INSTITUTION VISION AND MISSION

Vision

To be a globally reputed Technical Institution creating Competent leaders and Skillful innovators in Science, Technology and Management.

Mission

- Providing a dynamic and creative learning environment for its students to acquire exemplary technical, analytical, professional skills.
- Imbibing a spirit of innovation and research among its students and faculty for solving critical problems.
- Promoting Innovation, Employability and entrepreneurship skills through industry academia collaboration.
- Serving the society through technical intervention and creating socially responsible Professionals.

DEPARTMENT VISION AND MISSION

Vision

Nurturing future Innovators, Entrepreneurs, and Researchers committed to pioneering Technological solutions and making a meaningful difference in the world

Mission

- To develop critical thinking and problem-solving skills in students, so that they are empowered to take on and deal with the complex problems
- To motivate and help students convert their innovative idea into an entrepreneurial venture in their domains
- Enhance the Research skills and knowledge of students and professionals through cutting-edge research.
- Enlighten young minds to educate society on safeguarding human safety and security nationwide in the digital world.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO1: Employability

Graduates will gain expertise in IoT, Cyber security, and Blockchain, preparing them for employment in related industries with professional competence.

PEO2: Higher Education and Research

Graduates will be prepared to pursue advanced studies and research in IoT, Cyber security, Blockchain, and related fields to drive innovation and knowledge advancement.

PEO3: Entrepreneurship

Graduates will possess the skills to identify opportunities, innovate solutions, and build successful entrepreneurial careers in IoT, Cyber security, Blockchain, and related fields.

PEO4: Professionalism and Ethics

Graduates will develop strong professional ethics, effective communication, teamwork, and a multidisciplinary approach to responsibly and ethically tackle real-world engineering challenges.

PROGRAMME OUTCOMES (PO)

1. **Engineering Knowledge** – Apply knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to solve complex engineering problems.
2. **Problem Analysis** – Identify, formulate, review research literature, and analyze complex engineering problems using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/Development of Solutions** – Design solutions for complex engineering problems and design system components or processes that meet specified needs, considering public health, safety, cultural, societal, and environmental factors.
4. **Conduct Investigations of Complex Problems** – Use research-based knowledge and methods, including design of experiments, analysis, and interpretation of data, to provide valid conclusions.
5. **Modern Tool Usage** – Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities with an understanding of their limitations.
6. **The Engineer and Society** – Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal, and cultural issues relevant to professional engineering practice.
7. **Environment and Sustainability** – Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of sustainable development.
8. **Ethics** – Apply ethical principles and commit to professional ethics, responsibilities, and norms of engineering practice.
9. **Individual and Team Work** – Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication** – Communicate effectively on complex engineering activities with the engineering community and society at large, such as being able to comprehend and write effective reports, make presentations, and give and receive instructions.
11. **Project Management and Finance** – Demonstrate knowledge and understanding of engineering and management principles and apply them to one's own work as a member or leader of a team to manage projects in multidisciplinary environments.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO 1: IoT Systems Design and Development: Design, develop, and secure IoT systems with seamless connectivity, data analytics, and machine learning.

PSO 2: Cyber security and Blockchain Technologies: Implement advanced cyber security and Blockchain technologies to protect critical infrastructure and digital assets.

S. No.	Category	AICTE	PU R-2023	MIT Proposed CSE(ICB) R-2025
1	**Humanities and Social Sciences, including Management courses (HS)**	**16**	**13**	**14**
2	**Basic Science courses (BS)**	**23**	**22**	**20**
3	**Engineering Science courses including workshop, drawing, basics of Electronics /Electrical/Mechanical / Computer etc. (ES)**	**29**	**21**	**26**
4	**Professional core courses (PC)**	**59**	**73**	**64**
5	**Professional Elective courses relevant to chosen specialization/branch (PE)**	**12**	**12**	**12**
6	**Open subjects – Electives from other technical and /or emerging subjects (OE)**	**09**	**06**	**9**
7	**Core Enrichment Course (CE)** **(Includes project work, seminar, internships)**	**15**	**18**	**17**
8	**Employability Enhancement Courses (EEC)**	**-**	**-**	**-**
9	**Mandatory Courses (MCC)** **[Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]**	**non-credit**	**non-credit**	**non-credit**
10	**Certification Courses(CCC)**	**non-credit**	**non-credit**	**non-credit**
	Total	**163**	**165**	**162**

SUMMARY OF ALL COURSES

S.No	Course Category	I	II	III	IV	V	VI	VII	VIII	Total Credits
1	**HS**	2	3	3	3	3				**14**
2	**BS**	4	8	4	4					**20**
3	**ES**	13	9	4						**26**
4	**PC**		3	12	15	19	11	4		**64**
5	**PE**						6	3	3	**12**
6	**OE**							3	6	**9**
7	**CE**				1		1	5	10	**17**
8	**EEC**									
9	**MCC***									
10	**CCC***		-		-		-		-	
Total		**19**	**23**	**23**	**23**	**22**	**18**	**15**	**19**	**162**

SEMESTER I								MARKS		
S.No	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**	**CAM**	**ESM**	**TM**
INDUCTION PROGRAM										
THEORY										
1.	25UMAT11	Matrices and Calculus	BS	3	1	0	4	40	60	100
2.	25UECT12	Basic Electronics Engineering	ES	3	0	0	3	40	60	100
3.	25UHST13	Universal Human Values II	HS	2	0	0	2	40	60	100
4.	25UCST14	Computational Thinking	ES	3	0	0	3	40	60	100
INTEGRATED COURSE										
5.	25UCSI15	Programming in C	ES	3	0	2	4	50	50	100
PRACTICAL										
6.	25UECP16	Basic Electronics Engineering lab	ES	0	0	2	1	60	40	100
7.	25UGEP17	Fabrication lab	ES	0	0	2	1	60	40	100
8.	25UGEP18	Design Thinking & Idea Lab	ES	0	0	2	1	60	40	100
EMPLOYABILITY ENHANCEMENT COURSE										
9.	25UPCC11	Career Development Skills	EEC	0	0	2	0	100	-	100
MANDATORY COURSE										
10.	25UMCC11	IKS – Concepts and applications in Engineering and Science	MCC	1	0	1	0	100	-	100
11.	25UMCC12	Holistic Wellness	MCC	0	0	2	0	100	-	100
Total							**19**	**690**	**410**	**1100**

SEMESTER II								MARKS		
S.No	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**	**CAM**	**ESM**	**TM**
THEORY										
1.	25UMAT21	Differential Equations and Transforms	BS	3	1	0	4	40	60	100
2.	25UICT22	Introduction to Cyber Security	PC	3	0	0	3	40	60	100
3.	25UPHT23	Applied Physics for Computing Engineers	BS	3	0	0	3	40	60	100
4.	25UCST24	Digital System Design	ES	2	1	0	3	40	60	100
INTEGRATED COURSE										
5.	25UCSI25	Problem solving using Python	ES	2	0	4	4	50	50	100
6	25UHSI26	Professional Communication for Engineers	HS	1	0	4	3	50	50	100
PRACTICAL										
7	25UPHP27	Applied Physics Lab	BS	0	0	2	1	60	40	100
8	25UCSP28	Digital System Design Lab	ES	0	0	2	1	60	40	100
9	25UGEP29	Engineering Graphics and Auto CAD	ES	0	0	2	1	60	40	100
EMPLOYABILITY ENHANCEMENT COURSE										
10	25UPCC21	Communication Skills	EEC	0	0	2	0	100	-	100
11	25UCCC21	Certification Course I	CCC	0	0	0	0	100	-	100
MANDATORY COURSE										
12	25UMCC21	IKS in Humanities and Social Science	MCC	1	0	1	0	100	-	100
13	25UMCC22	Environmental Science& Sustainability	MCC	0	0	2	0	100	-	100
Total							**23**	**840**	**460**	**1300**

SEMESTER III								MARKS		
S.No	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**	**CAM**	**ESM**	**TM**
THEORY										
1.	25UMAT31	Fourier Series, Probability and Statistics	BS	3	1	0	4	40	60	100
2.	25UICT32	Data Structures and Algorithms	PC	3	0	0	3	40	60	100
3.	25UICT33	Object Oriented Programming using Java	PC	3	0	0	3	40	60	100
4.	25UICT34	Computer Networks	PC	3	0	0	3	40	60	100
5.	25UHST31	Human Resource Management	HS	3	0	0	3	40	60	100
INTEGRATED COURSE										
6.	25UICI35	Embedded C Programming for IoT Applications	ES	3	0	2	4	50	50	100
PRACTICAL										
7.	25UICP31	Data Structures Lab	PC	0	0	2	1	60	40	100
8.	25UICP32	Object Oriented Programming using Java Lab	PC	0	0	2	1	60	40	100

9.	25UICP33	Computer Networks Lab	PC	0	0	2	1	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES										
10.	25UPCE31	Personality Development **Skills**	EEC	0	0	2	0	100		100
11.	25UCCC10	Certification courses-II (Cyber Security Essentials)	CCC	0	0	0	0	100		100
MANDATORY COURSE										
12.	25UMCC3	Indian Constitution and Human Rights	MCC	2	0	0	0	100		100
Total							**23**	**730**	**470**	**1200**

SEMESTER IV								MARKS		
S.No	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credit**	**CAM**	**ESM**	**TM**
THEORY										
1.	25UMAT41	Number Theory and Cryptography	BS	3	1	0	4	40	60	100
2.	25UICT42	Operating System	PC	3	0	0	3	40	60	100
3.	25UICT43	Database Management System	PC	3	0	0	3	40	60	100
4.	25UICT44	Blockchain Technology	PC	3	0	0	3	40	60	100
5.	25UHST41	Organizational Behavior	HS	3	0	0	3	40	60	100
INTEGRATED COURSE										
6.	25UICI45	Industrial IoT (IIoT)	PC	3	0	2	4	50	50	100
PRACTICAL										
7.	25UICP41	Operating System Lab	PC	0	0	2	1	60	40	100
8.	25UICP42	Database Management System lab	PC	0	0	2	1	60	40	100
9.	25UICW41	Mini Project -1	CEC	0	0	2	1	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES										
10.	25UPCE41	Professionalism and Basic Aptitude	EEC	0	0	2	0	100	-	100
11.	25UCCC11	Certification Course III	CCC	0	0	0	0	**100**		**100**
MANDATORY COURSE										
12	25UMCC41	Entrepreneurial skills and concepts	MCC	2	0	0	0	100	-	100
Total							**23**	**730**	**470**	**1200**

HONOR COURSES							MARKS		
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**	**CAM**	**ESM**	**TM**
THEORY									
1.	25UICH01	Malware Analysis and Mitigation Techniques	3	1	0	4	40	60	100
2.	25UICH02	Digital Forensics and Investigation Techniques	3	1	0	4	40	60	100
3.	25UICH03	Cyber Threat Intelligence and Risk Management	3	1	0	4	40	60	100
4.	25UICH04	Blockchain Security and Performance	3	1	0	4	40	60	100
5.	25UICH05	Blockchain and FinTech	3	1	0	4	40	60	100
Total						20	200	300	500

MINOR COURSES							MARKS		
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**	**CAM**	**ESM**	**TM**
THEORY									
1.	25UICM01	Network Fundamentals and Security	3	1	0	4	40	60	100
2.	25UICM02	Fundamentals of Cyber Security	3	1	0	4	40	60	100
3.	25UICM03	Digital Forensics	3	1	0	4	40	60	100
4.	25UICM04	Security in Cloud Computing	3	1	0	4	40	60	100
5.	25UICM05	Fundamentals of Blockchain Technology	3	1	0	4	40	60	100
Total						20	200	300	500

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SEMESTER I

25UMAT11	MATRICES AND CALCULUS	Category	L	T	P	Credit
		BS	3	1	0	4

Course Prerequisite

- Higher Secondary Level Mathematics

Course Objective

- To understand and gain the knowledge of matrix algebra, partial differentiation, double integration, triple integration and their application, curl, divergence. To familiar with vector differential operators, integral theorems (Green's, Stoke's, Gauss divergence).

Course Outcome

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

CO1	Find eigenvalues and eigenvectors, verify the Cayley-Hamilton theorem, and perform orthogonal diagonalization.	Apply (K3)
CO2	Compute partial derivatives, determine total derivatives, Jacobians, employ Taylor's series, and find extremes of functions of two variables.	Apply (K3)
CO3	Demonstrate proficiency in evaluating double integration and triple integration and using them to compute area and volume.	Apply (K3)
CO4	Compute gradients, divergence, curl, directional derivatives, and apply vector identities to solve vector field problems.	Apply (K3)
CO5	Apply Green's theorem, Stoke's theorem and Gauss divergence theorem.	Apply (K3)

SYLLABUS

UNIT I MATRICES (12)

Eigenvalues and Eigen vectors of a real matrix, Characteristic equation, Properties of Eigen values and Eigenvectors- Cayley-Hamilton Theorem, Diagonalization of matrices. Reduction of a quadratic form to canonical form by orthogonal transformation -Nature of quadratic forms.

UNIT II FUNCTIONS OF SEVERAL VARIABLES (12)

Partial derivatives-Total derivative- Differentiation of implicit functions, Change of variables- Jacobians and their properties-Taylor's series for functions of two variables- Maxima and minima, Lagrange's method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS (12)

Multiple Integral – Change of order of integration (Cartesian form). Applications: Areas as a double integral (Cartesian form) – Volume as a triple integral (Cartesian form).

UNIT IV VECTOR DIFFERENTIATION (12)

Scalar and vector valued functions-gradient, tangent plane – directional derivative-divergence and curl-scalar and vector potentials. Statement of vector identities-simple problems.

UNIT V VECTOR INTEGRATION (12)

Line, surface and volume integrals- statements of Green's, Stoke's and Gauss Divergence theorems – verification and evaluation of vector integrals using them.

TOTAL PERIODS: 60

TEXT BOOKS

1. Veerarajan T., "Engineering Mathematics – I and II", Tata McGraw-Hill, New Delhi, 2014 and 2015.
2. Dr. M.K. Venkataraman, "Engineering Mathematics – Volume I and Volume II", The National Publishing Company, Chennai 2008.

REFERENCE BOOKS

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.
3. Bali N.P and Manish Goyal., "A Text Book of Engineering Mathematics", Laxmi Publications(P) Ltd, 2011.
4. Erwin Kreyszig, Advanced Engineering Mathematics (9th Edition), John Wiley & Sons, New Delhi, 2011.

Online Courses/NPTEL/SWAYAM:

1. https://nptel.ac.in/courses/111106100
2. https://nptel.ac.in/courses/111104125
3. https://nptel.ac.in/courses/111105121
4. https://nptel.ac.in/courses/111107112

CO-PO -PSO Mapping

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

Assessment Methodology	Assessment Tools	Marks
Test		25
Problem based Assignment	Moodle / Google form	5
Simulation (Python/Matlab/Scilab) Based Project assignment	Demo and viva	5
Attendance		5
Total		**40**

25UECT12	BASIC ELECTRONICS ENGINEERING	Category	L	T	P	Credit
		ES	3	0	0	3

Course Prerequisite:

- Basic knowledge about electronic circuits

Course Objective

- To learn the fundamental skills in the construction of electronics circuit design and develop various electronic systems.

Course Outcome

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

CO1	Understand the semiconductor physics of the intrinsic, p, and n materials.	Understand
CO2	Understand the function and operation of diodes, transistors and amplifiers.	Understand
CO3	Analyze the performance of BJT & FETs and its uses in amplifiers and oscillators.	Analyze
CO4	Analyze and design operational amplifier circuits.	Analyze
CO5	Understand the architecture, functions & their applications of IC 741 OP-Amp.	Understand

SYLLABUS

UNIT I SEMI CONDUCTORS AND DIODES (9)

Conductors - Semiconductors - Intrinsic Semiconductors - Extrinsic Semiconductors. Diode Theory, Basic Ideas - ideal Diode - Forward and Reverse Bias - Diode Equation - Volt-Ampere Characteristic- Special diodes, symbol of zener diode - operation - V-I characteristics - symbol of photo diode - working principle - LED symbol and principle.

UNIT II RECTIFIERS (9)

Half-wave Rectifier - Full-wave and Bridge Rectifier - derivation of Ripple factor - efficiency of Half-wave -Full-wave and Bridge rectifiers, Merits and demerits of Half-wave - Full-wave and Bridge rectifiers - Comparisons of rectifiers.

UNIT III BIPOLAR JUNCTION &, FIELD-EFFECT TRANSISTORS(9)

Symbols of PNP and NPN transistors and their working principles -Transistor - Construction & working - Input and output characteristics of CB and CE configuration- Transistor as an Amplifier - Construction and working of JFET & MOSFET.

UNIT IV OSCILLATORS (9)

Principle of oscillation and Barkhausen criteria - LC oscillators: Hartley and Colpitts (operation and applications) - RC oscillators: Phase shift and Wien bridge (principle and working) - Crystal oscillator basics and applications-555 timer- Astable and Monostable Multivibrator

UNIT V OPERATIONAL AMPLIFIERS (9)

Characteristics of Op-Amps, Introduction to Op-amp - Op-amp Block Diagram - ideal and practical Op-Amps specifications - 741 Op-Amps & its features - Op-amp parameters & Measurement - Applications of Op-Amps: Inverting and Non-inverting amplifier - Integrator and differentiator - Comparators.

TOTAL PERIODS: 45

TEXTBOOKS:

1. Albert Malvino and David J Bates, "Electronic Principles", Tata McGraw–Hill, 9thEdition, 2021. (Unit 1 & 2)

2. Boyelstad, "Electronic Devices and Circuits Theory", Pearson Education, 11th Edition, 2013.(Unit 1, 2 & 3)
3. Morris Mano, "Digital design", PHI Learning, 4th Edition, 2016. (Unit 4)
4. Ramakanth A. Gayakwad, "Op-Amps and Linear Integrated Circuits", PHI, 4th Edition, 2015. (Unit 5)
5. D. Roy Chowdhury, "Linear Integrated Circuits", New Age International Pvt.Ltd., 5th Edition, 2018.(Unit 5)

REFERENCES:

1. Robert L.Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson/PHI, 10*th* Edition, 2010.
2. David A.Bell, "Electronic Devices and Circuits", Oxford, 5*th* Edition, 2009.
3. S.Salivahanan, Kumar, Vallavaraj, "Electronic Devices and Circuits", TATA McGraw Hill, 2*nd* Edition, 2003.
4. David A, "Operational Amplifiers & Linear ICs", Oxford Uni. Press, 3*rd* Edition, 2005. (Unit 5)

ONLINE / NPTEL Courses:

1. Introduction to Basic Electronics: https://archive.nptel.ac.in/courses/122/106/122106025/
2. Basic Electronics: https://archive.nptel.ac.in/courses/108/101/108101091/

CO-PO Mapping

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

Assessment Methodology	Assessment Tools	Marks
Test		25
Application based Hobby circuits	Presentations	5
Simulation (TCAD, PSPICE, LT SPICE) Project based assignment	Demo and viva	5
Attendance		5
Total		**40**

25UHST13	UNIVERSAL HUMAN VALUES II	Category	L	T	P	Credit
		HS	2	0	0	2

Course Objective:

- To highlight the plausible implications of such a holistic understanding in terms of ethical human conduct, trustful, mutually fulfilling human behaviour, and mutually enriching interaction with Nature.

Course Outcome

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

CO1	Understand holistic vision of life.	Understand
CO2	Enhance socially responsible behavior.	Understand
CO3	Understand the responsibility of environmental work.	Understand
CO4	Understand the Competence and Capabilities for Maintaining Health and Hygiene.	Understand
CO5	Appreciate the aspiration for excellence (merit) and gratitude for all.	Understand

SYLLABUS

UNIT I INTRODUCTION TO VALUE EDUCATION (9)

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity the Basic Human Aspirations, Happiness and Prosperity Current Scenario, Method to Fulfil the Basic Human Aspirations.

UNIT II HARMONY IN THE HUMAN BEING (9)

Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

UNIT III HARMONY IN THE FAMILY AND SOCIETY (9)

Harmony in the Family, the Basic Unit of Human Interaction, Trust, Foundational Value in Relationship, Respect, Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.

UNIT IV HARMONY IN THE NATURE/EXISTENCE (9)

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence. Describing, Defining, Classifying, providingexamples or evidence, writing introduction and conclusion.

UNIT V IMPLICATIONS OF THE HOLISTIC UNDERSTANDING (9)

Natural Acceptance of Human Values, Definitive- ness of (Ethical) Human Conduct, A Basis

for Humanistic Education, Humanistic Constitution and Universal Hu- man Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models- Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Premvir Kapoor, "Professional Ethics and Human Values", Khanna Book Publishing Company, New Delhi, 2022.
2. R RGaur,R Asthana, G P Bagaria, "The Textbook - A Foundation Course in Human Values and Professional Ethics", Excel Books, New Delhi, 2nd Revised Edition, 2019.

REFERENCES:

1. Annie Leonard, "The Story of Stuff", 2011.
2. A.N. Tripathi,"Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. Mohandas Karamchand Gandhi, "The Story of My Experiments with Truth", FP classic, 2009.
4. A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, "VanVidya: EkParichaya", 1999.

CO-PO Mapping

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

Assessment Methodology	Assessment Tools	Marks
Test		25
Case study analysis	Group discussion and report	5
Value-based project proposal	Presentation and peer evaluation	5
Attendance		5
Total		**40**

25UCST14	COMPUTATIONAL THINKING	Category	L	T	P	Credit
		ES	3	0	0	3

Course Prerequisite

- Higher Secondary Level Mathematics and General computer usage.

Course Objective

- To develop computational thinking skills through understanding data, pattern recognition, algorithms, decomposition, abstraction, modeling, and complexity analysis in problem-solving and automation.

Course Outcomes

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

CO1	Explain the key concepts of decomposition, pattern recognition, abstraction, algorithms, complexity, modeling, automation, and visualization.	Understand
CO2	Recall the fundamental concepts of data analytics, visualization techniques, pattern recognition, and basic data encryption methods.	Remember
CO3	Apply decomposition and algorithmic thinking to design and represent algorithms for everyday tasks using pseudocode, flowcharts, and control structures such as selection, iteration, functions, and procedures.	Apply
CO4	Apply the concepts of abstraction and modeling to represent systems using automata, finite state machines, and object-based models focusing on repair, reuse, and recycle principles.	Apply
CO5	Analyze the efficiency of sorting and search algorithms and debug program errors.	Analyze

SYLLABUS

UNIT I INTRODUCTION TO COMPUTATIONAL THINKING (9)

Understanding the concepts: Decomposition, pattern recognition / data representation, generalization / abstraction and Algorithms. Complexity, Modeling, Automation, Analysis, visualization.

UNIT II UNDERSTANDING DATA AND PATTERN RECOGNITION (9)

Performing analytics on numeric data using any spreadsheet software and visualizing the data using charts, histograms, scatter plots, graphs, Logical thinking – reasoning, Pattern recognition in data, data sequences, puzzles, nonograms. Data Encryption – ciphering sentences and Compression

UNIT III DECOMPOSITION AND ALGORITHMIC THINKING (9)

Decomposition, Algorithmic thinking – creating oral algorithms for everyday tasks – visualizing algorithms through sequence of steps, pseudocode, flow charts, selection, iteration, functions and procedures

UNIT IV ABSTRACTION AND MODELING: (9)

Abstraction and Modeling, Automata and Finite State Machine, Object Description, Objects and Objects based modeling – Repair, Reuse, Recycle.

UNIT V UNDERSTANDING COMPLEXITY: (9)

Understanding complexity, sorting algorithms, search algorithms, Debugging, enhancing the clarity of a program – documentation, style, idioms, Automation and Simulation, AI, and Computational thinking.

TOTAL PERIODS: 45

TEXT BOOKS:

1. Karl Beecher, Computational Thinking – A Beginner's Guide to Problem–Solving and Programming, BCS Learning, 2017.
2. Venkatesh G, Madhavan Mukund, Computational Thinking, Notion Press, 1st Edition, 2021.
3. A.DavidD.Riley,KennyA.Hunt, Computational Thinking for the Modern Problem Solver, CRC Press, 2015

REFERENCE BOOKS

1. David Clark, Computational and Algorithmic Thinking Book 2, AMT Publishing, 2016.
2. Paul Curzon, "Computing Without Computers: A Gentle Introduction to Computer Programming, Data Structures, and Algorithms", 2014.
3. Wang Paul S, From computing to computational thinking, CRC Press, 2016.
4. Peter J. Denning, Matti Tedre, Computational Thinking, MIT Press, 2019.
5. Paolo Ferragina, Fabrizio Luccio, Computational Thinking_ First Algorithms, Then Code, Springer International Publishing, 2018.
6. Aman Yadav, Ulf Berthelsen, Computational Thinking in Education_ A Pedagogical Perspective, Routledge, 2021.
7. Zhiwei Xu, Jialin Zhang, Computational Thinking_ A Perspective on Computer Science,
8. Springer, 2021.

CO-PO Mapping

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

Assessment Methodology	**Assessment Tools**	**Marks**
Test		25
Problem based Assignment	Moodle/Google form	5
Project Based	Demo and viva	5
Attendance		5
Total		**40**

25UCSI16	PROGRAMMING IN C	Category	L	T	P	Credit
		ES	3	0	2	4

Course Prerequisite

- Basic programming skills.

Course Objective

- To impart the knowledge of basic programming constructs of C language, arrays and strings, functions, structures, pointers and input/output file handling.

Course Outcomes:

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

CO1	Demonstrate knowledge on C Programming constructs and develop simple program in C using basic constructs.	Understand
CO2	Apply arrays and string operations to solve basic problems using C	Apply
CO3	Develop modular programs using functions, recursion, and pointers	Apply
CO4	Implement user-defined data types using structures, unions, and manage memory dynamically.	Apply
CO5	Implement file operations and manage memory dynamically using pointers and preprocessor directives.	Apply

SYLLABUS

UNIT I INTRODUCTION TO PROGRAMMING PARADIGMS: (9)

Introduction to programming paradigms – Applications of C Language – Structure of C program – C programming: Data Types – Constants – Enumeration Constants – Keywords – Operators: Precedence and Associativity – Expressions – Input/Output statements, Assignment statements – Decision making statements – Switch statement – Looping statements – Compilation process.

UNIT II DECISION MAKING, ARRAYS AND STRINGS (9)

Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays – String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.

UNIT III FUNCTIONS AND POINTERS (9)

Modular programming – Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion, Binary Search using recursive functions – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Parameter passing: Pass by value, Pass by reference.

UNIT IV STRUCTURES AND UNION (9)

Structure – Nested structures – Pointer and Structures – Array of structures – Self-referential structures – typedef – Union – Storage classes and Visibility.

UNIT V FILE MANAGEMENT AND DYNAMIC MEMORY ALLOCATION: (9)

Files- Types of file processing, I/O Operations of File, Random access file, Command line arguments, Dynamic memory allocation – malloc, calloc, free, Preprocessor directive, Macro substitution, Compiler control directive.

TEXTBOOKS:

1. Reema Thareja, “Programming in C”, Oxford University Press, Second Edition, 2016.
2. E. Balagurusamy, “Programming in C” McGraw-Hill, 8th Edition, 2019.
3. Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.

REFERENCE BOOKS:

1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", 8th edition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", 2nd Edition, Oxford University Press, 2013.
4. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013

ONLINE/ NPTEL COURSES:

1. C for Everyone: Programming Fundamentals- https://www.coursera.org/learn/c-for-everyone
2. Art of C programming -https://onlinecourses.swayam2.ac.in/cec24_cs05/preview
3. Introduction to Programming in C.- https://onlinecourses.nptel.ac.in/noc22_cs40/preview

PRACTICE EXERCISES:

1. Study of Compilation and execution of simple C programs
2. Simple computational problems using arithmetic expressions (Arithmetic Operations, Area &circumference of a circle)
3. Problems involving if-then-else structures (ODD/EVEN numbers, Greatest Numbers)
4. Iterative problems e.g., sum of series (Factorial, Sum of Digits)
5. 1D and 2D, multi-dimensional arrays, traversal
6. Matrix problems, String operations (Addition, Subtraction, Multiplication, Palindrome StringOperations, String Handling Functions)
7. Simple functions (nCr Program, Swapping using call-by-reference)
8. Programming for solving Numerical methods problems (Palindrome Checking, Searching and Sorting Names)
9. Recursive functions (Factorial using Recursion)
10. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
11. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
12. .Files: reading and writing, File pointers, file operations, random access, processor directives

CO-PO Mapping

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

Assessment Methodology	Assessment Tools	Marks
Theory Test		15
Coding Assignment	Online submission	10
Mini project implementation	Code demo and documentation	10
Model Practical		10
Attendance		5
Total		50

25UECP16	BASIC ELECTRONICS ENGINEERING LABORATORY	Category	L	T	P	Credit
		ES	0	0	2	1

Course Prerequisite:
Nil

Course Objective:

- To design and analyze electronic circuits such as diodes, rectifiers, Zener diode, BJT, FET. To verify the basic logic operations and simple arithmetic circuits using logic gates.

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

CO1	Understand the characteristics of basic electronic devices. Apply problem-solving skills, recognize and utilize the characteristics of diodes, rectifiers & transistors.	Apply
CO2	Interpret the Op-Amp-based inverting and non-inverting amplifier circuit.	Apply
CO3	Integrate diverse applications of Op-Amp in differentiator, integrator, adder & subtractor circuits.	Apply

LIST OF EXPERIMENTS

1. Measurement of different signal parameters using oscilloscope.
2. V-I characteristics of an ordinary p-n junction diode.
3. Full wave rectifier, with and without filter.
4. Half-wave rectifier and observe output waveform and measure ripple
5. Zener diode as a voltage regulator.
6. Input and output characteristics of BJT. (CE, CB)
7. Input and output characteristics of FET.
8. Op-Amp based inverting and non-inverting amplifier.
9. Op-Amp based differentiator and integrator.
10. Op-Amp based adder and subtractor.
11. 555 timer A stable and Monostable
12. RC phase shift oscillator

(Total Periods:45)

CO PO Mapping:

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

Assessment Methodology	Assessment Tools	Marks
Laboratory Conduction	Observation	10
Record Work		10
Model Exam		15
Viva		05
Virtual Lab Assignment	Review	10
Total		60

25UGEP17	FABRICATION LABORATORY	Category	L	T	P	Credit
		ES	0	0	2	1

Course Prerequisite

- NIL

Course Objective

- To practice the usage of various tools towards the assembly and disassembly of different items/equipment and modern computer tools and advanced manufacturing/fabrication processes.

Course Outcomes:

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

CO1	Assemble and disassemble various items/equipment.	Understand
CO2	Make simple parts using suitable welding processes.	Apply
CO3	Set up wiring of distribution boards, machines, etc.	Apply
CO4	Utilize the electronic components to fabricate simple equipment, aided with sensors and actuators.	Apply
CO5	Take advantage of modern manufacturing practices	Apply

LIST OF EXPERIMENTS

(A). Dis-assembly & Assembly Practices

i) Tools and its handling techniques.

ii) Dis-assembly and assembly of home appliances – Grinder Mixer Grinder, Ceiling Fan, Table Fan & Washing Machine.

iii. Dis-assembly and assembly of Air-Conditioners & Refrigerators.

iv. Dis-assembly and assembly of a Bicycle.

(B). Welding Practices

i. Welding Procedure, Selection & Safety Measures.

ii. Power source of Arc Welding – Gas Metal Arc Welding & Gas Tungsten Arc Welding processes.

iii. Hands-on session of preparing base material & Joint groove for welding.

iv. Hands-on session of MAW, GMAW, GTAW, on Carbon Steel & Stainless Stell plates/pipes, for fabrication of a simple part.

(C)Electrical Wiring Practices

i. Electrical Installation tools, equipment & safety measures.

ii.Hands-on session of basic electrical connections for Fuses, Miniature Circuit Breakers and Distribution Box,

Iii.Hands-on session of electrical connections for Lighting, Fans, Calling Bells.

iv. Hands-on session of electrical connections for Motors & Uninterruptible Power Supply.

(D)Electronics Components / Equipment Practices

i. Electronic components, equipment & safety measures.

ii. Dis-assembly and assembly of Computers.

iii. Hands-on session of Soldering Practices in a Printed Circuit Breaker.

iv. Hands-on session of Bridge Rectifier, Op-Amp and Transimpedance amplifier.

v. Hands-on session of integration of sensors and actuators with a Microcontroller.

vi. Demonstration of Programmable Logic Control Circuit.

(E). Contemporary Systems

i. Demonstration of Solid Modelling of components.

ii. Demonstration of Assembly Modelling of components.

Iii.Fabrication of simple components/parts using 3D Printers.

iv. Demonstration of cutting of wood/metal in different complex shapes using Laser Cutting Machine.

CO PO Mapping:

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

Assessment Methodology	Assessment Tools	Marks
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
PCB design and fabrication	Working prototype demo	5
3DModelcontest	Review	5
Attendance		10
Total		60

25UGEP18	DESIGN THINKING AND IDEA LABORATORY	Category	L	T	P	Credit
		ES	0	0	2	1

Course Prerequisite

- Basic Knowledge of Science and interest in creative problem solving

Course Objective

- To introduce students to the principles, methodologies, and frameworks of design thinking for solving real-world problems.To cultivate user-centric, empathetic, and creative thinking through experiential learning and hands-on activities.

Course Outcome

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

CO1	Understand the fundamentals of design thinking, including its origin, process models, and tools, and apply them to identify opportunities and develop a design brief.	Understand
CO2	Apply empathy tools and defining methods to understand user needs and formulate clear problem statements in design thinking.	Apply
CO3	Generate creative and innovative ideas using ideation techniques such as brainstorming, mind mapping, and lateral thinking.	Apply
CO4	Apply prototyping techniques to translate ideas into tangible models through iterative development of low-fidelity prototypes.	Apply
CO5	Interpret feedback from prototype testing and iteratively improve the design to better align with user needs.	Analyze

SYLLABUS

UNIT I FUNDAMENTALS OF DESIGN THINKING

Design Thinking Process: Types of the thinking process, Common methods to change the human thinking process, Design thinking: Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking, Problem solving, the need of design thinking; An approach to design thinking**,** Design thinking Process model, Design thinking tools.

Case Studies: General, Engineering and Service applications

Activities: Identify Opportunity and Scope of the Project. Explore the possibilities and prepare a design brief

UNIT II: EMPATHIZE AND DEFINE

Design thinking phases, how to empathize, Role of empathy in design thinking, the purpose of empathy maps, Things to be done prior to empathy mapping, Activities during and after the session, Understanding empathy tools: Customer Journey Map, Personas.

Define- Methods of Define Phase: Storytelling, Critical items diagrams, Define success

Activities: Apply the methods of empathizing and Define Phases Finalize the problem statement

UNIT III IDEATION

Challenges in idea generation, Visualize, Empathize, and Ideate method, Importance of visualizing and empathizing before ideating, Applying the method**,** Create Thinking**,** Generating Design Ideas**,** Lateral Thinking**,** Analogies**,** Brainstorming**,** Mind mapping**,** National Group Technique**,** Synectic's**,** Development of work**,** Analytical Thinking**,** Group Activities. Ideation Tools: How Might We? (HMW), Storyboard, Brainstorming. What is design innovation? A mindset for innovation**,** and asking "What if?" asking "What wows?" and "What works?"

Activities- Apply the methods of Ideate Phase: Generate Lots of Ideas

UNIT I V PROTOTYPING

What is a prototype? - Prototyping as a mindset, prototype examples, prototyping for products; Why we prototype? Fidelity for prototypes, Process of prototyping- Minimum Viable prototype.

Activities: Apply the Methods of the Prototype Phase: Create prototypes for selected ideas

UNIT V TING PROTOTYPES

Prototyping for digital products: What's unique for digital products, Preparation; Prototyping for physical products: What's unique for physical products, Preparation; Testing prototypes with users. Create a Pitch-Plan for scaling up-Road map for Implementation, Fine-tuning and Submission of the project report

Activities: Collect feedback; iterate and improve ideas

Present your solution using the Storytelling method

TEXTBOOKS:

1. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins Publishers Ltd.
2. IdrisMootee, Design Thinking for Strategic Innovation,2013, John Wiley & Sons Inc

REFERENCE BOOKS

1. Peter G. Rowe, Design Thinking: Understanding How Designers Think and Work, MIT Press, 1991.
2. Don Norman, The Design of Everyday Things, Basic Books, 2013.
3. Tom Kelley and David Kelley, Creative Confidence: Unleashing the Creative Potential Within Us All, Crown Business, 2013.
4. Todd Zaki Warfel, Prototyping: A Practitioner's Guide, Rosenfeld Media, 2009.
5. Clive L. Dym, Patrick Little, Elizabeth J. Orwin, Engineering Design: A Project-Based Introduction, Wiley, 2011.
6. Karl T. Ulrich and Steven D. Eppinger, Product Design and Development, McGraw-Hill Education, 2015.
7. Charles Platt, Make: Electronics: Learning Through Discovery, Maker Media, 2011.

CO-PO Mapping

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

Assessment Methodology	Assessment Tools	Marks
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Virtual lab assignment	Review	10
Attendance		10
Total		**60**

25UPCE11	CAREER DEVELOPMENT SKILLS	Category	L	T	P	Credit
		EEC	0	0	2	0

Preamble/ Course Objective
To empower students with the skills for self-discovery, goal achievement, effective time management, and personal effectiveness, alongside foundational knowledge in career planning, emotional intelligence, higher education, competitive exams, and entrepreneurship

Prerequisite: Basic communication skills and foundational knowledge of workplace behavior

Course Outcome
On the successful completion of the course, the students will be able to

CO1	Help students assess themselves, explore career options, and set actionable goals through structured planning.
CO2	Develop motivation, enhance personality effectiveness, and instill discipline for personal and professional growth.
CO3	Build awareness and practice of grooming, hygiene, positive attitudes, manners, and professional behavior.
CO4	Strengthen self-awareness, time and stress management, and emotional intelligence for balanced personal development.
CO5	Introduce students to higher education paths, competitive exams, and the fundamentals of entrepreneurship and business planning

SYLLABUS

UNIT 1
10 Hrs
Career Planning: Introduction to Career Planning - Self-Assessment for Career Planning - Exploring Career Options- Developing a Career Plan;
Goal Settings: Understanding Goal Setting - Setting Effective Goals - Action Plan Development - Practical Exercises

UNIT 2 **10 Hrs**
Motivation – I: Definition and Importance of Motivation - Types of Motivation - Theories of Motivation - Factors Affecting Motivation
Personality Effectiveness: Components of Personality Effectiveness - Communication Skills - /Interpersonal Skills - Practical Exercises
Building Personality and Discipline: Introduction to Personality Development - Building Positive Habits - Discipline and Self-Control - Practical Application

UNIT 3 **10Hrs**
Grooming, hygiene and Cleanliness: Personal Hygiene Practices - Body Grooming Techniques - Environmental Cleanliness - Mental and Social Impact of Grooming and Hygiene.
Attitudes, Manners and Behaviour: Understanding Attitudes - Developing Positive Attitudes - Manners and Etiquette - Procedures and Protocols

UNIT 4 **10Hrs**
Self- Awareness & Self Confidence: Introduction to Self-Awareness- Understanding Strengths and Weaknesses- Building Self-Confidence- Practical Application

Time Management:Introduction to Time Management - Planning and Prioritizing Tasks-Overcoming Procrastination- Practical Time Management

Stress Management: Understanding Stress- Stress Management Techniques-Coping Strategies-Practical Application

Emotional Intelligence:Introduction to Emotional Intelligence- Managing Emotions- Social Awareness and Relationship Management-Practical Exercises

UNIT 5 **8 Hrs**

Introduction to Higher Education, Competitive exams:Overview of Higher Education- Competitive Exams Overview - Exam Preparation Techniques

Introduction to Entrepreneurship: Understanding Entrepreneurship- Developing a Business Idea - Business Planning

TEXT BOOKS:

1. Soft skills for Managers by Dr. T. KALYANA CHAKRAVATHI
2. Personal Development and Soft Skills by BARUN K MITRA, Oxford Higher Education

REFERENCE BOOKS:

1. The Emotionally Intelligent Workplace by DANIEL GOLEMAN.
2. Communication skills and soft skills an integrated approach by E. SURESH KUMAR, P. SREEHARI, J SAVITHRI.
3. Top Talking in English (international communication skills) by CHARLES T. RAJENDRA
4. Soft skills by RAJ LAKSHMI SURYAVANSHI, Guru cool Publishing

Mapping with Programme Outcomes

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

25UMCC11	IKS – CONCEPTS AND APPLICATIONS IN ENGINEERING AND SCIENCE	Category	L	T	P	Credit
		MCC	1	0	1	0

Course Prerequisite

- Basic understanding of science and engineering fundamentals

Course Objective

- Familiarize students with traditional Indian knowledge systems and their scientific
- foundations
- Explore the integration of ancient wisdom with modern engineering practices
- Understand sustainable technologies and innovations rooted in Indian traditions
- Develop appreciation for indigenous knowledge in solving contemporary challenges
- Foster research mindset towards validating and modernizing traditional practices

Course Outcome

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

CO1	Understand the historical development and scientific basis of Indian Knowledge Systems	Understand
CO2	Analyze traditional Indian practices in mathematics, astronomy, metallurgy, andmedicine	Analyze
CO3	Apply IKS principles to contemporary engineering and scientific problems	Apply
CO4	Evaluate the sustainability aspects of traditional Indian technologies	Evaluate
CO5	Create innovative solutions by integrating traditional knowledge with modernscience	Create

SYLLABUS

UNIT I INTRODUCTION TO INDIAN KNOWLEDGE SYSTEMS

Historical overview of Indian Knowledge Systems - Scientific methodology in ancient India - Major texts and scholars: Vedas, Upanishads, Charaka Samhita, Sushruta Samhita - Transmission and preservation of knowledge - Contemporary relevance and global recognition.

UNIT II: MATHEMATICS AND ASTRONOMY IN ANCIENT INDIA

Indian contributions to mathematics: Zero, decimal system, trigonometry - Aryabhata, Brahmagupta, Bhaskara's contributions - Astronomical observations and calendar systems - Navigation techniques and geographical knowledge - Applications in modern engineering calculations.

UNIT III: METALLURGY, MATERIALS, AND ARCHITECTURE

Ancient Indian metallurgy: Iron pillar of Delhi, Wootz steel - Traditional building materials and techniques -Architectural marvels: Structural engineering principles - Water harvesting and management systems - Sustainable construction practices.

UNIT IV: RENEWABLE ENERGY AND CLIMATE CHANGE

Ayurveda: Principles and scientific validation - Traditional agricultural practices and crop management – Biodiversity conservation methods - Food preservation techniques - Biotechnology applications in traditional practices.

UNIT V: INTEGRATION WITH MODERN SCIENCE AND TECHNOLOGY

Validating traditional knowledge through modern scientific methods - Case studies of successful IKS-modern science integration - Intellectual property and traditional knowledge protection -Research opportunities and career prospects - Future directions and challenges

TEXTBOOKS:

1. Subhash Kak, "The Nature of Physical Reality", Mount Meru Publishing, 2016
2. B.V. Subbarayappa, "Indian Astronomy: A Source Book", Nehru Centre, 2008
3. Kapila Vatsyayan, "Traditional Indian Art and Culture", Cambridge University Press, 2015

REFERENCE BOOKS & WEB RESOURCES

1. P.P. Divakaran, "The Mathematics of India: Concepts, Methods, Connections",Springer, 2018
2. S.N. Sen, "Ancient Indian History and Civilization", New Age International, 2010
   National Mission for Manuscripts - www.namami.gov.in
3. Digital Library of Traditional Ecological Knowledge - www.frlht.org
4. CSIR Traditional Knowledge Digital Library - www.tkdl.res.in

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

25UMCC12	HOLISTIC WELLNESS	Category	L	T	P	Credit
		MCC	0	0	2	0

Course Prerequisite

- Nil

Course Objective

- Foundational concepts of holistic wellness, emphasizing the integration of physical, mental, emotional, and Internal well-being. create a balanced lifestyle that promotes overall health and happiness through practical activities.
- Explore advanced techniques in mental, emotional, and spiritual well-being, with an emphasis on creating sustainable wellness habits.

Course Outcome

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

CO1	Understand the basic principles of holistic wellness. Apply strategies for maintaining physical health, including nutrition and exercise	Understand
CO2	Practice mindfulness techniques to enhance mental and emotional well-being.	Analyze
CO3	Develop a personal wellness plan incorporating various aspects of holistic health.	Apply
CO4	Apply advanced techniques in mindfulness, meditation, and stress management.	Evaluate
CO5	develop resilience and adaptability in maintaining wellness. Refine and sustain a personalized holistic wellness plan.	Create

SYLLABUS

UNIT I INTRODUCTION TO HOLISTIC AND PHYSICAL WELLNESS

Overview of holistic wellness: physical, mental, emotional, and internal health- The importance of balance in overall well-being. Importance of physical activity and exercise- Understanding nutrition and its role in health- Sleep hygiene and its impact on well-being.

Hands-on activity: Self-assessment of current wellness status.Designing a personalized fitness and nutrition plan.

UNIT II: MENTAL AND EMOTIONAL WELLNESS:

Stress management techniques- The role of Yoga, mindfulness and meditation in mental health- Emotional intelligence and its impact on relationships.

Hands-on activity: Practicing Yoga, mindfulness and emotional regulation exercises.

UNIT III: INTEGRATING WELLNESS PRACTICES:

Combining physical, mental, emotional, and Internal wellness practices into daily life - Developing a balanced wellness plan.

Hands-on activity: Creating a comprehensive personal wellness plan.

UNIT IV: EMOTIONAL RESILIENCEAND ADVANCED MINDFULNESS

Deepening mindfulness practices for enhanced mental clarity- Exploring different forms of meditation (e.g., guided, transcendental, movement-based). Building emotional resilience through positive psychology practices- Cognitive-behavioural strategies for managing stress and anxiety.

Hands-on activity: Developing and practicing a resilience toolkit. Daily meditation practice and journaling reflections.

UNIT V: INTERNAL GROWTH AND SUSTAINING WELLNESS PRACTICES:

Exploring the deeper aspects of internal wellness and self-actualization- Reflective practices for discovering life purpose and meaning. Strategies for maintaining wellness habits over the long term- Adapting wellness plans to life changes and challenges-

Hands-on activity: Revising and finalizing a long-term personal wellness plan. Creating a vision board or personal mission statement.

TEXTBOOKS:

1. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
2. Rosenberg, Marshall Bertram., Nonviolent Communication: A Language of Life., Puddle Dancer Press, Encinitas, CA (2015).
3. Patel, Kamlesh. Heartfulness Way: Heart-Based Meditations for Spiritual Transformation, Kamlesh Patel, 2018.

REFERENCE BOOKS

1. B.K.S Iyengar., Yoga: The Path to Holistic Health., Dorling Kindersley Limited, City of Publication (2001)
2.Goleman Daniel., Emotional Intelligence., Bloomsbury India, India, (2021).
3.James Allen., As a Man Thinketh., Maple Press, Noida, (2010)
4.Swami Budhanandha., Will power and its development., Advaita Ashrama Mayavati, Pithoragarh, Himalayas from its Publication Department, Calcutta. (2001)
5.KalderdonAdizesIchak., What Matters in Life: Lessons I Learned from Opening My Heart ., WS Press, Newtown, PA (2023)
6. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
7. Lipton, Bruce., The Biology of Belief 10th Anniversary Edition: Unleashing the Power of Consciousness, Matter & Miracles, Hay House, Carlsbad (2015).

WEB RESOURCES

1. Learning Suryanamskar
2. Yoga for well-being
3. Nutritional Educational contents
4. Introduction to Psychology
5. Guided Meditation
6. Simplified physical exercises instructions
7. Simplified Physical Exercises
8. Life skills and value education
9. James Allen Library

CO PO Mapping

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

SEMESTER II

25UMAT21	DIFFERENTIAL EQUATIONS AND TRANSFORMS	Category	L	T	P	Credit
		BS	3	1	0	4

Course Prerequisite-

- Matrices and Calculus

Course Objective

- To introduce mathematical tools to solve first order differentiation equations.
- To gain knowledge of problem-solving techniques of PDE.
- To understand concept of the Laplace transform.
- To inculcate the computation knowledge in Laplace transforms.
- To acquaint with Fourier Transform techniques used in a wide variety of situations involving functions that are not necessarily periodic.

Course Outcome

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

CO1	Solve higher order differential equations	Apply
CO2	Formulate and solve various types of partial differential equations	Apply
CO3	Apply Laplace transforms and initial and final value theorems to solve engineering problems involving step, impulse and periodic functions.	Apply
CO4	Apply Laplace transforms to solve ordinary differential equations with constant coefficients and simultaneous ordinary differential equations	Apply
CO5	Apply Fourier transform techniques, including Fourier integral theorem, properties of Fourier transforms, convolution, and Parseval's identity	Apply

SYLLABUS

UNIT I ORDINARY DIFFERENTIAL EQUATIONS (12)

Differential Equations (Higher order): Linear differential equations of higher order – with constant coefficients, the operator D, Euler 's linear equation of higher order with variable coefficients - simultaneous linear differential equations, solution by variation of parameters method.

UNIT II PARTIAL DIFFERENTIAL EQUATIONS (12)

Formation of partial differential equations- Solutions of standard types of first order partial differential equations- Lagrange's linear equation- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT III LAPLACE TRANSFORM (12)

Existence conditions-Transforms of elementary functions- Properties, Transform of unit step function and unit impulse function -Transforms of derivatives and integrals- Transforms of Periodic Functions- Initial and final value theorems.

UNIT IV INVERSE LAPLACE TRANSFORM (12)

Inverse Laplace Transforms – Properties, Convolution theorem, Application - Solution of ordinary differential equations with constant coefficients -Solution of simultaneous ordinary differential equations.

UNIT V FOURIER TRANSFORM (12)

Fourier Integral theorem (statement only), Fourier transform and its inverse – Properties, Fourier sine and cosine transform - Properties, Convolution and Parseval's identity.

TOTAL PERIODS:60

TEXTBOOKS:

1. Veerarajan T., "Engineering Mathematics – I and II",Tata McGraw-Hill, New Delhi, 2014 and 2015.
2. Dr. M.K. Venkataraman, "Engineering Mathematics – Volume I and Volume II", The National Publishing Company, Chennai 2008.

REFERENCE BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2015.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.
3. Bali N.P and Manish Goyal., "A Text Book of Engineering Mathematics", Laxmi Publications(P) Ltd, 2011.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 9th Edition, 2011.

ONLINE COURSES/NPTEL/SWAYAM:

1. https://nptel.ac.in/courses/111106139
2. https://nptel.ac.in/courses/111101153
3. https://nptel.ac.in/courses/111107119

CO-PO Mapping

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

Assessment Methodology	Assessment Tools	Marks
Test		25
Mathematical modeling assignment	Analytical solution presentation	5
Transform applications project (MATLAB/Python)	Demo and viva	5
Attendance		5
Total		**40**

25UICT22	INTRODUCTION TO CYBER SECURITY	Category	L	T	P	Credit
		PC	3	0	0	3

Course Prerequisite:

- Basic Computer knowledge

Course Objective:

- To learn the basic components of computer, instruction set architecture, memory hierarchy, Input Output Operations, basic processing concept and Pipelining.

Course Objective:

- To learn the fundamentals of cyber security including threats, vulnerabilities, security technologies, legal and ethical practices, network and system security, and emerging trends in the field..

CO1	Explain the fundamentals and importance of cyber security	Understand
CO2	Understand the threats, vulnerabilities, and attacks in various cyber environments.	Understand
CO3	Understand security technologies to protect systems and networks.	Understand
CO4	Understand legal, ethical, and forensic considerations in cyber security.	Understand
CO5	Understand legal emerging areas in cyber security such as cloud, IoT, and AI security.	Understand

SYLLABUS

UNIT I: INTRODUCTION TO CYBER SECURITY (9)

Need for Cyber Security - Principles of Security: Confidentiality, Integrity, Availability - Security Policies, Procedures, Standards - Security Architecture - Security Threats and Attacks

UNIT II: THREATS, ATTACKS AND VULNERABILITIES (9)

Types of Cyber Threats: Malware, Phishing, Ransomware - Social Engineering - Insider Threats - Network Attacks: DoS, DDoS, Man-in-the-middle-Spoofing.

UNIT III: SECURITY TECHNOLOGIES AND TOOLS (9)

Authentication Techniques - Firewalls - IDS/IPS - Cryptography: Symmetric & Asymmetric - Digital Signatures - Antivirus Tools - Security Information and Event Management (SIEM).

UNIT IV: NETWORK AND SYSTEM SECURITY (9)

Network Protocols and Vulnerabilities - Secure Network Design - VPNs – Wireless Security - Secure System Configurations - Application Security – Cloud Security Basics.

UNIT V: LEGAL, ETHICAL AND EMERGING ISSUES (9)

Cyber Laws and IT Act 2000 (India) - GDPR Overview - Digital Forensics Basics – Ethical Hacking - Emerging Threats in IoT, Cloud, and AI Security.

TOTAL PERIODS:45

TEXT BOOKS:

1. Raef Meeuwisse, “Cybersecurity for Beginners”, Cyber Simplicity, 2023 Edition.
2. Charles J. Brooks, Christopher Grow, Philip A. Craig, Jr., Donald Short, Cybersecurity Essentials, John Wiley & Sons, 2018.

REFERENCE BOOKS:

1. William Stallings & Lawrie Brown, Computer Security: Principles and Practice, 4th Edition, Pearson Education – published in 2018
2. Dharmendra Sharma, "Introduction to Cyber Security", Tata McGraw Hill.
3. Bhuvan Unhelkar, Internet of Things, Cyber Security and Governance, CRC Press – 1st Edition, 2020

ONLINE COURSES / NPTEL / SWAYAM:

1. https://nptel.ac.in/courses/106105217
2. https://nptel.ac.in/courses/106105031
3. https://nptel.ac.in/courses/106106129

CO-PO Mapping

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

Assessment Methodology	Assessment Tools	Marks
Test		25
Problem based Assignment	Moodle/Google form	5
Tool Based Project assignment	Demo and viva	5
Attendance		5
Total		**40**

25UPHT23	APPLIED PHYSICS FOR COMPUTING ENGINEERS	Category	L	T	P	Credit
		BS	3	0	0	3

Course Prerequisite

- Solid-state physics basics, Atomic models and bonding,Semiconductor theory.

Course Objective:

- To make the students understand the importance in studying electrical properties of materials, semiconductor physics, wave function in quantum mechanics and its practical application in technologies. To inculcate an idea of the significance of nanostructures, quantum confinement, ensuing nano device applications and quantum computing.

Course Outcome

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

CO1	Understand the effect of periodic potentials on electron motion using Bloch's theorem, and distinguish between metals, Semiconductors, and insulators based on electronic band structure.	Understand
CO2	Relate theoretical principles to real-world applications in electronics and IT hardware, fostering the ability to choose and apply suitable semiconductor devices in practical systems.	Understand
CO3	Understand and explain the properties of matter waves andparticle in a one-dimensional infinite potential well, quantization of energy levels.	Understand
CO4	Understand the basic mechanisms of light absorption, emission, and scatteringin various materials .Explore the function of photo detectors, and their application in light sensing technologies.	Understand
CO5	Understand classical bits and quantum bits (qubits), and understand theirrepresentation using quantum states. Apply basic quantum logic gates, such as theCNOT gate, and explore multi-qubit operations.	Understand

SYLLABUS

UNIT I ELECTRICAL PROPERTIES OF MATERIALS (9)

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential: Bloch theorem – metals and insulators - Energy bands in solids– tight binding approximation - Electron effective mass – concept of hole.

UNIT II SEMICONDUCTOR PHYSICS (9)

Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in Ntype& P-type semiconductors – Carrier transport: Velocity-electric field relations – drift and diffusion transport - Einstein's relation – Hall effect and devices – Zener and avalanche breakdown in p-n junctions - Ohmic contacts – tunnel diode - Schottky diode – MOS capacitor - power transistor.

UNIT III QUANTUM PHYSICS (9)

De Broglie hypothesis of matter waves; properties of matter wave; Wave function; Physical interpretation of wave function; Heisenberg uncertainty principle; non existence of electron in nucleus; Schrodinger 's time dependent wave equation; time independent wave equation; Particle trapped in one dimensional infinite potential well, – tunneling (qualitative) - scanning tunneling microscope, Quantum Computing.

UNIT IV OPTICAL PROPERTIES OF MATERIALS (9)

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and Semiconductors (concepts only) - photo current in a P- N diode – solar cell –photo detectors - LED – Organic LED – Laser diodes – excitons - quantum confined Stark effect – quantum dot laser.

UNIT V NANODEVICES AND QUANTUM COMPUTING (9)

Introduction - quantum confinement– quantum structures:quantum wells, wires and dots — band gap of nanomaterials. Tunneling – Single electron phenomena: Coulomb blockade- resonant-tunneling diode – single electron transistor – quantum cellular automata - Quantum system for information processing - quantum states – classical bits – quantum bits or qubits – CNOT gate - multiple qubits – Bloch sphere –quantum gates – advantage of quantum computing over classical computing

TOTAL PERIODS: 45

TEXTBOOKS

1. Umesh K Mishra & Jasprit Singh, "Semiconductor Device Physics and Design", Springer, 2008.
2. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials". Narosa Publishing House, 2009.
3. Kasap, S.O. "Principles of Electronic Materials and Devices", McGraw-Hill Education, 2007
4. Bhattacharya, D.K. & Poonam, T. ―Engineering Physics‖. Oxford University Press, 2015.
5. Jasprit Singh, ―Semiconductor Devices: Basic Principles, Wiley 2012.

Garcia, N. & Damask, A. ―Physics for Computer Science Students‖. Springer-Verlag, 2012

REFERENCES

1. Charles Kittel, Introduction to Solid State Physics, WileyIndiaEdition,2019.
2. Y.B.Band and Y. Avishai, Quantum Mechanics with Applications to Nanotechnology and Information Science, Academic Press, 2013.
3. V.V. Mitin, V.A.Kochelap and M.A.Stroscio ,Introduction to Nanoelectronics, Cambridge Univ. Press, 2008.
4. G.W.Hanson, Fundamentals of Nano electronics, Pearson Education (Indian Edition) 2009

CO-PO Mapping											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	3	-	-	2	-	-	-	-	2
CO2	3	3	3	-	-	2	-	-	-	-	2
CO3	3	3	3	-	-	2	-	-	-	-	2
CO4	3	3	3	-	-	2	-	-	-	-	2

Assessment Methodology	**Assessment Tools**	**Marks**
Test		25
MCQ unit wise 10 questions	Moodle/Google form	5
Virtual lab based assignment	Demo and viva	5
Attendance		5
Total		**40**

25UECT25	DIGITAL SYSTEM DESIGN	Category	L	T	P	Credit
		ES	2	1	0	3

Course Prerequisite

- Basic Programming Knowledge

Course Objective

- To design combinational logic circuits and Sequential logic circuits, including multiplexers, decoders, encoders, adders, subtractors, flip-flops and Latches. To learn the basics of IoT devices and types of boards.

Course Outcome

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

CO1	Understand the application of number representation and basic codes.	Understand
CO2	Understand Boolean algebra and its foundational theorems and use of the Karnaugh map simplification.	Understand
CO3	Design and analyse Combinational Logic Design and Programmable Logic Devices.	Analyse
CO4	Design and construct Combinational Logic circuits and Synchronous Sequential Circuits.	Analyse
CO5	Design and implement combinational logic circuits using PROM, PLA, and PAL	Apply

SYLLABUS

UNIT-I BASIC CONCEPTS (9)

Number System: Binary Number Representations – Signed Numbers and Complements, Unsigned, Fixed Point, and Floating-Point numbers. Addition and subtraction with 1‘s and 2‘s complements. Codes for detecting and correcting errors: Even and Odd parity codes

UNIT-II BOOLEAN ALGEBRA (9)

Boolean Algebra: Basic theorems- Postulates- Duality – Boolean Function- Canonical form- Standard form. Simplification of Boolean Function: Karnaugh Map Method. Basic Theorems - Simplification of K-map functions.

UNIT – III COMBINATIONAL LOGIC DESIGN (9)

Combinational Logic Design: Half adder - Full adder– Parallel Adder- Carry Look Ahead Adder – BCD Adder – Magnitude Comparator – Encoders and Decoders – Multiplexers – Code converters – Parity generator, Parity checker.

UNIT – IV SEQUENTIAL CIRCUITS (9)

Sequential Circuits: General model of sequential circuits –latches – Master-slave Configuration- Flip-Flops - Concept of State – State diagram – State Table. Design of Synchronous counters- Asynchronous counters- Shift Register- PN Sequence generator.

UNIT – VPROGRAMMABLE LOGIC DEVICES (9)

Programmable Logic Devices: PROM – EPROM – EEPROM- Programmable Logic Array (PLA) – Programmable Array Logic (PAL) -Realization of combinational circuits using PROM, PLA, and PAL.

TOTAL PERIODS: 45

TEXTBOOK:

1. M. Morris Mano and Michael D. Ciletti, Digital Design: With an Introduction to the Verilog HDL and System Verilog, 2018, 6th Edition, Pearson Pvt. Ltd.

REFERENCE BOOKS

1. Ming-Bo Lin, Digital Systems Design and Practice: Using Verilog HDL and FPGAs, 2015, 2nd Edition, Create Space Independent Publishing Platform.
2. Samir Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis, 2009, 2nd

edition, Prentice Hall of India Pvt. Ltd.
3. Stephen Brown and Zvonko Vranesic, Fundamentals of Digital Logic with Verilog Design, 2013, 3rd Edition, McGraw-Hill Higher Education.

ONLINE/ NPTEL COURSES:

1. Digital Circuits: https://onlinecourses.nptel.ac.in/noc23 ee115
2. Digital Circuits Design: https://onlinecourses.nptel.ac.in/noc22 ee110
3. Microelectronics: Devices to Circuits: https://nptel.ac.in/courses/108107142

Mapping with Programme Outcomes											
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
1	3	3	2	-	-	-	-	-	-	-	2
2	3	3	3	2	-	-	-	-	-	-	2
3	3	3	3	2	2	-	-	-	-	-	2
4	3	3	3	2	2	-	-	-	-	-	2
5	3	2	3	-	2	-	-	-	-	-	2

Assessment Methodology	**Assessment Tools**	**Marks**
Theory Test		15
Logic design project	Hardware implementation	10
Digital system simulation (TINKERCAD)	Demo and viva	10
Model Practical		10
Attendance		5
Total		**50**

25UCSI25	PROBLEM SOLVING USING PYTHON	Category	L	T	P	Credit
		ES	2	0	4	4

Course Prerequisite:

- Programming in C

Course Objective:

- To impart the knowledge of Python basic structure, components, object storage, exception handling, and graphics toolkit using Tinker.

Course Outcome

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

CO1	Understand Python's basic syntax, data types, and control statements.	Understand
CO2	Understand the components of Python programming and storage statements.	Understand
CO3	Understand the functions, modules, packages, andinterfaces in Python.	Understand
CO4	Understand the exception handling techniques and file operations.	Understand
CO5	Develop an application using GUI toolkits and widgets.	Apply

SYLLABUS

UNIT I INTRODUCTION (9)

History - Features -basic syntax - Data types - variables - Manipulating Numbers – Text Manipulations - Control Statements- Python Built-in Functions.

UNIT II COMPONENTS OF PYTHON PROGRAMMING (9)

Operator Basics - Numbers - String - List - Tuples - Dictionaries - Files - Object Storage - Type Conversion - Type Comparison - Statements – Assignments.

UNIT III FUNCTIONS AND PACKAGES (9)

Classes and Objects - creating a class, class methods, class inheritance. Functions Definition and Execution - Arguments - Return Values - Advanced Function Calling - Modules - Importing modules – Packages and Interfaces - Creating a module.

UNIT IV EXCEPTION HANDLING AND FILES (9)

Exception Handling- Building in Exceptions- Files, File operations, reading a file content, writing a file, modifying files pos, controlling file I/O, Manipulating file paths.

UNIT V GUI PROGRAMMING AND GRAPHICS (9)

GUI Programming toolkits – Introduction to Tkinter – Creating GUI widgets – Resizing – Configuring widget options – Creating Layouts – Radio buttons – Check boxes – Dialog boxes – Drawing using Turtle

TOTAL PERIODS: 45

TEXTBOOKS:

1. Martin C. Brown, "The Complete Reference - Python", Tata McGraw Hill Indian Edition, 2010. (UNIT 1-4)
2. Alan D. Moore Python GUI programming with Tkinter: Design and build functional and user-friendly GUI applications,2021. (Unit-5)

REFERENCES BOOKS:

1. Wesley J Chun, -Core Python Applications Programming, Prentice Hall, 2012.
2. Eric Matthes, "A Hands-On, Project-Based Introduction to Programming", 2nd Edition,2019.

ONLINE/ NPTEL COURSES:

1. Programming, Data Structures and Algorithms using Python
   https://nptel.ac.in/courses/106106145
2. The Joy of Computing using Python-
   https://nptel.ac.in/courses/106106182
3. Python for Data Science-
   https://nptel.ac.in/courses/106106212

PRACTICE EXERCISES:

1. Identify and solve simple real-life/scientific/technical problems. (Electricity Billing, Retail shop billing, Sin series, etc).
2. Python programming using simple statements and expressions (exchange the values of two variables, circulatethe values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists and tuples.
5. Implementing real-time/technical applications using Sets and dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets &Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of a shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. 8 Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
9. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age, validity, student mark range validation)
10. Exploring Pygame tool. Developing a game activity using Pygame, like bouncing ball, car race, etc.

CO PO Mapping

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

Assessment Methodology	**Assessment Tools**	**Marks**
Theory Test		15
Coding assignments	Online submission	10
Mini project implementation	Code demo and documentation	10
ModelPractical		10
Attendance		5
Total		50

25UHSI26	PROFESSIONAL COMMUNICATION FOR ENGINEERS	Category	L	T	P	Credit
		HS	1	0	4	3

Course Prerequisite:

- Basics of English Language

Course Objective:

- To improve the communicative competence of learners
- To learn to use basic grammatic structures in suitable contexts
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text
- To help learners use language effectively in professional contexts
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals

Course Outcome

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

CO1	Use appropriate words in a professional context.	Understand
CO2	Gain understanding of basic grammatic structures and use them in right context.	Understand
CO3	Speak fluently and accurately in formal and informal communicative contexts	Understand
CO4	Write definitions, descriptions, narrations and essays on various topics	Understand
CO5	Express their opinions effectively in both oral and written medium of communication	Analyze

SYLLABUS

UNIT II NARRATION AND SUMMATION (9)

Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar –Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.

LAB ACTIVITY: Listening – Travel podcast; Speaking – Narrating and sharing personal experiences through a podcast, Autobiography of a famous Personality

UNIT III DESCRIPTION OF A PROCESS / PRODUCT (9)

Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).

LAB ACTIVITY: Listening – Railway / Airport Announcements, Travel Vlogs; Speaking – Describing a place or picture description

UNIT-IV VISUALIZATION AND CLASSIFICATION (9)

Listening – TED talks Speaking – Interviewing a celebrity/Famous Personality Reading – Company profiles, Business Letters Vocabulary– Discourse Markers, Linking words and Phrases Collocation. Grammar – Pronouns, Conjunction, Preposition Writing – Interpretation of Charts and Graphs

LAB ACTIVITY: Picture Description, about purchasing a product, Summarizing a TED talk,

Role play, Narrating an unforgettable event

UNIT V EXPRESSION COMMUNICATION (9)

Listening – Watching Movies / Listening to Dialogues and Conversations Speaking – Role play, Panel Discussion, Debate Reading – Blogs, Novels, Short Stories Vocabulary – Phrasal Verbs Grammar– Simple/Compound/Complex Sentences, Error Spotting, Punctuation. Writing – Descriptive Essay, Dialogue Writing

LAB ACTIVITY: Listening /Reading Comprehension, Developing a story using given Vocabulary, Mini Presentation on General topic (ICT tools), Group Discussion

TOTAL PERIODS: 45

TEXTBOOKS:

1. Technical Communication: Principles and Practice Meenakshi Raman & Sangeeta Sharma Oxford University Press 3rd Edition (or latest)
2. Communication Skills Sanjay Kumar & Pushp Lata, Oxford University Press, 2nd Edition (2015)
3. Effective Technical Communication*:* M. Ashraf Rizvi, McGraw-Hill Education, 2nd Edition (2017)

REFERENCES BOOKS:

1. A Course Book on Technical English By Lakshmi Narayanan, Scitech Publications (India) Pvt. Ltd.(English For Technical Communication (With CD) By Aysha Viswamohan, McGraw-Hill Education, ISBN : 0070264244.)
2. Effective Communication Skill, Kulbhusan Kumar, R S Salaria, Khanna Publishing House.
3. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi, 2003.

Mapping with Programme Outcomes

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

Assessment Methodology	Assessment Tools	Marks
Test		15
Listening and reading Comprehension	Online tool	5
Speaking assessment (Oral)	review	10
Online assessment test	Online tool	10
Content creation Competition	Peer review	5
Attendance		5
Total		**50**

25UPHP27	APPLIED PHYSICS LABORATORY	Category	L	T	P	Credit
		BS	0	0	2	1

Course Prerequisite:

- Basic Programming Knowledge

Course Objective:

- To improve the knowledge about the theory learned in the class. To improve ability to analyze experimental result and write laboratory report.

Course Outcome

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

CO1	Perform the experiments based on laser and fiber optics and its characteristics.	Analyse
CO2	Perform the experiments using a spectrometer.	Analyse
CO3	Perform experiments on semiconductor devices and analyze their characteristics.	Analyse

LIST OF EXPERIMENTS

1. Determination of angle of divergence of a laser beam using laser.
2. Determination of particle size of lycopodium powder using semiconductor laser.
3. Determination of wavelength of laser light using semiconductor laser diffraction.
4. Determination of numerical aperture and acceptance angle in an optical fiber.
5. Determination of Dispersive power of a prism using Spectrometer.
6. Determination of wavelength of mercury spectrum – spectrometer grating .
7. Determination of band gap of a semiconductor.
8. Determination of solar cell characteristics**.**

CO PO Mapping

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

Assessment Methodology	Assessment Tools	Marks
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Virtual lab assignment	Review	5
STEM based model creation	Presentation	5
Attendance		10
Total		**60**

25UECP28	DIGITAL SYSTEM DESIGN LABORATORY	Category	L	T	P	Credit
		ES	0	0	2	1

Course Prerequisite:

- Basic Programming Knowledge

Course Objective:

- To design universal logic gates, Boolean expressions, and implement logic circuits.To design and test combinational and sequential circuits, including adders, subtractors, multiplexers, demultiplexers, flip-flops, counters, and shift registers.

Course Outcome

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

CO1	Analyze and verify the functionality of basic and universal logic gates.	Understand
CO2	Simplify Boolean expressions and implement corresponding digital circuits.	Understand
CO3	Design and test combinational circuits such as adders, subtractors, multiplexers, and demultiplexers.	Understand
CO4	Construct and verify sequential circuits including flip-flops, shift registers, and counters.	Understand
CO5	Simulate and validate digital circuits using VHDL tools**.**	Understand

LIST OF EXPERIMENTS

1. Study Of Logic Gates
2. A).Design and Implementation of Adder
   B) Design And Implementation of Subtractor
3. Design And Implementation of Binary to Gray Code and Gray to Binary.
4. Design And Implementation Of 4-Bit Binary Adder/ Subtractor and BCD Adder Using IC7483
5. Design And Implementation 4-Bit Magnitude Comparator Using Logic Gates.
6. Design And Implementation of 4:1 Multiplexer Using Logic Gates.
7. Design And Implementation of Priority Encoder.
8. Study Of Flip-Flops Using Gates
9. Design and Implementation of Ring Counter and Johnson Counter Using a Shift Register IC.
10. Design And Implementation 3-Bit Binary Up/Down Counter Using ICs.
11. Simulation Of Combinational Circuits Using LTspice Tools.
12. Design And Implementation Of 4-Bit Adder-Subtractor and BCD Adder Using IC7483

CO PO Mapping

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

Assessment Methodology	Assessment Tools	Marks
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Virtual lab assignment	Review	5
Circuit Construction Task	demo	5
Attendance		10
Total		60

25UGEP29	ENGINEERING GRAPHICS AND AUTO CAD	Category	L	T	P	Credit
		ES	0	0	2	1

Course Prerequisite:

- Basic knowledge of geometry and fundamentals of computer operation.

Course Objective:

- To provides hands-on training in engineering drawing techniques and the use of AutoCAD software. The objective is to equip students with the skills to produce accurate 2D and 3D technical drawings, interpret engineering details, and apply CAD tools for design documentation.

Course Outcome

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

CO1	Use drawing instruments and follow BIS standards in manual drawings.	Understand
CO2	Develop orthographic and isometric projections manually	Analyze
CO3	Create and modify 2D drawings using AutoCAD	Apply
CO4	Generate sectional and dimensioned views in AutoCAD.	Evaluate
CO5	Apply CAD tools to visualize and plot engineering components.	Apply

SYLLABUS

UNIT-I

Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning. Conic sections, Involutes, Spirals, Helix. Projection of Points, Lines and planes

UNIT-II

Projection of Solids and Sections of solids

UNIT-III

Development of surfaces

UNIT-IV

Isometric projections and Conversion of pictorial to Orthographic views

UNIT-V

Computer Aided Drafting: Introduction to Computer Graphics and Drafting, AutoCAD,2-D diagrams of simple geometries using Auto- CAD script.

TEXTBOOKS:

1. N.D. Bhatt, Engineering Drawing, Charotar Publishing House.

REFERENCES BOOKS:

1.Dhananjay A. Jolhe, Engineering Drawing with AutoCAD, Tata McGraw-Hill.
2.AutoDesk Official Tutorials: https://www.autodesk.com/learning

CO PO Mapping											
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	-	-	-		-	-	-	-	-	-
CO2	3	-	-	-		-	-	-	-	-	-
CO3	-	-	3	-	3	-	-	-	-	-	-
CO4	-	-	2	-	2	-	-	-	-	-	-
CO5	-	-		-	2	-	-	-	-	-	-

Assessment Methodology	**Assessment Tools**	**Marks**
Laboratory Conduction	Observation	10
Record work		10
Model exam		15
Viva		5
Virtual lab assignment	Review	5
Circuit Construction Task	demo	5
Attendance		10
Total		**60**

25UPCE21	COMMMUNICATION SKILLS	Category	L	T	P	Credit
		EEC	0	0	2	0

Preamble/ Course Objective: Ability to plan and manage their career paths effectively.
It focuses on developing self-assessment, goal setting, and decision-making skills.
Students will learn to research career options and align them with personal strengths and values.

Prerequisite: Carrier Development Skills

Course Outcome
On the successful completion of the course, the students will be able to

CO1	Develop sustained motivation and enhance interpersonal skills for effective communication and teamwork.
CO2	Build active listening and conversation skills essential for collaborative and respectful team interactions
CO3	Strengthen reading comprehension and writing clarity through critical analysis and audience-focused expression.
CO4	Improve public speaking and presentation skills while fostering self-assessment through SWOT analysis.
CO5	Promote team collaboration and communication through practical activities like debates and group problem-solving

Syllabus

UNIT 1: **10 Hrs**

Motivation –II: Intrinsic vs. Extrinsic Motivation- Goal Setting and Achievement -Building and Sustaining Motivation **Interpersonal skills:** Effective Communication - Active Listening - Conflict Resolution - Teamwork and Collaboration

UNIT 2: **Listening Skills**: **10 Hrs**

Roles and Responsibilities in a Team - Building Trust and Respect among Team Members – Effective Team Communication**Conversation skills**: Starting and Maintaining a Conversation - Non-Verbal Communication Cues- Active Listening and Responding.

UNIT 3: Reading Skills: **10 Hrs**

Skimming and Scanning Techniques – Critical reading and Interpretation**WritingSkills**:Grammar and Syntax - Clarity and Conciseness- Audience Awareness

UNIT 4: Presentation Speaking Skills: **10 Hrs**

Speech Structure and Organization – Verbal Delivery Techniques**Public speaking skills**: Confidence and overcoming Anxiety –Effective message Delivery **SWOT Analysis**: Identifying Internal Factors – Analyzing External Factors

UNIT 5:Team Building: **8 Hrs**

Roles and Responsibilities in a team – Communication and Trust – Conflict resolution and Problem Solving**Active Sessions**: Debate – Picture Connector

TEST BOOKS:

1. Soft skills for Managers by Dr. T. KALYANA CHAKRAVATHI
2. Personal Development and Soft Skills by BARUN K MITRA, Oxford Higher Education.

REFERENCE BOOKS:

1. The Emotionally Intelligent Workplace by DANIEL GOLEMAN
2. Communication skills and soft skills an integrated approach by E. SURESH KUMAR, P. SREEHARI, J SAVITHRI.
3. Top Talking in English (international communication skills) by CHARLES T. RAJENDRA
4. Soft skills by RAJ LAKSHMI SURYAVANSHI, Gurucool Publishing

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1:								2	2	2	2
CO2:									3	3	
CO3:										3	
CO4:								2		2	2
CO5:									3	3	

25UMCC21	IKS IN HUMANITIES AND SOCIAL SCIENCE	Category	L	T	P	Credit
		MCC	1	0	1	0

Course Prerequisite:

- Basic understanding of Indian history and culture

Course Objective:

- This course explores Indian Knowledge Systems in the context of humanities and social sciences, providing students with a deeper understanding of India's intellectual heritage.

Course Outcomes:

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

CO1	Understand the philosophical foundations and methodologies of Indian knowledge systems in the humanities.	Understand
CO2	Analyze Indian contributions to literature, arts, social organization, and governance systems	Analyze
CO3	Apply principles from Indian philosophical traditions to contemporary social and ethical issues	Apply
CO4	Evaluate the relevance and adaptability of traditional knowledge in modern social contexts	Evaluate
CO5	Create connections between ancient wisdom and contemporary challenges in society	Create

SYLLABUS

UNIT I: Philosophical Foundations of Indian Knowledge Systems (6 Hours) - Darshanas (Schools of Philosophy): Samkhya, Yoga, Nyaya, Vaisheshika, Mimamsa, Vedanta - Epistemology in Indian philosophy: Pramanas (means of knowledge) - Ethics and moral philosophy in Indian traditions - Concept of Dharma, Artha, Kama, and Moksha - Comparative study with Western philosophical traditions

UNIT II: Indian Literary and Artistic Traditions (6 Hours) - Sanskrit literature: Vedas, Upanishads, Puranas, Epics (Ramayana, Mahabharata) - Classical poetry and drama: Kalidasa, Bhartrhari, Bhasa - Regional literature and folk traditions - Indian classical music and dance: Theoretical foundations - Visual arts: Sculpture, painting, and architectural styles - Aesthetics in Indian tradition: Rasa theory and Alamkara shastra

UNIT III: Social Organization and Governance (6 Hours) - Ancient Indian social structure and organization - Varna and Ashrama systems: Historical context and evolution - Village self-governance: Panchayati Raj origins - Arthashastra: Principles of statecraft and administration - Justice system: Dharmashastra and Rajadharma - Economic systems: Trade, agriculture, and crafts

UNIT IV: Educational Systems and Knowledge Transmission (6 Hours) - Gurukula system: Teacher-student relationship - Ancient universities: Nalanda, Takshashila, Vikramshila - Oral tradition and preservation of knowledge - Women's education in ancient India - Integration of spiritual and material learning - Comparison with modern educational approach

UNIT V: Contemporary Relevance and Applications (6 Hours) - Indian knowledge systems in modern governance - Traditional conflict resolution mechanisms - Environmental consciousness in Indian traditions - Community-based development models - Gender studies: Women in Indian philosophical traditions - Relevance of Indian ethics in corporate governance - Cultural preservation and modernization challenges

LEARNING ACTIVITIES

Research Projects: 1. **Philosophical Analysis Project** - Study of a specific philosophical school - Comparison with contemporary thought - Presentation of findings

2. **Literary Heritage Study**
   - Analysis of classical texts
   - Cultural significance evaluation
   - Creative interpretation through modern media
3. **Social Systems Research**
   - Historical analysis of governance models
   - Contemporary applications study
   - Policy recommendation development
4. **Case Study Analysis**
   - Traditional knowledge applications
   - Success stories and challenges
   - Future implementation strategies

TEXTBOOKS

1. S. Radhakrishnan, "Indian Philosophy", Oxford University Press, 2008
2. A.L. Basham, "The Wonder That Was India", Rupa Publications, 2017
3. Kapila Vatsyayan, "Traditional Indian Art and Culture", Cambridge University Press, 2015

REFERENCE BOOKS

1. Heinrich Zimmer, "Philosophies of India", Princeton University Press, 1989
2. Romila Thapar, "Early India: From the Origins to AD 1300", Penguin Books, 2015
3. K.M. Munshi, "The History and Culture of the Indian People", Bharatiya Vidya Bhavan
4. Digital Library of India: https://www.dli.gov.in
5. Sahapedia - Encyclopedia of Indian Culture: https://www.sahapedia.org
6. Indian Council of Historical Research: https://ichr.ac.in
7. Archaeological Survey of India: https://asi.nic.in

CO PO MAPPING

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

25UMCC22	ENVIRONMENTAL SCIENCE AND SUSTAINABILITY	Category	L	T	P	Credit
		MCC	0	0	2	0

Course Prerequisite:

- Basic knowledge of chemistry, biology, and physics.

Course Objective:

- Understand fundamental concepts of environmental science and ecology
- Analyze environmental problems and their engineering solutions
- Develop awareness about sustainable development and green technologies
- Explore renewable energy systems and waste management strategies
- Foster environmental consciousness and responsible engineering practices

Course Outcome

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

CO1	Understand fundamental principles of environmental science and ecosystem dynamics	Understand
CO2	Analyze various types of pollution and their impact on human health and the environment	Analyze
CO3	Apply principles of sustainable development in engineering design and decision-making	Apply
CO4	Evaluate renewable energy technologies and waste management systems	Evaluate
CO5	Design environmentally sustainable solutions for engineering problems	Apply

SYLLABUS

UNIT IINTRODUCTION TO ENVIRONMENTAL SCIENCE AND ECOLOG(6)

Definition, scope and importance of environmental science - Structure and function of ecosystems - Biogeochemical cycles: Carbon, nitrogen, phosphorus, sulfur cycles - Biodiversity and its conservation - Environmental impact assessment principles.

UNIT IIENVIRONMENTAL POLLUTION AND CONTROL (6)

Air pollution: Sources, effects, and control measures - Water pollution: Industrial and domestic sources, treatment methods - Soil pollution: Causes, effects, and remediation techniques - Noise pollution: Sources, effects, and control - Solid waste management: 3R principles, waste-to-energy.

UNIT IIISUSTAINABLE DEVELOPMENT AND GREEN TECHNOLOGIES(6)

Concept of sustainable development and SDGs - Life cycle assessment (LCA) principles - Green building concepts and LEED certification - Cleaner production and industrial ecology - Environmental management systems (ISO 14001)

UNIT IV RENEWABLE ENERGY AND CLIMATE CHANGE (6)

Solar energy systems: Photovoltaic and thermal applications - Wind energy: Technology and site assessment - Hydroelectric and geothermal energy systems - Climate change: Causes, effects, and mitigation strategies - Carbon footprint and carbon trading mechanisms

UNIT V ENVIRONMENTAL REGULATIONS AND CASE STUDIES (6)

Environmental laws and regulations in India - Environmental clearance procedures - Corporate environmental responsibility - Case studies of environmental disasters and lessons learned - Future trends in environmental technology

TOTAL PERIODS: 30

TEXT BOOKS

1. G. Tyler Miller Jr., "Environmental Science: Working with the Earth", Cengage Learning, 2019
2. C. Anil Kumar, "Environmental Science and Engineering", PHI Learning, 2018
3. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, 2017

REFERENCE BOOK & WEB RESOURCES

1. Richard T. Wright, "Environmental Science: Toward a Sustainable Future", Pearson, 2017
2. Daniel B. Botkin, "Environmental Science: Earth as a Living Planet", Wiley, 2018
3. Central Pollution Control Board - www.cpcb.nic.in
4. Ministry of Environment and Forests - www.moef.gov.in
5. UN Environment Programme - www.unep.org
6. NPTEL Environmental Science Courses - nptel.ac.in

CO PO MAPPING

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

HEAD OF THE DEPARTMENT
Department of CSE (Internet of Things and Cyber Security Including Block Chain Technology)
Manakula Vinayagar Institute of Technology
Madagadipet, Puducherry - 605 107.

SEMESTER III

FOURIER SERIES, PROBABILITY AND STATISTICS			
(COMMON TO CSE, ICB, AIML & RA)			
Course Code:	**25UMAT31**	**Course Type:**	**BS**
Teaching Periods / Week (L:T:P:SL):	**3:1:0**	**Credits:**	**4**
Total Teaching Periods:	**60**	**CAM+ ESE Mark:**	**40+60=100**
Teaching Department:	Mathematics		

Course Objectives:

- To enable the students to expand functions in to Fourier series using change of intervals
- To gain knowledge in application of Fourier series
- To acquire knowledge in discrete random variable.
- To familiarize the student about the continuous random variables and their applications.
- To study the basic concepts of Statistics

To impart knowledge on the foundations of probabilistic and statistical methods in engineering field.

Unit 1	**FOURIER SERIES**	**Periods: 12**

Dirichlet 's conditions – General Fourier series - Expansion of periodic function into Fourier series – Fourier series for odd and even functions – Half-range Fourier cosine and sine series – Change of interval – Related problems.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: Apply

Unit 2	**PARSEVAL'S THEOREM & HARMONIC ANALYSIS**	**Periods: 12**

Root Mean Square Value – Parseval 's theorem on Fourier Coefficients. Complex form of Fourier series – Harmonic Analysis.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: Apply

Unit 3	**DISCRETE RANDOM VARIABLES**	**Periods: 12**

Random Variables and their event spaces – The probability mass function – Distribution functions – Binomial – Geometric – Negative Binomial and Poisson (Excluding Derivation of Mean, variance and MGF)

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: Apply

Unit 4	**CONTINUOUS RANDOM VARIABLES**	**Periods: 12**

Probability density function – Exponential distribution – Gamma – Uniform – Gaussian distributions (Excluding Derivation of Mean, variance and MGF).

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: Apply

Unit 5	**STATISTICS**	**Periods: 12**

Measures of central tendency – Arithmetic Mean, Median, Mode and Standard deviation – Correlation – Rank correlation and regression.

Teaching Learning Process	**Pedagogy:** Lecture-Based Teaching, Numerical problem-solving
	RBT Level: Apply

Total	**Periods: 60**

Suggested Activities and Evaluation Methods:

Tutorials, Mind Mapping, Quiz / MCQ (Gate Related Questions), Case Study Students' performance in continuous Assessment / Student Presentations, Model Exam.

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Expand periodic functions into Fourier series using Dirichlet's conditions and half-range series.
CO2: Solve engineering problems on Fourier seriesexpansion of complex functions, Harmonic analysis and Parseval's theorem.
CO3:Apply the concept of probability in random variables.
CO4:Solve the problem using continuous random variables.
CO5:Apply the concepts of measures of central tendency, standard deviation, correlation, rank correlation and regression to solve statistical problems.

Textbooks:

T1: M.K. Venkataraman, "Engineering Mathematics, The National Publishing Company, Madras, 2016.
T2: Balaji, "Engineering Mathematics II and Transforms and Partial Differential Equations", Balaji publishers, 18th Edition, 2018.
T3: H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Co. New Delhi, 2019.
T4: B.S. Grewal, "Higher Engineering Mathematics", Khanna publishers - Paperback – 3rd Edition - 2017.
T5: T. Veerarajan, "Probability, Statistics and Random Processes", Tata McGraw-Hill Education, 2008.
T6: Dr. A. Singaravelu, "Probability and Statistics", Meenakshi Agency, Paperback – 1, 2019.

References:

R1: N.P. Bali and Dr. Manish Goyal, "Engineering Mathematics", Lakshmi Publications Pvt. Ltd. New Delhi, 9th Edition, 2015.

R2: Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 10th Edition 2019.

R3: B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi 2018.

R4: Ravish R. Singh, Mukul Bhatt "Engineering Mathematics", McGraw-Hill, 1stEdition, 2017.

R5: William Mendenhall, Robert J. Beaver, Barbara M. Beaver: "Introduction to Probability & Statistics", Cengage Learning; 15thEdition 2019.

R6: Richard. A. Johnson, Irwin Miller and John E. Freund," Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2018.

Web links and Video Lectures (e-Resources):

1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_ma11
2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc23_ma43
3. http:// www.stat110.net
4. http://www.nptel.ac.in/courses/111105035 (R.V)
5. https://onlinecourses.nptel.ac.in/e-learning/preview/noc24_ma30

CO-PO&PSOMapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO1 0	PO11	PSO 1	PSO 2
CO1	3	2	2	1	1				1		1		
CO2	3	2	2	1	1				1		1		
CO3	3	2	2	1	1				1		1		
CO4	3	2	2	1	1				1		1		
CO5	3	2	2	1	1				1		1		
AVG	3	2	2	1	1				1		1		

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

DATA STRUCTURES AND ALGORITHMS			
(COMMON TO CSE, ICB, IT)			
Course Code:	**25UICT32**	**Course Type:**	**PC**
Teaching Periods / Week (L:T:P):	**3:0:0**	**Credits:**	**3**
Total Teaching Periods:	**45**	**CAM+ ESE Mark:**	**40+60=100**
Teaching Department:	CSE(ICB)		

Course Objectives:

To impart knowledge on the concept of data structures and their importance in computer science.

Unit 1	**BASIC TERMINOLOGIES OF DATA STRUCTURES**	**Periods:9**

Data structures: Definition, Types - Algorithm: Definition, Properties, Analyzing algorithms: Space and Time Complexity-Array and its operations. Searching: Linear search, Binary Search, Fibonacci search. Sorting Algorithms: Selection Sort, Bubble Sort, Quick Sort, Insertion sort, Heap Sort and Merge Sort

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Understand

Unit 2	**STACK, QUEUE AND LINKED LISTS**	**Periods:9**

Stacks: Definition – Operations - Applications of stack. Queues: Definition-Operations - Priority queues – De-queues – Applications of queue. Linked List: Singly Linked List, Doubly Linked List, Circular Linked List, Linked stacks, Linked queues, Applications of Linked List – Dynamic storage management.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Understand

Unit 3	**TREE**	**Periods:9**

Definition - Binary tree – Terminology – Representation – Operations - Applications – Binary search tree – AVL tree. B Trees: B Tree indexing - Operations on a B Tree - B + Tree Indexing. Trie - Trie operations.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 4	**GRAPH**	**Periods:9**

Definition – Terminology – Representation - Traversals – Applications - Spanning tree, Shortest path and Transitive closure, Topological sort. Set: Definition - Representation - Operations on sets – Applications.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 5	**HASH TABLE**	**Periods:9**

Tables: Rectangular tables - Jagged tables – Inverted tables - Symbol tables – Static tree tables - Dynamic tree tables - Hash tables-Overflow handling- Files: Sequential organization – Indexed organization.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Total	**Periods: 45**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study Students' performance in continuous Assessment / Student Presentations, Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Discuss the Algorithmic Notation with the programming principles for creating the programs for analysis and sorting techniques

CO2: Interpret the operations and applications of linear data structures Stack, queue with applications dynamic Storage management.

CO3: Apply the Concepts of Linked List and its types in real world scenario

CO4: Apply the tree concepts binary tree and its terminologies with the representation and traversal applications in search tree, AVL tree and B Trees.

CO5: Discuss the concepts of sets, tables and graphs

Textbooks:

T1: Ellis Horowitz, Sartaj Sahni," Fundamentals of Data Structures", Illustrated Edition, Computer Science Press, 2018.

T2: Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2010.

T3: Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", 4th Edition, 2009.

T4: Michael T. Goodrich and Robert, Tamassia, Wiley "Data Structures and Algorithms in Python", by, 1st Edition.

References:

R1:D. Samanta, "Classic Data Structures", Prentice-Hall of India, Second Edition, 2012.

R2: John Canning, Alan Broder, Robert Lafore, "Data Structures & Algorithms in Python", Addison-Wesley Professional,1st Edition, 2022

Web links and Video Lectures (e-Resources):

1. Programming, Data Structures and Algorithms using Python:
2. https://nptel.ac.in/courses/106106145 2. The Joy of Computing using Python:
3. https://nptel.ac.in/courses/106106182 3. Python for Data Science: https://nptel.ac.in/courses/106106212
4. Programming, Data Structures and Algorithms using Python for beginners: https: //nptel.ac.in /courses/106106145

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O 2
CO1	3	2	1	1	2	-	-	-	-	1	-	1	1
CO2	3	2	1	1	2	-	-	-	-	1	-	1	1
CO3	3	2	1	1	2	-	-	-	-	1	-	1	1
CO4	3	2	1	1	2	-	-	-	-	1	-	1	1
CO5	3	2	1	1	2	-	-	-	-	1	-	1	1
AVG	3	2	1	1	2					1		1	1

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

OBJECT ORIENTED PROGRAMMING USING JAVA			
(Common to CSE, IT, ICB)			
Course Code:	**25UICT33**	**Course Type:**	**PC**
Teaching Periods / Week (L:T:P):	**3:0:0**	**Credits:**	**3**
Total Teaching Periods:	**45**	**CAM+ ESE Mark:**	**40+60=100**
Teaching Department:	CSE(ICB)		

Course Objectives:

To introduce learners to the foundational principles of Java programming and guides them through structured problem-solving using classes, objects, and reusable code.

Unit 1	**INTRODUCTION TO OOP AND JAVA**	**Periods:9**

Overview of OOP – Object oriented programming paradigms – Features of Object-Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors Methods -Access specifiers – Static members- Java Doc comments.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 2	**INHERITANCE, PACKAGES AND INTERFACES**	**Periods: 9**

Overloading Methods – Objects as Parameters, Returning Objects, Static, Nested and Inner Classes- Inheritance: Basics, Types of Inheritance, Super keyword, Method Overriding, Dynamic Method Dispatch, Abstract Classes, final with Inheritance - Packages and Interfaces Packages, Packages and Member Access, Importing Packages, Interfaces.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 3	**EXCEPTION HANDLING AND MULTITHREADING**	**Periods: 9**

Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication-Suspending –Resuming and Stopping Threads –Multithreading. Wrappers – Auto boxing.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 4	**I/O, GENERICS, STRING HANDLING**	**Periods: 9**

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 5	**JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS**	**Periods: 9**

JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, Toggle Button – Radio Buttons – List View – Combo Box – Choice Box – Text Controls – Scroll Pane. Layouts – Flow Pane – HBox and VBox – Border Pane – Stack Pane – Grid Pane. Menus – Basics – Menu – Menu bars – Menu Item.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Total	**Periods: 45**

Suggested Activities and Evaluation Methods:
Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study, Students' performance in continuous Assessment / Student Presentations, Model Exam.

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Understand the principles of Object-Oriented Programming (OOP) and its implementation using Java, including classes, methods, and access specifiers.

CO2: Apply concepts of inheritance, polymorphism, and abstraction in developing Java programs.

CO3: Analyze error-handling mechanisms using exception handling and implement multithreading for concurrent programming.

CO4: Develop generic programs and handle strings effectively using Java's built-in libraries.

CO5: Design graphical user interfaces (GUIs) and event-driven applications using JavaFX controls, layouts, and menus.

Textbooks:

T1: Herbert Schildt, "Java: The Complete Reference", McGraw Hill Education, 11th Edition, 2019.
T2: Herbert Schildt, "Introducing JavaFX 8 Programming", McGraw Hill Education, 1st Edition, 2015.

References:

R1: Cay S. Horstmann, "Core Java Fundamentals", Volume 1, Prentice Hall, 11th Edition, 2018.

Web links and Video Lectures (e-Resources):

1. Object Oriented System Development using UML:
2. https://nptel.ac.in/courses/106105224
3. Java: https://nptel.ac.in/courses/106105225

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2
CO1	3	2	-	-	-	-	-	-	-	1	1	2	3
CO2	3	2	1	1	-	-	-	-	-	2	2	2	3
CO3	3	3	2	2	2	-	-	-	-	2	2	3	3
CO4	2	1	1	3	3	-	-	-	-	3	2	3	2
CO5	2	2	1	3	3	-	-	-	-	3	2	3	2
AVG	2.6	2	1	1.8	1.6					2.2	1.8	2.6	2.6

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

COMPUTER NETWORKS			
CSE (ICB)			
Course Code:	**25UICT34**	**Course Type:**	**PC**
Teaching Periods / Week (L:T:P):	**3:0:0**	**Credits:**	**3**
Total Teaching Periods:	**45**	**CAM+ ESE Mark:**	**40+60=100**
Teaching Department:	CSE(ICB)		

Course Objectives:

To understand network layering, the functions of protocols in each layer of the TCP/IP suite, the end-to-end flow of information, and the roles and protocols of the network and transport layers.

Unit 1	**DATA LINK AND PHYSICAL LAYERS**	**Periods: 9**

Data Link Layer – Framing –Error control – Data-Link Layer Protocols – HDLC – PPP - Media Access Control – Ethernet Basics – CSMA/CD – Virtual LAN – Wireless LAN (802.11) - Physical Layer: Data and Signals - Performance – Transmission media- Switching – Circuit Switching.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 2	**NETWORK LAYER**	**Periods: 9**

Switching : Packet Switching - Internet protocol - IPV4 – IP Addressing – Subnetting - IPV6, ARP, RARP, ICMP, DHCP

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Understand

Unit 3	**ROUTING**	**Periods: 9**

Routing and protocols- Unicast routing - Distance Vector Routing - RIP - Link State Routing – OSPF- Path-vector routing - BGP - Multicast Routing: DVMRP – PIM.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Understand

Unit 4	**TRANSPORT LAYER**	**Periods: 9**

Introduction - Transport-Layer Protocols: UDP – TCP: Connection Management – Flow control - Congestion Control - Congestion avoidance (DECbit, RED) – SCTP – Quality of Service

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Understand

Unit 5	**APPLICATION LAYER**	**Periods:9**

Data Communication - Networks – Network Types – Protocol Layering -TCP/IP Protocol suite – OSI Model – Introduction to Sockets - Application Layer protocols: HTTP – FTP – Email protocols (SMTP - POP3 - IMAP - MIME) – DNS – SNMP

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Total	**Periods: 45**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study, Students' performance in continuous Assessment / Student Presentations, Model Exam.

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Apply data link layer functions including framing, error control, media access control, and examine protocols (HDLC, PPP), LAN technologies (Ethernet, VLANs, Wireless LAN), and physical layer transmission fundamentals.

CO2: Explain network layer switching concepts, Internet Protocol (IPv4 and IPv6), addressing schemes, subnetting techniques, and supporting protocols (ARP, RARP,

ICMP, DHCP).

CO3: Compare routing protocols including unicast (RIP, OSPF), path-vector (BGP), and multicast (DVMRP, PIM) routing algorithms and their implementations.

CO4: Discuss transport layer protocols (UDP, TCP, SCTP), their connection management, flow control, congestion control mechanisms, and quality of service considerations.

CO5: Apply data communication fundamentals, protocol layering architectures (TCP/IP, OSI), and application layer protocols including HTTP, FTP, email systems, DNS, and SNMP.

Textbooks:

T1. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 2022.

T2. James Kurose, Keith Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021.

References:

R1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

R2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.

R3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.

Web links and Video Lectures (e-Resources):

1. Computer Networks – **https://nptel.ac.in/courses/111106100**
2. Introduction to Internet of Things / Computer Networks Concepts – **https://nptel.ac.in/courses/111104125**
3. Computer Networks and Internet Protocol – **https://nptel.ac.in/courses/111105121**
4. Advanced Computer Networks – **https://nptel.ac.in/courses/111107112**

CO-PO& PSO Mapping

CO	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2
CO1	2	2									2	2	
CO2	2	2			2					2	2	2	
CO3	2	2		1	3						2	2	
CO4	2	2	2		2				3		2	2	2
CO5	2	2									2	2	
AVG	2	2	0.4	0.2	1.4				0.6	0.4	2	2	0.4

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

HUMAN RESOURCE MANAGEMENT			
(Common for CSE, ICB)			
Course Code:	**25UHST31**	**Course Type:**	**HS**
Teaching Periods / Week (L:T:P):	**3:0:0**	**Credits:**	**3**
Total Teaching Periods:	**45**	**CAM+ ESE Mark:**	**40+60=100**
Teaching Department:	CSE(ICB)		

Course Objectives:

To understand the strategic importance of human resources, master HRM methods, and apply HR tools effectively in real-world business scenarios.

Unit 1	INTRODUCTION TO HRM: CONTEXT, FUNCTIONS, AND STRATEGY	Periods:9
Human Resources Management - Context and Concept of People Management in a Systems Perspective - Organisation and Functions of the HR and Personnel Department - HR Structure and Strategy; Role of Government and Personnel Environment including MNCs.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Understand	
Unit 2	**HR ACQUISITION AND PERFORMANCE MANAGEMENT**	**Periods:9**
Recruitment and Selection - Human Resource Information System [HRIS] - Manpower Planning - Selection – Induction & Orientation - Performance and Potential Appraisal - Coaching and Mentoring - HRM issues and practices in the context of Outsourcing as a strategy		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Understand	
Unit 3	**HUMAN RESOURCE DEVELOPMENT AND SEPARATION**	**Periods:9**
Human Resources Development –Training and Development Methods - Design & Evaluation of T&D Programmes - Career Development - Promotions and Transfers - Personnel Empowerment including Delegation - Retirement and Other Separation Processes.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Understand	
Unit 4	**COMPENSATION, MOTIVATION AND QUALITY OF WORK LIFE**	**Periods:9**
Financial Compensation- -Productivity and Morale - Principal Compensation Issues & Management - Job Evaluation - Productivity, Employee Morale and Motivation - Stress Management - Quality of Work Life.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Understand	
Unit 5	**EMPLOYEE RELATIONS, CONFLICT, AND INDUSTRIAL RELATION**	**Periods:9**
Building Relationships – Facilitating Legislative Framework - Trade Unions - Managing Conflicts - Disciplinary Process - Collective Bargaining - Workers Participation in Management - Concept, Mechanisms and Experiences.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Understand	
Total		**Periods: 45**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study, Students' performance in continuous Assessment / Student Presentations, Model Exam.

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Understand the strategic role of human resources, HRM concepts, and the organizational structure and functions of HR departments in various business environments.

CO2: Comprehend the methodologies and techniques involved in recruitment, selection, HRIS, manpower planning, and recognize HRM challenges within outsourcing and contemporary organizational contexts.

CO3: Interpret various training and development methodologies, elucidate career planning processes, and describe employee empowerment and separation procedures within organizational contexts.

CO4: Explain compensation structures, interpret job evaluation methods, and discuss strategies to enhance productivity, employee morale, motivation, and quality of work life.

CO5: Utilize knowledge of labor laws to manage industrial relations, resolve workplace conflicts, and implement strategies for effective worker participation in management through communication and negotiation.

Textbooks:

T1. Decenzo and Robbins, "Human Resource management", 8th Edition, Wiley, 2007
T2. Venkata Ratnam C. S. &Srivatsava B. K.,PERSONNEL MANAGEMENT AND HUMAN RESOURCES, Tata Mc-Graw Hill, NewDelhi, 2010.

References:

R1. Aswathappa, HUMAN RESOURCE MANGEMENT, Tata McGraw Hill, NewDelhi, 2010
R2. Garry Dessler &Varkkey, HUMAN RESOURCE MANAGEMENT, Pearson, New Delhi, 2009
R3. Alan Price, HUMAN RESOURCE MANAGEMENT, Cengage Learning, NewDelhi, 2007
R4. Pravin Durai, HUMAN RESOURCE MANGEMENT, Pearson, New Delhi,2010
R5. Snell, Bohlander & Vohra, HUMAN RESOURCES MANAGEMENT, Cengage, NewDelhi, 2010

Web links and Video Lectures (e-Resources):

1. https://uniathena.com/short-courses/basics-in-human-resource-management
2. https://www.mygreatlearning.com/academy/learn-for-free/courses/human-resource-management

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PSO 1	PSO2
CO1	3	2	1	-	-	-	-	-	-	1	1	2	3
CO2	3	3	2	1	-	-	-	-	-	2	2	2	3
CO3	2	3	2	-	-	-	-	-	-	2	2	3	3
CO4	3	2	3	1	-	-	-	-	-	3	2	3	2
CO5	3	3	2	2	-	-	-	-	-	3	2	3	2
AVG	2.8	2.6	2	0.8						2.2	1.8	2.6	2.6

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

EMBEDDED C PROGRAMMING FOR IOT APPLICATIONS

CSE (ICB)

Course Code:	**25UICI35**	**Course Type:**	**ES**
Teaching Periods / Week (L:T:P):	**3:0:2**	**Credits:**	**4**
Total Teaching Periods:	**75 (Theory: 45, Practical: 30)**	**CAM+ ESE Mark:**	**50+50=100**
Teaching Department:	CSE(ICB)		

Course Objectives:

To learn the 8051 microcontroller architecture with Embedded C programming, understand the complete embedded system design process and real-time processing concepts, and gain knowledge of IoT architecture, communication models, and design flow for designing and building IoT-based systems using open platforms.

Unit 1	**8-BIT EMBEDDED PROCESSOR**	**Periods:15**

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

Practical:

1. 8051 assembly language programs using simulator
2. Data transfer between registers and memory
3. ALU operations

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 2	**EMBEDDED C PROGRAMMING**	**Periods:15**

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

Practicals:

1. Embedded C programs for arithmetic and logical operations
2. Simple embedded applications using C

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 3	**IOT AND ARDUINO PROGRAMMING**	**Periods:15**

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

Practical:

1. Introduction to Arduino IDE and programming
2. Interfacing sensors and actuators with Arduino

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 4	**IOT COMMUNICATION AND OPEN PLATFORMS**	**Periods:15**

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

Practical:

1. Introduction to Raspberry Pi and Python programming
2. Interfacing sensors with Raspberry Pi
3. Wireless communication between Arduino and Raspberry Pi
4. Cloud data logging setup

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 5	**APPLICATIONS DEVELOPMENT**	**Periods:15**

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

Practical:

1. Design and implementation of an IoT-based system
2. Data logging and cloud integration using Raspberry Pi

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Total	**Periods: 75**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study, Students' performance in continuous Assessment / Student Presentations, Model Exam.

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Explain the architecture and functioning of embedded processors.

CO2: Write embedded C programs for real-time applications.

CO3: Design simple embedded and IoT-based applications.
CO4: Compare different IoT communication models and protocols.
CO5: Design and implement IoT applications using Arduino, Raspberry Pi, and open platforms.
CO5: Design graphical user interfaces (GUIs) and event-driven applications using JavaFX controls, layouts, and menus.

Textbooks:

T1. Muhammad Ali Mazidi et al., *The 8051 Microcontroller and Embedded Systems*, Pearson Education, 2014.
T2. David Hanes et al., *IoT Fundamentals: Networking Technologies, Protocols, and Use Cases*, CISCO Press, 2017.

References:

R1. Michael J. Pont, *Embedded C*, Pearson Education, 2007.
R2. Wayne Wolf, *Computers as Components*, Elsevier, 2006.
R3. Arshdeep Bahga, Vijay Madisetti, *Internet of Things – A Hands-on Approach*, Universities Press, 2015.

Web links and Video Lectures (e-Resources):

1. Official NPTEL course page (free learning, optional certificate)
   https://onlinecourses.nptel.ac.in/noc22_cs53/preview
2. Video lecture series on YouTube (Introduction to IoT basics)
   https://www.youtube.com/playlist?list=PLE7VH8RC_N3bpVn-e8QzOAHziEgmjQ2qE
3. **IoT & Embedded Programming Tutorial Series -**Practical IoT + Embedded C & Wireless topics
   https://www.youtube.com/playlist?list=PLKEtMKmofr9GnmPH4zUKPtLmYRZTBS8Bm

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2
CO1	3	3	3	3	-	-	-	1	2	3	3	2	1
CO2	2	1	3	2	2	-	-	1	2	2	3	3	1
CO3	3	1	3	3	1	-	-	1	2		1	1	3
CO4	3	2	3	2	1	-	-	1	2	2	3	2	2
CO5	2	3	3	2	2	-	-	1	3	3	2	3	1
AVG	2.6	2	3	2.4	1.2			1	2.2	2	2.4	2.2	1.6

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

DATA STRUCTURES AND ALGORITHMS LAB

(Common for CSE, IT, ICB)

Course Code:	**25UICP31**	**Course Type:**	**PC**
Teaching Periods / Week (L:T:P):	**0:0:2**	**Credits:**	**1**
Total Teaching Periods:	**30**	**CAM+ESE Mark:**	**60+40=100**
Teaching Department:	CSE(ICB)		

Course Objectives:

To enable students write programs using various data structures, analyze and understand the benefits of choosing the right data structure.

Practical Exercises:	**Periods : 30**

LIST OF EXPERIMENTS

1. Searching Algorithms (With the Number of Key Comparisons) - Sequential, Binary and Fibonacci Search Algorithms on an Ordered List
2. Sorting Algorithms: Insertion Sort, Selection Sort, Bubble Sort, Quick Sort, Heap Sort and Merge Sort.
3. Implementation of Stack and Its Operations.
4. Application of Stack for Converting an Arithmetic Expression into Postfix Form and Evaluation of Postfix Expression.
5. Implementation of Queue, Circular Queue, Priority Queue, Dequeue and Their Operations.
6. Implementation of Singly Linked List, Doubly Linked List, Circular Linked List.
7. Implementation of Binary Tree and Binary Traversal Techniques.
8. Implementation of Graph Traversal Techniques.
9. Implement Dijkstra's Algorithm to Obtain the Shortest Paths.
10. Implementation of Hash Tables and its Operations.

Software Required:

1. Python

References:

R1. D. Samanta, "Classic Data Structures", Prentice-Hall of India, Second Edition, 2012.

R2. John Canning, Alan Broder, Robert Lafore, "Data Structures & Algorithms in Python", Addison-Wesley Professional, 1st Edition, 2022.

Course Outcomes:

CO1: Discuss the Algorithmic Notation with the programming principles for creating the programs for analysis and sorting techniques

CO2: Interpret the operations and applications of linear data structures Stack, queue with applications dynamic Storage management.

CO3: Apply the Concepts of Linked List and its types in real world scenario

CO4: Apply the tree concepts binary tree and its terminologies with the representation and traversal applications in search tree, AVL tree and B Trees.

CO5: Discuss the concepts of sets, tables and graphs

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2
CO1	3	2	1	1	2	-	-	-	-	-	-	1	1
CO2	3	2	1	1	2	-	-	-	-	-	-	1	1
CO3	3	2	1	1	2	-	-	-	-	-	-	1	1
CO4	3	2	1	1	2	-	-	-	-	-	-	1	1
CO5	3	2	1	1	2	-	-	-	-	-	-	1	1
AVG	3	2	1	1	2							1	1

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

OBJECT ORIENTED PROGRAMMING USING JAVA LAB			
CSE (ICB)			
Course Code:	**25UICP32**	**Course Type:**	**PC**
Teaching Periods / Week (L:T:P):	**0:0:2**	**Credits:**	**1**

Total Teaching Periods:	30	CAM+ ESE Mark:	60+40=100
Teaching Department:	CSE(ICB)		

Course Objectives:

To develop object-oriented programming skills using Java by designing, implementing, and testing applications that utilize classes, inheritance, polymorphism, exception handling, multithreading, file handling, and graphical user interfaces.

Practical Exercises:	Periods : 30

LIST OF EXPERIMENTS

1. W rite a Java program to demonstrate the use of classes, objects, methods, constructors, and object creation.
2. Develop Java programs using control statements, arrays, strings, and command-line arguments.
3. Implement inheritance concepts (Single, Multilevel, Hierarchical) using Java programs.
4. Develop programs to demonstrate method overloading, method overriding, dynamic method dispatch, and polymorphism.
5. Write Java programs using abstract classes and interfaces to implement abstraction.
6. Develop Java programs using packages and user-defined packages.
7. Implement exception handling using try, catch, finally, throw, throws, and user-defined exceptions.
8. Write Java programs to demonstrate multithreading using Thread class and Runnable interface with thread synchronization.
9. Develop Java programs for file handling using File, FileReader, FileWriter, BufferedReader, and BufferedWriter classes.
10. Design GUI applications using AWT and Swing components such as Labels, Buttons, TextFields, Radio Buttons, Check Boxes, Combo Boxes, Menus, and Event Handling.

References:

R1. Herbert Schildt, Java: The Complete Reference, 12th Edition, McGraw-Hill Education, 2022.
R2. E. Balagurusamy, Programming with Java: A Primer, 7th Edition, McGraw-Hill Education, 2024.
R3. Paul Deitel and Harvey Deitel, Java: How to Program, 12th Edition, Pearson Education, 2020.
R4. Kathy Sierra and Bert Bates, Head First Java, 3rd Edition, O'Reilly Media, 2022.
R5. Y. Daniel Liang, Introduction to Java Programming and Data Structures, 13th Edition, Pearson Education, 2023.
R6. Cay S. Horstmann, Core Java Volume I – Fundamentals, 12th Edition, Pearson Education, 2022.
R7. Oracle Corporation, Java Platform Documentation (JDK 21), 2023.

Course Outcomes: On the successful completion of the course, students will be able to
CO1: Develop Java programs using classes, objects, constructors, methods, arrays, and strings.
CO2: Apply object-oriented concepts such as inheritance, polymorphism, abstraction, and interfaces to solve programming problems.
CO3: Develop robust Java applications using packages, exception handling, and multithreading.
CO4: Implement file handling techniques and build event-driven GUI applications using AWT and Swing.
CO5: Design and develop complete Java-based applications by integrating object-oriented programming concepts.

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO2
CO1	3	2	-	-	2	-	-	-	-	1	1	2	3

CO2	3	2	1	1	2	-	-	-	-	2	2	2	3
CO3	3	3	2	2	2	-	-	-	-	2	2	3	3
CO4	2	1	1	3	3	-	-	-	-	3	2	3	2
CO5	2	2	1	3	3	-	-	-	-	3	2	3	2
AVG	2.6	2	1	1.8	2.4					2.2	1.8	2.6	2.6
1 – Low, 2 – Medium, 3 – High, '-' – No correlation													

COMPUTER NETWORKS LAB			
CSE (ICB)			
Course Code:	**25UICP33**	**CourseType:**	**PC**
Teaching Periods / Week (L:T:P):	**0:0:2**	**Credits:**	**1**
Total Teaching Periods:	**30**	**CAM+ ESE Mark:**	**60+40=100**
Teaching Department:	CSE(ICB)		

Course Objectives:

To learn and apply network commands, capture and analyze network traffic, develop client-server applications using TCP/UDP sockets, simulate DNS, ARP/RARP, routing and congestion control algorithms, and study network performance using protocol analyzers and network simulators.

Practical Exercises: **Periods : 30**

LIST OF EXPERIMENTS

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and trace route PDUs using a network protocol analyzer and examine.
2. Write a HTTP web client program to download a web page using TCP sockets.
3. Applications using TCP sockets like: a) Echo client and echo server b) Chat
4. Simulation of DNS using UDP sockets.
5. Use a tool like Wireshark to capture packets and examine the packets
6. Write a code simulating ARP /RARP protocols.
7. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
8. Study of TCP/UDP performance using Simulation tool.
9. Simulation of Distance Vector/ Link State Routing algorithm.
10. Simulation of an error correction code (like CRC)

References:

R1. Behrouz A. Forouzan, *Computer Networking: A Top-Down Approach*, **6th Edition**, McGraw-Hill Education, **2013**.

R2. James F. Kurose and Keith W. Ross, *Computer Networking: A Top-Down Approach*, **8th Edition**, Pearson Education, **2021**.

R3. Andrew S. Tanenbaum and David J. Wetherall, *Computer Networks*, **5th Edition**, Pearson Education,

2011.

R4. Douglas E. Comer, *Internetworking with TCP/IP – Volume I*, **6th Edition**, Pearson Education, **2014**.

R5. William Stallings, *Data and Computer Communications*, **10th Edition**, Pearson Education, **2014**.

R6. NS-2 Documentation, *The Network Simulator – NS-2*, **2011**.

R7. Wireshark Foundation, *Wireshark User's Guide*, **2022**.

Course Outcomes: On the successful completion of the course, students will be able to
CO1: Apply basic networking concepts using network commands and protocol analyzers to observe and analyze network behavior.
CO2: Develop client–server applications using TCP and UDP socket programming for reliable and connectionless communication.
CO3: Analyze and simulate network protocols such as DNS, ARP/RARP, routing, and error control mechanisms.
CO4: Evaluate network performance and congestion control algorithms using network simulation tools.
CO5: Use packet capturing and simulation tools to study, analyze, and interpret real-time network traffic and protocol operations.

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO2
CO1	3	2	-	-	2	-	-	-	-	1	1	2	3
CO2	3	2	1	1	2	-	-	-	-	2	2	2	3
CO3	3	3	2	2	2	-	-	-	-	2	2	3	3
CO4	2	1	1	3	3	-	-	-	-	3	2	3	2
CO5	2	2	1	3	3	-	-	-	-	3	2	3	2
AVG	2.6	2	1	1.8	2.4					2.2	1.8	2.6	2.6

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

PERSONALITY DEVELOPMENT SKILLS			
(Common to all department)			
Course Code:	**25UPCE31**	**Course Type:**	**EEC**
Teaching Periods/Week (L:T:P:SL):	**0 : 0 : 2**	**Credits:**	**0 (Zero Credit)**
Total Teaching Periods:	**30**	**CAM Mark:**	**Internal Assessment**
Teaching Department:	Placement Cell		

Course Objectives:

To impart knowledge on a well-rounded personality by enhancing essential personal and professional skills and to foster self-awareness, effective communication, interpersonal abilities, emotional intelligence, confidence, leadership and goal-setting strategies.

Unit1	**WORKPLACE AND EMAIL& MICROSOFT OFFICE SUITE**	**Periods: 6**

Work place and Email Etiquette: Professional Behavior and Dress Code – Email and Meeting Etiquette .Microsoft office suite: MS Word(Document Creation and Formatting) - MS Excel (Data Analysis and Functions) - MS PowerPoint (Creating Effective Presentations)

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Understand

Unit2	BUSINESS COMMUNICATION , SALES AND NEGOTIATIONS&CUSTOMER SERVICE	Periods: 6
Business Communication: Verbal and Non - Verbal Communication – Written Communication in Business. Sales and Negotiations: Sales Techniques and Strategies – Negotiation Tactics and Styles. Customer Service: Effective Communication Skills- Customer support channels and Tools		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	

Unit3	DECISION MAKING & PROBLEM SOLVING	Periods: 6
Decision Making: Types of Decision Making – Decision Making models and Techniques –Cognitive Biases and Risk Assessment Problem Solving: Problem Identification and Analysis – Creative and Critical Thinking techniques – Implementation and Evaluation techniques		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	

Unit4	INTERVIEW SKILLS , RESUME BUILDING , MANNERISM & BEHAVIORAL SKILLS	Periods: 6
Interview Skills: Preparation and Research – Effective Communication and Presentation Resume Building: Resume Formats and Structure – Tailoring Resumes for Specific Jobs Mannerism: Body Language – Respect and Courtesy in Interactions Behavioral skills: Emotional Intelligence – Adaptability and flexibility.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	

Unit5	Group Discussion& Monk Interview	Periods: 6
Group Discussion: Effective communication and Active Listening – Leadership and Participation skills – Critical Thinking and Topic Analysis Monk Interview: Common Interview Questions and Ideal Responses – Feedback and Self-Assessment		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	

Total	30 Periods

Suggested Activities and Evaluation Methods:

SWOT analysis (personal), Group discussions, Role-play, case studies, Resume writing and mock interviews
Students' performance in continuous Assessment / Student Presentations, Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Apply workplace etiquette and use Microsoft Office tools effectively for professional communication and documentation

CO2: Demonstrate effective communication skills in business contexts, including sales, negotiation, and customer service scenarios

CO3: Apply structured decision-making and problem-solving techniques in professional and organizational settings.

CO4: Prepare for interviews and present oneself professionally with an effective resume, proper mannerisms, and behavioral skills.

CO5: Demonstrate confidence and clarity in group discussions and interviews through guided practice and feedback.

Textbooks:

T1. Personal Development and Soft Skills By BARUNKMITRA, Oxford Higher Education.

T2. Seven Habits of Highly Effective People by STEPHENCOVEY.

References:

R1. Communication Skills by SANJAY KUMAR, PUSHP , Oxford Higher Education
R2. Communication Skills for Professionals by NIRAKONAR, PHI learning Pvt. Ltd.

WeblinksandVideoLectures(e-Resources):

1. https://careerbridgesolutions.com/skills-and-personality-development

CO-PO & PSO Mapping

CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2
CO1					2				2	2			
CO2								2	2	2			
CO3	2			2							2		
CO4									2	2	2		
CO5									2	2	2		
AVG	0.4			0.4	0.4			0.4	1.6	1.6	1.2		

1 – Low, 2 – Medium, 3 – High,'-' – No correlation

INDIAN CONSTITUTION AND HUMAN RIGHTS

(Common to All Branches of UG Engineering Programs)

Course Code:	**25UMCC31**	**Course Type:**	**Mandatory Course (Audit)**
Teaching Periods / Week (L:T:P):	**2:0:0**	**Credits:**	**0 (Zero)**
Total Teaching Periods:	**30**	**CAM Mark:**	**Pass / Fail (Satisfactory / Unsatisfactory)**
Teaching Department:	General Engineering		

Course Objectives:

To impart knowledge on:

1. Historical background, Preamble, and salient features of the Indian Constitution
2. Fundamental Rights, Directive Principles of State Policy, and Fundamental Duties
3. Structure and functioning of Union, State, and Local Self Governments
4. Universal Human Rights principles and international protection frameworks
5. Contemporary human rights issues and remedial mechanisms in India

Unit 1	**INTRODUCTION TO INDIAN CONSTITUTION**	**Periods: 6**

Historical Background: Making of the Constitution - Constituent Assembly and its key members - Draft Committee. Preamble: Philosophy and Core Values - Sovereign, Socialist, Secular, Democratic, Republic - Justice, Liberty, Equality, Fraternity. Salient Features of Indian Constitution: Written Constitution - Lengthy document - Blend of Rigidity and Flexibility - Federal Structure with Unitary Bias - Parliamentary System.

Instructional Activity

Timeline Activity on Constitutional History (or) Preamble Analysis Worksheet

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Understand

Unit 2	**FUNDAMENTAL RIGHTS AND DUTIES**	**Periods: 6**

Fundamental Rights (Articles 12-35): Right to Equality (Art. 14-18) - Right to Freedom (Art. 19-22) - Right Against Exploitation (Art. 23-24) - Right to Freedom of Religion (Art. 25-28) - Cultural and Educational Rights (Art. 29-30) - Right to Constitutional Remedies (Art. 32): Writs - Habeas Corpus, Mandamus, Prohibition, Certiorari, Quo Warranto. Directive Principles of State Policy (Articles 36-51): Classification - Socialistic, Gandhian, Liberal-Intellectual Principles. Fundamental Duties (Article 51A): Citizen Responsibilities - 11 Duties. Relationship and Conflict between Fundamental Rights and Directive Principles.

Instructional Activity		
Case Study Analysis on Landmark Supreme Court Judgments (or) Mock PIL Filing Exercise (or) Rights Violation Scenario Analysis		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Understand	
Unit 3	**UNION AND STATE GOVERNMENT STRUCTURE**	**Periods: 6**
Union Executive: President - Election, Powers, Position - Vice-President - Prime Minister and Council of Ministers - Cabinet Committees. Union Legislature: Parliament - Lok Sabha and Rajya Sabha - Composition, Functions - Legislative Process - Bill to Act. State Executive: Governor - Chief Minister - State Council of Ministers. State Legislature: Legislative Assembly and Council - State Law-making Process. Centre-State Relations: Legislative, Administrative, and Financial Relations - Role of Finance Commission. Local Self Government: 73rd Amendment (Panchayati Raj) - 74th Amendment (Urban Local Bodies) - Three-tier System.		
Instructional Activity		
Flowchart Creation (Bill to Law) (or) Field Visit Report on Local Panchayat/Municipality		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Understand	
Unit 4	**HUMAN RIGHTS: CONCEPTS AND FRAMEWORKS**	**Periods: 6**
Evolution of Human Rights: Historical Development - Natural Rights Theory - Magna Carta - French Declaration - American Bill of Rights. Universal Declaration of Human Rights (UDHR) 1948: 30 Articles - Civil, Political, Economic, Social, Cultural Rights. International Human Rights Instruments: ICCPR - ICESCR - CEDAW - CRC - CAT - CERD. Human Rights in Indian Constitution: Part III and Part IV Provisions. National Human Rights Commission (NHRC): Composition - Functions - Powers - Procedure. State Human Rights Commissions - National Commission for Women, SC, ST, Minorities.		
Instructional activities		
NHRC Case Study Analysis		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Unit 5	**CONTEMPORARY HUMAN RIGHTS ISSUES**	**Periods: 6**
Rights of Vulnerable Groups: Women (POSH Act, Domestic Violence Act) - Children (POCSO, JJ Act) - Elderly (Maintenance Act) - Persons with Disabilities (RPWD Act 2016). Rights of Marginalized Communities: SC/ST (Prevention of Atrocities Act) - Minorities - LGBTQ+ (Navtej Singh Johar Case). Right to Information (RTI Act 2005): Provisions and Application. Right to Education (RTE Act 2009). Environmental Rights: Right to Clean Environment - Sustainable Development - PIL on Environmental Issues. Digital Rights: Right to Privacy (Puttaswamy Case) - Data Protection - Cyber Rights. Human Rights Violations and Remedies: Legal Aid - Grievance Redressal Mechanisms.		
Instructional activities		
RTI Application Drafting Workshop (or) Case Study on HR Violations		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Total		**Periods: 30**
Suggested Activities and Evaluation Methods:		
Active Learning: Case Studies, Role Play, Mock Court/Parliament, Group Discussions, Debates, Panel Discussions Practical Activities: RTI Application Drafting, Field Visits to Panchayat/Municipal Offices, Digital Tools: Kahoot Quizzes, Mentimeter Polls, Online Discussion Forums, Digital Portfolios Assessment Methods: Entry/Exit Tickets, One-Minute Papers, Peer Review, Reflective Journals, Group Presentations Evaluation: Continuous Assessment through Formative Activities, End-Semester Viva-voce/Written Test		
Course Outcomes:		
After successful completion of this course, the student should be able to: **CO1:** Explain the historical evolution, Preamble, and salient features of the Indian Constitution		

CO2: Describe Fundamental Rights, Directive Principles of State Policy, and Fundamental Duties and explain their interrelationship.

CO3: Describe the structure and functions of Union, State, and Local Self Governments in India.

CO4: Apply the principles of Universal Human Rights to identify international protection frameworks.

CO5: Illustrate contemporary human rights issues and demonstrate the use of remedial mechanisms available in India.

Textbooks:

T1: D.D. Basu, "Introduction to the Constitution of India", 24th Edition, LexisNexis, 2020.

T2: M.V. Pylee, "India's Constitution", 16th Edition, S. Chand Publishing, 2017.

T3: S.K. Kapoor, "Human Rights Under International Law and Indian Law", Central Law Agency, 2018.

References:

R1: Granville Austin, "The Indian Constitution: Cornerstone of a Nation", Oxford University Press, 2019.

R2: J.N. Pandey, "Constitutional Law of India", 57th Edition, Central Law Agency, 2020.

R3: K.K. Ghai, "Human Rights", Kalyani Publishers, 2019.

R4: P.M. Bakshi, "The Constitution of India", Universal Law Publishing, 2020.

Web Links and Video Lectures (e-Resources):

1. Constitution of India - https://legislative.gov.in/constitution-of-india
2. National Human Rights Commission - https://nhrc.nic.in
3. United Nations Human Rights - https://www.ohchr.org
4. SWAYAM Course on Indian Constitution - https://swayam.gov.in
5. NPTEL Course on Constitution of India - https://nptel.ac.in
6. Lok Sabha TV Documentaries - https://www.youtube.com/c/LokSabhaTVChannel
7. PRS Legislative Research - https://prsindia.org

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1						2	2				1		
CO2						3	3	1	1		2		
CO3						2	2	1			1		
CO4						3	2		2		2		
CO5						3	3	2	2		2		
AVG						2.6	2.4	0.8	1		0.625		

1 - Low, 2 - Medium, 3 - High

SEMESTER IV

NUMBER THEORY AND CRYPTOGRAPHY			
CSE (ICB)			
Course Code:	25UMAT41	**Course Type:**	BS
Teaching Periods / Week (L:T:P):	3:1:0	**Credit:**	4
Total Teaching Periods:	60	**CAM+ ESE Mark:**	40+60=100
Teaching Department:	General Engineering		

Course Objectives:

To Learn the concept of primes and divisibility, congruences, cryptography, diophantine, and elliptic cryptosystems.

Unit 1	**PRIMES AND DIVISIBILITY:**	**Periods 12**

Euclidean Algorithm - Primes and Factorization - Distribution of primes, Prime number theorem.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 2	**CONGRUENCES**	**Periods 12**

Modular Arithmetic - Consequences of Fermat's Theorem -Chinese Remainder Theorem – Primality and Compositeness Testing-Groups, Rings and Felds - Primitive Roots -Prime Power Moduli and Power Residues.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 3	**INTRODUCTION TO CRYPTOGRAPHY**	**Periods 12**

Symmetric Ciphers-Public Key Cryptography-Discrete Log Problem- RSA Cryptosystem-PARI-Breaking RSA.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 4	**DIOPHANTINE EQUATIONS**	**Periods 12**

Quadratic Diophantine equations -Units in quadratic number rings - Pell's equation - Unique factorization - Elliptic curves, Elliptic curves over Fp.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 5	**ELLIPTIC CRYPTOSYSTEMS**	**Periods 12**

Elliptic curve discrete log problem (ECDLP) - Elliptic curve cryptography -Lenstra's factorization algorithm - Pairing-based cryptography - Divisors and the Weil pairing.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Total	**Periods 60**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study
Students' performance in continuous Assessment / Student Presentations, Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

C01: understand the basic knowledge of Primes and Divisibility.
C02: To understand the Congruences.
C03: To understand the fundamental knowledge of Cryptography.
C04: To understand the Diophantine equation.
C05: To understand the concept of Elliptic cryptosystems.

Textbooks:

T1 Stefano Spezia"Number Theory with Applications to Cryptography", Arcler Education Inc, 2019.
T2 Douglas R. Stinson,"Cryptography: Theory and Practice", CRC Press, 3rd Edition, 2019.
T3 Behrouz A. Forouzan,"Dedeep Mukhopadhyay Cryptography & Network Security", Tata McGraw Hill, New Delhi, 2nd Edition, 2010.

References:

R1. Mohamed Omar,"Number Theory Toward RSA Cryptography", Create Space Independent Publishing Platform, 2017.
R2. G. H. Hardy, E. M. Wright, D. R. Heath-Brown, Joseph Silverman,"An Introduction to the Theory of Numbers, OUP Oxford 2008.

Web links and Video Lectures (e-Resources):

1. Foundations of Cryptography: https://archive.nptel.ac.in/courses/106/105/106105162/53

CO-PO& PSO Mapping

CO	PO 1	PO 2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1	3	2									1		2
CO2	3	2	2								1		2
CO3	3	2	2								1		2
CO4	3	2	3	2							2		2
CO5	3	2		2							2		2
AVG	3	2	1.2	0.8							1.4		2

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

OPERATING SYSTEMS			
CSE (ICB)			
Course Code:	25UICT42	**Course Type:**	PC
Teaching Periods / Week (L:T:P):	3:0:0	**Credit:**	3
Total Teaching Periods:	45	**CAM+ ESE Mark:**	40+60=100
Teaching Department:	CSE(ICB)		

Course Objectives:

To have an overview of different types of operating systems and Operating system Services with case study of the Linux System, Windows and Android.

Unit 1	INTRODUCTION TO OPERATING SYTSEMS	Periods:9

Computer-System Organization - OS Structures- Operating-System Operations, Operating System Services, System Calls, System Programs – Processes- Concept, Scheduling, Operations on Processes, Inter-process Communication. Threads- Overview, Multithreading, Threading issues - CPU Scheduling – Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 2	**PROCESS MANAGEMENT**	**Periods:9**

The Critical- Section Problem, Synchronization Hardware, Semaphores, Classic problems of Synchronization, Monitors. Deadlock- Characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlocks.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 3	**MEMORY MANAGEMENT**	**Periods:9**

Swapping, Contiguous Memory allocation, Paging, Segmentation, Structure of the Page table, Virtual Memory, Demand Paging, Page Replacement, Allocation of frames, Thrashing.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 4	**FILE SYSTEM INTERFACE**	**Periods:9**

File Concept, Access Methods, Directory and Disk Structure, File System Mounting, File Sharing, Protection. File System Implementation – Directory Implementation, Allocation Methods, Free-space Management. Kernel I/O Subsystems - Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 5	**THE LINUX SYSTEM**	**Periods:9**

Design Principles, Kernel Modules, Security - Windows - Design Principles, System Components, Networking - Mobile OS- Android - Design Goals, Android Architecture, Android Applications.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Total	**Periods: 45**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study, Students' performance in continuous Assessment / Student Presentations, Model Exam.

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Gain the knowledge of different types of operating systems, processes, threads and CPU scheduling concepts.

CO2: Realize the need for Process Synchronization and the various constructs for Process Synchronization.

CO3: Gain knowledge about file systems, directory management and mass storage systems.

CO4: Solve the problem using continuous random variables

CO5: Be familiar with the basics of OS like Linux and Windows and Android OS.

Textbooks:

T1 Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.

T2 Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022.

References:

R1: Harvey M. Deitel, Paul J. Deitel, and David R. Choffnes, "Operating Systems", Prentice Hall, Third edition,2003.

R2: William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.

R3: Gary J. Nutt, "Operating Systems: A Modern Perspective", Addison-Wesley, Second edition,2001.

Web links and Video Lectures (e-Resources):

1. https://web.cs.wpi.edu/~cs3013/c07/
2. http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/
3. http://www.cse.iitd.ac.in/~sbansal/os/
4. https://archive.nptel.ac.in/courses/106/105/106105214/

CO-PO & PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1	2	-	1	-	1	-	-	-	-	-	-	-	2
CO2	2	2	1	1	-	-	-	-	-	-	-	-	2
CO3	2	2	1	1	-	-	-	-	-	-	-	-	2
CO4	2	3	1	1	-	-	-	-	-	-	-	-	2
CO5	2	3	1	1	2	-	-	-	-	-	-	-	2
AVG	2	2	1	0.8	0.6	-	-	-	-	-	-	-	2

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

DATABASE MANAGEMENT SYSTEMS

CSE (ICB)

Course Code:	25UICT43	**Course Type:**	PC
Teaching Periods / Week (L:T:P):	3:0:0	**Credit:**	3
Total Teaching Periods:	45	**CAM+ ESE Mark:**	40+60=100
Teaching Department:	CSE(ICB)		

Course Objectives:

To learn the basic concepts and the applications of database systems, SQL Queries and Normalization.

Unit 1	**DATABASE SYSTEM**	**Periods:9**

Applications, Purpose of Database Systems, View of Data – Data Abstraction –Instances and Schemas – Database Languages – database Access for applications Programs –Database Users and Administrator – Transaction Management – Database Architecture – Storage Manager – the Query Processor. Data Models: Introduction to the Relational Model – Structure – Database Schema, Keys – Schema Diagrams. Database design– Other Models, ER diagrams – ER Model - Entities, Attributes and Entity sets – Relationships and Relationship sets.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 2	**RELATIONAL ALGEBRA**	**Periods:9**

Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple Relational Calculus (TRC) – Domain relational calculus (DRC). Overview of the SQL Query Language – Basic Structure of SQL Queries, Set Operations, Aggregate Functions – GROUPBY – HAVING, Nested Sub queries, Views, Triggers, Procedures.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Unit 3	**NORMALIZATION**	**Periods:9**
Introduction, Non loss decomposition and functional dependencies, First, Second, and third normal forms – dependency preservation, Boyce/Codd normal form. Higher Normal Forms - Introduction, Multi-valued dependencies and Fourth normal form, Join dependencies and Fifth normal form		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Unit 4	**TRANSACTION CONCEPT**	**Periods:9**
Transaction State- Implementation of Atomicity and Durability – Concurrent Executions – Serializability- Recoverability – Implementation of Isolation – Testing for serializability- Lock –Based Protocols – Timestamp Based Protocols Validation- Based Protocols – Multiple Granularity.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Unit 5	**RECOVERY AND ATOMICITY**	**Periods:9**
Log – Based Recovery – Recovery with Concurrent Transactions – Check Points - Buffer Management – Failure with loss of nonvolatile storage.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Total		**Periods: 45**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study, Students' performance in continuous Assessment / Student Presentations, Model Exam.

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Demonstrate the basic elements of a relational database management system

CO2: Understand to identify the data models for relevant problems

CO3: Understand to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data

CO4: Apply normalization for the development of application software's

CO5: Ability to design and develop a large database with optimal query processing

Textbooks:

T1: Database System Concepts, Silberschatz, Korth, McGraw hill, Sixth Edition.(All UNITS except III)

T2: Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TATAMcGrawHill 3rd Edition.

References:

R1: Fundamentals of Database Systems, Elmasri Navathe Pearson Education.

R2: An Introduction to Database systems, C.J. Date, A.Kannan, S.Swami Nadhan, Pearson, Eight Edition for UNIT III.

Web links and Video Lectures (e-Resources):

1. https://www.geeksforgeeks.org/dbms/

2. https://onlinecourses.nptel.ac.in/noc22_cs51/preview

CO-PO& PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	1	1	-	-	-	-	-	-	-	-	
CO2	2	2	1	1	-	-	-	-	-	-	-	-	
CO3	2	2	1	1	-	-	-	-	-	-	-	-	
CO4	2	3	1	1	-	-	-	-	-	-	-	-	
CO5	2	3	1	1	-	-	-	-	-	-	-	-	
AVG	2	2.4	1	1									

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

BLOCKCHAIN TECHNOLOGY

CSE (ICB)

Course Code:	25UICT44	**Course Type:**	PC
Teaching Periods / Week (L:T:P):	3:0:0	**Credit:**	3
Total Teaching Periods:	45	**CAM+ ESE Mark:**	40+60=100
Teaching Department:	CSE (ICB)		

Course Objectives:

- To understand the fundamentals of distributed systems and blockchain architecture.
- To explore cryptographic mechanisms used in blockchain systems.
- To analyze Bitcoin and Ethereum platforms.
- To study consensus algorithms and smart contract execution.
- To examine recent trends and enterprise applications of blockchain technology.

Unit 1	**INTRODUCTION**	**Periods: 9**

Distributed systems, blockchain systems, characteristics of blockchain, elements of blockchain, blockchain architecture and structure, Merkle tree, working of blockchain, types of blockchain, blockchain ecosystem, challenges and applications, consensus problem, Nakamoto consensus in permissionless peer-to-peer networks, types of consensus algorithms, asynchronous Byzantine agreement, tiers of blockchain technology.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, ICT Tools, Group Discussion
	RBT Level: Understand

Unit 2	**CRYPTOGRAPHIC FUNDAMENTALS**	**Periods: 9**

Cryptographic primitives, public key cryptography, hashing overview, cryptographic algorithms, SHA-256 ,elliptic curve cryptography, Hyperledger introduction and framework, public and private ledgers, identities and policies, membership and access control, channels, transaction validation.

Teaching Learning Process	**Pedagogy:** Lecture, Hands-on Practice, Case Analysis
	RBT Level: Apply

Unit 3	**BITCOIN**	**Periods: 9**

Introduction to Bitcoin, mining pools, elements of Bitcoin, transaction life cycle, transaction fees and data structure, types of transactions (P2PKH, P2SH, Multisig), transaction verification, Bitcoin network, wallets, Bitcoin payments, alternative coins.

Teaching Learning Process	**Pedagogy:** Lecture, Seminar, Practical Demonstration
	RBT Level: Apply

Unit 4	ETHEREUM	Periods: 9
Introduction to Ethereum, components, Turing completeness, accounts and types of accounts, Ethereum currency, wallets, Ethereum Virtual Machine (EVM) architecture, instruction set, state, gas mechanism, oracles, Ethereum framework – Truffle.		
Teaching Learning Process	**Pedagogy:** Lecture, Hands-on Coding, Project-Based Learning	
	RBT Level: Apply	
Unit 5	**BLOCKCHAIN RECENT TRENDS**	**Periods: 9**
Blockchain implementation challenges, business model challenges, zero-knowledge proofs, attacks on blockchain (Sybil attack, selfish mining, 51% attack), Algorand, sharding-based consensus algorithms, enterprise applications such as cross-border payments, KYC, food security.		
Teaching Learning Process	**Pedagogy:** Seminar, Case Study, Analytical Discussion	
	RBT Level: Apply	
Total		**Periods: 45 Hrs**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study
Students' performance in continuous Assessment / Student Presentations, Model Exam

After Successful completion of this course, the student should be able to

Course Outcomes:

CO1: Explain the fundamentals of blockchain architecture and distributed systems.
CO2: Apply cryptographic techniques in blockchain systems.
CO3: Analyze Bitcoin transaction mechanisms and network operations.
CO4: Develop and evaluate smart contracts using Ethereum platform.
CO5: Examine recent blockchain advancements and enterprise applications.

Textbooks:

T1: Imran Bashir, *Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained*, Packt Publishing, 2nd Edition, 2018.
T2: Melanie Swan, "Block Chain: Blueprint for a New Economy", O Reilly, 1st Edition – 2015.
T 3: Daniel Drescher, *Blockchain Basics: A Non-Technical Introduction in 25 Steps*, Apress, 1st Edition, 2017.

References:

R1: Anshul Kaushik, *Blockchain and Cryptocurrencies*, Khanna Publishing House, Delhi, 2018.
R2: Andreas M. Antonopoulos and Gavin Wood, *Mastering Ethereum: Building Smart Contracts and DApps*, O'Reilly Media, 1st Edition, 2018.
R3: Arshdeep Bahga and Vijay Madisetti, *Blockchain Applications: A Hands-On Approach*, VPT Publications, 2017.

Web links and Video Lectures (e-Resources):

1. **Blockchain and its Applications**, NPTEL Course
   Available at: https://nptel.ac.in/courses/106104220

CO-PO& PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1	3	2	1	1	-	-	-	-	-	-	2	2	1
CO2	3	2	-	1	-	-	-	-	-	-	2		-
CO3	2	2	1	1	-	-	-	-	-	-	2	2	1
CO4	2	2	3	2	3	-	-	-	1	-	2	3	3
CO5	2	3	2	2	1	1	1	1	-	-	3	2	2
AVG	2.4	2.2	1.4	1.4	0.8	0.2	0.2	0.2	0.2		2.2	2.2	1.4

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

ORGANIZATIONAL BEHAVIOR			
(Common to ICB)			
Course Code:	25UHST41	**Course Type:**	HS
Teaching Periods / Week (L:T:P):	3:0:0	**Credit:**	3
Total Teaching Periods:	45	**CAM+ ESE Mark:**	40+60=100
Teaching Department:	CSE(ICB)		

Course Objectives:

To learn organizational behaviour, management practices and solving organizational challenges to understand the important issues pertaining to individual.

Unit 1	**FOCUS AND PURPOSE**	**Periods:9**

Definition, need and importance of organizational behaviour – Nature and scope – Frame work – Organizational behaviour models.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 2	**INDIVIDUAL BEHAVIOUR**	**Periods:9**

Personality, types, Factors influencing personality, Theories – Learning, Types of learners, The learning process, Learning theories – Organizational behavior modification, Misbehaviour, Types, Management Intervention- motions Emotional Labour, Emotional Intelligence, Theories- Attitudes, Characteristics, Components, Formation, Measurement Values- Perceptions, Importance, Factors influencing perception, Interpersonal perception, Impression Management Motivation, Importance, Types – Effects on work behavior

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 3	**GROUP BEHAVIOUR**	**Periods:9**

Organization structure – Formation – Groups in organizations, Influence, Group dynamics – Emergence of informal leaders and working norms, Group decision making techniques, Team building, Interpersonal relations, Communication – Control.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 4	**LEADERSHIP AND POWER**	**Periods:9**

Meaning, Importance, Leadership styles – Theories, Leaders Vs Managers – Sources of power, Power centers – Power and Politics.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 5	**DYNAMICS OF ORGANIZATIONAL BEHAVIOUR**	**Periods:9**

Organizational culture and climate, Factors affecting organizational climate, Importance- Job satisfaction, Determinants, Measurements, Influence on behavior- Organizational change, Importance, Stability Vs Change , Proactive Vs Reaction change, the change process, Resistance to change, Managing change- Stress, Work Stressors, Prevention and Management of stress, Balancing work and Life- Organizational development, Characteristics, objectives.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT

	RBT Level: Apply
Total	**Periods: 45**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study, Students' performance in continuous Assessment / Student Presentations, Model Exam.

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: To analyze the inter personnel communication process to increase their effectiveness
CO2: To evaluate the development of basic conflict resolutions
CO3: To examine what makes an organization, how organization evolve and what makes them effective
CO4: To appraise their ability to manage, lead and work with other people in an organizational setting
CO5: To understand the organizational behaviour in dynamics.

Textbooks:

T1: Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, "Essentials of Organizational Behaviour", Pearson, 2019.

References:

R1. K. Aswathappa, "Organizational Behavior", Himalaya Publishing House, 2018.
R2. Richard L, "Organization Theory and Design", South Western College Publishing, 11th Edition, 2012.
R3. S.TrevisCerto, "Modern Management Concepts and Skills", Pearson Education, 2018.

Web links and Video Lectures (e-Resources):

1. Understanding Organizational Behaviour: https://nptel.ac.in/courses/110105033
2. Organizational Behaviour: https://nptel.ac.in/courses/110106145
3. Organizational Behaviour - II: https://nptel.ac.in/courses/110105154

CO-PO& PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3			-	-	-	-	-	-	-	-	-
CO2	2	3			2	-	-	-	-	-	-	-	-
CO3	3	2			-	-	2	-	-	-	-	-	-
CO4	3				2	-	2	-	-	-	-	-	-
CO5	3	2			2	-	2	-	-	-	-	-	-
AVG	2.6	2			1.2		1.2						

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

INDUSTRIAL IOT (II0T)

(Common to)

Course Code:	25UICI45	**Course Type:**	PC
Teaching Periods/Week (L:T:P):	3:0:2	**Credit:**	4
Total Teaching Periods:	**75 (Theory: 45, Practical: 30)**	**CAM+ ESE Mark:**	**50+50=100**
Teaching Department:	CSE (ICB)		

Course Objectives:

To impart knowledge on Internet of Things concepts, system architecture, communication protocols, IoT hardware platforms, cloud integration, and design challenges in real-time IoT systems.

Unit 1	INTERNET OF THINGS	Periods: 15

IoT definition, importance of IoT, applications of IoT, IoT architecture, working of sensors and actuators, sensor calibration, study of different sensors : light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, DHT11 temperature and humidity sensor, motion detection sensors, Bluetooth sensors, level sensors, USB sensors, embedded sensors, ultrasonic distance measurement sensor.

Practical :

1. Implement an IoT-based sensor interfacing and calibration system using Arduino/Raspberry Pi to acquire data from light sensor, thermistor-based temperature sensor, voltage sensor, DHT11 temperature and humidity sensor, and ultrasonic distance sensor, and analyze ADC and DAC operations.
2. Design a smart environment monitoring application using motion detection sensor, temperature and humidity sensor, ultrasonic sensor, and Bluetooth module to demonstrate real-time data acquisition and wireless communication in an IoT system.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 2	IOT COMMUNICATION PROTOCOLS AND DEVICE INTERFACING	Periods: 15

UART communication protocol, I2C protocol device interfacing and decoding of signal, SPI protocol device interfacing and decoding of signal, Wi-Fi and router interfacing, Ethernet configuration, Bluetooth study and analysis of data flow, Zigbee interfacing and study of signal flow.

Practical:

1. Study and demonstrate basic serial communication by sending and receiving data using UART, I2C, and SPI protocols between a microcontroller and simple devices, and observe how data is transferred in each protocol.
2. Connect an IoT device to the internet using Wi-Fi and Bluetooth, send sensor data to a mobile or computer, and observe how data flows through Wi-Fi, Ethernet, Bluetooth, and Zigbee communication methods.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit3	ARDUINO AND RASPBERRY PI FOR IOT APPLICATIONS	Periods: 15

Introduction to Arduino and Raspberry Pi, installation, interfaces (Serial, SPI, I2C), Python programming with Raspberry Pi focusing on interfacing external gadgets, controlling output, reading input from pins. Controlling hardware using LED, buzzer, switching high power devices with transistors, controlling AC power devices with relays, servo motor control, DC motor speed control, unipolar and bipolar stepper motors.

Practical:

1. Get started with Arduino and Raspberry Pi by installing the required software, understanding basic interfaces (Serial, SPI, I2C), and writing a simple program to read input from switches and control outputs like LED and buzzer.
2. Control real-world devices using a Raspberry Pi/Arduino by switching high-power loads through transistors and relays, and operating motors such as servo motor, DC motor, and stepper motor to understand basic automation.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit4	INTRODUCTION TO INDUSTRIAL INTERNET	Periods: 15

Innovation and IIoT – Intelligent Devices – Industrial Internet – Health care –Oil and Gas Industry – Smart Office – Logistics – IoT Innovations in Retail. Google Cloud IoT architecture, AWS IoT architecture, Microsoft Azure IoT architecture, open-source cloud services, initial state IoT dashboard and cloud services.

Practical:

1. Create a basic IoT cloud setup to send sensor data from an IoT device to a cloud platform through a gateway using Wi-Fi, and display the data on a simple cloud dashboard.
2. Send IoT sensor data to a cloud platform and configure web services such as email or SMS alerts, and observe how data is stored, tracked, and visualized using a cloud dashboard.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit5	**IIOT REFERENCE ARCHITECTURE**	**Periods: 15**

Industrial Internet Architecture Framework – Functional Viewpoint – Operational Domain, Information Domain, Application Domain, Business Domain – Implementation View point – Architectural Topology – Three Tier Topology – Data Management.

Practical:

1. Interface an industrial-type sensor (temperature, vibration, gas, etc.) with a microcontroller.
2. Simulate industrial data acquisition and observe how raw data is captured and transmitted to the gateway.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Total	**Periods: 75**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study
Students' performance in continuous Assessment / Student Presentations, Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Understand IoT concepts and system architecture.
CO2: Analyze communication protocols used in IoT systems.
CO3: Interface and control IoT hardware and sensors.
CO4: Apply IoT technologies in industrial domains such as healthcare, oil & gas, logistics, smart offices, and retail.
CO5: Identify Analyze the Three-Tier topology and architectural structures used in Industrial IoT systems.

Textbooks:

T1. S. Misra, A. Mukherjee, and A. Roy, Introduction to IoT. Cambridge University Press, 2020
T2. S. Misra, C. Roy, and A. Mukherjee, Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.2020
T3. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies Sensors for the Internet of Things Businesses & Market Trends 2014 -2024',Yole Development Copyrights ,2014
T4. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015

References:

R1: Olivier Hersent – The Internet of Things: Key Applications.
R2: Dieter Uckelmann – Architecting the Internet of Things.

WeblinksandVideoLectures(e-Resources):

1. https://www.coursera.org/learn/industrial-internet-of-things
2. https://onlinecourses.nptel.ac.in/noc25_cs43/preview

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1	3	2	–	–	1	–	–	–	–	–	–	2	1
CO2	2	3	–	2	2	–	–	–	–	–	–	2	2
CO3	2	2	3	2	3	–	–	–	–	1	–	3	2
CO4	2	2	2	3	3	–	–	–	–	1	2	2	3
CO5	2	3	2	3	2	1	1	1	–	1	2	2	2
AVG	2.2	2.4	1.4	2	2.2	0.2	0.2	0.2		0.6	0.8	2.2	2
1 – Low, 2 – Medium, 3 – High,'-' – No correlation													

OPERATING SYSTEMS LAB			
Course Code:	25UICP41	**Course Type:**	PC
Teaching Periods / Week (L:T:P):	0:0:2	**Credit:**	1
Total Teaching Periods:	30	**CAM + ESE Mark:**	60+40=100
Teaching Department:	CSE(ICB)		

Course Objectives:

The program execution and requirements processes, threads, memory management, files and to impart Hands-on practical experience in different OS concepts.

Practical Exercises: **Periods:30**

LIST OF EXPERIMENTS

1. Installation of windows operating system.
2. Illustrate
   a. UNIX commands
   b. Shell Programming using System Calls :fork(), exit(), getpid(), wait(), close(), open(), read() ,write(), grep().
3. Write C programs to implement the various CPU Scheduling Algorithms
4. Implement mutual exclusion by Semaphore
5. Write C programs to avoid Deadlock using Banker's Algorithm
6. Write C programs to implement the following Memory Allocation Methods
   a. First Fit b. Worst Fit c. Best Fit
7. Write C programs to implement the various Page Replacement Algorithms
8. Write C programs for the implementation of various disk scheduling algorithms
9. Install any guest operating system like Linux using VMware.

SOFTWARE REQUIRED

1. **Operating Systems**: Microsoft Windows 10/11, Ubuntu Linux / Any Linux Distribution
2. **Virtualization Software**: VMware Workstation / VMware Player, Alternative: Oracle VirtualBox
3. **Compiler and Programming Tools**: GCC Compiler (GNU C Compiler), Turbo C / Code::Blocks / Dev-C++ (for C programming in Windows), Visual Studio Code (optional)
4. **UNIX / Linux Shell Environment**: Bash Shell, Terminal (Linux), Text Editors
5. **System Utilities**: Grep, fork(), wait(), open(), read(), write() system call support (via Linux environment)

References:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, *Operating System Concepts*, 10th Edition, Wiley, 2018.

2. William Stallings, *Operating Systems: Internals and Design Principles*, 9th Edition, Pearson, 2018.
3. Andrew S. Tanenbaum, Herbert Bos, *Modern Operating Systems*, 4th Edition, Pearson, 2015.
4. Sumitabha Das, *UNIX Concepts and Applications*, 4th Edition, McGraw Hill, 2017.
5. Yashavant P. Kanetkar, *Let Us C*, BPB Publications (for C programming practice).
6. Brian W. Kernighan, Dennis M. Ritchie, *The C Programming Language*, 2nd Edition, Pearson.

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Install and configure operating systems and virtual machines for practical experimentation.
CO2: Demonstrate UNIX commands and implement shell programs using system calls such as fork(), wait(), open(), read(), and write().
CO3: Implement CPU scheduling algorithms and synchronization techniques using semaphores to solve mutual exclusion problems.
CO4: Develop C programs to handle deadlock avoidance using Banker's algorithm and implement various memory allocation and page replacement techniques.
CO5: Implement disk scheduling algorithms and analyze their performance in operating system environments.

CO–PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	1	-	1	-	-	-	-	-	-		
CO2	2	2	1	1	-	-	-	-	-	-	-		
CO3	2	2	1	1	-	-	-	-	-	-	-		
CO4	2	3	1	1	-	-	-	-	-	-	-		
CO5	2	3	1	1	2	-	-	-	-	-	-		
AVG	2	2	1	0.8	0.6								

1–Low, 2–Medium, 3–High, '-' –No correlation

DATABASE MANAGEMENT SYSTEM LAB

Course Code:	25UICP42	**Course Type:**	PC
Teaching Periods / Week (L:T:P):	0:0:2	**Credit:**	1
Total Teaching Periods:	30	**CAM + ESE Mark:**	60+40=100
Teaching Department:	CSE(ICB)		

Course Objectives:

To provide practical knowledge and hands-on experience on creating and manipulating databases using SQL and PL/SQL, and to reinforce the understanding of relational database concepts.

Practical Exercises: **Periods:30**

LIST OF EXPERIMENTS

1. Introduction to SQL: DDL and DML commands (CREATE, INSERT, UPDATE, DELETE, ALTER, DROP)

2. Querying with SELECT, WHERE, ORDER BY, DISTINCT

3. Aggregate Functions and GROUP BY, HAVING clauses

4. JOIN operations: INNER JOIN, LEFT JOIN, RIGHT JOIN, FULL OUTER JOIN

5. Nested and Correlated Subqueries

6. Set Operations: UNION, INTERSECT, MINUS

7. Creation and usage of Views and Indexes

8. Writing and executing Stored Procedures and Functions

9. Working with Triggers

10. Implementing Cursors in PL/SQL

11. Exception Handling and Control Structures in PL/SQL

12. Database design using ER diagrams and normalization

13. Mini Project: Design and implementation of a real-time database application

Tools Used

MySQL / Oracle / PostgreSQL / SQLite, MySQL Workbench / SQL Developer / pgAdmin

References:

1. Silberschatz, Korth. *Database System Concepts*, 6th Edition, McGraw Hill
2. Raghu Ramakrishnan, Johannes Gehrke. *Database Management Systems*, 3rd Edition, Tata McGraw Hill.
3. Elmasri & Navathe. *Fundamentals of Database Systems*, Pearson Education.

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Create and manipulate database tables using SQL commands
CO2: Formulate complex queries using joins, subqueries, and set operations
CO3: Implement views, indexes, triggers, and stored procedures
CO4: Develop PL/SQL blocks using functions, loops, and exception handling.
CO5: Design and develop a mini project applying normalization and query optimization

CO–PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1		3				3	2	2	2	2	2		3
CO2	2	1	1	1	1	1	1	1					1
CO3	2	2	2								2		
CO4	2		2					2			2		
CO5	2	2	2						2		2		
AVG	1.6	1.6	1.4	0.2	0.2	0.8	0.6	1	0.8	0.4	1.6		0.8

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

PROFESSIONALISM AND BASIC APTITUDE			
(Common to)			
Course Code:	**25UPCE41**	**CourseType:**	**EEC**
Teaching Periods/Week (L:T:P:SL):	0 : 0 : 2	**Credit:**	**0 (Zero Credit)**
Total Teaching Periods:	30	**CAM Mark:**	**Internal Assessment**
Teaching Department:	Placement Cell		

Course Objectives:

To impart knowledge on communication, teamwork, and time management to behave professionally and work well with others , problem-solving and leadership skills

Unit 1	**ATTITUDE, ADAPTABILITY, VALUES, AND LEARNING IN PROFESSIONAL LIFE**	**Periods: 6**

Attitude: Positive thinking and optimism - Growth mindset vs. fixed mindset - Self-motivation and initiative - Managing negative attitudes and stress

Adaptability: Change management - Cognitive flexibility - Continuous learning - Workplace diversity adjustment

Values: Personal vs. professional values - Integrity and honesty - Respect and empathy - Ethical decision-making

Perception and learning: Sensory perception and attention - Factors affecting perception - Types of learning - Learning styles and strategies.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 2	**LEADERSHIP, CREATIVITY, AND PERSONAL EXCELLENCE**	**Periods: 6**

Leadership: Leadership styles-Effective communication-Decision-making-Team motivation

Creativity: Brainstorming-Innovation-Problem-solving-Imagination Reaching your potential: Self-awareness - Goal setting - Time management - Continuous improvement

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 3	**FUNDAMENTALS OF NUMBER SYSTEM AND FACTORIAL-BASED PROBLEM SOLVING**	**Periods: 6**

General Aptitude

Number System: Types of Numbers - Prime and Composite Numbers -Place Value and Face Value - Conversions between Number Bases

HCF & LCM: Prime Factorization Method - Division Method - Relationship between HCF and LCM - Word Problems on HCF and LCM

Factorial Concepts: Definition and Notation of Factorial - Factorial Identities - Factorial in Permutations and Combinations - Trailing Zeros in Factorials

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 4	**FUNDAMENTALS OF QUANTITATIVE APTITUDE: PERCENTAGES, PROFIT–LOSS, AND INTEREST CALCULATIONS**	**Periods: 6**

Quantitative Aptitude – 1

Profit and Loss: Cost Price and Selling Price - Profit and Loss Percentage - Marked Price and Discount - Successive Transactions

Percentage, Ratio and Proportion: Percentage Basics and Calculations - Ratio Simplification and Comparison - Direct and Inverse Proportion - Percentage to Ratio Conversions

Simple Interest and Compound Interest: Simple Interest Formula and Calculation - Compound Interest Basics - Difference between SI and CI - Time and Rate-Based Problems

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 5	**PROBABILITY, COUNTING TECHNIQUES, AND WORK–TIME APPLICATIONS**	**Periods: 6**

Probability: Basic Probability - Sample Space - Independent and Dependent Events - Complementary Events

Permutation and Combination: Fundamental Principle of Counting - Permutations - Combinations - Circular Permutations

Pipe and Cistern: Inlet and Outlet Pipes - Filling and Emptying Time - Pipes Working Together - Alternate Inlet–Outlet Problems

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Total	**Periods: 30**

Suggested Activities and Evaluation Methods:

Group Discussions, Aptitude Practice Sessions, Case Study Analysis Online Quizzes & Practice Tests Students' performance in continuous Assessment / Student Presentations, Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

CO1: Apply positive attitude, adaptability, ethical values, and effective perception and learning strategies for personal and professional development

CO2: Build leadership, creativity, and self-awareness to communicate effectively, solve problems, and achieve continuous growth

CO3: Apply number system concepts, HCF & LCM methods, and factorial principles to solve quantitative problems efficiently

CO4: Calculate profit/loss, percentage, ratio, proportion, and interest problems to make informed financial and quantitative decisions

CO5: Solve problems on probability, permutations, combinations, and pipe-cistern scenarios using logical and mathematical reasoning

Textbooks:

T1: Quantitative aptitude for competitive exams by S.Chand, Dr.R.S.Aggarwal

T2: Quantitative aptitude for CAT by Arun Sharma, Tata McGrew Hill

References:

R1: Rapid Quantitative Aptitude by Er.Deepak Agarwal and Mr.D.PGupta

R2: Numerical Ability and Quantitative aptitude for Competitive examinations by P.K.Mittal**.**

Web links and Video Lectures(e-Resources):

1. https://www.teachbritannica.com/lesson-minis/professional-skills-in-action-lib/

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1		3				3	2	2	2	2	2		

CO2	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**					
CO3	**2**	**2**	**2**								**2**		
CO4	**2**		**2**					**2**			**2**		
CO5	**2**	**2**	**2**						**2**		**2**		
AVG	**1.6**	**1.6**	**1.4**	**0.2**	**0.2**	**0.8**	**0.6**	**1**	**0.8**	**0.4**	**1.6**		
1 – Low, 2 – Medium, 3 – High, '-' – No correlation													

ENTREPRENEURIAL SKILLS AND CONCEPTS			
Common to all branches			
Course Code:	25UMCC41	**Course Type:**	MCC
Teaching Periods/Week (L:T:P:SL):	2 : 0 : 0	**Credits:**	0 (Zero Credit)
Total Teaching Periods:	30	**CAM Mark:**	**Pass / Fail (Satisfactory / Unsatisfactory)**
Teaching Department:	MBA		
Prerequisite:	Knowledge in Computing Skills		

Course Objectives:

1. To create a learning experience to enable the students to face the challenges of starting new ventures.
2. To prepare the students for starting new businesses and the skills for managing existing family businesses.
3. To gain knowledge in business plan preparation by using various sources of finance and to become entrepreneurs in different fields.

UNIT 1	**6**

Introduction to Entrepreneurship: Concept, Significance, Theories and Models of Entrepreneurship Development - Traits and Characteristics, Functions, Types - Entrepreneurial Processes - Problems - Capacity building - Risk Analysis - Scope of Entrepreneurship in India.

UNIT 2	**6**

Entrepreneurial Environment for Start-up Enterprises: Significance - Internal and External Environment forces - Entrepreneurial Culture and Society - EDP: Objectives, Features, Steps and Issues in EDP Process - Role of Institutions and Government in EDP.

UNIT 3	**6**

Developing Start-up Enterprises: Developing a Business Idea: Opportunity, Methods, and Creativity - Deciding to setup a Start-up Enterprise: Effectual Reasoning, Forms, Size and Location - Entrepreneurial skills and Competences - Feasibility Study: Market Survey, Techno-Economic feasibility and Preparing Project Report - Financial Requirements.

UNIT 4	**6**

Steps in Promoting Start-up Micro-Enterprises: Entrepreneurial Success in Rural Areas - Establishing Entrepreneurial System - Assistance and Sickness - Institutions Supporting and providing Financial Assistance: SSI, KVIC, MSME-DO, NSIC, NIESBUD, IIE, SIDC, SDIs, DICs NGOs, Industry Association, SIDBI and SFCs - Self-help Groups - Technological Up-gradation - Challenges.

UNIT 5	**6**

Managing a New or Start-up Enterprise: Management - HRM, Marketing, Financial Management, Production and Operations Management in a New or Start-up Enterprise

Total Periods: 30 Hrs

Course Outcomes:

After successful completion of this course, the student should be able to:

CO1: Explain the concepts, theories, characteristics, and scope of entrepreneurship.

CO2: Analyze the entrepreneurial environment, EDP process, and institutional support for start-up enterprises.

CO3: Develop business ideas and prepare feasibility studies and project reports for start-up enterprises.

CO4: Examine the promotion and support systems available for micro and rural enterprises.

CO5: Apply management principles in HRM, marketing, finance, production, and operations for start-up enterprises.

Textbooks:

T1: Saravanavel, P, "Entrepreneurial Development", Margham Publication, 2020.

T2: Prasanna Chandra, "Protect Preparation, Appraisal, Implementation", Tata McGraw Hill, 2019.

References:

R1: Srinivasan, N.P. & Gupta, C.B, "Entrepreneurial Development", Sultan Chand & Sons, 2017.

R2: Barringer, Bruce R, "Entrepreneurship: Successfully launching new ventures", Pearson Education, 2018.

R3: Drucker, Peter F. and Peter Ferdinand Drucker, "Innovation and Entrepreneurship: Practice and Principles", 2017.

CO-PO & PSO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2
CO1	2	-	1	-	1	-	-	-	-	1	-	-	
CO2	2	2	1	1	-	-	-	-	-	1	-	-	
CO3	2	2	1	1	-	-	-	-	-	1	-	-	
CO4	2	3	1	1	-	-	-	-	-	1	-	-	
CO5	2	3	1	1	2	-	-	-	-	1	-	-	
AVG	2	2	1	0.8	0.6	-	-	-	-	1	-	-	

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

HONOR COURSES

HONOR COURSES						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
THEORY						
1.	25UICH01	Malware Analysis and Mitigation Techniques	3	1	0	4
2.	25UICH02	Digital Forensics and Investigation Techniques	3	1	0	4
3.	25UICH03	Cyber Threat Intelligence and Risk Management	3	1	0	4
4.	25UICH04	Blockchain Security and Performance	3	1	0	4
5.	25UICH05	Blockchain and FinTech	3	1	0	4

MALWARE ANALYSIS AND MITIGATION TECHNIQUES			
Course Code:	25UICH01	**Course Type:**	HC
Teaching Periods / Week (L:T:P):	3:1:0	**Credits:**	4
Total Teaching Periods:	45	**CAM+ ESE Mark:**	100
Teaching Department:	CSE(ICB)		

Course Objectives:

The objective of this course is to perform static and dynamic binary analysis using industry-standard tools, develop advanced detection systems using machine learning and heuristics, and deploy robust endpoint and network security controls to counter sophisticated cyber attacks.

Unit 1	**INTRODUCTION TO MALWARE**	**Periods:9**

Introduction to Malware: Definition and History – Types of Malware: Viruses, Worms, Trojans, Ransomware, Spyware, Adware, Rootkits, Botnets – Malware Infection Vectors – Malware Lifecycle – Malware Attack Objectives – Overview of Malware Analysis Approaches

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT, Case Study
	RBT Level: Apply

Unit 2	**STATIC AND DYNAMIC MALWARE ANALYSIS**	**Periods: 9**

Static Malware Analysis: File Hashing – Strings Extraction – PE Header Analysis – Disassembly Techniques. Dynamic Malware Analysis: Sandboxing – Behavioural Analysis – Process and Registry Monitoring – Network Traffic Analysis – Analysis Tools: IDA Pro, OllyDbg, Wireshark, Process Monitor

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT

	RBT Level: Apply	
Unit 3	**MALWARE DETECTION AND CLASSIFICATION**	**Periods: 9**
Malware Detection: Signature-Based Detection – Heuristic Detection – Behaviour-Based Detection – Anomaly Detection. Malware Classification: Machine Learning Approaches – Feature Extraction – Classification Algorithms – Anti-Analysis Techniques: Obfuscation, Packing, Encryption, Anti-Debugging		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Unit 4	**MALWARE MITIGATION STRATEGIES**	**Periods: 9**
Malware Mitigation: Prevention Strategies – Endpoint Protection Platforms – Antivirus and Anti-Malware Solutions – Intrusion Detection and Prevention Systems – Patch Management – Application Whitelisting – Network Segmentation – Email and Web Filtering – Incident Response to Malware Attacks		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Unit 5	**ADVANCED TOPICS IN MALWARE ANALYSIS**	**Periods: 9**
Advanced Malware Analysis: Rootkit and Bootkit Analysis – Ransomware Analysis and Recovery – APT (Advanced Persistent Threat) Malware – Mobile Malware Analysis – Fileless Malware – Malware Forensics and Reporting – Legal and Ethical Issues in Malware Analysis – Threat Intelligence and Malware Sharing Frameworks (MISP, MITRE ATT&CK)		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Total		**Periods: 45**

Suggested Activities and Evaluation Methods:

Exercises, Quiz / MCQ (GATE-Oriented Questions), Projects, Student Presentations, Continuous Assessment, Model Examination.

Course Outcomes:

After successful completion of this course, the student should be able to:

- **CO1** Classify distinct types of malware based on their lifecycles, objectives, and infection vectors.
- **CO2** Apply static and dynamic analysis techniques to analyze malicious executable files and network traffic.
- **CO3** Develop signature-based and behavior-based detection models while identifying evasion and obfuscation strategies.
- **CO4** Deploy defensive mitigation strategies, security controls, and endpoint protections to neutralize active malware threats.
- **CO5** Investigate advanced persistent threats, mobile malware, and fileless attacks using threat intelligence and forensic frameworks.

Textbooks:

T1. Michael Sikorski and Andrew Honig, "Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software", No Starch Press, ISBN: 9781593272906, 2012.

T2. Abhijit Mohanta and Anoop Saldanha, "Malware Analysis and Detection Engineering: A Comprehensive Approach to Detect and Analyze Modern Malware", Apress, ISBN: 9781484261927, 2020.

T3. Monnappa K A, "Learning Malware Analysis: Explore the concepts, tools, and techniques to analyze and investigate Windows malware", Packt Publishing, ISBN: 9781788392501, 2018.

References:

R1. Mastering Malware Analysis, Alexey Kleymenov and Amr Thabet, Packt Publishing, ISBN: 9781838828288, 2022.

R2. Advanced Malware Analysis, Christopher C. Elisan, McGraw-Hill Education, ISBN: 9780071819749, 2015.

R3. The Malware Analyst's Cookbook: Tools and Techniques for Fighting Malicious Code, Michael Ligh, Steven Adair, Blake Hartstein, and Matthew Richard, Wiley, ISBN: 9780470613221, 2010.

Web links and Video Lectures (e-Resources):

1. NPTEL – https://nptel.ac.in/courses/106106129

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	2	-	-	-	-	1	1	2	2	1
CO2	3	2	1	2	2	-	-	2	2	2	2	2	2
CO3	3	3	2	2	2	-	-	2	2	2	2	3	2
CO4	2	2	2	3	3	-	-	2	2	2	3	3	2
CO5	2	2	2	3	3	-	-	-	3	3	3	3	3
AVG	**2.6**	**2.2**	**1.4**	**1.8**	**1.6**	-	-	-	**2.0**	**2.0**	**1.8**	**2.6**	**2.0**

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

DIGITAL FORENSICS AND INVESTIGATION TECHNIQUES

(Common to)

Course Code:	25UICH02	**Course Type:**	HC
Teaching Periods / Week (L:T:P):	3:1:0	**Credits:**	4
Total Teaching Periods:	45	**CAM+ ESE Mark:**	100
Teaching Department:	CSE(ICB)		

Course Objectives:

This course aims to systematically accumulate and analyze digital information used in civil administrative and criminal cases using digital forensics investigation

Unit 1	INTRODUCTION TO DIGITAL FORENSICS	Periods:9
Overview, preparing a digital forensics investigation, procedures for private sector investigations, conducting an investigation, physical requirements for digital forensics lab, basic forensic workstation		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Understand	
Unit 2	**DATA ACQUISITION AND PROCESSING DIGITAL EVIDENCE**	**Periods: 9**
Storage formats for digital evidence, Acquisition tools, validating and performing RAID, Digital evidence, preparing for a search, securing and storing digital evidence, Digital Hash, reviewing a case investigation		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Understand	
Unit 3	**DIGITAL FORENSICS TOOLS AND ITS ANALYSIS AND VALIDATION**	**Periods: 9**
Evaluation, software and hardware tools, data analyzing and validating, Addressing data hiding techniques, data compression, identifying unknown file formats		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Unit 4	**DIGITAL FORENSICS EVIDENCE AND ANALYSIS**	**Periods: 9**
Data Recovery, evidence collection, duplication and preservation of digital evidence. Verification and Autentication, identification of data and past events, Network forensics.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Unit 5	**REPORT WRITING AND EXPERT TESTIMONY IN DIGITAL INVESTIGATIONS**	**Periods: 9**
Inportance and types of reports, guidelines for writing reports, generating reports using forensics tool, preparing for testimony, Testifying in court, forensics evidence.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Total		**Periods: 45**
Suggested Activities and Evaluation Methods: Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study, Students' performance in continuous Assessment / Student Presentations, Model Exam.		
Course Outcomes:		

After Successful completion of this course, the student should be able to

- **CO1:** Understand the importance of digital forensics investigation and physical requirements.
- **CO2:** Understand digital evidence and acquisition tools with processing.
- **CO3:** Analyze**,** evaluate and validating digital acquisition tools and processing.
- **CO4:** Formulate the data recovery of digital evidence and network forensics.
- **CO5:** Understand the importance of reports, generating and testifying the evidence.

Textbooks:

T1. Bill Nelson, Amelia Phillips, Chris Steuart, *Guide to Computer Forensics and Investigations*. Sixth edition, Cengage

T2. John Vacca, *Computer Frensics: Computer Crime Scene Investigation*, Firewall media

References:

R1. Warren G. Kruse II and Jay G. Heiser, "*Computer Forensics: Incident Response Essentials*", Addison Wesley, 2002.

R2. Marjie T Britz, "*Computer Forensics and Cyber Crime: An Introduction*", Pearson Education, 2nd Edition, 2008.

Web links and Video Lectures (e-Resources):

1. https://esu.desire2learn.com/
2. https://cytrain.ncrb.gov.in/
3. https://www.ifsedu.in/cyber-forensics/

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	1	-	-	-	-	1	1	2	2
CO2	3	3	1	1	2	-	-	-	-	1	1	2	3
CO3	3	3	2	2	3	-	-	-	-	1	1	2	2
CO4	3	3	3	3	3	-	-	-	-	2	1	3	3
CO5	3	3	3	3	2	-	-	-	-	2	2	2	2
AVG	3.0	2.8	1.8	1.8	2.2					1.4	1.2	2.2	2.4

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

CYBER THREAT INTELLIGENCE AND RISK MANAGEMENT

(Common to)

Course Code:	25UICH03	**Course Type:**	HC
Teaching Periods / Week (L:T:P):	3:1:0	**Credits:**	4
Total Teaching Periods:	45	**CAM+ ESE Mark:**	100
Teaching Department:	CSE(ICB)		

Course Objectives:

To understand the fundamentals and lifecycle of cyber threat intelligence, to learn the sources and techniques of threat intelligence collection, to understand risk assessment and risk management frameworks, to study threat hunting and vulnerability management practices, and to gain knowledge of integrating threat intelligence with incident response.		
Unit 1	**INTRODUCTION TO CYBER THREAT INTELLIGENCE**	**Periods:9**
Overview of Cyber Threat Intelligence (CTI) - Need for CTI - Types of Threat Intelligence: Strategic, Operational, Tactical, Technical - Threat Intelligence Lifecycle: Planning & Direction, Collection, Processing, Analysis, Dissemination, Feedback - Threat Actors and their motivations - Advanced Persistent Threats (APT) - Cyber Kill Chain - MITRE ATT&CK Framework.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Understand	
Unit 2	**THREAT INTELLIGENCE COLLECTION AND SOURCES**	**Periods: 9**
Open Source Intelligence (OSINT) - Human Intelligence (HUMINT) - Technical Intelligence sources - Dark Web monitoring - Threat feeds and Indicators of Compromise (IOCs) - Structured Threat Information Expression (STIX) and Trusted Automated Exchange of Indicator Information (TAXII) - Threat Intelligence Platforms (TIPs) - Data collection and aggregation techniques.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Understand	
Unit 3	**RISK ASSESSMENT AND MANAGEMENT**	**Periods: 9**
Fundamentals of Risk Management - Risk Identification, Risk Analysis, Risk Evaluation - Qualitative and Quantitative risk assessment methods - Risk Matrix - Risk Treatment strategies: Avoidance, Mitigation, Transfer, Acceptance - Risk Management Frameworks: NIST RMF, ISO/IEC 27005, FAIR model - Business Impact Analysis.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Understand	
Unit 4	**THREAT HUNTING AND VULNERABILITY MANAGEMENT**	**Periods: 9**
Threat Hunting concepts and methodologies - Hypothesis-driven hunting - Vulnerability Assessment and Penetration Testing (VAPT) - Common Vulnerabilities and Exposures (CVE) - Common Vulnerability Scoring System (CVSS) - Patch management - Security Information and Event Management (SIEM) - User and Entity Behavior Analytics (UEBA).		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Understand	
Unit 5	**INCIDENT RESPONSE AND THREAT INTELLIGENCE SHARING**	**Periods: 9**
Incident Response lifecycle - Integration of CTI with Incident Response - Threat intelligence sharing communities and ISACs/ISAOs - Legal and ethical considerations in threat intelligence - Privacy issues - Building a Threat Intelligence program - Metrics for measuring CTI effectiveness..		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Understand	

Total	Periods: 45

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects (deploying a token/NFT contract), Quiz / MCQ (GATE-related questions), Hands-on Lab Exercises, Students' performance in Continuous Assessment / Student Presentations, Model Exam.

Course Outcomes:

After Successful completion of this course, the student should be able to

- **CO1:** To understand the fundamentals and lifecycle of cyber threat intelligence.
- **CO2:** To understand the various sources and techniques for threat intelligence collection.
- **CO3:** To understand risk assessment and risk management frameworks.
- **CO4:** To understand threat hunting and vulnerability management techniques.
- **CO5:** To understand incident response and threat intelligence sharing practices.

Textbooks:

T1. Henry Dalziel, "How to Define and Build an Effective Cyber Threat Intelligence Capability", Syngress, 2014.

T2. Recorded Future, "The Threat Intelligence Handbook", 2nd Edition, CyberEdge Group, 2019.

References:

R1. Douglas Landoll, "The Security Risk Assessment Handbook", 3rd Edition, CRC Press, 2021.

R2. 2. William Stallings, "Cryptography and Network Security: Principles and Practice", 8th Edition, Pearson, 2020.

Web links and Video Lectures (e-Resources):

1. Cyber Security and Privacy (Risk Management): https://onlinecourses.nptel.ac.in/noc23_cs127/preview

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	1	1	2	3
CO2	3	2	2	1	-	-	-	-	-	2	2	2	3
CO3	3	3	2	2	2	-	-	-	-	2	2	3	3
CO4	2	2	2	3	3	-	-	-	-	2	2	3	3
CO5	2	3	2	3	3	-	-	-	-	3	2	3	3
AVG	2.6	2.4	1.8	1.8	1.6					2.0	1.8	2.6	3.0

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

BLOCKCHAIN SECURITY AND PERFORMANCE

(Common to)

Course Code:	25UICH04	**Course Type:**	HC
Teaching Periods / Week (L:T:P):	3:1:0	**Credits:**	4
Total Teaching Periods:	45	**CAM+ ESE Mark:**	100
Teaching Department:	**CSE(ICB)**		

Course Objectives:

To understand blockchain fundamentals, security mechanisms, consensus protocols, performance evaluation techniques, scalability challenges, and real-world blockchain applications.		
Unit 1	**INTRODUCTION TO BLOCKCHAIN**	**Periods: 9**
Introduction to Blockchain: Evolution of Blockchain, Distributed Ledger Technology, Blockchain Architecture, Types of Blockchain (Public, Private, Consortium), Blockchain Components, Cryptographic Hash Functions, Merkle Trees, Blockchain Transactions, Blocks and Chains, Cryptocurrency Fundamentals, Bitcoin Architecture and Working.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Understand	
Unit 2	**BLOCKCHAIN SECURITY**	**Periods: 9**
Blockchain Security: Cryptography Basics, Public Key Cryptography, Digital Signatures, Wallet Security, Identity Management, Privacy and Anonymity, Security Threats in Blockchain, Double Spending Attack, Sybil Attack, Eclipse Attack, 51% Attack, Smart Contract Vulnerabilities, Blockchain Security Best Practices.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Unit 3	**CONSENSUS MECHANISMS AND SMART CONTRACTS**	**Periods: 9**
Consensus Mechanisms: Proof of Work (PoW), Proof of Stake (PoS), Delegated Proof of Stake (DPoS), Proof of Authority (PoA), Byzantine Fault Tolerance (BFT), Mining Process, Consensus Security Issues. Smart Contracts: Introduction, Ethereum Architecture, Solidity Basics, Decentralized Applications (DApps), Hyperledger Framework.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Unit 4	**BLOCKCHAIN PERFORMANCE AND SCALABILITY**	**Periods: 9**
Performance Metrics: Throughput, Latency, Resource Utilization, Scalability Challenges, Network Performance, Block Propagation Delay, Transaction Processing, Benchmarking Techniques, Layer-2 Solutions, Side Chains, Payment Channels, Sharding, Performance Optimization Strategies.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Unit 5	**APPLICATION LAYER**	**Periods: 9**
Risk Management in Blockchain: Security Risk Assessment, Threat Modeling, Risk Mitigation Strategies, Regulatory and Compliance Issues, Governance Models. Blockchain Applications: Supply Chain Management, Healthcare, Banking and Finance, Digital Identity, E-Governance, IoT Integration, Case Studies and Emerging Trends.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Total		**Periods: 45**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Blockchain Simulation Exercises, Smart Contract Development, Case Studies, Student Presentations, Continuous Assessment, Model Examination.

Course Outcomes:

After successful completion of this course, the student should be able to:

CO1: Explain blockchain architecture, distributed ledger technologies, and cryptocurrency fundamentals.

CO2: Analyze blockchain security mechanisms, cryptographic techniques, and common security attacks.

CO3: Apply consensus algorithms and develop smart contracts for blockchain-based applications.

CO4: Evaluate blockchain performance metrics, scalability issues, and optimization techniques.

CO5: Implement blockchain risk management practices and design blockchain solutions for real-world applications.

Textbooks:

T1. Mastering Blockchain, Packt Publishing, Latest Edition.

T2. Blockchain Basics, Apress Publications.

References:

R1. Blockchain Technology, Universities Press.

R2. Hands-On Blockchain with Hyperledger, Packt Publishing.

R3. Blockchain Revolution, Penguin Books.

R4. Introducing Ethereum and Solidity, Apress.

Web links and Video Lectures (e-Resources):

1. https://openlearning.mit.edu/
2. https://hyperledger-fabric.readthedocs.io/
3. https://ethereum.org/en/developers/docs

CO-PO& PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	1	-	-	-	-	1	1	2	3
CO2	3	3	1	2	2	-	-	-	-	1	2	2	3
CO3	3	3	3	2	3	-	-	-	-	2	2	3	3
CO4	2	3	2	3	3	-	-	-	-	2	2	3	2
CO5	2	2	2	3	3	-	-	-	-	3	2	3	2
AVG	**2.6**	**2.6**	**1.6**	**2.0**	**2.4**	-	-	-	-	**1.8**	**1.8**	**2.6**	**2.6**

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

BLOCKCHAIN AND FINTECH			
(Common to)			
Course Code:	25UICH05	**Course Type:**	HC
Teaching Periods / Week (L:T:P):	3:1:0	**Credits:**	4
Total Teaching Periods:	45	**CAM+ ESE Mark:**	100
Teaching Department:	CSE(ICB)		

Course Objectives:

This course aims to provide students with a comprehensive understanding of cryptocurrencies, decentralized finance (DeFi), decentralized markets, and blockchain technology. It also enables learners to explore blockchain applications in financial systems, regulatory frameworks, and banking services, preparing them for emerging innovations in the digital economy.

Unit 1	**Cryptocurrencies**	**Periods:9**

Concept, Cryptocurrency Mining, Uses of Cryptocurrencies, Tokens, Token vs Crypto Coin, Concept of ICOs (Initial Coin Offerings), Benefits of Using ICOs, STOs (Security token offerings), ICO vs STO, Cryptocurrency wallets

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 2	**Decentralized Finance (DeFi)**	**Periods: 9**

Concept, Benefits and Risks Associated with DeFi, Centralized vs Decentralized finance, DeFi Projects, DeFi future trends.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 3	**Decentralized Markets-I &Decentralized Markets-II**	**Periods: 9**

Concept of Decentralized markets, impact of decentralization on financial market, Decentralized Exchanges (DEX), Security, control and privacy concerns related to DEX Liquidity and Usability of DEX, best DEXs for trading, Fund Management and Trading logic of DEX, Concept of Decentralized Web.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 4	**Blockchain & Cryptocurrency Regulations**	**Periods: 9**

Introduction, History Stance of the Government, Judicial Approach to Cryptocurrency, Possible Reasons for Ban, Virtual Currency Regulations, Global Perspective of Regulations on Blockchain, Future needs for Regulations

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 5	**Blockchain in Banking Sector**	**Periods: 9**

Cross-Border Payments Using Blockchain and Its Benefits, Study of blockchain platforms used for cross-border payments, Impact of Blockchain on Banking Services.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT

	RBT Level: Apply
Total	**Periods: 45**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study, Students' performance in continuous Assessment / Student Presentations, Model Exam.

Course Outcomes:

After Successful completion of this course, the student should be able to

- CO1: Explain the concepts of cryptocurrencies, cryptocurrency mining, tokens, ICOs, STOs, and cryptocurrency wallets.
- CO2: Analyze the principles, benefits, risks, and emerging trends of Decentralized Finance (DeFi).
- CO3: Evaluate decentralized markets, decentralized exchanges (DEX), and their impact on financial systems and Assess the liquidity, usability, fund management, and trading mechanisms ofdecentralized exchanges and decentralized web technologies.
- CO4: Examine blockchain and cryptocurrency regulations, government policies, and global regulatory perspectives.
- CO5: Analyze the applications of blockchain in the banking sector, particularly in cross-border payments and

Textbooks:

T1. Melanie Swan, *Blockchain: Blueprint for a New Economy*, 2nd Edition, Shroff Publisher.

T2. Ron Quaranta, *Blockchain in Financial Markets and Beyond: Challenges and Applications*, Risk Books Publisher.

References:

R1. Richard Hayner, *Blockchain & FinTech: A Comprehensive Blueprint to Understanding Blockchain & Financial Technology – Bitcoin, FinTech, Smart Contracts, Cryptocurrency*, Risk Books Publisher.

R2. Andreas Antonopoulos and Gavin Wood, *Mastering Ethereum: Building Smart Contracts and DApps*, Shroff Publisher / O'Reilly Publisher.

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/106/104/106104220/
2. https://www.youtube.com/results?search_query=blockchain+cryptocurrency+defi+lectures

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	1	-	-	-	-	1	1	2	3
CO2	3	3	1	1	2	-	-	-	-	1	1	2	3
CO3	3	3	2	2	3	-	-	-	-	1	1	3	3
CO4	3	3	3	3	2	1	-	1	-	2	1	3	2
CO5	3	3	3	3	3	-	-	-	-	2	2	3	3
AVG	3.0	2.8	1.8	1.8	2.4	0.2		0.2		1.4	1.2	2.6	2.8

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

MINOR COURSES

MINOR COURSES						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
THEORY						
1.	25UICM01	Network Fundamentals and Security	3	1	0	4
2.	25UICM02	Fundamentals of Cyber Security	3	1	0	4
3.	25UICM03	Digital Forensics	3	1	0	4
4.	25UICM04	Security in Cloud Computing	3	1	0	4
5.	25UICM05	Fundamentals of Blockchain Technology	3	1	0	4

NETWORK FUNDAMENTALS AND SECURITY			
(Common to)			
Course Code:	25UICM01	**Course Type:**	MC
Teaching Periods / Week (L:T:P):	3:1:0	**Credits:**	4
Total Teaching Periods:	45	**CAM+ ESE Mark:**	100
Teaching Department:	CSE(ICB)		
Course Objectives:			
The course aims to provide students with a strong foundation in computer networking principles, network architectures, communication protocols, and network security mechanisms. It enables learners to understand the functioning of modern computer networks, analyze routing and transport protocols, implement secure communication techniques, and explore practical network security solutions using industry-standard tools.			
Unit 1	**NETWORK FUNDAMENTALS**		**Periods:9**
Introduction to Computer Networks, Data Communication Concepts, Types of Computer Networks, Network Topologies, Network Models, Network Devices, Transmission Media, Data Encoding Techniques, Error Detection and Correction.			
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT		
	RBT Level: Apply		
Unit 2	**DATA LINK LAYER AND NETWORK LAYER**		**Periods: 9**
Data Link Layer Functions, Framing Techniques, Flow Control, Error Control, MAC Protocols, Ethernet (IEEE 802.3), Wireless LAN (IEEE 802.11), Bluetooth, IPv4 Addressing, IPv6 Fundamentals, Internet Protocol (IP), ICMP, ARP, Routing Concepts, Routing Algorithms.			
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT		
	RBT Level: Apply		

Unit 3	TRANSPORT LAYER AND APPLICATION LAYER	Periods: 9
Transport Layer Services, UDP Protocol, TCP Protocol, TCP Three-Way Handshake, Flow Control, Congestion Control, Quality of Service (QoS), DNS, DHCP, HTTP, HTTPS, FTP, SMTP, SNMP.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Unit 4	**NETWORK SECURITY FUNDAMENTALS**	**Periods: 9**
Introduction to Network Security, Security Goals, Security Attacks, Security Services, Security Mechanisms, Classical Cryptography, Symmetric Key Cryptography, Public Key Cryptography, Hash Functions, Digital Signatures, Authentication Mechanisms, Key Management, X.509 Certificates, Public Key Infrastructure (PKI)		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Unit 5	**SECURE COMMUNICATION AND NETWORK DEFENSE**	**Periods: 9**
Firewalls, Intrusion Detection Systems (IDS), Intrusion Prevention Systems (IPS), Virtual Private Networks (VPN), SSL Architecture, SSL Protocols, TLS Protocols, Secure Electronic Transaction (SET), Network Monitoring, Wireless Network Security, Network Security Best Practices, Emerging Trends in Network Security.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Total		**Periods: 45**

Suggested Activities and Evaluation Methods:

Packet Capture and Analysis using **Wireshark**, Network Scanning using **Nmap**, Client–Server Socket Programming, Network Configuration and Troubleshooting, Firewall Configuration, Mini Projects, Quiz / MCQ (GATE-Oriented Questions), Case Studies on Recent Network Attacks, Student Presentations, Continuous Assessment, Model Examination.

Course Outcomes:

After Successful completion of this course, the student should be able to

- **CO1:** Explain the fundamentals of computer networks, communication models, transmission media, and networking devices.
- **CO2:** Describe the functions of the data link and network layers, including Ethernet, IP addressing, routing, and wireless networking technologies.
- **CO3:** Analyze transport and application layer protocols, including TCP, UDP, DNS, HTTP, FTP, SMTP, and SNMP.
- **CO4:** Apply network security concepts, cryptographic techniques, authentication mechanisms, and public key infrastructure to secure communication.
- **CO5:** Demonstrate the use of secure communication protocols, firewalls, IDS/IPS, VPNs, SSL/TLS, and network monitoring tools to protect computer networks.

Textbooks:

T1. James F. Kurose and Keith W. Ross, *Computer Networking: A Top-Down Approach*, 8th Edition, Pearson, 2022.

T2. William Stallings, *Data and Computer Communications*, 11th Edition, Pearson, 2019.

T3. William Stallings, *Network Security Essentials: Applications and Standards*, 7th Edition, Pearson, 2023.

References:

R1. Andrew S. Tanenbaum and David J. Wetherall, *Computer Networks*, 6th Edition, Pearson, 2021.
R2. Behrouz A. Forouzan, *Data Communications and Networking*, 5th Edition, McGraw-Hill.
R3. Charles P. Pfleeger and Shari Lawrence Pfleeger, *Security in Computing*, 5th Edition, Pearson.
R4. Douglas Comer, *Internetworking with TCP/IP*, Volume 1, 6th Edition, Pearson.

Web links and Video Lectures (e-Resources):

1. NPTEL – Computer Networks: https://nptel.ac.in/course.html
2. NPTEL – Network Security: https://nptel.ac.in/course.html
3. Cisco Networking Academy: https://www.netacad.com/
4. Wireshark Documentation: https://www.wireshark.org/docs/
5. RFC Editor – Internet Standards: https://www.rfc-editor.org/

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	1	1	2	3
CO2	3	3	2	1	-	-	-	-	-	2	2	2	3
CO3	3	3	3	2	2	-	-	-	-	2	2	3	3
CO4	2	2	2	3	3	-	-	-	-	2	2	3	2
CO5	2	2	2	3	3	-	-	-	-	3	2	3	2
AVG	**2.6**	**2.4**	**1.8**	**1.8**	**1.6**	-	-	-	-	**2.0**	**1.8**	**2.6**	**2.6**

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

FUNDAMENTALS OF CYBER SECURITY

(Common to)

Course Code:	25UICM02	**Course Type:**	MC
Teaching Periods / Week (L:T:P):	3:1:0	**Credits:**	4
Total Teaching Periods:	45	**CAM+ ESE Mark:**	100
Teaching Department:	CSE(ICB)		

Course Objectives:

The course aims to provide students with a foundational and practical understanding of operating system architectures and modern cybersecurity paradigms.

Unit 1	**OPERATING SYSTEM OVERVIEW**	**Periods:9**

Computer-System Organization – Architecture – Operating-System Operations – Resource Management – Security and Protection – Distributed Systems – Kernel Data Structures –Operating-System Services – System Calls – System Services – Why Applications Are Operating System Specific – Operating-System Design and Implementation - Operating-System Structure –Building and Booting an Operating System .

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Understand

Unit 2	**SECURITY IN OPERATING SYSTEMS**	**Periods: 9**

UNIX Security – UNIX Protection System – UNIX Authorization – UNIX Security Analysis – UNIX Vulnerabilities – Windows Security – Windows Protection System – Windows Authorization – Windows Security Analysis – Windows Vulnerabilities – Address Space Layout Randomizations – Retrofitting Security into a Commercial Operating System – Introduction to Security Kernels.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Unit 3	**INTRODUCTION TO CYBERSECURITY**	**Periods:9**
Definition and Scope of Cybersecurity, Digital Ecosystem Threat Landscape, Categories of Cyber Threats, Vulnerability and Risk: Definitions and Relationships, Cybercrime Statistics and Industry Reports (Verizon DBIR), Case Studies (Equifax Data Breach (2017), WannaCry Ransomware (2017), SolarWinds Supply Chain Attack (2020)).		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT, Case Study	
	RBT Level: Apply	
Unit 4	**CYBERSECURITY FUNDAMENTALS & CRYPTOGRAPHY**	**Periods: 9**
CIA Triad (Confidentiality, Integrity, Availability), Security Principles, Cybersecurity Roles, Classical Cryptography, Symmetric Cryptography(DES, AES), Asymmetric Cryptography(RSA, ECC), Cryptographic Hash Functions.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Unit 5	**WEB & APPLICATION SECURITY**	**Periods: 9**
HTTP/HTTPS Fundamentals, Request and Response Headers, Common Web Vulnerabilities, Secure Software Development Lifecycle (SSDLC), Static and Dynamic Application Security Testing (SAST & DAST), Threat Modeling using STRIDE.		
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT	
	RBT Level: Apply	
Total		**Periods: 45**

Suggested Activities and Evaluation Methods:

Laboratory Experiments using VirusTotal, CyberChef, CrypTool, Wireshark, Nmap, Ettercap, pfSense, Snort, OpenVPN, and OWASP ZAP, Mini Projects, Case Studies on Recent Cyber Attacks, Capture-the-Flag (CTF) Exercises, Quiz / MCQ (GATE-Oriented Questions), Student Presentations, Continuous Assessment, Model Examination.

Course Outcomes:

After successful completion of this course, the student should be able to:

- **CO1:** Explain the architecture, resource management, and structural design of operating systems, including the execution of system calls and booting processes.
- **CO2** Deploy authorization and protection mechanisms within UNIX and Windows environments while mitigating memory exploits using Address Space Layout Randomization (ASLR).
- **CO3** Analyze real-world cyber threat landscapes, risk relationships, and attack vectors by evaluating industrial security reports and high-profile breach case studies.
- **CO4:** Implement symmetric and asymmetric cryptographic algorithms, alongside hash functions, to enforce data privacy, integrity, and non-repudiation.

CO5: Conduct vulnerability assessments on web applications using STRIDE threat modeling, secure lifecycle practices (SSDLC), and automated testing tools (SAST/DAST).

Textbooks:

T1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts, Wiley, Tenth Edition, 2018.

T2. Charles J. Brooks, Christopher Grow, Philip Craig Jr., Donald Short, *Cybersecurity Essentials*, Wiley, First Edition, 2018.

T3. William Stallings, *Network Security Essentials: Applications and Standards*, Pearson Education, Sixth Edition, 2017.

References:

R1. Andrew S. Tanenbaum, Herbert Bos, Modern Operating Systems, Pearson Education, Fourth Edition, 2015.

R2. William Stallings, Operating Systems: Internals and Design Principles, Pearson Education, Ninth Edition, 2018.

R3. William Stallings, *Cryptography and Network Security: Principles and Practice*, Pearson Education, Eighth Edition, 2020.

R4. Nina Godbole and Sunit Belapure, *Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Wiley India, Second Edition, 2019.

R5. Georgia Weidman, *Penetration Testing: A Hands-On Introduction to Hacking*, No Starch Press, First Edition, 2014.

R6. OWASP Foundation, *OWASP Testing Guide v4*.

Web links and Video Lectures (e-Resources):

1. NPTEL – Cyber Security: https://nptel.ac.in/courses/106105217
2. NPTEL – Ethical Hacking: https://nptel.ac.in/courses/106106129
3. NPTEL – Operating System Fundamentals: https://nptel.ac.in/courses/106105214
4. NPTEL – Operating Systems Design and Implementation: https://nptel.ac.in/courses/106102132
5. CISA Cybersecurity Resources: https://www.cisa.gov

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1	-	-	-	-	-	-	-	-	2		3
CO2	3	3	2	2	1	1	-	-	-	-	2		3
CO3	2	3	-	3	-	2	1	2	2	-	3		3
CO4	3	2	3	1	-	-	-	-	-	-	2		3
CO5	3	3	3	2	3	2	1	2	1	1	3		3
AVG	2.8	2.4	2.7	2	2	1.7	1	2	1.5	1	2.4		3

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

DIGITAL FORENSICS

(Common to)

Course Code:	25UICM03	**Course Type:**	MC
Teaching Periods / Week (L:T:P):	3:1:0	**Credits:**	4
Total Teaching Periods:	45	**CAM+ ESE Mark:**	100
Teaching Department:	CSE(ICB)		

Course Objectives:

The course aims to provide students with a structured understanding of digital forensics methodologies, investigation frameworks, and evidence handling.

Unit 1	**COMPUTER FORENSICS FUNDAMENTALS**	**Periods:9**

Computer Forensics Fundamentals – Benefits of Forensics – Computer Crimes – Computer Forensics Evidence and Courts – Legal Concerns and Privacy Issues.

3	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Understand

Unit 2	**COMPUTING INVESTIGATIONS AND WORKSTATIONS**	**Periods: 9**

Understanding Computing Investigations – Procedure for Corporate High-Tech Investigations – Understanding Data Recovery Workstation and Software – Conducting an Investigation.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Understand

Unit 3	**DIGITAL EVIDENCE AND DATA ACQUISITION**	**Periods: 9**

Data Acquisition – Understanding Storage Formats and Digital Evidence – Determining the Best Acquisition Method – Acquisition Tools – Validating Data Acquisitions – Performing RAID Data Acquisitions – Remote Network Acquisition Tools – Other Forensics Acquisitions Tools.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Understand

Unit 4	**INCIDENT PROCESSING AND SCENE MANAGEMENT**	**Periods: 9**

Processing Crimes and Incident Scenes – Securing a Computer Incident or Crime – Seizing Digital Evidence at Scene – Storing Digital Evidence – Obtaining Digital Hash – Reviewing Case.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Understand

Unit 5	**FORENSIC TOOLS AND E-MAIL INVESTIGATIONS**	**Periods: 9**

Current Computer Forensics Tools – Software and Hardware Tools – Validating and Testing Forensic Software – Addressing Data-Hiding Techniques – Performing Remote Acquisitions – E-Mail Investigations – Investigating E-Mail Crime and Violations – Understanding E-Mail Servers – Specialized E-Mail Forensics Tools.

Teaching Learning Process	**Pedagogy: Chalk & Talk, PPT**
	RBT Level: Understand

Total	**Periods: 45**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Students' performance in continuous

Assessment / Student Presentations, Model Exam.

Course Outcomes:

After Successful completion of this course, the student should be able to

- CO1: Explain the foundational principles of computer forensics, the nature of computer crimes, and the associated legal concerns and privacy issues in judicial environments.
- CO2: Execute standard investigative procedures for corporate high-tech incidents and configure specialized data recovery workstations and software.
- CO3: Implement data acquisition methods across diverse environments, including storage formats, RAID arrays, and remote networks, while validating data integrity.
- CO4: Secure digital crime scenes, systematically seize and store digital evidence, and generate cryptographic digital hashes to preserve chain of custody.
- CO5: Deploy hardware and software forensic tools to neutralize data-hiding techniques and perform specialized investigations on email servers and violations.

Textbooks:

T1. Bill Nelson, Amelia Phillips, Christopher Steuart, Guide to Computer Forensics and Investigations, Cengage Learning, Sixth Edition, 2019.

T2. Marie-Helen Maras, Computer Forensics: Cybercriminals, Laws, and Evidence, Jones & Bartlett Learning, Second Edition, 2014

References:

R1. Albert Marcella Jr., Doug Menendez, Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, CRC Press, Second Edition, 2010.

R2. Warren G. Kruse II, Jay G. Heiser, Computer Forensics: Incident Response Essentials, Pearson Education, First Edition, 2001.

R3. Michael Hale Ligh, Andrew Case, Jamie Levy, Aaron Walters, The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory, Wiley, First Edition, 2014.

R4. Chuck Easttom, Digital Forensics, Investigation, and Response, Jones & Bartlett Learning, Fourth Edition, 2021.

R5. Nihad A. Hassan, Digital Forensics Basics: A Practical Guide Using Windows OS, Apress, First Edition, 2019.

Web links and Video Lectures (e-Resources):

1. NPTEL – Cyber Security: nptel.ac.in
2. NPTEL – Cyber Crime Investigation and Digital Forensics: https://nptel.ac.in/courses/129106894
3. SWAYAM – Digital Forensics Foundations: https://onlinecourses.swayam2.ac.in/cec20_lb06/preview
4. SWAYAM – Applied Data Analytics and Disk Forensics: https://onlinecourses.swayam2.ac.in/nou22_cs05/preview
5. SWAYAM – Information Security and Cyber Forensics: https://onlinecourses.swayam2.ac.in/cec21_ge10/preview

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	3	2	1	1	1	1	2	2	3
CO2	3	3	3	3	2	1	1	1	1	1	2	1	2

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

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

SECURITY IN CLOUD COMPUTING

Course Code:	25UICM04	**Course Type:**	PC
Teaching Periods / Week (L:T:P):	3:0:2	**Credits:**	5
Total Teaching Periods:	45	**CAT+ ESE Marks:**	100
Teaching Department:	CSE(ICB)		

Course Objectives:

To impart knowledge on cloud computing security concepts, cloud threats, virtualization security, data protection mechanisms, and security frameworks for designing secure cloud-based applications and services.

Unit 1	**INTRODUCTION TO CLOUD COMPUTING SECURITY**	**Periods: 9**

Introduction to Cloud Computing, Cloud Service Models (IaaS, PaaS, SaaS), Deployment Models (Public, Private, Hybrid, Community), Cloud Architecture, Security Challenges in Cloud Computing, Threat Landscape, Cloud Security Principles, Shared Responsibility Model, Cloud Risk Management, Security Standards and Compliance.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Understand

Unit 2	**IDENTITY, ACCESS MANAGEMENT AND DATA SECURITY**	**Periods: 9**

Identity and Access Management (IAM), Authentication and Authorization, Multi-Factor Authentication (MFA), Role-Based Access Control (RBAC), Attribute-Based Access Control (ABAC), Cloud Data Security, Data Encryption (At Rest and In Transit), Key Management Systems (KMS), Data Integrity, Backup and Recovery.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 3	**VIRTUALIZATION AND NETWORK SECURITY**	**Periods: 9**

Virtualization Concepts, Hypervisor Security, Virtual Machine Security, Container Security, Network Security in Cloud, Firewalls, Virtual Private Cloud (VPC), VPN, Security Groups, Network Access Control Lists (NACLs), Intrusion Detection and Prevention Systems (IDS/IPS), Distributed Denial of Service (DDoS) Protection.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 4	**CLOUD APPLICATION SECURITY**	**Periods:9**

Secure Software Development Life Cycle (SSDLC), Web Application Security, API Security, Secure Cloud Storage, DevSecOps, Vulnerability Assessment, Penetration Testing, Security Monitoring, Logging and Auditing, Incident Response in Cloud Environments.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 5	**CLOUD GOVERNANCE, COMPLIANCE AND EMERGING TRENDS**	**Periods:9**

Cloud Governance, Security Policies, Risk Assessment, Compliance Standards (ISO/IEC 27001, GDPR, HIPAA, PCI DSS), Cloud Security Alliance (CSA), Zero Trust Security Model, Artificial Intelligence for Cloud Security, Security Automation, Case Studies of Cloud Security Breaches.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Total	**Periods: 45**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions),Hands-on Cloud Security Labs Case Study Students' performance in continuous Assessment / Student Presentations, Model Exam

Course Outcomes:

After Successful completion of this course, the student should be able to

- **CO1:** Understand cloud computing architecture, deployment models, security principles, and security challenges in cloud environments.
- **CO2:** Analyze and implement identity and access management mechanisms, authentication techniques, and data protection methods in cloud platforms.
- **CO3:** Apply virtualization security, network security mechanisms, and cloud infrastructure protection techniques to secure cloud environments.
- **CO4:** Design and implement secure cloud applications using secure development practices, DevSecOps principles, and cloud security monitoring techniques.
- **CO5:** Evaluate cloud governance frameworks, compliance standards, and emerging security technologies to build secure and resilient cloud solutions.

Textbooks:

T1. Ronald L. Krutz and Russell Dean Vines, *Cloud Security: A Comprehensive Guide to Secure Cloud Computing*, Wiley, 2010.
T2. Tim Mather, Subra Kumaraswamy and Shahed Latif, *Cloud Security and Privacy*, O'Reilly Media, 2009.
T3. Vic (J.R.) Winkler, *Securing the Cloud: Cloud Computer Security Techniques and Tactics*, Elsevier, 2011.

References:

R1. Ben Potter and Tim Mather, *Cloud Security and Privacy*, O'Reilly Media.
R2. John R. Vacca, *Cloud Computing Security: Foundations and Challenges*, CRC Press.

Web links and Video Lectures (e-Resources):

1. https://aws.amazon.com/security/
2. https://learn.microsoft.com/azure/security/
3. https://cloud.google.com/security
4. https://www.coursera.org/learn/cloud-security-basics

CO-PO & PSO Mapping													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PS O1**	**PS O2**
CO1	3	2	2	3	3	2	1	2	1	2	3	2	3
CO2	2	3	2	2	2	3	2	-	2	2	-	2	2
CO3	3	3	-	3	2	3	2	2	3	2	2	1	3
CO4	3	3	3	2	-	3	3	2	2	3	3	3	3
CO5	3	2	3	3	3	2	2	1	2	3	2	3	3
AVG	**3**	**3**	**2**	**3**	**2**	**3**	**2**	**1**	**2**	**2**	**2**	**2**	**3**
1 – Low, 2 – Medium, 3 – High, '-' – No correlation													

FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY			
(Common to)			
Course Code:	25UICM05	**Course Type:**	MC
Teaching Periods / Week (L:T:P):	3:1:0	**Credits:**	4
Total Teaching Periods:	45	**CAM+ ESE Mark:**	100
Teaching Department:	CSE(ICB)		
Course Objectives:			
To provide a fundamental understanding of blockchain technology, cryptographic techniques, and digital signatures used in secure distributed systems. The course aims to develop knowledge of Bitcoin, distributed consensus, cryptocurrency storage, mining, and anonymity mechanisms. It also enables learners to understand the practical applications of blockchain and cryptocurrencies in modern digital ecosystems.			
Unit 1	**BLOCK CHAIN FUNDAMENTALS & INTRODUCTION TO CRYPTOGRAPHY**		**Periods:9**
Block chain Fundamentals: Tracing Block chain's Origin, Revolutionizing the Traditional Business Network, How Blockchain Works, What Makes a Blockchain Suitable for Business? Cryptographic Hash Functions, SHA256, Hash Pointers and Data Structures, Merkle tree			
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT		
	RBT Level: Apply		
Unit 2	**DIGITAL SIGNATURES**		**Periods: 9**
Elliptic Curve Digital Signature Algorithm (ECDSA), Public Keys as Identities, A Simple Crypto currency.			
Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT		
	RBT Level: Apply		
Unit 3	**MECHANICS OF BIT COIN**		**Periods: 9**

Centralization vs. Decentralization, Distributed Consensus, Consensus without identity using a block chain, Incentives and proof of work. Bit coin transactions, Bit coin Scripts, Applications of Bit coin scripts, Bit coin blocks, The Bit coin network.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 4	**STORAGE OF AND USAGE OF BIT COINS**	**Periods: 9**

Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Unit 5	**BIT COIN MINING & BIT COIN AND ANONYMITY**	**Periods: 9**

The Task of Bit coin miners, Mining Hardware, Mining pools, Mining incentives and strategies. Anonymity Basics, Mixing, Zero coin and Zero cash.

Teaching Learning Process	**Pedagogy:** Chalk & Talk, PPT
	RBT Level: Apply

Total	**Periods: 45**

Suggested Activities and Evaluation Methods:

Tutorials, Mini Projects, Quiz / MCQ (Gate Related Questions), Case Study, Students' performance in continuous Assessment / Student Presentations, Model Exam.

Course Outcomes:

After Successful completion of this course, the student should be able to

- **CO1:** Explain the fundamentals of blockchain technology, cryptographic hash functions, SHA-256, hash pointers, and Merkle trees.
- **CO2:** Describe digital signatures, Elliptic Curve Digital Signature Algorithm (ECDSA), public keys, and the basic concepts of cryptocurrencies.
- **CO3:** Analyze the concepts of decentralization, distributed consensus, proof-of-work, Bitcoin transactions, blocks, and the Bitcoin network.
- **CO4:** Demonstrate knowledge of Bitcoin storage mechanisms, wallets, exchanges, payment services, and cryptocurrency transactions.
- **CO5:** Understand Bitcoin mining, mining strategies, anonymity techniques, and privacy-enhancing technologies such as Zerocoin and Zerocas

Textbooks:

T1. BlockChain for dummies, Manav Gupta, Second IBM Limited Edition, 2018, John Wiley & Sons.

T2. Bitcoin and Cryptocurrency Technologies, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, 2016.

References:

R1. Blockchain: Blueprint for a New Economy,Melanie Swan, First edition, 2015, O'Reilly Media.

R2. Bitcoin: Programming the Open Blockchain, Andreas M. Antonopoulos, Mastering, Second edition, 2017, O'Reilly Media.

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/106/104/106104220/
2. https://nptel.ac.in/courses/106/105/106105184/

CO-PO & PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	1	1	2	3
CO2	3	2	1	1	-	-	-	-	-	2	2	2	3
CO3	3	3	2	2	2	-	-	-	-	2	2	2	3
CO4	2	2	2	3	3	-	-	-	-	2	2	3	3
CO5	2	2	1	3	3	-	-	-	-	3	2	3	2
AVG	2.6	2.2	1.2	1.8	1.6					2.0	1.8	2.6	3

1 – Low, 2 – Medium, 3 – High, '-' – No correlation

HEAD OF THE DEPARTMENT
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