SCHEME OF INSTRUCTION AND SYLLABI R-22(A)

OF
B.E I - VIII SEMESTERS OF FOUR DEGREE COURSE
IN

COMPUTER ENGINEERING AND TECHNOLOGY

(Inline with AICTE Model Curriculum with effect from AY 2024-25)

R-22(A) Regulation

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)
Affiliated to OU, Approved by AICTE, Accrediated by NBA, NAAC (A++)
Kokapet Village, Gandipet Mandal, Hyderabad– 500 075. Telangana
E-Mail: principal@cbit.ac.in; Website: www.cbit.ac.in;
Phone Nos.: 040-24193276 / 277 / 279

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

DEPARTMENT OF COMPUTER ENGINEERING AND TECHNOLOGY

B.E CSE (IOT & CYBER SECURITY INCLUDING BLOCK CHAIN TECHNOLOGY)

INSTITUTE VISION AND MISSION:

Vision: To be a Centre of Excellence in Technical Education and Research

Mission: To address the emerging needs through quality technical education and advanced research

DEPARTMENT VISION AND MISSION:

Vision: To be in the frontiers of Computer Science and Engineering with academic excellence and Research

Mission: The mission of Computer Science and Engineering Department is to:

1. Educate students with the best practices of Computer Science by integrating the latest research into the curriculum.
2. Develop professionals with sound knowledge in theory and practice of Computer Science and Engineering.
3. Facilitate the development of academia-industry collaboration and societal outreach programs.
4. Prepare students for full and ethical participation in a diverse society and encourage lifelong learning.

PROGRAM EDUCATION OBJECTIVES (PEOS):

1. Graduates will apply their knowledge and skills to succeed in their careers and/or obtain advanced degrees, provide solutions as entrepreneurs.
2. Graduates will creatively solve problems, communicate effectively, and successfully function in multi-disciplinary teams with superior work ethics and values.
3. Graduates will apply principles and practices of Computer Science, mathematics and science to successfully complete hardware and/or software-related engineering projects to meet customer business objectives.
4. Graduates will have the ability to adapt, contribute, innovates modern technologies and systems in the domain of Cyber Security, IoT or productively engage in research.

PROGRAM SPECIFIC OUTCOMES (PSOS):

1. Able to acquire the practical competency through emerging technologies and open- source platforms related to the areas of Cyber Security, IoT and Block Chain.
2. Able to assess the hardware and software aspects necessary for the development of solutions to secure critical IT infrastructure and prepare collaborative plans for any incidence response.
3. Able to provide diversified solutions in product development by adhering to ethical values for the benefit of society.

ABOUT B.E. CSE (IOT & CYBER SECURITY INCLUDING BLOCK CHAIN TECHNOLOGY) PROGRAM:

Internet of Things (IoT) refers to scenarios where network connectivity and computing capabilities extend to objects, sensors, and everyday appliances. IoT enabled devices generate, exchange, and consume data with minimal human intervention. Edge computing enables local storage and local computation for the data generated by the IoT devices.

Ubiquitous connectivity, widespread adoption of IP-based networking, miniaturization, advances in data analytics, and the rise of cloud computing are the (enabling technologies) technology enablers that are driving the Internet of Things closer to widespread reality. It is estimated that by 2025, there will be more than to 21 billion IoT devices. Many industries and sectors are adopting IoT to simplify, improve, automate and control different processes. We live in a time of unprecedented change.

The Internet of Things holds significant promise for delivering social and economic benefits to emerging and developing economies in areas like agriculture, water quality, healthcare, industrialization, and environmental management and others.

IoT leads to hyper connected world with huge security concerns. Block Chain provides strong protection against data tampering thereby locking access to IoT devices. Block Chain based approaches can be employed for IoT security. IoT, Cloud, Artificial Intelligence and Block Chain are key technologies driving the digital transformation.

Cyber security is the practice of protecting computers, servers, mobile devices, electronic systems, networks, and data from malicious attacks.

To address the needs of digital transformation, CBIT offers a four-year UG program B.E CSE (Internet of Things and Cyber Security including Block Chain Technology) for laying a strong foundation in IoT, Cyber Security and Block Chain Technology.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2024-25

SEMESTER – I

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22MTC01	Linear Algebra and Calculus	3	1	-	3	40	60	4
2	22PYC01	Optics and Semiconductor Physics	3	-	-	3	40	60	3
3	22CSC01N	Problem Solving and Programming using C	2	1	-	3	40	60	3
4	22EGC01N	English	2	-	-	3	40	60	2
PRACTICAL									
5	22PYC03	Optics and Semiconductor Physics Lab	-	-	3	3	50	50	1.5
6	22EGC02N	English lab	-	-	2	3	50	50	1
7	22CSC02N	Problem Solving and Programming using C Lab	-	-	3	3	50	50	1.5
8	22MEC01N	Engineering Graphics	-	1	3	3	50	50	2.5
9	22MEC38N	Digital Fabrication Workshop	-	-	3	3	50	50	1.5
TOTAL			**10**	**3**	**14**	**-**	**410**	**490**	**20**

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2024-25

SEMESTER -II

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22MTC04	Differential Equations and Numerical Methods	3	1	-	3	40	60	4
2	22CYC01	Chemistry	3	-	-	3	40	60	3
3	22EEC01	Basic Electrical Engineering	2	1	-	3	40	60	3
4	22ITC20N	Data Structures using C++	3	-	-	3	40	60	3
PRACTICAL									
5	22CYC02	Chemistry Lab	-	-	3	3	50	50	1.5
6	22MBC02N	Community Engagement	-	-	2	-	50	-	1
7	22ITC21N	Data Structures using C++ Lab	-	-	2	3	50	50	1
8	22MEC37N	Robotics and Drones Lab	-	1	3	-	100	-	2.5
9	22EEC02	Basic Electrical Engineering Lab	-	-	2	3	50	50	1
TOTAL			**11**	**3**	**12**	**-**	**460**	**390**	**20**

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2025-26

SEMESTER -III

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22CSC11N	Database Management Systems	3	-	-	3	40	60	3
2	22ITC02N	Java Programming	3	-	-	3	40	60	3
3	22CSC14N	Design and Analysis of Algorithms	3	-	-	3	40	60	3
4	22ITC05N	Discrete Mathematics	3	-	-	3	40	60	3
5	22ITC01N	Digital Logic and Computer Architecture	3	-	-	3	40	60	3
6	22CIC01	Fundamentals of Cyber Security and Tools	2	1	-	3	40	60	2
PRACTICAL									
7	22CSC13N	Database Management Systems Lab	-	-	3	3	50	50	1.5
8	22ITC03N	Java Programming Lab	-	-	3	3	50	50	1.5
9	22CSC58	Design and Analysis of Algorithms Lab	-	-	3	3	50	50	1.5
10	22CII01	MOOCs / Training / Internship	-	-	-	90 Hours	50	-	2
11	22ACT	Activity Points	-	-	-	-	-	-	-
TOTAL			**17**	**1**	**9**	**-**	**440**	**510**	**23.5**

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2025-26
SEMESTER -IV

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22MTC13	Mathematical Foundation for Data Science and Security	3	-	-	3	40	60	3
2	22CAC03N	Principles of Artificial Intelligence	3	-	-	3	40	60	3
3	22CSC48	Theory of Computation	3	-	-	3	40	60	3
4	22CSC42	Web Programming	3	-	-	3	40	60	3
5	22ECC36	Basic Electronics and Sensors	3	-	-	3	40	60	3
6	22MBC01	Engineering Economics and Accountancy	3	-	-	3	40	60	3
PRACTICAL									
7	22CAC06N	Principles of Artificial Intelligence Lab	-	-	3	3	50	50	1.5
8	22CSC43	Web Programming Lab	-	-	3	3	50	50	1.5
9	22ECC37	Basic Electronics and Sensors Lab	-	-	2	3	50	50	1
10	22CICU01	Upskill Certification Course – I					25	-	0.5
11	22ACT	Activity Points	-	-	-	-	-	-	-
TOTAL			**18**	**-**	**8**	**-**	**415**	**510**	**22.5**

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS) Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2026-27
SEMESTER -V

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22CIC05	Blockchain Technology	3	-	-	3	40	60	3
2	22CSC15N	Operating Systems	3	-	-	3	40	60	3
3	22CIC07N	Industrial Internet of Things	3	-	-	3	40	60	3
4	22ITC10	Computer Networks	3	-	-	3	40	60	3
5	22EGM01	Indian Constitution and Fundamental Principles	2	-	-	2	-	50	Non Credit
6		Professional Elective – I	3	-	-	3	40	60	3
PRACTICAL									
7	22CSC18N	Operating Systems Lab	-	-	3	3	50	50	1.5
8	22CIC08N	Industrial Internet of Things Lab	-	-	2	3	50	50	1
9	22ITC16N	Computer Networking Technologies Lab	-	-	2	3	50	50	1
10	22EGC03	Employability Skills	-	-	2	3	50	50	1
11		Professional Elective – I Lab			2	3	50	50	1
12	22CICI02	Industrial/ Rural Internship	3-4 weeks / 90 hours			-	50	-	2
		TOTAL	**15**	**-**	**11**	**-**	**500**	**550**	**22.5**

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Professional Elective - I

S.NO	THEORY	
	Course Code	**Course**
1	22CIE19	Devops Essentials
2	22ADE65N	Social Network Analytics
3	22CSC52	Data Analysis and Visualization
4	22CSC24N	Compiler Design
5	22CIE05	Distributed Systems
	LAB	
	Course Code	**Course**
1	22CIE20	Devops Essentials Lab
2	22ADE67N	Social Network Analytics Lab
3	22CSC53	Data Analysis and Visualization Lab
4	22CSC25N	Compiler Design Lab
5	22CIE06	Distributed Systems Lab

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Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2026-27
SEMESTER –VI

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22CIC21	Ethical Hacking	3	-	-	3	40	60	3
2	22CIC09	Cryptography and Network Security	3	-	-	3	40	60	3
3	22CIC13N	Design and Development of Blockchain Applications	3	-	-	3	40	60	3
4		Professional Elective – II	3	-	-	3	40	60	3
5		Open Elective-I	3	-	-	3	40	60	3
6	22CSC21N	Software Engineering	3	-	-	3	40	60	3
PRACTICAL									
7	22CIC22	Ethical Hacking Lab	-	-	2	3	50	50	1
8	22CIC14N	Design and Development of Blockchain Applications Lab	-	-	2	3	50	50	1
9		Professional Elective – II Lab	-	-	2	3	50	50	1
10	22CIC60	Mini Project	4 Weeks			-	50	-	2
11	22CICU02	Upskill Certification Course - II	-	-	-	-	25	-	0.5
TOTAL			**18**	**-**	**06**	**-**	**465**	**510**	**23.5**

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

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Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Professional Elective – II

S.NO	THEORY	
	Course Code	**Course**
1	22CSE17	Mobile Application Development
2	22CIE21	Vulnerability Assessment and Penetration Testing
3	22CAE14N	Machine Learning
4	22CAE03N	Image Processing
5	22ITE07	Cloud computing
	LAB	
	Course Code	**Course**
1	22CSE18	Mobile Application Development Lab
2	22CIE22	Vulnerability Assessment and Penetration Testing Lab
3	22CAC15N	Principles Of Machine Learning Lab
4	22CAE13N	Image Processing Lab
5	22ITE08	Cloud computing Lab

List of Open Electives

Course Code	Course Name	
22ECO02	Remote Sensing and GIS	ODD/EVEN
22ECO03	Fundamentals of Wireless Communications	ODD/EVEN
22ECO05	Principles of Embedded Systems	ODD/EVEN
22EGO01	Technical Writing Skills	ODD/EVEN
22EGO02	Gender Sensitization	ODD/EVEN
22CEO01	Infrastructure for Smart Cities	ODD
22CEO02	Disaster Risk Reduction and Management	ODD
22EEO01	Energy Management System	ODD/EVEN
22EEO06	Waste Management	ODD/EVEN
22BTO05	Cognitive Neuroscience	ODD/EVEN
22CHO02	Fundamentals of Nano Science and Nano Technology	ODD/EVEN
22CHO03	Industrial Pollution Control	ODD/EVEN
22CHO04	Environmental and Sustainable Development	EVEN
22MEO02	3D Printing	ODD/EVEN
22MEO03	Corporate Organizational Behavior	ODD/EVEN
22MEO05	Research Methodologies and Innovation	ODD/EVEN
22MEO06	Principles of Entrepreneurships and Startups	ODD/EVEN
22MEO01	Principles of Design Thinking	ODD/EVEN

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2027-28

SEMESTER -VII

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22CIC23	Cybersecurity: Attacks & Defenses	3	-	-	3	40	60	3
2		Professional Elective-III	3	-	-	3	40	60	3
3		Professional Elective-IV	3	-	-	3	40	60	3
4		Professional Elective-V	3	-	-	3	40	60	3
5		Open Elective-II	3	-	-	3	40	60	3
6	22EEM01	Universal Human Values-II: Understanding Harmony	-	1	-	-	50	-	1
PRACTICAL									
7	22CIC24	Cybersecurity: Attacks & Defenses Lab	-	-	2	3	50	50	1
8		Professional Elective-III Lab	-	-	2	3	50	50	1
9	22CIC17	Technical Seminar	2	-	-	-	50	-	1
10	22CIC18	Project Part - I	-	-	4	-	50	-	2
		TOTAL	**17**	**1**	**8**	**-**	**450**	**400**	**21**

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

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Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

	Professional Elective – III		**Professional Elective - IV**	
S.NO	**THEORY**		**THEORY**	
	Course Code	**Course Name**	**Course Code**	**Course Name**
1	22CSE28	Full Stack Development	22CIE13	3D Modelling and Animation
2	22CIE03N	Digital Forensics	22CIE18N	Social Engineering
3	22CSC54	Deep Learning for Computer Vision	22CSE26	Applied Natural Language Processing
4	22ITE024	Computer Vision	22CAE08N	Reinforcement Learning
5	22ADC71N	Principles of Big data analytics	22CIE23	Graphics Design

	LAB	
	Course Code	**Course Name**
1	22CSE29	Full Stack Development Lab
2	22CIE04N	Digital Forensics Lab
3	22CSC55	Deep Learning for Computer Vision Lab
4	22AITE26	Computer Vision Applications Lab
5	22ADE78N	Foundations of Big Data Analytics Lab

Professional Elective - V	
Course Code	**Course Name**
22CIE24	Immersive Technologies
22CIE25	AI for Cybersecurity
22ADC14	Generative AI
22CSE23	Robotics Process Automation
22CIE26	Free and Open Source Technologies

List of Open Electives

Course Code	**Course Name**	
22ECO02	Remote Sensing and GIS	ODD/EVEN
22ECO03	Fundamentals of Wireless Communications	ODD/EVEN
22ECO05	Principles of Embedded Systems	ODD/EVEN
22EGO01	Technical Writing Skills	ODD/EVEN
22EGO02	Gender Sensitization	ODD/EVEN
22CEO01	Infrastructure for Smart Cities	ODD
22CEO02	Disaster Risk Reduction and Management	ODD
22EEO01	Energy Management System	ODD/EVEN
22EEO06	Waste Management	ODD/EVEN
22BTO05	Cognitive Neuroscience	ODD/EVEN
22CHO02	Fundamentals of Nano Science and Nano Technology	ODD/EVEN
22CHO03	Industrial Pollution Control	ODD/EVEN
22CHO04	Environmental and Sustainable Development	EVEN
22MEO02	3D Printing	ODD/EVEN
22MEO03	Corporate Organizational Behavior	ODD/EVEN
22MEO05	Research Methodologies and Innovation	ODD/EVEN
22MEO06	Principles of Entrepreneurships and Startups	ODD/EVEN
22MEO01	Principles of Design Thinking	ODD/EVEN

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

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Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2027-28

SEMESTER -VIII

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1		Open Elective-III	3	-	-	3	40	60	3
2	22CEM01	Environmental Science	2	-	-	2	-	50	No Credits
PRACTICAL									
3	22CIC20	Project Part – II	0	0	8	-	100	100	4
		TOTAL	**5**	**-**	**8**	-	**140**	**210**	**7**

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

List of Open Electives

Course Code	Course Name	
22ECO02	Remote Sensing and GIS	ODD/EVEN
22ECO03	Fundamentals of Wireless Communications	ODD/EVEN
22ECO05	Principles of Embedded Systems	ODD/EVEN
22EGO01	Technical Writing Skills	ODD/EVEN
22EGO02	Gender Sensitization	ODD/EVEN
22CEO01	Infrastructure for Smart Cities	ODD
22CEO02	Disaster Risk Reduction and Management	ODD
22EEO01	Energy Management System	ODD/EVEN
22EEO06	Waste Management	ODD/EVEN
22BTO05	Cognitive Neuroscience	ODD/EVEN
22CHO02	Fundamentals of Nano Science and Nano Technology	ODD/EVEN
22CHO03	Industrial Pollution Control	ODD/EVEN
22CHO04	Environmental and Sustainable Development	EVEN
22MEO02	3D Printing	ODD/EVEN
22MEO03	Corporate Organizational Behavior	ODD/EVEN
22MEO05	Research Methodologies and Innovation	ODD/EVEN
22MEO06	Principles of Entrepreneurships and Startups	ODD/EVEN
22MEO01	Principles of Design Thinking	ODD/EVEN

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Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

List of Open Electives offered to other departments

	ODD SEMESTER		**EVEN SEMESTER**	
S.NO	**THEORY**		**THEORY**	
	Course Code	**Course Name**	**Course Code**	**Course Name**
1	22CIO01	Fundamentals of Internet of Things	22CIO02N	Fundamentals of Blockchain Technology
2	22CIO03	Basics of Cybersecurity	22CIO04	Fundamentals of AR and VR

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

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Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2024-25

SEMESTER – I

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22MTC01	Linear Algebra and Calculus	3	1	-	3	40	60	4
2	22PYC01	Optics and Semiconductor Physics	3	-	-	3	40	60	3
3	22CSC01N	Problem Solving and Programming using C	2	1	-	3	40	60	3
4	22EGC01N	English	2	-	-	3	40	60	2
PRACTICAL									
5	22PYC03	Optics and Semiconductor Physics Lab	-	-	3	3	50	50	1.5
6	22EGC02N	English lab	-	-	2	3	50	50	1
7	22CSC02N	Problem Solving and Programming using C Lab	-	-	3	3	50	50	1.5
8	22MEC01N	Engineering Graphics	-	1	3	3	50	50	2.5
9	22MEC38N	Digital Fabrication Workshop	-	-	3	3	50	50	1.5
TOTAL			**10**	**3**	**14**	**-**	**410**	**490**	**20**

L: Lecture T: Tutorial D: Drawing
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SEE - Semester End Exam

With effect from AY 2024-25

22MTC01

LINEAR ALGEBRA AND CALCULUS

(CSE, CSE(AI&ML), CSE(IOT & Cyber Security including Block Chain Technology), IT, AI&ML, AI&DS)

Instruction	3 L+1T Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:

1. To explain the Partial Derivatives and the extreme values of functions of two variables.
2. To discuss Physical interpretations of scalar and vector functions.
3. To discuss vector line, surface and volume integrals.
4. To explain the concepts of basis, dimension of vector space and matrix representation of a linear transformation.
5. To explain the solution of system of linear equations by Matrix Methods.

Course Outcomes:

Upon completing this course, students will be able to:

1. Determine the extreme values of functions of two variables.
2. Apply the vector differential operator to scalar and vector functions
3. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.
4. Determine the basis and dimension of a vector space, compute linear transformation.
5. Apply the Matrix Methods to solve the system of linear equations

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	-	-	-	-	-	-	2	1	-	-
CO 2	3	3	3	3	-	-	-	-	-	-	2	1	-	-
CO 3	3	3	3	3	-	-	-	-	-	-	2	1	-	-
CO 4	3	3	3	3	-	-	-	-	-	-	1	2	-	-
CO 5	3	3	3	3	-	-	-	-	-	-	1	2	-	-

UNIT-I

Partial Differentiation and Its Applications: Functions of two or more variables, Partial derivatives, Higher order partial derivatives, Total derivative, Differentiation of implicit functions, Jacobians, Taylor's expansion of functions of two variables, Maxima and minima of functions of two variables.

UNIT-II

Vector Differential Calculus and multiple Integrals: Scalar and Vector point functions, vector operator Del, Gradient, Directional derivative, Divergence, Curl, Del applied twice to point functions, Del applied to product of point functions (vector identities), Irrotational fields and Solenoidal fields, Double integral, Change of order of integration and Triple integrals.

UNIT-III

Vector Integral Calculus: Line integral, Surface integral and Volume integral. Verification of Green's theorem in a plane (without proof), verification of Stroke's theorem (without proof) and Gauss's divergence theorem (without proof).

UNIT-IV:

Vector space: Vector space, Subspace, linear combination of vectors, linear span, row and column spaces, linear dependent, independent vectors, basis, dimension, linear transformation, invertible transformation, matrix of linear transformation, kernel and range of LT, rank and nullity of LT-rank nullity theorem(without proof), change of basis.

UNIT-V

Matrices: Rank of a matrix, Echelon form, consistency of linear System of equations, Eigen values, Eigenvectors, Properties of Eigen values, Cayley-Hamilton theorem, Quadratic forms, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic form.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, KhannaPublishers,44th Edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Seymour Lipschutz, Schaum's Outline of Linear Algebra, 5th Edition, McGraw Hill, 2013.
4. Gilbert Strang, Introduction to linear algebra, 5th Edition, Wellesley - Cambridge press, 2016.

Suggested Reading:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw- Hill, New Delhi, 2008.
2. R.K. Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/ Cole, 2005.
4. Kuldeep Singh, Linear algebra: step by step. OUP Oxford, 2013.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/111104125
2. https://archive.nptel.ac.in/courses/111/107/111107112/ (Unit- 1,3,5 and 6)
3. https://nptel.ac.in/courses/111108098 (Unit-1,3 and 9)
4. https://nptel.ac.in/courses/111102152 (Week -1 to Week- 6)

With effect from AY 2024-25

22PYC01

OPTICS AND SEMICONDUCTOR PHYSICS
(CSE, IT, CSE(AI&ML), CSE(IoT & Cyber Security including Block Chain Technology), AI&ML, AI&DS)

Instruction	3L Hours per week
Duration of SEE	3Hours
SEE	60Marks
CIE	40Marks
Credits	3

Course Objectives: The objectives of the course is to make the student
1. Understand the fundamentals of wave nature of flight
2. Acquire knowledge of lasers, holography and fiber optics
3. Familiarize with quantum mechanics
4. Learn the fundamental concepts of solids

Course Outcomes: At the end of the course, the student will be able to
1. Demonstrate the physical properties of light.
2. Explain characteristic properties of lasers and fiber optics
3. Find the applications of quantum mechanics
4. Classify the solids depending upon electrical conductivity
5. Identify different types of semiconductors

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	3	2	2	1	1	-	-	2	-	-	-
CO 2	3	3	3	3	3	3	3	2	-	3	2	-	-	-
CO 3	3	3	3	3	3	2	2	1	-	-	2	-	-	-
CO 4	2	2	2	1	2	2	2	1	-	2	2	-	-	-
CO 5	3	2	2	2	2	2	3	2	-	3	2	-	-	-

UNIT-I

Wave Optics: Huygens' principle –Superposition of waves –Interference of light by wave front splitting and amplitude splitting–Fresnel's biprism – Interference in thin films in reflected light– Newton's rings– Fraunhofer diffraction from a single slit –Double slit diffraction – Rayleigh criterion for limit of resolution– Concept of N-slits–Diffraction grating and its resolving power.

UNIT-II

Lasers & Holography: Characteristics of lasers – Einstein's coefficients –Amplification of light by population inversion –Different types of lasers: solid-state lasers: Ruby & Nd:YAG; gas lasers: He-Ne & CO_2; semiconductor laser –Applications of lasers in engineering and medicine. Holography: Principle – Recording and reconstruction–Applications.

Fiber Optics: Introduction –Construction –Principle –Propagation of light through an optical fiber – Numerical aperture and acceptance angle –Step-index and graded-index fibers –Pulse dispersion –Fiber losses--Fiber optic communication system –Applications.

UNIT-III

Principles of Quantum Mechanics: Introduction –Wave nature of particles – de-Broglie hypothesis – Physical significance of ψ –Time-dependent and time-independent Schrodinger equations – Born interpretation – Probability current –Wave packets –Uncertainty principle –Particle in infinite square well potential –Scattering from potential step – Potential barrier and tunneling.

UNIT-IV

Band Theory of Solids: Salient features of free electron theory of metals (Classical and Quantum) – Fermi level –Density of states – Bloch's theorem for particles in a periodic potential – Kronig-Penney model – Classification of solids: metals, semiconductors and insulators.

UNIT-V

Semiconductors: Intrinsic and extrinsic semiconductors –Charge carrier concentration in intrinsic semiconductors –Dependence of Fermi level on carrier concentration and temperature in extrinsic semiconductors (qualitative) –Carrier generation and recombination –Carrier transport: diffusion and drift – P-N junction – Thermistor – Hall effect – LED –Solar cell.

TEXT BOOKS:

1. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Publications,2012.
2. M.N. Avadhanulu and P.G. Kshirsagar, A Text Book of Engineering Physics, S. Chand Publications, 2014.
3. M. Arumugam, Materials Science, Anuradha Publications,2015.
4. S.L. Gupta and Sanjeev Gupta, Modern Engineering Physics, Dhanpat Rai Publications, 2011.

SUGGESSTED READING:

1. R. Murugeshan and KiruthigaSivaprasath, Modern Physics, S. Chand Publications S. Chand Publications, 2014.
2. V. Rajendran, Engineering Physics, McGraw-Hill Education Publications,2013.
3. P.K. Palanisamy, Engineering Physics, Scitech Publications,2012.
4. V. Raghavan, Materials Science and Engineering, Prentice Hall India Learning Private Limited; 6th Revised edition,2015.

With effect from AY 2024-25

22CSC01N

PROBLEM SOLVING AND PROGRAMMING USING C

Instruction	2 L + 1 T Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

This course aims to:

1. Understanding the steps in problem solving and formulation of algorithms to problems.
2. Develop programming skills as a means of implementing an algorithmic solution with appropriate control and data structures.
3. Develop intuition to enable students to come up with creative approaches to problems.

Course Outcomes:

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

1. Formulate solutions to problems and represent those using algorithms/ Flowcharts.
2. Choose proper control statements and data structures to implement the algorithms
3. Decompose a problem into modules and use functions to implement the modules.
4. Develop programs using arrays, pointers and structures.
5. Develop applications using file I/O.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	1	2	-	-	-	-	1	-	-	2	1	1
CO 2	3	2	1	2	-	-	-	-	1	-	-	2	2	2
CO 3	3	2	1	2	-	-	-	-	1	-	-	2	1	1
CO 4	3	2	-	2	-	-	-	-	1	-	-	2	2	1
CO 5	2	1	-	-	-	-	-	-	-	-	-	2	1	1

UNIT-I

Introduction: Introduction to Programming, Idea of Algorithm, Representation of Algorithm, Flowchart, from algorithms to programs, source code.

Basics of C: Background, Structure of a C Program, Datatypes, Tokens, Operators and Expressions- Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions, Input and Output Functions.

UNIT-II

Control Statements: Conditional Execution -Selection Statements, Conditional Operator, Switch statement**.** Iteration Execution - While Construct, For Construct, do-while Construct Goto Statement, Special Control Statements, Nested Loops.

Arrays: One-Dimensional Arrays-Declaration, Initialization, internal representation. Multidimensional Arrays.

UNIT–III

Strings: Strings: One-dimensional Character Arrays, Arrays of Strings: Two-dimensional Character Array.

Functions: Concept, Uses, Prototype, Declaration, Parameter passing techniques, Passing Arrays to Functions, Storage Classes, Recursion.

UNIT-IV

Search and Sorting: searching algorithms-linear, binary .sorting algorithms-bubble sort, selection sort.

Pointers: Declaring a Pointer, Initializing Pointers, Indirection Operator and Dereferencing, Arrays and Pointers, Pointers and Strings, Pointers to Pointers, Array of Pointers, Pointers to an Array, Two-dimensional Arrays and Pointers, Pointers to Functions and Dynamic Memory Allocation.

UNIT–V

Userdefined Datatypes: Structures- Declaring Structures and Structure Variables, Accessing the Members of a Structure, Initialization of Structures, Typedef, Nesting of Structures, Arrays and Structures, Structures and Pointers, Structures and Functions, Union, Enumeration Types.

Files: Using Files in C, Declaration of File Pointer, Working with Text Files, Character Input and Output, Working with Binary Files, Sequential Versus Random File Access, File Record.

Text Books:

1. Pradip Dey and Manas Ghosh "Programming in C 2/e", 2nd Edition Oxford University Press, 2012.

Suggested Reading:

1. B. W. Kernighan and D.M. Ritchie, "The 'C' Programming Language" Prentice Hall India, 2nd Edition. 1990.
2. B.A.Forouzan and R.F. Gilberg "A Structured Programming Approach in C", Cengage Learning,2007.
3. Byron Gottfried, "Schaum's Outline of Programming with C", McGraw- Hill.
4. E. Balaguruswamy, "Programming in ANSI C", Tata McGraw-Hill.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs40/preview
2. https://archive.nptel.ac.in/courses/106/105/106105171/

22EGC01N With effect from AY 2024-25

ENGLISH

(B.E/B.Tech - Common to all Branches)

Instruction	2L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

Prerequisite: Basic knowledge of English grammar and vocabulary.

Course Objectives: The course is taught with the objectives of enabling the students to:

1. Improve their understanding of communication skills while developing their usage of English for correct use of grammar and vocabulary.
2. Equip themselves with Reading Comprehension strategies and techniques.
3. Enhance their writing skills through paragraphs, précis and essays by using devices of cohesion and coherence.
4. Build appropriate, longer meaningful sentences for professional writing through formal letters and e-mails.
5. Demonstrate knowledge of drafting formal reports to define, describe and classify the processes by following a proper structure.

Course Outcomes:

After successful completion of the course the students will be able to:

1. Step-up the awareness of correct usage of English grammar and vocabulary by speaking fluently and comprehensively with a grip on communication skills.
2. Apply effective reading techniques through critical reading exercises to enhance quality of life and to support lifelong learning.
3. Develop their ability to write paragraphs independently on any context with cohesion, edit essays coherently while realizing brevity through précis writing.
4. Construct sentences clearly and comprehensively to write effective business letters and draft emails for a better professional communication.
5. Advance efficiency in writing, distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.

CO PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	1	1	2	2	3	3	2	3	1	2	1
CO 2	1	1	1	1	1	2	1	1	2	1	3	1	2	1
CO 3	1	2	1	1	-	2	1	1	3	1	3	1	2	1
CO 4	1	2	1	1	-	2	2	2	2	2	3	2	2	2
CO 5	1	2	1	2	1	3	2	3	3	2	3	1	1	1

UNIT-I Communication Skills:

Introduction, nature and importance of communication; Process of communication; Types of communication: verbal and non-verbal; Barriers to communication; Intrapersonal, Interpersonal communication; Understanding Johari Window.

Vocabulary & Grammar: The concept of Word Formation - Root words, Use of prefixes and suffixes to form derivatives, Standard abbreviations. Basic Sentences.
Reading Task I.

UNIT-II Reading Skills:
The Reading process, purpose, different kinds of texts; Reading Comprehension; Techniques of comprehension – skimming, scanning, drawing inferences and conclusions. Practice in Critical Reading passages
Vocabulary and Grammar: Determiners. Use of Synonyms and Antonyms, Construction of Sentences.
Reading Task II.

UNIT-III Writing Skills:
Paragraph Writing. – Structure and features of a paragraph; Essay writing, Cohesion and coherence. Techniques of writing précis.
Vocabulary & Grammar: Use of connectors and linkers, Tenses, Punctuation.
Reading Task III.

UNIT-IV Professional Writing Skills-1:
Letter Writing – Structure, format of a formal letter; Letter of Request and Response, Drafting Emails, Email and Mobile etiquette.
Vocabulary and Grammar: Phrasal verbs, Misplaced modifiers, Subject-verb agreement.
Reading Task IV

UNIT-V Professional Writing Skills-2:
Report writing – Importance, structure, elements & style of formal reports; Writing a formal report. Writing for Blogs.
Vocabulary and Grammar: Words often Confused, Common Errors. Avoiding Ambiguity & Redundancy.
Reading Task V.

Text Books:

1. Sanjay Kumar & Pushp Lata, "English Language and Communication Skills for Engineers", Oxford University Press, 2018.
2. "Language and Life: A Skills Approach", Board of Editors, 2018th Edition, Orient Black Swan, 2018.

Suggested Readings:

1. Ashraf, M. Rizvi, "Effective Technical Communication", Tata McGraw-Hill, 2006.
2. Michael Swan, "Practical English Usage", Oxford University Press, 4th Edition, 2016.
3. Meenakshi Raman and Sangeetha Sharma, "Technical Communication: Principles and Practice" 3rd Edition, Oxford University Press, 2015.

With effect from AY 2024-25

22PYC03

OPTICS AND SEMICONDUCTOR PHYSICS LAB
(CSE, IT, CSE(AI&ML), CSE(IoT & Cyber Security including Block Chain Technology), AI&ML, AI&DS)

Instruction	3P Hours per week
Duration of SEE	3Hours
SEE	50Marks
CIE	50Marks
Credits	1.5

Course Objectives: The objectives of the course is to make the student

1. Apply theoretical physics knowledge in doing experiments
2. Understand the behaviour of the light experimentally
3. Analyze the conduction behaviour of semiconductor materials and optoelectronic devices

Course Outcomes: At the end of the course, the student will be able to

1. Interpret the errors in the results of an experiment.
2. Demonstrate physical properties of light experimentally
3. Make use of lasers and optical fibers for engineering applications
4. Explain the V-I characteristics of some optoelectronic and semiconductor devices
5. Find the applications thermistor

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	3	1	3	3	3	-	1	2	-	-	-
CO 2	3	3	2	2	2	2	3	3	-	1	3	-	-	-
CO 3	3	3	3	3	3	1	3	3	-	1	2	-	-	-
CO 4	3	3	3	2	2	1	3	3	-	1	3	-	-	-
CO 5	3	2	2	3	2	1	3	3	-	1	2	-	-	-

Experiments:

1. Error Analysis : Estimation of errors in the determination of time period of a torsional pendulum
2. Fresnel's Biprism : Determination of wavelength of given monochromatic source
3. Newton's Rings : Determination of wavelength of given monochromatic source
4. Single Slit Diffraction : Determination of wavelength of given monochromatic source
5. Diffraction Grating : Determination of wavelengths of two yellow lines of light of mercury lamp
6. Laser : Determination of wavelength of given semiconductor laser
7. Holography : Recording and reconstruction of a hologram
8. Optical Fiber : Determination of numerical aperture and power losses of given optical fiber
9. Energy Gap : Determination of energy gap of given semiconductor
10. P-N Junction Diode : Study of V-I characteristics and calculation of resistance of given diode in forward bias and reverse bias
11. Thermistor : Determination of temperature coefficient of resistance of given thermistor

12.	Hall Effect	**:**	Determination of Hall coefficient, carrier concentration and mobility of charge carriers of given semiconductor specimen
13.	LED	**:**	Study of I-V characteristics of given LED
14.	Solar Cell	**:**	Study of I-V characteristics of given solar cell and calculation of fill factor, efficiency and series resistance
15.	Planck's Constant	**:**	Determination of Planck's constant using photo cell

NOTE: A minimum of TWELVE experiments should be done.

With effect from AY 2024-25

22EGC02N

ENGLISH LAB

(B.E/B.Tech - Common to all Branches)

Instruction	2P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisite: Basic Knowledge of English Communication.

Course Objectives: This course will introduce the students

1. To nuances of Phonetics and give them sufficient practice in correct pronunciation through computer-aided multi-media instruction.
2. To the significance and application of word and sentence stress and intonation.
3. To sufficient practice in listening to English spoken by educated English speakers in different socio-cultural and professional settings.
4. To reading and speaking activities enabling them to critically interpret and respond to different texts and contexts, and produce speech with clarity and confidence.
5. To team work, role behaviour while developing their ability to use language appropriately, to discuss in groups and make presentations.

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

1. Define the speech sounds in English and understand the nuances of pronunciation in English.
2. Produce speech with clarity and confidence using correct word and sentence stress, and intonation.
3. Achieve improved ability to listen, understand, analyse, and respond to English spoken in various settings.
4. Read, interpret, and review a variety of written texts, contexts, and perform appropriately in different situations.
5. Design effective posters collaboratively through creative decisions, give presentations, and efficiently participate in Group discussions.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	-	-	-	-	-	-	-	1	2	1	3	1	2	1
CO 2	-	-	-	-	-	-	-	2	2	1	3	1	2	1
CO 3	-	-	-	-	-	-	-	2	1	1	2	1	2	1
CO 4	1	1	1	1	1	1	1	3	3	1	3	2	2	2
CO 5	-	1	1	1	1	1	1	3	3	2	3	1	1	1

Exercises

Computer-Aided Language Learning Lab

1. **Introduction to English Phonetics**: Introduction to English Phonetics and organs of speech.

2. **Sound system of English**: Speech sounds- Vowels and Consonants- structure of syllables (Introduction to syllables) - Basic phonetic transcription practice.
3. **Word and Sentence stress**: Rules of word stress -Primary stress, Secondary stress; Sentence stress (word emphasis in sentences) -Practice.
4. **Intonation**: Types of Intonation, Practice in Articulation – MTI-Errors in pronunciation.
5. **Listening skills**: understanding Listening- Practice in Listening comprehension texts.

Interactive Communication Skills Lab

1. **JAM-** Ice Breaking, Speaking Activity**.**
2. **Role play/Public speaking –** Speaking with confidence and clarity in different contexts on various issues.
3. **Group Discussions -** Dynamics of a Group Discussion, Group Discussion Techniques, Non-Verbal Communication.
4. **Read and Review** - Preparation for active reading and instructing the students to cultivate effective reading habits to read select texts, review and write their responses.
5. **Poster presentation –** Theme, poster preparation, team work and presentation.

Text Books:

1. T Balasubramanian, "A Textbook of English Phonetics for Indian Students", Macmillan, 2nd Edition, 2012.
2. J Sethi et al., "A Practical Course in English Pronunciation (with CD)", Prentice Hall India, 2005.
3. Priyadarshi Patnaik, "Group Discussions and Interview Skills", Cambridge University Press Pvt. Ltd., 2nd Edition, 2015.
4. Aruna Koneru, "Professional Speaking Skills", Oxford University Press, 2018.

Suggested Reading:

1. "English Language Communication Skills – Lab Manual cum Workbook", Cengage Learning India Pvt. Ltd., 2022.
2. KN Shoba & J. Lourdes Javani Rayen."Communicative English – A workbook", Cambridge University Press, 2019.
3. Sanjay Kumar & Pushp. Lata. "Communication Skills: A Workbook. Oxford University Press", 2019.
4. Veerendra Mishra et al. "English Language Skills: A Practical Approach", Cambridge University Press, 2020.

Suggested Software:

1. K-VAN Multi-Media Language Lab
2. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
3. Digital All
4. Orell Digital Language Lab (Licensed Version).

With effect from AY 2024-25

22CSC02N

PROBLEM SOLVING AND PROGRAMMING USING C LAB

Instruction	3 P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Course Objectives:

This course aims to:

1. Setting up programming environment.
2. Develop Programming skills to solve problems.
3. Use of appropriate C programming constructs to implement algorithms.

Course Outcomes:

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

1. Identify and setup program development environment.
2. Implement the algorithms using C programming language constructs.
3. Develop programs using arrays, structures and pointers.
4. Solve problems in a modular approach using functions.
5. Implement file operations with simple text data.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	-	1	1	1	-	-	-	-	1	-	-	2	1	2
CO 2	3	2	1	2	-	-	-	-	-	-	-	2	2	2
CO 3	3	2	1	2	-	-	-	-	-	-	-	1	2	2
CO 4	3	2	1	2	-	-	-	-	-	-	-	1	1	1
CO 5	3	1	-	1	-	-	-	-	-	-	-	2	2	1

Laboratory / Practical Experiments:

1. Familiarization with programming environment.
2. Draw flowcharts using Raptor or Drakon Tool.
3. Simple computational problems using arithmetic expressions.
4. Problems involving if-then-else structures.
5. Iterative problems e.g., sum of series, generating patterns.
6. Iterative and Recursive functions.
7. 1D Arrays, 2D arrays and strings.
8. Sorting and Searching, Matrix problems.
9. Pointers and structures.
10. Dynamic memory allocation.
11. File Handling.

Text Books:

1. Pradip Dey and Manas Ghosh “Programming in C 2/e”, 2nd Edition, Oxford University Press, 2012.

Suggested Reading:

1. B. W. Kernighan and D.M. Ritchie, "The 'C' Programming Language”, 2nd Edition. Prentice Hall India, 1990.
2. B.A.Forouzan and R.F. Gilberg, “A Structured Programming Approach in C”, Cengage Learning,2007.

3. Byron Gottfried, “Schaum’s Outline of Programming with C”, McGraw- Hill.
4. E. Balaguruswamy, “Programming in ANSI C”, Tata McGraw-Hill.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs40/preview
2. https://archive.nptel.ac.in/courses/106/105/106105171/

With effect from AY 2024-25

22MEC01N

ENGINEERING GRAPHICS

Instruction	1 T + 3 D Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	2.5

Prerequisite: Nil

Course Objectives:

This course aims to:

1. Get exposure to a cad package and its utility.
2. Understand orthographic projections.
3. Visualize different solids and their sections in orthographic projection.
4. Prepare the student to communicate effectively by using isometric projection.
5. Prepare the student to use the techniques, skills, and modern tools necessary for practice.

Course Outcomes:

Upon completion of this course, student will be able to:

1. Become conversant with appropriate use of CAD software for drafting and able to draw conic sections.
2. Understand orthographic projections of points and straight lines.
3. Draw the projections of planes.
4. Draw and analyze the internal details of solids through sectional views.
5. Create an isometric projections and views.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	1	2	2	-	1	2	3	1	3	2	1	2
CO 2	3	2	2	1	2	2	-	1	2	2	1	2	2	-	2
CO 3	3	3	2	1	2	2	-	1	2	2	1	2	2	-	2
CO 4	3	3	3	2	2	2	-	1	2	2	1	2	2	1	2
CO 5	3	2	2	1	2	2	-	1	2	2	1	2	2	2	2

List of Exercises:

1. Introduction to CAD package: Settings, draw, modify tools, dimensioning, documentation and practice exercises using Auto CAD software.
2. Construction of Conic Sections by General method.
3. Orthographic projection: Principles, conventions, Projection of points.
4. Projection of straight lines: Simple position, inclined to one plane & inclined to both the planes (without traces and mid-point)
5. Projection of planes: Perpendicular planes.
6. Projection of planes: Oblique planes.
7. Projection of solids: Simple position.
8. Projection of solids: Inclined to one plane.
9. Sections of solids: Prism, pyramid in simple position.
10. Sections of solids: Cone and Cylinder in simple position.

11. Isometric projections and views.
12. Conversion of isometric views to orthographic projections and vice-versa.

Text Books:

1. N.D.Bhatt, “Elementary Engineering Drawing”, Charotar Publishers, 2012.
2. K.Venugopal, “Engineering Drawing and Graphics + AutoCAD”, New Age International Pvt.Ltd, 2011.
3. Basanth Agrawal and C M Agrawal, “Engineering Drawing”, 2/e, McGraw-Hill Education (India) Pvt. Ltd.

Suggested Reading:

1. Shaw M.B and Rana B.C., “Engineering Drawing”, 2/e, Pearson, 2009.
2. K.L. Narayana and P.K. Kannaiah, “Text Book of Engineering Drawing”, Scitech Publications,2011.

With effect from AY 2024-25

22MEC38N

DIGITAL FABRICATION WORKSHOP

Instruction	3 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Prerequisite: Nil

Course Objectives:

This course aims to:

1. Give a feel of Engineering Practices and develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive and team work attitude to get things right the first time.
3. Provide basic knowledge of steel, plastic, composite, and other materials for suitable applications.
4. Study of principle and hands on practice on techniques of fabrication, manufacturing, and allied skills.
5. Advance important, hard and pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop components and processes and can communicate their work in a technical, clear and effective way.

Course Outcomes:

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

1. Understand safety measures to be followed in workshop to avoid accidents.
2. Identify various tools used in carpentry, house wiring and plumbing.
3. Make a given model by using workshop trades like carpentry, plumbing, House wiring and 3D modeling using solid works software for Additive Manufacturing.
4. Perform pre-processing operations on STL files for 3D printing, also understand reverse engineering process.
5. Conceptualize and produce simple device/mechanism of their choice.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	1	-	-	-	1	-	-	-	1	-	-	1
CO 2	1	-	1	-	-	-	-	-	-	-	-	1	-	2	1
CO 3	1	-	1	-	-	1	-	-	-	-	-	1	2	2	1
CO 4	1	-	1	-	-	1	-	-	-	-	-	1	2	2	1
CO 5	2	2	2	1	3	1	-	1	1	2	-	2	3	3	3

Lab Experiments:

Group 1: Workshop Practice

1. To make a lap joint on the given wooden piece according to the given dimensions.
2. To make a dovetail joint on the given wooden piece according to the given dimensions.
3. (a)Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single switch.

(b)Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs. Wiring of two light points connected in parallel from two single pole switches and a three pin socket.

4. Stair case wiring of one light point controlled from two different places independently using two 2way switches.
5. To make external threads for GI pipes using die and connect the GI pipes as per the given diagram using taps, couplings, and bends.
6. To connect the GI pipes as per the given diagram using, Coupling, Unions, reducers, and bends. To connect the GI pipes as per the given diagram using shower, tap, and valves and demonstrate by giving water connection.

Group 2: Additive Manufacturing /3D Printing

1. To Study the methods of Additive manufacturing process using a 3D printer.
2. To create a 3D CAD model of a door bracket using a modelling software.
3. To print a door bracket using an extruder type 3D printer.
4. To create a 3D CAD model using Reverse engineering.
5. Engraving, Drilling and Cutting operations on printed circuit boards using CNC PCB Mate.
6. To design an innovative component using the CAD software./print the selected innovative component by the student using a 3D printer.

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I, 2008 and Vol. II, Media promoters and publishers private limited, Mumbai, 2010.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th Edition, Pearson Education India Edition, 2002.

Suggested Reading:

1. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology.
2. Oliver Bothmann, 3D Printers: A Beginner's Guide, January 1, 2015

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2024-25

SEMESTER -II

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22MTC04	Differential Equations and Numerical Methods	3	1	-	3	40	60	4
2	22CYC01	Chemistry	3	-	-	3	40	60	3
3	22EEC01	Basic Electrical Engineering	2	1	-	3	40	60	3
4	22ITC20N	Data Structures using C++	3	-	-	3	40	60	3
PRACTICAL									
5	22CYC02	Chemistry Lab	-	-	3	3	50	50	1.5
6	22MBC02N	Community Engagement	-	-	2	-	50	-	1
7	22ITC21N	Data Structures using C++ Lab	-	-	2	3	50	50	1
8	22MEC37N	Robotics and Drones Lab	-	1	3	-	100	-	2.5
9	22EEC02	Basic Electrical Engineering Lab	-	-	2	3	50	50	1
		TOTAL	**11**	**3**	**12**	**-**	**460**	**390**	**20**

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

With effect from AY 2024-25

22MTC04

DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS
(CSE, CSE(AI&ML), CSE(IOT & Cyber Security including Block Chain Technology), IT, AI&ML, AI&DS)

Instruction	3 L+1T per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:

1. To explain the relevant methods to solve first order differential equations.
2. To explain the relevant methods to solve higher order differential equations.
3. To discuss numerical methods to solve algebraic and transcendental equations.
4. To discuss the interpolation and numerical differentiation.
5. To discuss convergence and divergence of Infinite series.

Course Outcomes:

Upon completing this course, students will be able to:

1. Calculate the solutions of first order linear differential equations.
2. Calculate the solutions of higher order linear differential equations.
3. Solve the algebraic, transcendental and system of equations.
4. Apply interpolation and numerical differentiation techniques for given data.
5. Test the convergence and divergence of Infinite series.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	-	-	-	-	-	-	2	-	1	-
CO 2	3	3	3	3	-	-	-	-	-	-	2	-	1	-
CO 3	2	2	2	2	-	-	-	-	-	-	1	-	2	-
CO 4	2	2	2	2	-	-	-	-	-	-	1	-	2	-
CO 5	1	1	1	1	-	-	-	-	-	-	1	-	1	-

UNIT - I

Differential Equations of First Order: Exact Differential Equations, Equations Reducible to Exact Equations, Linear Equations, Bernoulli's Equations, Riccati's and Clairaut's Equations, Orthogonal trajectories, Rate of decay of radio-active materials.

UNIT-II

Higher Order Linear Differential Equations: Higher order linear differential equations with constant coefficients, rules for finding Complementary function, Particular Integral and General solution. Method of Variation of Parameters, solution of Cauchy- Euler equation. LR and LCR circuits.

UNIT-III

Numerical solution of equations: Numerical solutions of algebraic and transcendental equations by Bisection method, Regula-falsi method and Newton-Raphson's method, Solution of system of linear equations by LU decomposition methods, Crout's method, Jacobi's method, Gauss Seidel method.

UNIT-IV

Interpolation and Numerical Differentiation: Forward, Backward and Central differences, Newton's forward and backward interpolation formulae, Gauss's forward and backward interpolation formulae, Lagrange interpolation, Numerical differentiation at the tabulated points with forward, backward and central differences**.**

UNIT-V

Infinite Series: Convergence of sequence and series. Series of positive terms, Necessary condition for convergence, Comparison tests, limit form comparison test, D'Alembert's Ratio test, Raabe's test, Cauchy's root test, Alternating series, Leibnitz's rule, absolutely and conditionally convergence.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.
3. M.K. Jain, S.R.K Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering and Computation, New age International Publications, 2008.

Suggested Reading:

1. R.K.Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.
2. Ramana B.V, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. A.R.Vasishtha and R.K.Guptha, Integral Transforms, Krishna's Educational Publishers, Reprint, 2014.

Online Resources:

1. NPTEL :: Mathematics - NOC:Advanced Calculus For Engineers (Week 5 & Week 6)
2. https://archive.nptel.ac.in/courses/111/107/111107105/ (Unit- 1,2,4 and 5)
3. https://archive.nptel.ac.in/courses/111/104/111104085/ (Infinite Series)

With effect from AY 2024-25

22CYC01

CHEMISTRY

(Common to All Branches)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives

1. This syllabus helps at providing the concepts of chemical bonding and chemical kinetics to the students aspiring to become practicing engineers
2. Thermodynamic and Electrochemistry units give conceptual knowledge about processes and how they can be producing electrical energy and efficiency of systems.
3. To teach students the value of chemistry and to improve the research opportunities knowledge of stereochemistry and organic reactions is essential.
4. Water chemistry unit impart the knowledge and understand the role of chemistry in the daily life.
5. New materials lead to discovering of technologies in strategic areas for which an insight into Polymers, nanomaterials and basic drugs of modern chemistry is essential.

Course Outcomes

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

1. Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
2. Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
3. Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
4. Classify the various methods used in treatment of water for domestic and industrial use.
5. Outline the synthesis of various Engineering materials & Drugs.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	-	-	2	-	-	-	-	2	-	-	-
CO 2	3	2	2	-	-	2	-	-	-	-	2	-	-	-
CO 3	3	2	3	-	-	2	-	-	-	-	2	-	-	-
CO 4	3	2	3	-	-	2	-	-	-	-	2	-	-	-
CO 5	3	2	2	-	-	2	-	-	-	-	2	-	-	-

Unit – I

Atomic and molecular structure and Chemical Kinetics:

Atomic and molecular structure: Molecular Orbital theory - atomic and molecular orbitals. Linear combination of atomic orbitals (LCAO) method. Molecular orbitals of diatomic molecules. Molecular Orbital Energy level diagrams (MOED) of diatomic molecules & molecular ions (H_2 , He_2^+ ,N_2 , O_2 , O_2^- , CO, NO). Pi- molecular orbitals of benzene and its aromaticity. **Chemical Kinetics:** Introduction, Terms involved in kinetics: rate of reaction, order & molecularity; First order reaction-Characteristics: units of first order rate constant & its half-life period, second order reaction-Characteristics: units of second order rate constant & its half- life period. Numericals.

Unit – II

Use of free energy in chemical equilibria

Use of free energy in chemical equilibria: Thermodynamic functions: Internal energy, entropy and free energy. Significance of entropy and free energy (criteria of spontaneity). Free energy and emf (Gibbs Helmholtz equations and its applications). Cell potentials, electrode potentials, – Reference electrodes (NHE, SCE)-electrochemical series. Nernst equation and its applications. Determination of pH using combined Glass & Calomel electrode. Potentiometric Acid base & Redox Titrations. Numericals. **Battery technology:**

Rechargeable batteries & Fuel cells. Lithium batteries: Introduction, construction, working and applications of Li-MnO_2 and Li-ion batteries. Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell.

Unit – III

Stereochemistry and Organic reactions

Stereochemistry: Representations of 3 dimensional structures, Types of stereoisomerism- Conformational isomerism – confirmations of n-butane (Newman and sawhorse representations), Configurational isomerism - Geometrical (cis-trans) isomerism & Optical isomerism- optical activity, Symmetry and chirality: Enantiomers (lactic acid)&Diastereomers (Tartaric acid), Absolute configurations, Sequence rules for R&S notation.**Types of Organic reactions:** Substitution Reactions- Electrophilic substitution (Nitration of Benzene); Nucleophilic Substitution (S_N1& S_N2); Free Radical Substitution (Halogenation of Alkanes)
Addition Reactions: Electrophilic Addition – Markonikoff's rule, Free radical Addition - Anti Markonikoff's rule (Peroxide effect), Nucleophilic Addition – (Addition of HCN to carbonyl compounds)
Eliminations-E1 and E2 (dehydrohalogenation of alkyl halides)
Cyclization (Diels - Alder reaction).

Unit – IV

Water Chemistry:

Hardness of water – Types, units of hardness, Disadvantages of hard water, Alkalinity and Estimation of Alkalinity of water, Boiler troubles - scales & sludge formation, causes and effects, Softening of water by lime soda process (Cold lime soda process),ion exchange method and Reverse Osmosis. Specifications of potable water & industrial water. Disinfection of water by Chlorination; break point chlorination, BOD and COD definition, Estimation (only brief procedure) and significance, Numericals.

Unit – V

Engineering Materials and Drugs:

Introduction, Terms used in polymer science; Thermoplastic polymers (PVC) &Thermosetting polymers (Bakelite); Elastomers (Natural rubber). Conducting polymers- Definition, classification and applications.
Polymers for Electronics: Polymer resists for integrated circuit fabrication, lithography and photolithography.
Nano materials-Introduction to nano materials and general applications, basic chemical methods of preparation- Sol-gel method. Carbon nanotubes and their applications. Characterisation of nanomaterials by SEM and TEM (only Principle).
Drugs-Introduction, Synthesis and uses of Aspirin (analgesic), Paracetamol (Antipyretic), Atenolol (antihypertensive).

Textbook:

1. P.C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company Ltd.,New Delhi,16th edition (2015).
2. W.U. Malik, G.D.Tuli and R.D.Madan, "Selected topics in Inorganic Chemistry", S Chand & Company Ltd, New Delhi, reprint (2009).
3. R.T. Morrison, R.N. Boyd and S.K. Bhattacharjee, "Organic Chemistry", Pearson,Delhi, 7th edition(2019).
4. A Textbook of Polymer Science and Technology , Shashi Chawla,Dhanpat Rai & Co. (2014)
5. T. Pradeep, Nano: The Essentials, Tata McGraw-Hill Education, Delhi, 2012
6. G.L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C.Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad (2007).

Reference Books

1. B. H. Mahan, "University Chemistry", Narosa Publishing house, New Delhi, 3rd edition (2013).
2. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", S. Nagin Chand & Company Ltd., 46thedition(2013).
3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, "Organic Chemistry", Wiley,12th edition (2017).
   P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8th edition (2006).

With effect from AY 2024-25

22EEC01

BASIC ELECTRICAL ENGINEERING

Instruction	2L + 1T Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites

Course Objectives

1. To understand the behaviour of different circuit elements R, L & C, and the basic concepts of electrical AC circuit analysis
2. To comprehend the basic principle of operation of AC and DC machines
3. To infer about different types of electrical wires and cables, domestic and industrial wiring. safety rules and methods of earthing.

Course Outcomes

After the completion of this course, the student will be able to

1. Understand the concepts of Kirchhoff's laws and their application various theorems to get solution of simple dc circuits.
2. Predict the steady state response of RLC circuits with AC single phase/three phase supply.
3. Infer the basics of single phase transformer
4. Describe the construction, working principle of DC machine and 3-phase Induction motor.
5. Acquire the knowledge of electrical wires, cables, earthing, Electrical safety precautions to be followed in electrical installations and electric shock and its safety and energy calculations

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	-	-	-	-	1	2	-	3	-	1	1
CO 2	3	3	2	-	-	-	-	1	2	-	3	-	1	1
CO 3	3	3	2	1	-	-	-	1	2	-	3	-	-	1
CO 4	2	1	-	-	-	-	-	1	2	-	3	-	-	1
CO 5	2	-	2	-	-	-	-	1	2	-	3	1	1	1

Unit – I

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation, Superposition, Thevenin's and Norton's Theorems

Unit – II

AC Circuits: Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, series RL and RC. Three phase balanced circuits, voltage and current relations in star and delta connections

Unit – III

Single Phase Transformer: Construction, Working principle, EMF Equation, Ideal and Practical transformer, Equivalent circuit of Transformer, OC and SC tests on a transformer, Efficiency and Regulation

Unit – IV

DC and AC Machines: DC Generators: Construction, Principle of operation, EMF equation, Classification, Characteristics of shunt generators. DC Motors: Classification, Torque Equation, Characteristics and Speed control of DC Shunt and Series Motors, Losses and efficiency Three - Phase Induction Motors: Principle of

operation, Applications

Unit – V

Electrical Installations: Electrical Wiring: Types of wires and cables, Electrical Safety precautions in handling electrical appliances, electric shock, first aid for electric shock, safety rules. Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Earthing (Elementary Treatment only), Elementary calculations for energy consumption .

Textbook:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.

Reference Books

1. D. P. Kothari & I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989
3. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009
4. P.V. Prasad, S. Sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 20

22ITC20N

DATA STRUCTURES USING C++

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites

Problem Solving and Programming using C (22CSC01N), Problem Solving and Programming using C Lab (22CSC02N)

Course Objectives

The objectives of this course are to

1. Acquaint with OOP concepts.
2. Familiarize with the asymptotic analysis of Algorithms.
3. Learn sorting techniques.
4. Explore linear and nonlinear data structures.
5. Introduce pattern-matching algorithms and hashing.

Course Outcomes

After completion of the course, students will be able to

1. Understand the concepts of OOPs.
2. Analyse the time complexity of operations on data structures.
3. Apply sorting techniques, pattern-matching algorithms, and hashing.
4. Demonstrate operations on linear and nonlinear data structures.
5. Develop solutions to the problems using linear and nonlinear data structures.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	1	-	1	-	-	-	-	-	-	1	1	1	-
CO 2	2	2	2	-	1	-	-	-	-	-	-	1	1	-	-
CO 3	2	2	2	-	1	-	-	-	-	-	-	1	1	-	-
CO 4	2	3	2	-	1	-	-	-	-	-	-	1	1	-	-
CO 5	2	3	2	-	1	-	-	-	-	-	-	1	1	-	-

Unit – I

Object Oriented Design: Object-Oriented Design Goals, Object-Oriented Design Principles, Classes: Class Structure, Constructors and Destructor, Classes and Memory Allocation, Class Friends and Class Members, Standard Template Library; Inheritance: Inheritance in C++, Examples, Multiple Inheritance, Interfaces and Abstract Classes, Templates: Class Templates.

Unit – II

Algorithm Analysis: Experimental Studies, Primitive Operations, Asymptotic notation, Asymptotic Analysis, Seven functions.

Sorting: Selection Sort, Insertion Sort, Merge-Sort: Divide-and-Conquer, Quick-Sort: Randomized Quick-Sort, Linear-Time Sorting: Bucket-Sort and Radix-Sort, Comparing Sorting Algorithms.

Unit – III

Linked Lists: Singly Linked Lists, Implementing a Singly Linked List, Insertion to the Front of a Singly Linked List, Removal from the Front of a Singly Linked List, Implementing a Generic Singly Linked List, Doubly Linked Lists, Insertion into a Doubly Linked List, Removal from a Doubly Linked List, Circularly Linked Lists, Reversing a Linked List.

Stacks: The Stack Abstract Data Type, A C++ Stack Interface, A Simple Array-Based Stack Implementation, Reversing a Vector Using a Stack, Matching Parentheses; **Queues:** The Queue Abstract Data Type, A C++ Queue Interface, A Simple Array-Based Implementation, Implementing a Queue with a Circularly Linked List.

Unit – IV

Trees: General Tree Definitions and Properties, Binary Trees, The Binary Tree ADT, Properties of Binary Trees, A Linked Structure for Binary Trees, A Vector-Based Structure for Binary Trees, Traversals of a Binary Tree, Representing General Trees with Binary Trees, **Binary Search Trees:** Searching, Update Operations, AVL Trees: Insertion; **Heaps:** The Heap Data Structure, Complete Binary Trees, Heap Sort.

Unit – V

Strings: Pattern Matching Algorithms: Brute Force, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm. **Graphs:** Graphs, Data Structures for Graph, Graph Traversals. **Hash Tables**: Hash Tables, Bucket Arrays, Hash Functions, Hash Codes, Compression functions, Collision-Handling Schemes, Load Factors and Rehashing.

Textbook:

1. Michael T.Goodrich, Roberto Tamassia, David M.Mount, "Data Structure and Algorithms in C++", 2nd Edition, John Wiley, 2011.
2. Narasimha Karumanchi, "Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles", Career Monk Publications, 5th Edition, 2017.
3. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, "Fundamentals of Data Structures in C++" 2nd Edition, Universities Press, 2007.

Reference Books

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rd Edition, Addison-Wesley, 2007.
2. Narasimha Karumanchi, "Data Structures and Algorithms for GATE", Career Monk Publications, 2011.
3. D. Samantha, "Classic Data Structures", Prentice Hall India, 2nd Edition, 2013.

Web Reference

1. NPTEL Videos: Introduction to data structures and algorithms – http://nptel.ac.in/courses/106102064/1
2. https://takeuforward.org/strivers-a2z-dsa-course/strivers-a2z-dsa-course-sheet-2/
3. https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html.
5. https://visualgo.net/en

With effect from AY 2024-25

22CYC02

CHEMISTRY LAB

(Common to All Branches)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Pre-Requisites

Course Objectives

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory.
2. To provide the knowledge in both qualitative and quantitative chemical analysis
3. The student should be conversant with the principles of volumetric analysis
4. To apply various instrumental methods to analyse the chemical compounds and to improve understanding of theoretical concepts.
5. To interpret the theoretical concepts in the preparation of new materials like drugs and polymers.

Course Outcomes

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

1. Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
2. Estimate the amount of chemical substances by volumetric analysis.
3. Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
4. Calculate the concentration and amount of various substances using instrumental techniques.
5. Develop the basic drug molecules and polymeric compounds.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	-	-	2	-	-	-	-	2	-	-	-
CO 2	3	2	1	-	-	2	-	-	-	-	2	-	-	-
CO 3	3	2	3	-	-	2	-	-	-	-	2	-	-	-
CO 4	3	2	2	-	-	2	-	-	-	-	2	-	-	-
CO 5	3	2	3	-	-	2	-	-	-	-	2	-	-	-

Chemistry Lab

1. Introduction: Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Estimation of metal ions (Co^{+2}& Ni^{+2}) by EDTA method.
3. Estimation of temporary and permanent hardness of water using EDTA solution
4. Determination of Alkalinity of water
5. Determination of rate constant for the reaction of hydrolysis of methyl acetate. (first order)
6. Determination of rate constant for the reaction between potassium per sulphate and potassium Iodide. (second order)
7. Estimation of amount of HCl Conductometrically using NaOH solution.
8. Estimation of amount of HCl and CH_3COOH present in the given mixture of acids Conductometrically using NaOH solution.
9. Estimation of amount of HCl Potentiometrically using NaOH solution.

10. Estimation of amount of Fe^{+2} Potentiometrically using $KMnO_4$ solution
11. Preparation of Nitrobenzene from Benzene.
12. Synthesis of Aspirin drug and Paracetamol drug.
13. Synthesis of phenol formaldehyde resin.

Textbook:

1. J. Mendham and Thomas , "Vogel's text book of quantitative chemical analysis", Pearson education Pvt.Ltd. New Delhi ,6^{th} ed. 2002.
2. Senior practical physical chemistry by B.D.Khosla, V.C.Garg&A.Gulati,; R. Chand & Co. : New Delhi (2011)..

Reference Books

1. Dr.Subdharani , "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing, 2012.
2. S.S. Dara , "A Textbook on experiment and calculation in engineering chemistry", S.Chand and Company, 9^{th} revised edition, 2015

With effect from AY 2024-25

22MBC02N

COMMUNITY ENGAGEMENT

Instruction	2 Hours per week
Semester End Examination	Nil
CIE	50 Marks
Credits	1

Pre-Requisites

Course Objectives: The main Objectives of this Course are to:

1. Develop an appreciation of Rural culture, life-style and wisdom among the Students.
2. Learn about the various livelihood activities that contribute to Rural economy.
3. Familiarize the Rural Institutions and the Rural Development Programmes in India.

Course Outcomes::

After the completion of this Course, Student will be able to

1. Gain an understanding of Rural life, Culture and Social realities.
2. Develop a sense of empathy and bonds of mutuality with Local Communities.
3. Appreciate significant contributions of Local communities to Indian Society and Economy.
4. Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.
5. Utilise the opportunities provided by Rural Development Programmes.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	1	2	2	2	-	3	1	2	-	-	2	2	1	1
CO 2	-	1	2	2	-	2	-	2	1	-	1	1	1	2
CO 3	-	1	1	2	-	3	1	3	1	2	1	2	1	1
CO 4	2	2	3	2	-	2	1	2	2	1	-	1	2	1
CO 5	1	2	2	1	-	2	-	1	-	1	1	1	1	1

Module I Appreciation of Rural Society

Rural life style, Rural society, Caste and Gender relations, Rural values with respect to Community, Nature and Resources. Rural Infrastructure.

Module II Understanding Rural Economy and Livelihood

Agriculture, Farming, Landownership, Water management, Non-farm Livelihood and Artisans, Rural Entrepreneurs, Rural markets, Rural Credit Societies, Farmer Production Organization/Company.

Module III Rural Institutions

Traditional Rural organizations, Self-Help Groups, Panchayati Raj Institutions (Gram Sabha), Gram Panchayat, Standing Committees.

Module IV Rural Development Programmes

History of Rural Development in India, Current National Programmes: Sarva Shiksha Abhiyan, Beti Bhachao, Beti Padhao, Ayushman, Bharat, Swachh Bharat, PM Awas Yojana, Skill India. NRLM, MNREGA etc.

Textbook:

1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, New Delhi, 2015.

2. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002.
3. United Nations, Sustainable Development Goals, 2015, un.org/sdgs
4. M.P Boraia, Best Practices in Rural Development, Shanlax Publishers, 2016.

Journals:

1. Journal of Rural development (published by NIRD & PR, Hyderabad).
2. Indian Journal of Social Work, (by TISS, Bombay).
3. Indian Journal of Extension Educations (by Indian Society of Extension Education).
4. Journal of Extension Education (by Extension Education Society).
5. Kurukshetra (Ministry of Rural Development, GOI).
6. Yojana (Ministry of Information & Broadcasting, GOI).

With effect from AY 2024-25

22ITC21N

DATA STRUCTURES USING C++ LAB

Instruction	2P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Pre-Requisites:
Problem Solving and Programming using C (22CSC01N), Problem Solving and Programming using C Lab (22CSC02N)

Course Objectives:
The objectives of this course are to:
1. Acquaint with OOP concepts.
2. Learn sorting techniques.
3. Explore linear and nonlinear data structures.
4. Introduce pattern-matching algorithms
5. Explain hashing and Collision handling.

Course Outcomes:
After completion of the course, students will be able to:
1. Practice the concepts of OOPs.
2. Define ADT for linear and nonlinear Data Structures.
3. Apply sorting techniques, pattern matching algorithm, and hashing.
4. Demonstrate standard operations on linear and nonlinear data structures.
5. Develop solutions to the problems using linear and nonlinear data structures

CO-PO Articulation Matrix:

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	2	-	1	-	-	-	-	-	-	1	1	-	-
CO 2	2	2	2	-	1	-	-	-	-	-	-	1	1	-	-
CO 3	2	2	2	-	1	-	-	-	-	-	-	1	1	-	-
CO 4	2	2	2	-	1	-	-	-	-	-	-	1	1	-	-
CO 5	2	2	2	-	1	-	-	-	-	-	-	1	1	-	-

LIST OF EXPERIMENTS:
1. Practice problems on Inheritance and Polymorphism
2. Implement the following sorting techniques: Insertion Sort, Selection Sort, Merge Sort, Quick Sort.
3. Define Linked List ADT and implement its operations.
4. Implement Stack ADT and perform arithmetic expression evaluation.
5. Implement Queues, Circular Queues.
6. Implement Heap sort.
7. Construct a Binary Search Tree and implement Tree Traversals.
8. Define String ADT and implement the Boyer Moore pattern matching algorithm.
9. Implement Hashing with chaining.
10. Implement Graph Traversals.

Textbook:

1. Michael T. Goodrich, Roberto Tamassia, David M. Mount, "Data Structure and Algorithms in C++", 2nd Edition, John Wiley, 2011.
2. Narasimha Karumanchi, "Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles", Career Monk Publications, 5th Edition, 2017.
3. Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, "Fundamentals of Data Structures in C++" 2nd Edition, Universities Press, 2007

Reference Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rd Edition, Addison-Wesley, 2007.
2. D. Samantha, "Classic Data Structures", Prentice Hall India, 2nd Edition, 2013.

Web Reference:

1. https://takeuforward.org/strivers-a2z-dsa-course/strivers-a2z-dsa-course-sheet-2/
2. https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/

With effect from AY 2024-25

22MEC37N

ROBOTICS AND DRONES LAB

Instruction	1 T + 3 P Hours per Week
Duration of SEE	-
SEE	-
CIE	100 Marks
Credits	2.5

Prerequisite: Nil

Course Objectives:
This course aims to:

1. To develop a thorough understanding of various autonomous robot structures.
2. To gain expertise in working with various sensors and gain the ability to interface sensors with microcontrollers, read data, and seamlessly integrate them into robotics applications.
3. To acquire proficiency in understanding different types of motors, motor drivers, develop the skills to interface motors with microcontrollers, motors and construct two-wheel robots with controlled movements.
4. To attain proficiency in utilizing OpenCV for advanced image processing tasks master techniques such as RGB value extraction, creating colored shapes, and extracting Regions of Interest (ROI) from images.
5. To develop a thorough understanding of various drone structures/develop autonomous systems.

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

1. Understand mechanical structures, motors, sensors, and circuits essential for constructing robots.
2. Demonstrate the utilization of sensors (Ultrasonic, IR, Rotary Encoder) for Arduino interfacing, reading data, and integrating them seamlessly into robotics applications.
3. Demonstrate expertise in operating robot controllers, applying theory to precisely control servo and stepper motors, 2 wheel robots ensuring desired motion.
4. Able to apply Python and OpenCV for image processing, including RGB extraction and ROI tasks.
5. Proficiently assemble a quadcopter drone, showcasing understanding of its classification, parts, and operational principles/ Proficiency to develop autonomous systems fostering creativity and practical application.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	1	1	0	0	1	3	3	1	2	2	1	3
CO 2	1	2	2	1	1	0	0	1	3	3	1	2	2	1	3
CO 3	1	2	2	1	1	0	0	1	3	3	1	2	3	1	3
CO 4	2	2	2	1	1	0	0	1	3	3	1	2	2	1	1
CO 5	2	2	2	1	1	0	0	1	3	3	1	2	3	1	3

Lab Experiments:

Experiment No	Title	CO
1.	Introduction to Robotics, Definition and scope of robotics, Robot configurations- Cartesian, cylinder, polar and articulate. Uses and Significance of Robots, Parts of a Robot, Current applications and future trends. Introduction to Arduino, C++, Arduino Programming Environment. Interfacing Arduino with Electronic Devices such as LEDs/Piezo Buzzer.	1

2.	Interfacing Arduino with Electronic Devices such as Push Button/Potentiometer.	1
3.	Introduction to Sensors, Types of Sensors, Reading Data from Sensors, Interfacing Sensors with Microcontrollers. Interfacing Arduino with Ultrasonic Distance Sensor and Reading Sensor Data on Serial Monitor.	2
4.	Interfacing Arduino with IR Sensor and Reading Sensor Data on Serial Monitor.	2
5.	Interfacing Arduino with Rotary Encoder and Reading Sensor Data on Serial Monitor.	2
6.	Introduction to motors, Types of motors, Motor drivers, Interfacing motors with Microcontrollers, Introduction to Li-ion, LIPO batteries, uses and safety precaution. Implement a system that utilizes an Arduino microcontroller to control the precise movement of a servo motor.	3
7.	Implement a system that utilizes an Arduino microcontroller to control the precise and sequential movements of a stepper motor.	3
8.	Construct a two-wheel robot using DC motors controlled by an Arduino microcontroller. Implement a program that allows the robot to execute specific movements. The robot should: i. Move forward with controlled acceleration. ii. Move backward with controlled deceleration.	3
9.	Construct an Obstacle avoidance robot.	3
10.	Construct a Pick and place robot.	3
11.	OpenCv for image processing: i. Extraction of RGB values of a pixel ii. Create colored shapes and save image iii. Extraction of ROI	4
12.	Assembly of quad copter drone.	5
Open-Ended Project on Autonomous System		

Note:

- Mandatory Open-Ended Project (20 marks) in CIE.
- Any 10 experiments the students must do among the 12 experiments.

Suggested Reading:

1. https://www.geeksforgeeks.org/robotics-introduction/
2. https://www.ohio.edu/mechanical-faculty/williams/html/PDF/IntroRob.pdf
3. https://www.idtechex.com/en/research-report/new-robotics-and-drones-2018-2038-technologies-forecasts-players/584
4. https://dronebotworkshop.com/

With effect from AY 2024-25

22EEC02

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2P Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To acquire the knowledge on different types of electrical elements and to verify the basic electrical circuit laws and theorems.
2. To determine the parameters and power factor of a coil, calculate the time and frequency responses of RLC circuits and to familiarize with measurement of electric power & energy.
3. To determine the characteristics of Transformers, dc, ac machines and switch gear components

Course Outcomes: At the end of the course, the students are expected to

1. Comprehend the circuit analysis techniques using various circuital laws and theorems.
2. Analyse the parameters of the given coil and measurement of power and energy in AC circuits
3. Determine the turns ration/performance parameters of single-phase transformer
4. Infer the characteristics of DC shunt motor different tests.
5. Illustrate different parts and their function of electrical components, equipment and machines.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	-	-	2	-	-	-	-	2	-	1	1
CO 2	3	2	1	-	-	2	-	-	-	-	2	-	1	1
CO 3	3	2	3	-	-	2	-	-	-	-	2	-	-	1
CO 4	3	2	2	-	-	2	-	-	-	-	2	-	-	1
CO 5	3	2	3	-	-	2	-	-	-	-	2	-	-	1

List of Laboratory Experiments/Demonstrations:

1. Verification of KCL and KVL.
2. Verification of Thevenin's theorem.
3. Verification of Norton's theorem.
4. Charging and discharging of Capacitor.
5. Determination of parameters of a choke or coil by Wattmeter Method.
6. Power factor improvement of single-phase AC System.
7. Active and Reactive Power measurement of a single-phase system using
   (i) 3-Ammeter method (ii) 3-Voltmeter method
8. Measurement of 3-Phase Power in a balanced system
9. Calibration of single-phase energy meter.
10. Verification of Turns/voltage ratio of single-phase Transformer.
11. Open Circuit and Short Circuit tests on a given single phase Transformer
12. Brake test on DC Shunt Motor
13. Speed control of DC Shunt Motor
14. Demonstration of Measuring Instruments and Electrical Lab components.
15. Demonstration of Low-Tension Switchgear Equipment/Components
16. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

Note: TEN experiments to be conducted to cover all five Course Outcomes.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2025-26

SEMESTER -III

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22CSC11N	Database Management Systems	3	-	-	3	40	60	3
2	22ITC02N	Java Programming	3	-	-	3	40	60	3
3	22CSC14N	Design and Analysis of Algorithms	3	-	-	3	40	60	3
4	22ITC05N	Discrete Mathematics	3	-	-	3	40	60	3
5	22ITC01N	Digital Logic and Computer Architecture	3	-	-	3	40	60	3
6	22CIC01	Fundamentals of Cyber Security and Tools	2	1	-	3	40	60	2
PRACTICAL									
7	22CSC13N	Database Management Systems Lab	-	-	3	3	50	50	1.5
8	22ITC03N	Java Programming Lab	-	-	3	3	50	50	1.5
9	22CSC58	Design and Analysis of Algorithms Lab	-	-	3	3	50	50	1.5
10	22CII01	MOOCs / Training / Internship	-	-	-	90 Hours	50	-	2
11	22ACT	Activity Points	-	-	-	-	-	-	-
TOTAL			**17**	**1**	**9**	**-**	**440**	**510**	**23.5**

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

With effect from AY 2024-25

22CSC11N

DATA BASE MANAGEMENT SYSTEMS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Programming and Data Structures.

Course Objectives:

This course aims to:

1. Familiarize students with fundamental concepts of database management. These concepts include aspects of database design, database languages and database-system implementation.
2. Understand about data storage techniques and indexing.
3. Impart knowledge in transaction management, concurrency control techniques and recovery procedures.

Course Outcomes:

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

1. Understand fundamental concepts of database and design database schema for an application.
2. Write relational algebra expression and SQL queries for various tasks.
3. Apply the principles of functional dependency and normalization to ensuredata integrity
4. Understand indexing and transaction processing
5. Analyze transaction processing, concurrency control and recovery mechanisms.

CO-PO ARTICULATION MATRIX

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	2	3	-	-	-	-	-	1	1	1	1
CO 2	2	3	2	2	3	-	-	-	-	-	1	2	2	2
CO 3	2	1	2	1	3	-	-	-	-	-	-	1	1	1
CO 4	2	1	1	-	-	-	-	-	-	-	-	1	1	1
CO 5	2	1	-	1	-	-	-	-	-	-	-	2	1	1

UNIT-I

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Users and Administrators, Database System Architecture, Data Models, **E-R Model**: Introduction, Constraints, E-R Diagrams, E-R Design Issues, Mapping from ER to relational model, Extended E-R Features.

UNIT-II

Relational Algebra: Introduction to relational algebra operations, Basic relational algebra operators, Natural join, Assignment operator. **SQL:** Data Types, Basic Structure of SQL Queries, Modification of the Database, Set Operations, Aggregate Functions, Data-Definition Language, Integrity Constraints, Null Values, Views, Join Expression. Simple Queries (select/project/join/ aggregate queries), Complex queries (With Clause, Nested Sub queries, Views)

UNIT-III

Functional Dependency: Trivial and Nontrivial Dependencies, Closure of Set of Functional Dependencies, Attribute closure, Irreducible Set of Functional Dependencies, lossless decomposition, **Normalization**–1NF, 2NF, 3NF and BCNF, Dependency preserved decomposition, Comparison of BCNF and 3NF.

UNIT–IV

Indexing: Basic Concepts, Primary Index, Dense and Sparse Indices, Secondary Indices, Tree-Structured Indexing, Indexed Sequential Access Method (ISAM), B+Tree Index Files, Hash indices, Bitmap indices. **Transaction Processing:** Concept of transactions and schedules, ACID properties, Conflict-serializability

UNIT-V

Concurrency control: Lock-Based Protocols, Dead lock handling, Timestamp-Based Protocols, Validation-Based Protocols. **Recovery system:** Failure classification, Log based recovery, recovery algorithm, ARIES.

Text Books:

1. Silberschatz, Korth and Sudarshan, “Database System Concepts”, 7th Edition, McGraw-Hill, 2021.
2. C.J. Date, "An Introduction to Database Systems", 8th edition, Pearson, 2020,

Suggested Reading:

1. Raghu Ramakrishnan, JohnnesGehrke, “Database Management Systems”, 3rd Edition, McGraw Hill, 2014.
2. Elmasri and Navathe, “Fundamentals of Database Systems”, 7th Edition, Pearson Pubs, 2017.
3. Lemahieu, Broucke and Baesens, “Principles of Database Management”, Cambridge University Press, 2018.
4. Krishnan, “Database Management Systems”, McGraw Hill.

Online Resources:

1. http://www.nptelvideos.in/2012/11/database-managementsystem.html.

With effect from AY 2024-25

22ITC02N

JAVA PROGRAMMING
(Common to CSE, IT, AI&DS , CET and allied branches)

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives

The objectives of this course are:

1. Introduce the fundamental concepts of Object-Oriented Programming (OOP).
2. Guide students through the process of creating and managing classes and objects.
3. Explain and demonstrate the use of inheritance and polymorphism.
4. Teach effective handling of runtime exceptions and the basics of multithreading.
5. Provide hands-on experience with Java's IO package for application development.

Course Outcomes

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

1. Apply OOP concepts to develop structured Java applications.
2. Utilize inheritance and interfaces to enhance code reusability and flexibility.
3. Implement exception handling and multithreading to manage complex program flows.
4. Build applications using the Java Collection Framework.
5. Develop programs that handle input and output operations using the IO package.

CO-PO Articulation Matrix

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

Unit-I

Introduction to Java: Procedural and object-oriented programming paradigms, Principles, Features, Basic structure a java program, Java Primitive Data Types, Basic Operators, Flow-control statements. Defining Classes, Adding Instance Fields and Methods, Object Creation, Constructors, Access Modifiers, Method Overloading and Constructor Overloading, Use of static and final keyword, Arrays, Strings and String Tokenizer, Scannner.

Unit-II

Inheritances and Packages: Types of Inheritance, super keyword, preventing inheritance, the Object class, method overriding and dynamic method dispatch, abstract classes and methods. Interfaces, Interfaces vs. Abstract classes, Inner classes and types, Packages, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

Unit-III

Exception Handling and Threading: What are exceptions, Error vs. Exception, usage of try, catch, throw, throws and finally clauses, Multithreading in Java, Life cycle of Thread, how to create threads, Thread class in java, Thread priorities, Thread Synchronization. Introduction to Generics, Advantages of Generics, Generic class, Type Parameters, Generic Methods.

Unit-IV

Collections: Overview of Java Collection Framework, Collection Interfaces – Collection, Set, List, Map, Collection classes – Array List, Linked List, Hash Set, Tree Set, Hash Map, Tree Map, Iteration over Collections – Iterator and List Iterator, Comparable and Comparator interface, Introduction to Java 8 Features, Lambda Expressions, Functional Interfaces.

Unit-V

Java I/O and NIO: Input Stream, Output Stream, Reader, Writer, File Reader, File Writer, Buffered Reader, Buffered Writer, Object Serialization and Deserialization, Java NIO: Non-blocking I/O, Path, Files, Selectors, Channels, Buffers, Asynchronous I/O, NIO vs. IO

Text Books:

1. Herbert Schildt, “Java: The Complete Reference”, 12th Edition, Tata McGraw Hill Publications, 2020.
2. K Somasundaram “Advanced Programming in Java2” Jaico Publishing House, 2008.

Suggested Reading:

1. E Balaguruswamy “Programming with Java”, TataMcGraw-Hill, 6th Edition, 2019.
2. Paul Deitel and Harvey Deitel “Java How to Program, Early Objects ”, 11th Edition., 2018.

Online Resources:

1. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html
2. https://nptel.ac.in/courses/106106147/2

With effect from AY 2024-25

22CSC14N

DESIGN AND ANALYSIS OF ALGORITHMS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Basics of Data structures and algorithms.

Course Objectives:

This course aims to:

1. Provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms.
2. Introduce the different algorithmic approaches for problem solving through numerous example problems.
3. Provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness.

Course Outcomes:

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

1. Identify and apply asymptotic notations and recurrence-solving techniques to analyze the performance of recursive algorithms
2. Apply greedy and dynamic programming strategies to solve optimization problems and identify the most suitable design approach based on problem characteristics.
3. Implement backtracking and branch-and-bound techniques to solve combinatorial and decision problems and evaluate their efficiency.
4. Solve and evaluate the performance of graph traversal and shortest path algorithms.
5. Demonstrate NP-completeness through problem reductions and complexity classes.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	-	-	-	-	-	-	-	-	-	2	-	-
CO 2	3	3	2	-	-	-	-	-	-	-	-	2	1	-
CO 3	3	3	2	-	-	-	-	-	-	-	-	2	1	-
CO 4	3	3	-	-	-	-	-	-	-	-	-	2	-	-
CO 5	2	3	-	1	-	-	-	-	-	-	-	2	-	-

UNIT - I

Introduction: Characteristics of algorithm. **Analysis of algorithm:** Asymptotic analysis of complexity bounds – best, average and worst-case behavior. Performance measurements of Algorithm, Time and space trade-offs. **Divide and Conquer:** The general method, Minimum and Maximum Problem **Analysis of recursive algorithms through recurrence relations:** Iterative/Expansion method, Recursion tree method and Masters' theorem.

UNIT - II

Greedy Algorithms: The general method, Knapsack Problem, Huffman Codes, Job scheduling with deadlines. **Dynamic Programming**: The general method, 0/1 Knapsack, Travelling Salesman Problem, Matrix chain multiplication, Longest Common subsequence.

UNIT - III

Backtracking: The general Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycle. **Branch-and-Bound**: The general method, FIFO branch and bound, LC branch and bound, 0/1 Knapsack Problem using FIFO branch and bound, Travelling Salesperson problem using LC branch and bound.

UNIT - IV

Graph Algorithms: Applications of DFS: Bi-Connected components, strongly connected components, topological sorting. **Shortest Path Algorithms**: Dijkstra's, Bellman-Ford, Floyd-Warshall

UNIT - V

Theory of NP-Completeness: Polynomial time, Polynomial time verification, P, NP, NP-hard and NP-Complete classes, NP-Completeness and Reducibility. **Standard NP-Complete Problems and Reduction Techniques:** The Clique Problem, Vertex-Cover Problem.

Text Books:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", MIT Press/McGraw-Hill, 4th Edition, 2022.
2. E. Horowitz, sartaj sahni and sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press, 2008.

Suggested Reading:

1. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis", and Internet Examples, Wiley Second Edition.

Online Resources:

1. https://nptel.ac.in/courses/106101060/

With effect from AY 2024-25

22ITC05N

DISCRETE MATHEMATICS

(Common to CSE-AIML, AIML, CET and IT branches)

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES:

This course aims to

1. Introduce Propositional, Predicate Logic and various proof techniques for validation of arguments.
2. Develop an understanding of counting, functions and relations.
3. Familiarize with fundamental notions and applicability of graph theory and algebraic systems

COURSE OUTCOMES:

After completion of this course, students will be able to

1. Describe rules of inference for Propositional and Predicate logic.
2. Demonstrate use of Set Theory, Venn Diagrams, and relations in Real-world scenarios.
3. Model solutions using Generating Functions and Recurrence Relations.
4. Determine the properties of graphs and trees to solve problems arising in computer science applications.
5. Distinguish between groups, semi groups and monoids in algebraic systems

CO-PO ARTICULATION MATRIX

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	3	1	-	-	-	2	-	-	-	-	-
CO 2	3	3	1	3	-	-	-	-	-	-	1	1	2	3
CO 3	2	3	1	3	1	-	-	-	-	-	-	-	-	-
CO 4	3	3	2	3	1	-	-	-	-	-	1	2	2	2
CO 5	3	3	1	1	-	-	-	-	-	-	-	-	-	-

UNIT-I

Introduction to Propositional Calculus: Basic Connectives and Truth tables, Logical Equivalence: Laws of Logic, Logical Implication; Rules of Inference. **Predicates**: The Use of Quantifiers, Definitions and the Proofs of Theorems

UNIT-II

Sets: Sets and Subsets, Operations on sets and the Laws of Set Theory, Counting and Venn Diagrams. **Relations**: Cartesian Products and Relations. Partial ordering relations, POSET, Hasse diagrams, Lattices as Partially Ordered Sets, Equivalence relations. Pigeon hole principle.

UNIT-III

Generating Functions: Generating Functions, Calculating Coefficient of generating functions.

Recurrence Relations: The First Order Linear Recurrence Relation, Second Order Linear Homogeneous Recurrence relations with constant coefficients, Non Homogeneous Recurrence relations.

UNIT-IV

Introduction to Graphs: Graphs and their basic properties- degree, path, cycle, Sub graphs, Complements and Graph Isomorphism, Euler trails and circuits, Hamiltonian paths and cycles, planar graphs, Euler formula, Graph Coloring.

Trees: Definitions, Properties, Spanning Trees, **Minimum Spanning trees**: The Algorithms of Kruskal and Prim

UNIT-V

Algebraic Structures: Algebraic Systems, Examples and General Properties, Semi groups and Monoids.

Groups: Definitions and Examples, Subgroups, Homomorphisms and cyclic groups

TEXT BOOKS:

1. Rosen, K. H. (2019). Discrete Mathematics and Its Applications. (8th Edition) ISBN10: 125967651X ISBN13: 9781259676512(latest edition)
2. Oscar Levin Discrete Mathematics An Open Introduction (4th Edition) ISBN 9781032966168 2025 2025, CRC Press.
3. J. P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TATA Mc Graw-Hill Edition, 1995.

SUGGESTED READING:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", An Applied Introduction, 5th edition, Pearson Education, 2016. (latest edition)
2. Singh, S.B., Discrete Mathematics, Khanna Book Publishing Company, New Delhi. SBN: 9789382609407, 9789382609407 Edition: 3, 2019 (latest edition)
3. David D. Railey, Kenny A. Hunt, "Computational Thinking for the Modern Problem Solving", CRC Press, 2014
4. Joe L. Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", 8th Edition, PHI, 1986

WEB RESOURCES:

1. https://nptel.ac.in/courses/111107058/
2. https://nptel-discrete-mathematics-5217

With effect from AY 2024-25

22ITC01N

DIGITAL LOGIC AND COMPUTER ARCHITECTURE

(Common to IT, AI&DS and CET branches)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To familiarize with Data representation, Number system and Logic gates.
2. To provide understanding of Combinational and Sequential logic circuits , Digital Registers and Counters.
3. To present the operation of the Central Processing Unit.
4. To facilitate the techniques that computers use to communicate with input and output devices.
5. To introduce the concept of memory hierarchy and memory management.

Course Outcomes: Upon completing this course, students will be able to:

1. Apply Boolean algebra for simplification and learn representation of data using numbers.
2. Understand fundamentals of Combinational & Sequential logic gates, registers and counters.
3. Infer the architecture and functionality of the central processing unit.
4. Explore the techniques that computers use to communicate with I/O devices for data transfer.
5. Comprehend memory hierarchy, cache memory and virtual memory.

CO-PO ARTICULATION MATRIX

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	1	1	0	1	0	0	0	1	0	0	2	0	2
CO 2	2	2	1	0	1	0	0	0	0	0	0	1	0	2
CO 3	2	2	1	0	0	0	0	0	0	0	2	0	0	2
CO 4	2	1	0	0	0	0	0	0	0	0	0	0	0	2
CO 5	2	2	1	0	0	0	1	0	1	0	2	1	0	2

UNIT–I

Data Representation: Number Systems, Octal, binary, Hexadecimal and Decimal Representation, Complements: (r-1)'s Complement, r's Complement, Subtraction of Unsigned Numbers.

Digital Logic Circuits: Digital Computers, Logic Gates, Boolean algebra, Map simplification, Sum-of-Products and Product-of-sums Simplification, Don't -Care Conditions.

UNIT–II

Combinational Circuits: Decoders, Encoders, Multiplexers, Half-Adder, Full-Adders.

Flip-Flops: SR, D, JK, T Flip- Flops, Edge triggered Flip-Flops, Excitation Tables.

Registers: Register with Parallel load, Bidirectional Shift Register with Parallel load, 4-bit Synchronous Binary Counter.

UNIT-III

Central Processing Unit: Computer Registers, General register Organization, Instruction Cycle, Instruction Formats: Three Address Instructions, Two-Address Instructions, One-Address Instructions, Zero-Address Instructions, RISC Instructions, Addressing Modes, Data Transfer and Manipulation, Program Control.

UNIT-IV

Input-Output Organization: Input-output Interface: I/O Bus and Interface Modules, Asynchronous Data Transfer: Strobe Control, Handshaking, Asynchronous Communication Interface, Modes of Transfer, Interrupt-Initiated I/O, Priority Interrupt: Daisy Chaining Priority, Parallel Priority Interrupt, Priority Encoder, Direct Memory Access(DMA): DMA Controller.

UNIT- V

Memory Organization: Memory Hierarchy, Main Memory: RAM and ROM Chips, Memory Address Map, Memory Connection to CPU, Auxiliary memory: Magnetic Disks, Associative Memory: Hardware Organization, Cache Memory: Associative Mapping, Direct Mapping, Set-Associative Mapping, Virtual Memory: Address Space and Memory Space.

Text Book:

1. M.Morris Mano, "Computer System Architecture", 3rd Edition, Pearson Education. 2016.

References:

1. Stephen Brown, ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL design", 2nd Edition, McGraw Hill, 2009.
2. ZVI Kohavi, "Switching and Finite Automata Theory", 2nd Edition, Tata McGraw Hill, 1995.
3. William Stallings, "Computer Organization and Achitecture", 8th Edition,PHI.2010
4. Carl Hamachar, Vranesic, Zaky, "Computer Organization", 5th Edition, McGraw Hill.2002.

Web Resources:

1. https://nptel.ac.in/courses/108105132
2. https://nptel.ac.in/courses/106105163

With effect from AY 2024-25

22CIC01

FUNDAMENTALS OF CYBER SECURITY AND TOOLS

Instruction	2 L+1T Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

Pre-Requisites
Programming and Problem Solving

Course Objectives

1. Understand the fundamental concepts of cybercrime, cyber threats, and layered security architectures.
2. Explore the various tools, methods, and techniques employed in planning and executing cyber-attacks.
3. Explain the core principles and procedures of digital forensics and cyber investigation.
4. Analyse the implications of system-level security, including OS vulnerabilities, browser threats, and organizational risks.
5. Evaluate cyber laws and develop practical strategies to respond to cyber threats through a capstone project.

Course Outcomes
By the end of this course, students should be able to:

1. Discuss different types of cybercrimes and analyse legal frameworks to deal with these cybercrimes.
2. Describe the usage of tools in cybercrimes.
3. Recognize the importance of digital evidence in prosecution.
4. Analyse and resolve cyber security issues in various domains.
5. Understand the importance of Cyber Laws and their Legal perspective.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	1	2	1	-	1	1	-	-	2	3	2	3
CO 2	3	2	2	-	-	-	2	-	1	-	2	3	2	3
CO 3	2	2	1	-	-	-	-	-	2	1	2	3	2	3
CO 4	2	-	1	-	2	-	-	-	-	-	2	3	2	3
CO 5	1	-	1	-	-	-	-	-	-	-	2	3	2	3

Unit – I
Introduction to Cyber Crime: Cyber Crime - Definition and Origins of the Word, Cyber-crime and Information Security, Layered approach architecture for Cyber Security, Classification of Cyber Crimes.

Cyber Offenses: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cybercafé and Cybercrimes. Botnets: The Fuel for Cybercrime, Attack Vector.

Unit – II
Tools and Methods Used in Cybercrime: Introduction, Foot Printing Tools, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares TCP-dump, Wireshark.
Malware Analysis: Virus and Worms, Trojan Horse, Backdoors and Ransomware, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

Unit – III

Understanding Cyber Forensics: Introduction, Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Challenges in Computer Forensics.

Unit – IV

Security: Windows Security at the heart of the defense, Attacks against the windows workstation, the focus of UNIX/Linux Security, Web Browser Attacks and Operating Safely, E-Mail Security and Operating safely when using E-Mail.

Cyber Security Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations.

Unit – V

Cyber Laws: The Legal Perspectives, Need of Cyber laws: the Indian Context, The Indian IT Act, Amendments of Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India.

Capstone Project: Group project: analyse a real-world cyber-attack, develop a mitigation strategy, and present findings to the class.

Textbooks:

1. Sunit Belpre and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India Pvt.Ltd, 2011.
2. Dr. Eric Cole, Dr. Ronald Krutz and James W. Conley, “Network Security Bible”, Edition 2, Wiley India Pvt. Ltd, 2010.
3. Kevin Mandia, Chris Prosise, “Incident Response and computer forensics”, Tata McGraw Hill, 2006.

Reference Books:

1. Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, “Cyber Security and Cyber Laws”, Paperback, 2018.
2. Mark F Grady, Fransesco Parisi, “The Law and Economics of Cyber Security”, Cambridge university press, 2006.

Web References:

1. https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks
2. https://www.coursera.org/specializations/intro-cyber-security
3. https://www.coursera.org/learn/foundations-cybersecurity
4. https://onlinecourses.swayam2.ac.in/ugc19_hs25/preview

With effect from AY 2024-25

22CSC13N

DATABASE MANAGEMENT SYSTEMS LAB

Instruction	3 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Course Objectives:

This course aims to:

1. Become familiar with the concepts of structured query language.
2. Understand about Programming Language / Structured Query Language (PL/SQL).
3. Learn database constraints, DCL, TCL and advanced SQL commands.
4. Familiarize with cursors, triggers, exceptions, procedures and functions in PL/SQL.

Course Outcomes:

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

1. Outline the built-in functions of SQL and Create, Alter and Drop table.
2. Demonstrate Queries to retrieve and Change Data using Select, Insert, Delete and Update. Construct Queries using Group By, Order By and Having Clauses.
3. Demonstrate Commit, Rollback, save point commands and formulate the Queries for Creating Views and constraints.
4. Develop queries using Joins, Sub-Queries.
5. Develop PL/SQL code to create stored procedures, functions, cursors and exceptions.

CO-PO Articulation Matrix

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

List of Experiments:

1. Queries using Built-In functions, like aggregate functions, String Functions, Numeric Functions, Data Functions, Conversion Functions and other miscellaneous.
2. Queries using DDL and DML statements.
3. Queries using Group By, Order By, Having Clauses and set operations.
4. Queries on Controlling Data: Commit, Rollback and Save point.
5. Queries for Creating, Dropping and Altering Tables, Views and Constraints.
6. Queries using Joins, views and Sub-Queries.
7. Write PL/SQL code using Basic Variables, bind and substitution variables.
8. Write PL/SQL code using Control Structures.
9. Write PL/SQL code using Procedures, Functions.
10. Write PL/SQL code using Cursors, Triggers and Exceptions.

Text Books:

1. "Oracle: The complete Reference", Oracle Press.
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007.

Suggested Reading:

1. Rick FVander Lans, "Introduction to SQL", 4th Edition, Pearson Education, 2007.
2. "The Language of SQL (Learning)" by Larry Rockoff.
3. Steven Feuerstein, "Oracle PL/SQL Programming", 6th Edition, O'reilly publications, 2014.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs91/preview

With effect from AY 2024-25

22ITC03N **JAVA PROGRAMMING LAB**

(Common to CSE, IT, AI&DS , CET and allied branches)

Instruction	3P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Course Objectives:
This course aims to:

1. Introduce the core principles of Object-Oriented Programming (OOP).
2. Explain the object-oriented approach to designing and implementing classes and objects.
3. Demonstrate the use of inheritance and polymorphism in Java.
4. Illustrate exception handling and multithreading techniques for managing runtime behaviour.
5. Explore Java's IO package for developing basic input/output functionalities in applications.

Course Outcomes:
Upon successful completion of this course, student will be able to:

1. Apply OOP principles to design and develop Java applications.
2. Implement inheritance and interfaces to build modular and reusable code.
3. Use exception handling and multithreading to manage multiple execution paths efficiently.
4. Develop robust applications utilizing the Java Collection Framework.
5. Integrate Java IO concepts for effective data input and output operations in applications.

CO-PO Articulation Matrix

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

LIST OF EXPERIMENTS

1. Implement the program(s) to handle the various data types, operators, expressions, control-flow, and strings.
2. Develop a java program(s) for constructors.
3. Develop a java program to demonstrate the method overloading and riding.
4. Develop a java program(s) to deal with different types of inheritances and interfaces.
5. Implement the program(s) to demonstrate the packages.
6. Develop a java program(s) to handle user defined exceptions with multiple catch blocks.
7. Implement program(s) to demonstrate Multithreading and thread synchronization.
8. Implement program(s) to demonstrate generics.
9. Implement the collection framework classes with Iterator/List Iterator.
10. Develop a java program(s) to implement the features of JDK8.

Text Books:

1. Herbert Schildt, “Java: The Complete Reference”, 12th Edition, Tata McGraw Hill Publications, 2020.
2. K Somasundaram “Advanced Programming in Java2” Jaico Publishing House, 2008.

Suggested Reading:

1. E Balaguruswamy “Programming with Java”, TataMcGraw-Hill, 6th Edition, 2019.
2. Paul Deitel and Harvey Deitel “Java How to Program, Early Objects ”, 11th Edition., 2018.

Web Resources:

1. https://www.cse.iitb.ac.in/~nlp-ai/javalect_august2004.html
2. https://nptel.ac.in/courses/106106147/2

With effect from AY 2024-25

22CSC58

DESIGN AND ANALYSIS OF ALGORITHMS LAB

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Pre-requisites: Programming and Problem Solving, Basics of Data structures and algorithms lab and Object Oriented Programming.

Course Objectives:

This course aims to:

1. Design and construct simple programs by using the different design strategies for solving different problems.
2. To enhance programming skills while improving their practical knowledge in implementing the algorithms.
3. To strengthen the practical ability and to apply suitable algorithmic approaches for solving real time problems.

Course Outcomes:

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

1. Apply Divide and Conquer to solve problems like Minimum-Maximum.
2. Develop solutions for optimization problems like Fractional Knapsack, Job Scheduling using Greedy algorithms.
3. Develop and Analyse solutions of 0/1 Knapsack and LCS using Dynamic Programming.
4. Design and Implement solutions using Backtracking for N-Queens, Graph Colouring problems.
5. Implement Topological Sorting and Dijkstra's Algorithm for graph problems.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	3	2	-	2	-	-	-	-	-	-	2	-	-
CO 2	2	3	2	-	2	-	-	-	-	-	-	2	2	-
CO 3	2	3	2	-	2	-	-	-	-	-	-	2	2	-
CO 4	2	3	2	-	2	-	-	-	-	-	-	2	2	-
CO 5	2	3	2	-	2	-	-	-	-	-	-	2	-	-

List of Experiments:

1. Implement the Minimum-Maximum Problem using the Divide and Conquer approach.
2. Implement the Fractional Knapsack Problem using the Greedy approach.
3. Implement Job Scheduling with Deadlines using the Greedy approach.
4. Implement the 0/1 Knapsack Problem using Dynamic Programming.
5. Implement the Longest Common Subsequence (LCS) using Dynamic Programming.
6. Implement the N-Queens Problem using Backtracking.
7. Implement the Graph Coloring Problem using Backtracking.
8. Implement Topological Sorting on directed acyclic graphs (DAGs).
9. Implement Dijkstra's Algorithm for finding the shortest path in a graph.
10. Implement bi-connected components
11. Case Studies on dynamic programming, backtracking, branch and bound, breadth first search

Text Books

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", MIT Press/McGraw-Hill, 4th Edition, 2022.
2. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis", and Internet Examples, Wiley Second Edition.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2025-26
SEMESTER -IV

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22MTC13	Mathematical Foundation for Data Science and Security	3	-	-	3	40	60	3
2	22CAC03N	Principles of Artificial Intelligence	3	-	-	3	40	60	3
3	22CSC48	Theory of Computation	3	-	-	3	40	60	3
4	22CSC42	Web Programming	3	-	-	3	40	60	3
5	22ECC36	Basic Electronics and Sensors	3	-	-	3	40	60	3
6	22MBC01	Engineering Economics and Accountancy	3	-	-	3	40	60	3
PRACTICAL									
7	22CAC06N	Principles of Artificial Intelligence Lab	-	-	3	3	50	50	1.5
8	22CSC43	Web Programming Lab	-	-	3	3	50	50	1.5
9	22ECC37	Basic Electronics and Sensors Lab	-	-	2	3	50	50	1
10	22CICU01	Upskill Certification Course – I					25	-	0.5
11	22ACT	Activity Points	-	-	-	-	-	-	-
TOTAL			**18**	**-**	**8**	**-**	**415**	**510**	**22.5**

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

With effect from AY 2024-25

22MTC13

Mathematical Foundation For Data Science & Security
(For (IOT&CS))

Instruction	3 L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. Able to learn and Analyzing data in Linear and Non-Linear form.
2. Able to fit the hypothetical data using probability distribution.
3. To know the characteristic of various continuous probability distributions.
4. To discuss the testing of hypothesis of sample data.
5. To know the security issues of Cryptography.

Course outcomes: On successful completion of this course the students shall be able to

1. Analyze the coefficient of skewness and fitting of the data by various methods.
2. Apply properties of Mathematical Expectations and analyze the various distributions.
3. Evaluate areas of curves by using various distributions.
4. Apply various tests for testing the significance of sample data.
5. Apply RSA –PKC for solving security issues.

CO-PO Articulation Matrix

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	-	2	1	1	-
CO2	3	3	2	3	-	-	-	-	-	-	2	1	1	-
CO3	3	3	2	3	-	-	-	-	-	-	2	1	1	-
CO4	3	3	3	3	-	-	-	-	-	-	2	1	1	-
CO5	3	3	2	3	-	-	-	-	-	-	2	1	1	-

UNIT-I: Basic Statistics

Measures of Central Tendency, Measures of Dispersion, Moments (Moments about the mean and moments about a point). Skewness, Karl Pearson's coefficient of skewness and Bowley's coefficient of skewness for frequency distribution, Kurtosis. Correlation, coefficient of correlation, limits of correlation coefficient. Linear Regression, Regression coefficients, Properties of Regression Coefficients. Curve fitting by the Method of Least Squares, Fitting of Straight lines and Exponential curve.

UNIT-II: Mathematical Expectation and Discrete Probability Distribution

Conditional Probability, Baye's theorem. Random variable, discrete random variable, Probability Mass Function, continuous random variable, probability density function. Mathematical expectation, properties of Expectation, properties of variance. Poisson distribution, MGF and Cumulates of the Poisson distribution, Recurrence formula for the probabilities of Poisson distribution (Fitting of Poisson distribution)

UNIT-III: Continuous Probability Distributions

Normal distribution, Characteristics of normal distribution and Normal probability Curve, MGF and CGF of Normal distribution, Areas under normal curve. Uniform distribution, Moment generating function, Mean and Variance of uniform distribution. Exponential distribution, MGF, CGF, Mean and Variance of Exponential distribution.

UNIT-IV: Testing of Hypotheses

Test of significance, null and alternative hypotheses, Errors in sampling, level of significance. Large sample test: Test of significance for single proportion, difference of proportions, single mean and difference of means. Small Sample Tests: T-Test for single mean, differences of Means. F- test for equality of two population variances. Chi-Square test of Goodness of fit.

UNIT-V: Number Theory & CRYPTOGRAPHY (RSA – PKC)

Division Algorithm, Greatest Common Divisor, Euclidean Algorithm, Wilson's Theorem, Euler's Phi-Function, Euler's Theorem, Some Properties of the Phi-Function. The RSA public key cryptosystem, Implementation and security issues, Pollard's p−1 factorization algorithm, Quadratic Residues and quadratic reciprocity.

Text books:

1. S.C.Gupta, V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.
2. Burton, David M. (2007) Elementary Number Theory (7^{th}edu.). Tata McGraw Hill Edition, Indian Reprint
3. Mathematical Cryptography by Jeffrey Hoffstein, Jill Pipher, Joseph H. Silverman Springer Science+ Business Media LLC.

Suggested Reading:

1 .W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, 3rd Ed., Wiley, 1968.
2. Sheldon Ross, "A First Course in Probability", 9th Edition, Pearson publications, 2014.
3. Koshy, T.Elementary Number Theory with Applications, Elsevier Publications, New Delhi, 2002.
4. G.A.Jones & J.M.Jones "Elementary Number Theory", Springer UTM, 2007.

Online Resources:

1. https://www.youtube.com/watch?v=z7AE2kUoZYU&list=PLyqSpQzTE6M_JcleDbrVyPnE0PixKs2JE&index=2
2. https://archive.nptel.ac.in/courses/110/107/110107114/ (Unit-3,4,6,7,9 &11)

With effect from AY 2024-25

22CAC03N

PRINCIPLES OF ARTIFICIAL INTELLIGENCE

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-requisites: Data structures, Discrete Mathematics, Probability Theory.

COURSE OBJECTIVES: This course aims to

1. To list the significance of AI.
2. To discuss the various components that are involved in solving an AI problem.
3. To analyze the various knowledge representation schemes, reasoning and learning techniques of AI.

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

1. Explain the role of agents and interaction with the environment to establish goals.
2. Identify and formulate search strategies to solve problems by applying suitable search strategies.
3. Compare and contrast the various knowledge representation schemes of AI.
4. Appraise probabilistic reasoning and model building
5. Apply Markov decision Process to solve real world Problems.

CO-PO Articulation Matrix

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

UNIT - I

Introduction: **Foundations of AI, History, State of the Art, Risks and Benefits.**
Intelligent agents: Agents and Environment, The Concept of Rationality, Structure of an Agent.
Solving problems by Search- Problem-Solving Agents, State space representation, Search graph and Search tree Searching for Solutions,

UNIT - II

Uninformed Search Strategies: Uniform cost search, Iterative deepening Depth-first search, Bidirectional search**.**
Informed (Heuristic) Search Strategies: Heuristic Functions, Hill- climbing, Greedy best-first search, A* search, Simulated Annealing search.

UNIT – III

Adversarial Search: Game Theory, Alpha–Beta Pruning, Constraint Satisfaction Problems.
Logic Concepts and Logic Programming: Introduction, Propositional Calculus Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau, Predicate Logic, Resolution Refutation in Propositional Logic and Predicate Logic

UNIT - IV

Knowledge Representation: Introduction, approaches to knowledge Representation, Knowledge Representation using Semantic Network, Knowledge Representation using Frames.

Probabilistic Reasoning: Probability, inference using full joint distributions, Bayes rule, Bayesian networks-representation, construction, exact and approximate inference, temporal model, hidden Markov model.

UNIT – V

Markov Decision process: MDP formulation, utility theory, multi attribute utility functions, decision networks, sequential decision problems value iteration, policy iteration partially observable MDP.

Text Books:

1. Russell, Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 4th Edition, 2020.
2. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, First Edition, 2011.

Suggested Reading:

1. Rich, Knight, Nair, "Artificial Intelligence", Tata McGraw Hill, 3rd Edition 2009.
2. Trivedi. M.C., "A classical approach to Artificial Intelligence", Khanna Publishing House, Delhi.

Online Resources:

1. http://nptel.ac.in/courses/106106126/
2. http://nptel.ac.in/courses/106105077/

With effect from AY 2024-25

22CSC48

THEORY OF COMPUTATION

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Discrete Structures, Data Structures, Design and analysis of algorithms.

Course Objectives:
This course aims to:
1. Study abstract computing models namely Finite Automata, Pushdown Automata, and Turning Machines.
2. Introduce various grammars, formal languages and equivalence between various languages and their corresponding recognizers.
3. Familiarize with decidability and undecidability of computational problems.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Build Deterministic, Nondeterministic Finite automata for Languages and show the acceptance of strings using Formal Machines.
2. Develop regular expressions and their equivalent finite automata for various languages.
3. Demonstrate context-free grammar, check the ambiguity of grammar.
4. Construct pushdown automata for languages and Analyze Equivalence of PDA's, CFG's.
5. Design Turing Machines, Analyze and distinguish between decidable and undecidable problems.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	1	1	-	1	-	-	-	-	1	-	2	2	2
CO 2	2	1	1	-	1	-	-	-	-	-	-	2	2	2
CO 3	2	1	1	-	1	-	-	-	-	-	-	2	2	2
CO 4	2	1	1	-	1	-	-	-	-	-	-	2	2	2
CO 5	2	1	1	-	1	-	-	-	-	1	-	1	1	1

UNIT-I
Automata: Introduction to Finite Automata, the Central Concepts of Automata Theory: Alphabets, Strings and Languages. **Finite Automata:** Deterministic Finite Automata, Nondeterministic Finite Automata, Equivalence of NFA and DFA, Finite Automata with Epsilon -Transitions, Minimization of DFA, Introduction to Mealy and Moore machine, Equivalence of Mealy and Moore Machine.

UNIT-II
Regular Expression and languages: Regular Expressions, Finite Automata and Regular Expression: From DFAs to Regular Expressions, Converting Regular Expressions to Automata, Applications of Regular Expressions, Algebraic Laws for Regular Expressions. **Properties of Regular Languages:** The pumping lemma for Regular Languages, Applications of Pumping Lemma, Closure Properties of Regular Languages, Decision Properties of Regular Languages.

UNIT-III
Context Free Grammars and Languages: Context-Free Grammars, Leftmost and Rightmost Derivations, The language of a Grammar, Constructing Parse Trees, The Yield of a Parse Tree, Applications of CFGs, Ambiguous Grammars, Removing Ambiguity From Grammars. **Properties of Context Free Languages:** Normal Forms for Context-Free Grammars: Eliminating Useless Symbols, Computing the Generating and

Reachable Symbols, Eliminating Epsilon Productions, Eliminating Unit Productions, Chomsky Normal Form, Greibach Normal form, Pumping Lemma for CFL.

UNIT-IV

Pushdown Automata: The Formal Definition of PDA, Graphical Notation for PDA's, Instantaneous Description of a PDA, The Language of a PDA: Acceptance by Final State, Acceptance by Empty Stack, Equivalence of PDA's and CFG's: From Grammars to PDA's, From PDA's to Grammars, Deterministic Pushdown Automata. **Context-sensitive Languages**: Context-sensitive grammars (CSG), linear bounded automata.

UNIT-V

Introduction to Turing Machines: Notation for the TM, Instantaneous Descriptions for TM's, The Language of a TM, Turing Machines and Halting, Extensions to the Basic Turing machine, Restricted Turing machines, Turing Machines and computers. **Undecidability:** Codes for Turing Machines, The Diagonalization Language, The Universal Language, Undecidablity of the Universal Language, Undecidable problems about Turing Machines: Rice's Theorem and Properties of RE languages, Post's Correspondence Problem: Definition of PCP, The Modified PCP.

Text Books:

1. John E. Hopcroft, Rajeev Motwani, Jeffery D Ullman, "Introduction to Automata Theory Languages and Computation", 3rd Edition, Pearson Education, 2015.

Suggested Reading:

1. John C Martin. "Introduction to Language and Theory of Computation", 3rd Edition, TMH, 2003.
2. Daniel Cohen, "Introduction to Computer Theory", 2nd Edition, Wiley Publications, 2007.
3. Mishra K., Chandrasekaran N., "Theory of Computer Science (Automata, Languages and Computation)", 3rd Edition, Prentice Hall of India 2008.
4. ShyamalendraKandar, "Introduction to Automata Theory, Formal Languages and Computation", Pearson, 2013.

Online Resources:

1. http://courses.cs.vt.edu/cs4114/spring2012/index.php
2. http://online.stanford.edu/course/automata-theory
3. https://nptel.ac.in/courses/106103070
4. https://nptel.ac.in/courses/106106049

With effect from AY 2024-25

22CSC42

WEB PROGRAMMING

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

This course aims to:

1. Acquire knowledge on HTML, Java Script and XML to develop client side web applications.
2. Learn developing web applications using Vue.js.
3. Explore various features of JS and its functionality.

Course Outcomes:

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

1. Understand the technologies required for developing web application.
2. Identify and choose HTML tags, CSS and java scripts to develop well-structured and easily maintained web pages.
3. Design and Develop interactive and innovative web pages using various platforms/technologies like HTML, CSS, XML, JAVASCRIPT.
4. Create web applications using Vue.js framework.
5. Build an end-to-end application from scratch using Vue.js, Node.js and Mongo DB.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	2	3	1	1	-	-	1	1	1	-	2	2	1
CO 2	2	1	2	1	2	-	-	-	-	1	1	2	3	2
CO 3	1	1	2	1	2	-	-	-	-	-	-	2	2	2
CO 4	1	-	2	1	2	-	-	-	-	-	-	2	2	2
CO 5	1	-	2	2	1	-	-	-	-	-	1	1	3	3

UNIT - I

Web Basics: Introduction to Internet, World Wide Web, URL, MIME, HTTP Transactions, SSL, Client-Side Scripting, Server-Side Scripting, Accessing Web Servers, MySQL, IDEs.

UNIT – II

Introduction HTML5: basic tags, Images, Tables, Lists, Forms, Layout, Graphics, span and div tags, Introduction to Cascading Style Sheets. XML: Introduction, uses of XML, the Syntax of XML, XML Document Structure, Namespaces, XML schemas.

UNIT - III

The Basics of Java script: Primitive operations and Expressions, Arrays, Functions, Pattern Matching Using Regular Expressions, Document Object Model, Element Access in JavaScript, Events and Event Handling, Handling Events from Body, Button, Text Box and Password Elements, Introduction to JSON. **JQuery:** Introduction, Positioning Elements, Moving Elements.

UNIT – IV

Bootstrap: Introduction to Bootstrap, bootstrap grid, bootstrap components. **Vue.js:** Introduction, Instance and Template Syntax, Directives, Components and Props, Events, Event modifiers, Forms and Two-way Binding, Routing, Connecting Vue.js with databases.

UNIT – V

Node.js: Introduction, server creation. MongoDB: Introduction, Importance of NoSQL databases, Data types, Documents, nested Documents, CRUD Operations, Basic cursor methods: map, to Array, pretty, for Each, limit, count, sort, CRUD Operations.

Text Books:

1. HTML5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery), Dreamtech, 2017.
2. Fullstack Vue The Complete Guide to Vue.js, Hassan Djirdeh,2018.

Suggested Reading:

1. Simon D. Holmes and Clive Harber, "Getting MEAN with Mongo, Express, Angular, and Node", Second Edition, Manning Publications, 2019.
2. Edition, Manning Publications, 2019 JavaScript, by Alok Ranjan, Abhilasha Sinha, Ranjit Battwad, BPB, 2020.

Online Resources:

1. https://www.w3.org/standards/webdesign/
2. https://vuejs.org/examples/
3. https://www.mongodb.com/

With effect from AY 2024-25

22ECC36

BASIC ELECTRONICS AND SENSORS
(Common for CSE and CSE - IOT & Cyber Security including Blockchain Technology)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Concepts of Semiconductor Physics and Applied Physics.

Course Objectives:
This course aims to:

1. Describe semiconductor device's principles and understand the characteristics of junction diode and transistors.
2. Understand working principles of Analog to Digital and Digital to Analog conversion.
3. Understand Interfacing of various modules myRIO.

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

1. Identify various types of semiconductor devices for building electronic circuits.
2. Describe the operation of various sensors, data convertors and actuators.
3. Acquire the data from various sensors.
4. Analyse usage of sensors/actuators for the development of real-time applications.
5. Apply theoretical learning to implement practical real-time problems for automation.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	1	1	1	1	3	3	2	1	2	1	1	1
CO 2	3	3	3	1	1	1	2	3	2	2	2	1	1	1
CO 3	3	2	2	1	2	2	1	3	2	2	2	1	1	1
CO 4	3	3	3	3	1	2	2	3	2	2	2	1	1	1
CO 5	3	3	3	2	1	2	2	3	2	2	2	1	1	1

UNIT-I
Diodes and its Applications: Overview of Semiconductors, Characteristics of P-N Junction diode, current equation. Characteristics of Zener Diode, Voltage regulator, Half Wave, Full Wave: Center tap, Bridge Rectifiers.
Display Systems: Constructional details of C.R.O and Applications.

UNIT-II
Bipolar Junction Transistors: Classification, Bipolar Junction Transistors Configurations. CE, CB Characteristics, h-parameters, Analysis of BJT amplifier using h-parameters in CE, CB configuration.
Field Effect Transistor: Junction Field Effect Transistor: Principle of Operation, Characteristics of JFET and Operation of MOSFET.

UNIT- III

Op-Amps Circuits: Basic Principle, Ideal and practical Characteristics, Voltage Follower, Op-Amp parameters, Applications-Summer, Integrator, Differentiator, Instrumentation amplifiers, Logic Gates-IC's. Data Converters: Specifications, DAC- Weighted Resistor, R-2R Ladder, ADC-Parallel Comparator, Successive Approximation and Dual Slope(Qualitative treatment Only).

UNIT-IV

Sensors: Definition, classification, Proximity Sensors, Tacho generator as a Velocity, Optical encoder as motion and Strain Gauge as force Sensor; Temperature and light sensors, Collision Avoidance sensors.

ROBOT Sensors: Sensors in robot – Touch sensors; Camera Systems in Machine: Camera Technology, History in Brief, Machine Vision versus closed Circuit Television (CCTV).

Actuators: Introduction, Types of actuators in IOT, Real life examples of actuators in IOT.

UNIT-V

Hardware/software platforms: Introduction to LabVIEW, Data Acquisition System: hardware Overview of my RIO, Converting Raw Data Values to a Voltage.

Sensors interfacing with my RIO: Introduction, Pin configuration, diagrams of thermistor, photo cell, hall effect, IR Range Finder, Bluetooth, Temperature Sensors.

Text Books:

1. Robert L.Boylestad, Louis Nashelsky, "Electronic Devices and Circuits Theory", Pearson Education, 9th Edition, LPE, Reprinted, 2006.
2. D Patranabis, Sensors and Transducers, PHI 2nd Edition 2013.
3. DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013.
4. Ed Doering, NI myRIO Project Essentials Guide, Feb. 2016.

Suggested Reading:

1. Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th Edition 2012.
2. Anindya Nag, Subhas Chandra Mukhopadhyay, Jurgen Kosel, Printed Flexible Sensors: Fabrication, Characterization and Implementation, Springer International Publishing, Year: 2019, ISBN: 978-3-030-13764-9,978-3-030-13765-6.
3. User guide and specifications NI myRIO-1900.

With effect from AY 2024-25

22MBC01

ENGINEERING ECONOMICS AND ACCOUNTANCY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. To demonstrate the importance of Managerial Economics in Decision Making.
2. To explain the concept of Accountancy and provide basic knowledge on preparation of Final accounts.
3. To understand the importance of Project Evaluation in achieving a firm's Objective.

COURSE OUTCOMES: After Completion of the Course, Student will be able to:

1. Apply fundamental knowledge of Managerial Economics Concepts and Tools.
2. Analyze various aspects of Demand Analysis, Supply and Demand Forecasting.
3. Understand Production and Cost relationships to make the best use of resources available.
4. Apply Accountancy Concepts and Conventions and preparation of Final Accounts.
5. Evaluate Capital and Capital Budgeting decision based on any technique.

CO-PO Articulation Matrix:

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO	1	1	3	1	1	1	-	1	1	1	-	-	-	-
CO2	2	2	2	2	-	1	-	1	-	1	-	1	1	-
CO3	1	2	1	2	2	1	-	1	-	1	-	-	-	-
CO4	2	2	1	2	2	1	-	3	-	1	-	-	-	-
CO5	1	3	1	2	1	1	-	-	-	1	2	-	-	1

UNIT-I

Introduction to Managerial Economics

Introduction to Economics and Its Evolution - Managerial Economics - Its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic Concepts of Managerial Economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equi-Marginal Principle, Contribution, Negotiation Principle.

UNIT-II

Demand and Supply Analysis

Demand Analysis - Concept of Demand, Determinants, Law of Demand – Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple Numerical Problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

UNIT-III

Production and Cost Analysis

Theory of Production - Production function - Isoquants and Iso-costs, MRTS, Input - Output Relations; Laws of Returns. Cost Analysis: Cost Concepts – Types of Costs, Cost - Output Relationship – Short Run and Long Run; Market Structures – Types of Competition, Features of Perfect Competition, Price Output Determination under Perfect Competition, Features of Monopoly Competition, Price Output Determination under Monopoly Competition. Break-even Analysis – Concepts, Assumptions, Limitations, Numerical problems.

UNIT-IV

Accountancy

Book-keeping, Principles and Significance of Double Entry Bookkeeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Ledger Accounts, Trial Balance Concept and preparation of Final Accounts with Simple Adjustments.

UNIT-V

Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and Sources of raising Finance. Capital Budgeting, Methods: Traditional and Discounted Cash Flow Methods - Numerical Problems.

TEXT BOOKS:

1. Mehta P.L., "Managerial Economics: Analysis, Problems and Cases", Sultan Chand & Son's Educational publishers, 2016.
2. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 12th Edition, 2018.

SUGGESTED READINGS:

1. Panday I.M. "Financial Management", 11th edition, Vikas Publishing House, 2016.
2. Varshney and K L Maheswari, Managerial Economics, Sultan Chand, 2014.
3. M. Kasi Reddy and S. Saraswathi, Managerial Economics and Financial Accounting, Prentice Hall of IndiaPvt Ltd, 2007.
4. R. Aryasri, Managerial Economics and Financial Analysis, McGraw-Hill, 2018

With effect from AY 2024-25

22CAC06N

PRINCIPLES OF ARTIFICIAL INTELLIGENCE LAB

Instruction	3P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Pre-requisites: Programming Basics, Probability and Statistics.

COURSE OBJECTIVES: This course aims to

1. To design and analyze various computing algorithms and techniques using Python.
2. To apply different learning algorithms to solve real time problems.
3. To recognize the underlying mathematical models and logics behind various AI techniques.

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

1. Understand the basic components of library environment and installations.
2. Analyze the design heuristics and apply various techniques to solve real world problems.
3. Apply variety of algorithms to solve problems.
4. Identify how to use GitHub and submit back genuine contributions.
5. Implement problems using game search algorithms.

CO-PO Articulation Matrix:

PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	2	-	-	-	-	-	2	2	3	2
CO2	3	3	3	3	3	-	-	-	-	-	3	2	2	3
CO3	3	3	3	2	3	-	-	-	-	-	3	3	2	2
CO4	2	2	2	-	3	-	2	3	3	3	3	2	2	3
CO5	3	2	3	2	3	-	-	2	-	-	3	3	3	2

Load all the experiments in GitHub Repository

Lab Experiments:

1. Design/construct the workflow of a general AI project using draw.io
2. Implement Water Jug Problem using A* search
3. Implement an 8-puzzle solver using Heuristic search technique.
4. Implement the Constraint Satisfaction problem using backtracking.
5. Implement a program for game search.
6. Implement a Bayesian network from a given data and infer the data from that Bayesian network.
7. Implement a Hidden Markov Model for a given data.
8. Implement a MDP to run value iteration in any environment.
9. Implement a MDP to run policy iteration in any environment.
10. Build a bot to build any game using easy AI libraries

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, 3rd Edition, Prentice Hall, 2010.
2. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011.

With effect from AY 2024-25

22CSC43

WEB PROGRAMMING LAB

Instruction	3 P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Course Objectives:

This course aims to:

1. Build Strong expertise to develop front end applications using HTML5 and CSS3.
2. Become proficient in Bootstrap concepts.
3. Understand core features of JavaScript.
4. Learn how to develop web applications using Vue.js.

Course Outcomes:

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

1. Identify and install web development tools.
2. Build interactive and user-friendly static frontend UI applications using HTML, CSS and JavaScript.
3. Develop a web page based on Bootstrap.
4. Validate form data and create dynamic content using javascript.
5. Build an end-to-end application from scratch using Vue.js, Node.js and Mongo DB.

CO-PO Articulation Matrix

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

List of Experiments:

1. Creation of development environment (IDE, Web Server) and Demonstration of Web Browsers(Different components, Checking SSL Certificates, Inspect Elements, Browser Console, View Source etc.).
2. Design simple web pages using HTML5 and CSS.
3. Create well-formed document using XML schema. Apply CSS to style and format an XML document then display it in a browser
4. Develop an application to validate form fields using java script.
5. Demonstrate DOM manipulation using Jquery: dynamically change content and style of a page
6. Build a website using HTML5, CSS3, Bootstrap and Java script.
7. Create a Vue.js app with data binding and user input handling.
8. Implement Routing in Vue.js.
9. Demonstrate the CRUD operations on MongoDB.
10. Build a mini Vue.js CRUD app that connects to a backend (using Axios with a mock server or Flask API)

Text Books:

1. HTML5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery), Dreamtech, 2017.
2. Fullstack Vue The Complete Guide to Vue.js, Hassan Djirdeh,2018.

Suggested Readings:

1. Simon D. Holmes and Clive Harber, "Getting MEAN with Mongo, Express, Angular, and Node", Second Edition, Manning Publications, 2019.
2. Edition, Manning Publications, 2019 JavaScript, by Alok Ranjan, Abhilasha Sinha, Ranjit Battwad, BPB, 2020.

Online Resources:

1. https://www.w3.org/standards/webdesign/
2. https://vuejs.org/examples/
3. https://www.mongodb.com/

With effect from AY 2024-25

22ECC37

BASIC ELECTRONICS AND SENSORS LAB
(Common for CSE and CET)

Instruction	2 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisite: Students should have prior knowledge of Applied Physics and Semiconductor Physics.

Course Objectives:
This course aims to:
1. Learn about various electronic components and devices.
2. Study the transistor characteristics in different modes.
3. Familiarize to use customizable software and modular measurement hardware to create user-defined measurement systems.

Course Outcomes:
After the completion of this course, the student will be able
1. Comprehend the circuit analysis techniques using various circuital laws and theorems.
2. Analyse the parameters of the given coil and measurement of power and energy in AC circuits
3. Determine the turns ration/performance parameters of single-phase transformer
4. Infer the characteristics of DC shunt motor different tests.
5. Illustrate different parts and their function of electrical components, equipment and machines.

CO-PO Articulation Matrix

PO/ PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	1	1	1	1	1	3	1	3	2	~	`1	~
CO 2	3	3	3	3	1	2	1	3	1	3	3	1	1	1
CO 3	3	3	3	3	2	2	2	3	2	2	3	1	1	1
CO 4	1	2	3	3	3	2	3	3	2	3	2	1	~	~
CO 5	1	2	3	3	3	2	3	3	2	3	2	~	1	1

List of Experiments:
1. Study of Semiconductor components, sensors, transducers.
2. Characteristics of Semiconductor Diodes.
3. CRO Applications.
4. Half Wave Rectifier with and without filters.
5. Full Wave Rectifiers with and without filters
6. Voltage Regulator using Zener diode.
7. CB Input and Output Characteristics.
8. FET Characteristics.
9. Operational Amplifiers – Inverting Op-Amp, Adder.
10. Operational Amplifiers – Integrator, Differntiator.
11. Interfacing LDR/Photo Resistor and LED with myRIO (Intensity control of LED with respect to Illumination).
12. Interfacing LM35, Thermistor, and Buzzer with myRIO. (Temperature Thresholding Application).

13. Interfacing IR Range Finder with myRIO. (Obstacle detection and Ranging).
14. Interfacing Motor with Motor Adapter using myRIO. (Motor momentum control).
15. Interfacing Accelerometer and Inbuilt accelerometer with myRIO. (Vibration calculation in specific axis).
16. **Structured Enquiry:** Design a switching circuit using BJT and analyse its operation.
17. **Open ended Enquiry:** Design a LED running lights circuit for vehicles to avoid accidents in fog/rain condition.

(Note: At least 12 experiments have to be performed.)

Suggested Reading:

1. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, "Basic Electronics, a Text- Lab Manual", 7th Edition, TMH, 1994.
2. Paul B. Zbar, "Industrial Electronics, a Text-Lab Manual", 4th Edition, 2008.
3. Jeffrey Travis and Jim Kring, "LabVIEW for Everyone: Graphical Programming Made Easy and Fun", 3rd Edition, Prentice Hall, 2007.
4. Ed Doering, NI myRIO Project Essentials Guide, Feb. 2016.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2026-27

SEMESTER -V

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
3	22CIC05	Blockchain Technology	3	-	-	3	40	60	3
2	22CSC15N	Operating Systems	3	-	-	3	40	60	3
3	22CIC07N	Industrial Internet of Things	3	-	-	3	40	60	3
4	22ITC10N	Computer Networks	3	-	-	3	40	60	3
5	22EGM01	Indian Constitution and Fundamental Principles	2	-	-	2	-	50	Non Credit
6		Professional Elective – I	3	-	-	3	40	60	3
PRACTICAL									
7	22CSC18N	Operating Systems Lab	-	-	3	3	50	50	1.5
8	22CIC08N	Industrial Internet of Things Lab	-	-	2	3	50	50	1
9	22ITC16N	Computer Networking Technologies Lab	-	-	2	3	50	50	1
10	22EGC03	Employability Skills	-	-	2	3	50	50	1
11		Professional Elective – I Lab			2	3	50	50	1
12	22CICI02	Industrial/ Rural Internship	3-4 weeks / 90 hours			-	50	-	2
		TOTAL	**15**	**-**	**11**	**-**	**500**	**550**	**22.5**

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Professional Elective - I

S.NO	THEORY	
	Course Code	**Course**
1	22CIE19	Devops Essentials
2	22ADE65N	Social Network Analytics
3	22CSC52	Data Analysis and Visualization
4	22CSC24N	Compiler Design
5	22CIE05	Distributed Systems
	LAB	
	Course Code	**Course**
1	22CIE20	Devops Essentials Lab
2	22ADE67N	Social Network Analytics Lab
3	22CSC53	Data Analysis and Visualization Lab
4	22CSC25N	Compiler Design Lab
5	22CIE06	Distributed Systems Lab

With effect from AY 2024-25

22CIC05

BLOCKCHAIN TECHNOLOGY

Instruction	3 Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: Distributed systems, Computer networks and Basic understanding of programming concepts.

Course Objectives:

1. To get acquainted with the foundations of blockchain.
2. To provide the significance of the bitcoin ecosystem.
3. To explore the consensus mechanisms and technologies that support Ethereum.
4. To introduce Hyperledger Fabric and its architecture.
5. To familiarize blockchain use cases in various domains.

Course Outcomes:

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

1. Understand the significance of distributed systems and blockchain.
2. Explain the concepts of bitcoin and consensus mechanisms in bitcoin mining.
3. Explore the consensus mechanisms and technologies that support Ethereum.
4. Describe Hyperledger Fabric architecture and Hyperledger projects.
5. Analyse blockchain use cases in various domains.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	3	2	2	3	1	-	-	1	-	1	3	3	3
CO2	3	3	2	1	3	2	-	-	2	-	1	3	3	3
CO3	3	3	2	1	3	2	-	-	1	-	2	3	3	3
CO4	3	3	2	2	2	1	-	-	2	-	2	3	3	2
CO5	3	3	2	2	3	2	-	-	2	-	1	3	3	3

Unit –I

Blockchain Foundations: Overview of distributed systems, Introduction to blockchain, Generic elements of a blockchain, Features of blockchain, Applications of blockchain, Hash Functions and Merkle Trees, Components of blockchain Ecosystem, Cryptography and Consensus Algorithms, Types of blockchain, Blockchain Platforms.

Unit –II

Bitcoin Platform: Bitcoin definition, Keys and addresses, Public keys and Private keys in bitcoin, The transaction life cycle, The transaction structure, Bitcoin payments, Consensus mechanism in bitcoin, Wallet types, Non-deterministic wallets, Deterministic wallets, Alternative Coins: Namecoin, Litecoin, Zcash.

Unit –III

Ethereum Blockchain: Introducing Smart Contracts, Ethereum blockchain, The Ethereum stack, Ethereum virtual machine (EVM), Consensus mechanism in Ethereum, The Ethereum network, Ethereum Development, Setting up a development environment, Development tools: Remix IDE, Truffle, Ganache.

Unit –IV

Hyperledger Fabric: Introduction to Hyperledger Fabric, Hyperledger Fabric architecture, Membership services, Hyperledger Projects: Fabric, Sawtooth, Iroha, Components of the Fabric, Alternate blockchains-Ripple, Corda, Hyperledger Smart Contracts (Chaincode).

Unit –V

Case studies using blockchain: Cross border payments, Know Your Customer (KYC), Food supply chain, Mortgage over blockchain, Identity on blockchain, Blockchain in Insurance Industry, Education, Healthcare, Real estate management and Metaverse.

Text Books:

1. Imran Bashir, “Mastering Blockchain - A technical reference guide to the inner workings of blockchain, from cryptography to DeFi and NFTs”, Packt Publishing Ltd, Fourth Edition, 2023.
2. Melanie Swan, "Blockchain: Blueprint for a New Economy", First Edition, O'Reilly, 2018.

Suggested Reading:

1. Andreas M. Antonopoulos, “Mastering Bitcoin Unlocking Digital Cryptocurrencies”, First Edition Apress, 2017.
2. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and BlockChain”, Packt Publishing, 2019.
3. Ramchandra Sharad Mangrulkar, Pallavi Vijay Chavan, “Blockchain Essentials - Core Concepts and Implementations”, APress Publishing, 2024.

Online Resources:

1. https://andersbrownworth.com/blockchain/public-private-keys/
2. https://www.hyperledger.org/projects/fabric
3. NPTEL courses:
   a. Blockchain and its Applications,
   b. Blockchain Architecture Design and Use Cases

With effect from AY 2024-25

22CSC15N

OPERATING SYSTEMS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Computer Architecture and Programming Fundamentals.

Course Objectives:

This course aims to:

1. Understand the basic concepts and design of an operating system.
2. Interpret the structure and organization of the file system.
3. Learn Inter Process Communication mechanisms and memory management approaches.
4. Explore cloud infrastructures and technologies.

Course Outcomes:

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

1. Understand the basics of Operating systems and its major components.
2. Illustrate the concepts related to process management.
3. Distinguish various memory management techniques.
4. Apply concepts of process synchronization and deadlocks to a given situation.
5. Evaluate various file allocation methods and security as well as recovery features in the designing Operating system.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	2	1	1	-	-	-	-	-	-	-	-	1	1	2
CO2	3	3	-	3	1	-	-	-	-	-	-	2	1	2
CO3	3	3	2	1	1	-	-	-	-	-	-	2	2	2
CO4	3	3	1	3	-	-	-	-	-	-	-	1	2	1
CO5	3	3	2	3	1	-	-	-	-	-	-	2	3	3

UNIT-I

Introduction to Operating Systems: Computer System overview, Components of a computer system, functions of OS, Examples and different types of OS *(RTOS vs. desktop vs. mobile etc.)*, OS distributions and versions.
OS architectures: Micro-kernel, Layered, Kernel Approaches and examples, Linux/Unix OS Design and architecture overview.

UNIT-II

Process management: Program vs. process, process states, Process Control Block (PCB), OS services and system calls *(*fork, wait, exec, getpid, getppid etc.), system calls vs. System programs, Process scheduling- Process context switching, scheduling algorithms, scheduling criteria. Process management in Unix/Linux. **Inter Process Communication:** Linux IPC Mechanisms, RPC, RPC exception handling and Security issues.

UNIT-III

Memory Management: Memory view of a process, Process memory usage requirements, virtual and physical memory related system calls (mmap, munmap, sbrk, mprotect*)*. Address translation mechanisms static mapping, segmentation, paging, page faults, page replacement algorithms, page sharing, read/write permissions, swapping. Memory management in Linux/Unix. **Secondary Memory Management:** Disk structure, disk scheduling, disk management, buffering, swap space management**.**

UNIT-IV

Concurrency and Synchronization: Introduction to threads, benefits, types and thread APIs, Synchronization, issues, hardware and software solutions for synchronization, Classical problems of synchronization. **Deadlocks**: Introduction, necessary conditions for deadlock occurrence, RAG, deadlock handling mechanisms - prevention, avoidance and recovery.

UNIT-V

File Systems: File concepts, file types, allocation and organization methods, file handling system calls, File system metadata, directory structure, caching optimizations, File Systems case study**. OS Security and Defence:** Types of threats in OS, basic security mechanisms, malware taxonomy, viruses, worms, and rootkits, logging, auditing, and recovery.

Text Books:

1. Galvin, Silberschatz, "Operating system Concepts", 10th Edition, John Wiley & Sons, 2018.
2. William Stallings, "Operating Systems Internals and Design Principles" Pearson Edition, 2012.

Suggested Reading:

1. Ekta Walia Khanna, "Operating System Concepts", 2nd Edition, Publishing House, 2019.
2. W. Richard Stevens, Stephen A. Rago, "Advanced Programming in the UNIX® Environment", 3rd Edition, Pearson Education India; 2013.
3. Maurice J. Bach, "Design of the UNIX Operating System", 1st Edition, Pearson Education India, 2015.

Online Resources:

1. Remzi H. Arpaci-Dusseau and Andrea C. , "Three Easy Pieces", Arpaci-Dusseau Arpaci-Dusseau Books, LLC https://pages.cs.wisc.edu/~remzi/OSTEP/ (online version).
2. Frans Kaashoek, Robert Morris, and Russ Cox, Xv6, a simple Unix-like teaching operating system [T4-R] https://github.com/mit-pdos/xv6-riscv (RISC-V version) [T4-X] https://github.com/mit- pdos/xv6-public (x86 version).

With effect from AY 2024-25

22CIC07N

INDUSTRIAL INTERNET OF THINGS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60Marks
CIE	40Marks
Credits	3

Pre-Requisites
Computer Architecture and Micro Processor, Programming for Problem Solving.

Course Objectives
1. Understand the basics of IoT and IIOT.
2. Impart necessary and practical knowledge in Industrial Internet of Things.
3. Develop skills required to build real-time IIoT based projects.

Course Outcomes
By the end of this course, students should be able to:
1. Understand Internet of Things and IIOT basics components.
2. Analyzing IoT Systems: Sensor Interfaces, Protocols, and Communication Modules.
3. Applying Raspberry Pi in IoT: Interface Sensors and Actuators
4. Understanding Arduino Basics
5. Develop real-time IoT-based projects.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	1	-	-	-	-	-	-	1	-	-	1	1	1	1
CO2	1	-	-	-	-	-	-	1	-	-	1	1	2	-
CO3	1	1	1	-	1	-	-	1	1	-	1	1	1	-
CO4	1	1	1	-	1	-	-	1	1	-	1	1	1	-
CO5	2	2	1	1	2	1	1	1	1	1	1	1	1	1

Unit – I
Internet of Things: The Third Wave? Definition of IoT, and M2M, Advantages and Disadvantages of IoT.More than Smart "Things": IoT key attributes, Three Major Challenges Facing IoT, Architecture of IoT.

Industrial Internet of Things (IIoT): Definition of IIoT, IoT, and M2M, IIoT Challenges, IIoT Requirements.

Unit – II
Physical design of IoT: Sensors, Networks, Standards.Things in IoT, IoT protocols,Intelligent analysis, Intelligent actions
Logical Design of IoT: IoT Functional Blocks,IoTCommunication Models, IoT Communication APIs.

Unit – III
Raspberry Pi: IoT Physical Devices and Endpoints:Introduction to Raspberry Pi-Interfaces (serial, SPI, I2C), Programming Raspberry PI with Python- Controlling LED with Raspberry PI, interfacing an LED and Switch with Raspberry PI, and Interfacing a light sensor (LDR) with Raspberry Pi

Unit – IV

Programming Arduino:Introduction, Arduino Boards, Programming Variables, if, loops, functions, digital inputs and outputs, the serial monitor, analog inputs and outputs, using libraries, Arduino data types and commands. Programming Arduino Uno with Arduino- Controlling LED with Arduino, interfacing an LED and a Switch with Arduino.

Unit – V

Domain-specific applications of IoT:Home automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health, and lifestyle.

Textbooks:

1. Ahmed Banafa by Introduction to Internet of Things (IoT) Published 2023 by River Publishers
2. Jivan S. Parab · MadhusudanGanujiLanjewar · Marlon Darius Sequeira · GourishNaik · Arman Yusuf Shaikh by Python Programming Recipes for IoTApplications , Springer Nature Singapore Pte Ltd. 2023.
3. ArshdeepBahga, Vijay Madisetti, Internet of Things: A hands on approach, 2014, VPT publishers
4. Simon Monk, Programming Arduino Next Steps: Going Further with Sketches, Second Edition,2019.

Reference Books:

1. Dr. SRN Reddy, RachitTirnkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. he Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press).
4. R2. Matt Richardson & Shawn Wallace, Getting Started with Raspberry Pi, O'Reilly (SPD), 2014.
5. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill, 2017.
6. CunoPfister, "Getting Started with the Internet of Things", O Reilly Media, 2011.

Web References:

1. Li Da Xu, Wu He, and Shancang Li, "Internet of Things in Industries: A Survey", IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik , JP. Vasseur, R. Alexander, "RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks", IETF, Standards Track, Mar. 2012.
3. Z. Shelby, K. Hartke, C. Bormann, "The Constrained Application Protocol (CoAP)", Internet Engineering Task Force (IETF), Standards Track, 2014.
4. L.Fenzel, "What‟s The Difference Between IEEE 802.15.4 And ZigBee Wireless?", Electronic Design (Online), Mar. 2013.

With effect from AY 2024-25

22ITC10N

COMPUTER NETWORKS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES:

This course aims to:

1. Understand the basics of Layering Concepts, Physical layer, data transmission, transmission media.
2. Demonstrate the state-of-the-art knowledge on data link layer concepts.
3. Distinguish the different types of routing algorithms and network layer in the Internet.
4. Introduce Transport Layer basics, UDP and TCP Protocols.
5. Know the concepts of Application Layer Protocols.

COURSE OUTCOMES:

Upon completion of this course, students will be able to

1. Explain the functions of each layer in the OSI, TCP/IP reference models and demonstrate the concepts of Physical Layer.
2. Analyse the Data Link Layer protocols and MAC mechanisms.
3. Evaluate the Routing algorithms and the IP Protocols.
4. Illustrate the functions and performance of Internet Transport Protocols TCP and UDP.
5. Explore the various Application layer protocols.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	1	2	1	2	1	0	0	0	0	0	0	2	3	2
CO 2	3	3	3	2	1	0	0	0	0	0	0	3	3	2
CO 3	3	3	2	2	3	0	0	0	0	0	0	3	3	2
CO 4	3	3	2	2	2	0	0	0	0	0	0	3	3	3
CO 5	2	2	1	2	3	3	3	2	3	3	3	3	3	2

UNIT-I

Introduction: Network Hardware, Network Topologies, Reference Models- The OSI Reference Model- the TCP/IP Reference Model – A Comparison of the OSI and TCP/IP Reference, Packet Switching, Circuit Switching and Virtual Circuit Switching. Physical Layer: Guided Transmission media, Twisted Pairs, Coaxial Cable, Fiber Optics, Wireless transmission.

UNIT-II

Data Link Layer: Design Issues, Error Detection and Correction, Elementary Data Link Protocols: Simplex Protocol, A Simplex Stop and Wait Protocol for an Error-free channel, Sliding Window Protocols, Go-Back-N, Selective Repeat. Medium Access Sub Layer: The Channel allocation problem, Multiple Access Protocols: ALOHA, Carrier Sense Multiple Access Protocols.

UNIT- III

Network Layer: Design Issues, Routing algorithms: The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, OSPF, BGP, Quality of Service, The Network layer in the Internet- The IP Version 4 Protocol, IP Addresses, IP Version 6.

UNIT-IV

Transport Layer: Transport Service, Berkeley Sockets, Elements of Transport Protocols, **The Internet Transport Protocols:** Introduction to UDP, The TCP Protocol, The TCP Segment Header, The TCP Connection Establishment, TCP Connection Release, TCP Sliding Window, TCP Timer Management, TCP Flow Control, Congestion Control.

UNIT-V

Application Layer: DNS, The Domain Name System, The DNS Name Space, Domain Resource Records, Name Servers. **Electronic MAIL:** Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery, SMTP, FTP, TELNET, SNMP.

TEXT BOOKS:

1. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks", 5th Edition, Pearson Education, 2014.

SUGGESTED READING:

1. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks", 5th Edition, Pearson Education, 2021.
2.Chwan-Hwa (John) Wu, J. David Irwin, "Introduction to Computer Networks and Cyber Security", CRC Press, 2013.
3. W. Richard Stevens, "Unix Network Programming", Prentice Hall/Pearson Education, 2009.
4. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", 5th Edition, Addison-Wesley, 2012.
5. Larry L. Peterson and Bruce S. Davie "Computer Networks: A Systems Approach", 5e, 2018
6. Behrouz A. Forouzan "Data Communications and Networking", Fourth Edition,2007.

WEB RESOURCES:

1. https://nptel.ac.in/courses/117105148,title of the course
2. Computer Networks - Books, Notes, Tests 2025-2026 Syllabus
3. IEEE Transactions on Networking | IEEE Communications Society
4. Web Resources for Computer Networks, 5 (vu.nl)

22EGM01 With effect from AY 2024-25

INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES

(BE/BTech III/IV/VI/VII Semester - Common to all branches)

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	-
Credits	0

Prerequisite: Basic awareness of Indian Constitution and Government.

Course Objectives

The course will introduce the students to:

1. Understand the history of framing of the Indian Constitution.
2. Awareness on Fundamental Rights, Duties and Directive Principles of State Policy.
3. Explore the organization of Union Government, and functions of President and Prime Minister.
4. Gain an insight into the inter-functionality of Union Legislature and Judiciary
5. Educate on the local governance and problems in development of rural and urban areas.

Course Outcomes

After successful completion of the course the students will be able to:

1. Understand the history of framing of the Indian Constitution and its features.
2. Assess the realization of Fundamental Rights and Directive Principles of State Policy.
3. Analyze the challenges to federal system and position of the President and the Prime Minister in the Union Government.
4. Underline the role of the Legislature and the Judiciary in Union Government and their mutual relations.
5. Evolve the development of the local governments in India and assess the role of Collector in district administration.

CO-PO-PSO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	-	-	1	-	-	1	1	1	-	-	-	-	-	-
CO 2	-	-	2	-	-	3	2	1	-	-	-	1	-	2
CO 3	-	-	1	-	-	1	-	-	-	-	-	-	-	-
CO 4	-	-	1	-	-	1	-	-	-	-	-	-	-	1
CO 5	-	-	2	-	-	3	1	1	-	-	-	-	1	2

Unit-I

Constitutional History and Framing of Indian Constitution

East India Company rule (1757-1857): Social, Economic, Political and Administrative impact of Company rule in India. British Rule (1858-1947): Indian National Movement, Government of India Acts 1909, 1919 and 1935, and Indian Independence Act 1947. Framing of the Indian Constitution: Constituent Assembly, Preamble and Salient Features.

Unit-II

Fundamental Rights, Duties and Directive Principles of State Policy

The Fundamental Rights**:** Features and significance of Rights. Fundamental Duties: Importance and the legal status of Duties. Directive Principles of State Policy: Socialist, Gandhian and Liberal-intellectual principles, importance and relevance.

Unit-III

Union Government and its Administration

Federalism: Division of legislative and financial powers between the Union and the State. Union Executive: Role and position of President, Prime Minister and Council of Ministers. Emergency Provisions: National Emergency, Constitutional Emergency and Financial Emergency.

Unit-IV

Union Legislature and Judiciary

Union Legislature: Parliament of India-Composition and functions of Parliament, and Parliamentary Committees. Union Judiciary: Supreme Court of India-Composition and Functions.

Unit-V

Local Self Governments

Rural Local Governments: Zilla Parishad- CEO and functions of Zilla Parishad, Mandal Parishad- Role of Elected and Officials, Gram Panchayat- Sarpanch, Secretary and Gram Sabha. Urban Local Governments: Structure and functions of Municipalities and Municipal Corporations. District Collector: Powers and functions of Collector.

Text Books:

1. Sastry Ravindra, (Ed), "Indian Government & Politics", Telugu Akademy, 2nd edition, 2018.
2. "Indian Constitution at Work", NCERT, First edition 2006, Reprinted in 2022.

Suggested Reading:

1. D.D. Basu, "Introduction to the Constitution of India", Lexis Nexis, 2015.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, "Framing of Indian Constitution", 1st Edition, 2015.
3. Granville Austin, "The Indian Constitution: The Cornerstone of a Nation", OUP, 2nd Edition, 1999.
4. M.V. Pylee, "India's Constitution", S. Chand Publishing, 16th Edition, 2017.
5. Rajeev Bhargava (ed), "Politics and Ethics of the Indian Constitution", OUP, 2008.

With effect from AY 2024-25

22CSC18N

OPERATING SYSTEMS LAB

Instruction	3 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Prerequisite: Operating systems, Programming for problem solving.

Course Objectives:

This course aims to:

1. Explore Unix/Linux operating system.theory
2. Analyze various system calls available in Linux/Unix.

Course Outcomes:

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

1. Understand Linux/Unix environment.
2. Identify and interpret various system programs.
3. Understand and implement shell programming.
4. Simulate memory management, file allocation techniques and process schedules.
5. Analyze process and file management system calls by creating and/or modifying concurrent programs.

CO-PO Articulation Matrix

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

List of Experiments: (Implement the following experiments in C Programming Langugage)

1. Demonstration of Linux/Unix file related system calls: mkdir, link, unlink, mount, unmount, users+, chown, chmod, open, close, read, write, lseek, stat, sync.
2. Demonstration of Linux/Unix process related system calls: fork, wait, exec, exit, getpid, getuid, setuid brk, nice, sleep.
3. Shell programming.
4. Implement CPU scheduling algorithms (a) Round Robin (b) SJF (c) FCFS.
5. Implement page replacement algorithms (a) FIFO (b) LRU.
6. Programs to illustrate threads.
7. Demonstration of GNU/Linux IPC mechanisms- Pipes, Semaphores, Shared memory, Message Queues.
8. Implementation of Classical Problems for synchronization (Dining philosopher problem and Producer-Consumer problem).
9. Implementation of Bankers algorithm for Deadlock detection and avoidance.
10. Implementation of Linked, Indexed and Contiguous file allocation methods.

Text Books:

1. Galvin, Silberschatz, “Operating System Concepts”, 10th Edition, John Wiley & Sons, 2018.
2. Dhananjay Dhamdhare, “Operating Systems-A Concept Based Approach”, 3rd Edition, McGraw Hill Education, 2017.

Suggested Readings:

1. Ekta Walia, “Operating System Concepts”, Khanna Book Publishing, 2020.
2. William Stallings, “Operating Systems Internals and Design Principles”, Pearson Ed., 2012.
3. Charles Crowley, “Operating Systems –A Design Oriented Approach”, McGraw Hill Education, 2017.
4. Andrew S. Tanenbaum, Albert S Woodhull, “Operating systems Design and Implementation”, Pearson Ed., 2009.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc21_cs88/preview
2. https://onlinecourses.swayam2.ac.in/aic20_sp05/preview

With effect from AY 2024-25

22CIC08N

INDUSTRIAL INTERNET OF THINGS LAB

Instruction	2 Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Pre-Requisites
CAMP, Programming Basics.

Course Objectives
1. Understand the basics of IoT.
2. Impart necessary and practical Skills using components of Internet of Things.
3. Develop skills required to build real-time IoT based projects.

Course Outcomes
By the end of this course, students should be able to:
1. Use of various hardware and software components related to the Internet of Things.
2. Interface I/O devices, sensors to Raspberry Pi.
3. Monitoring remote systems using IoT.
4. Understand Things Speak in Real time IoT based projects.
5. Develop real life IoT based projects

CO-PO Articulation Matrix

PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	-	-	1	-	-	1	1	1	-
CO2	1	1	1	1	1	-	-	-	-	-	1	1	1	-
CO3	1	1	1	1	-	-	-	-	-	-	1	-	1	-
CO4	1	1	1	1	1	-	-	-	1	-	1	1	1	-
CO5	1	1	1	1	1	1	1	-	1	-	1	2	2	1

LIST OF EXPERIMENTS

1. Introduction to IoT devices and perform necessary software installation.
2. Write a program to interface PIR sensor with Raspberry Pi and turn ON LED when motion is detected.
3. Write a program to interface DHT22 sensor with Raspberry Pi and display temperature and humidity readings.
4. Write a program to interface motor with Raspberry Pi. Turn ON motor when the temperature is high.
5. Write a program to interface LCD with Raspberry Pi and print temperature and humidity readings on it.
6. Write a program to interface flame/smoke sensor with Arduino /Raspberry Pi and give an alert message when flame/smoke is detected.
7. Write a program to interface Moisture/Rainfall sensor with Raspberry Pi and give an alert message.
8. Any case study implemented using Thing speak platform

Textbook:
1. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Reference Books:

1. Dr. SRN Reddy, Rachit Tirnkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill, 2017
4. Cuno Pfister, "Getting Started with the Internet of Things", 0 Reilly Media, 2011.
5. O. Vermesan, P. Friess, “Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publishers, Series in Communications, 2013.

Web References:

1. Li Da Xu, Wu He, and Shancang Li, “Internet of Things in Industries: A Survey “, IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik, JP. Vasseur, R. Alexander, “RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks”, IETF, Standards Track, Mar. 2012.
3. Z. Shelby, K. Hartke, C. Bormann, “The Constrained Application Protocol (CoAP)”, Internet Engineering Task Force (IETF), Standards Track, 2014.
4. L.Fenzel, “What‟s The Difference Between IEEE 802.15.4 And ZigBee Wireless?”, Electronic Design (Online), Mar. 2013.
5. S. N. Das and S. Misra, "Information theoretic self-management of Wireless Sensor Networks", Proceedings of NCC 2013.
6. F. Luo et al., "A Distributed Gateway Selection Algorithm for UAV Networks," in IEEE Transactions on Emerging Topics in Computing, vol. 3, no. 1, pp. 22-33, March 2015.

With effect from AY 2024-25

22ITC16N

COMPUTER NETWORKING TECHNOLOGIES LAB

Instruction	2P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

COURSE OBJECTIVES:

This course aims to:

1. Know about the various network commands.
2. Familiarize with the Cyclic Redundancy check method and Cisco packet tracer installation.
3. Learn the basic Simulation tools and their installation and Datalink layer protocols.
4. Explore the concepts of networks topologies and packet sniffer tool.
5. Acquire knowledge on Socket Programming.

COURSE OUTCOMES:

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

1. Describe the concepts of Networking commands.
2. Implement the CRC method, Cisco Router and VLAN.
3. Install the various Simulation Tools in Networks.
4. Solve the Network Problems by using Simulators.
5. Implement the Socket Programming

CO-PO Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	2	0	0	0	0	0	0	0	3	3	3
CO2	2	2	3	2	1	0	0	0	0	0	0	3	3	3
CO3	3	2	2	3	2	0	0	0	0	0	0	3	3	3
CO4	3	2	3	3	2	0	0	0	0	0	0	3	3	3
CO5	3	2	2	2	3	2	3	2	3	3	3	3	3	3

LIST OF EXPERIMENTS:

1. Write and analyze the output of various Network commands such as ping, ipconfig, arp, netstat, tracert, nslookup, hostname, system info etc.,
2. Implement Cyclic Redundancy Check method in C/C++/Java/Python Language.
3. Configuration of Cisco Router and VLAN.
4. Installation setup of Network simulator software (NS2/NS3/ NetSim /OPNET/ QualNet/ OMNet++ / J-Sim and Cisco Packet Tracer).
5. Simulation of Star topology.
6. Simulation of Sliding Window Protocol
7. Simulation of the Distance Vector Routing algorithm
8. Use Wireshark Packet sniffer software and captures TCP, UDP, IP, ARP, ICMP, Telnet, FTP packets
9. Implement Socket Programming.

TEXT BOOKS:

1. Andrew S. Tanenbaum, Computer Networks, Pearson Education,6th Edition,2021.
2. Michael Gregg, "Build Your Own Security Lab", Wiley Publishing, Inc., 2008.

3. Michael E Whitman, Herbert J. Mattord, Andrew Green," Hands on Information Security lab manual", Cengage Learning, Fourth edition, December 27, 2013.

SUGGESTED READING:

1. James F. Kurose, Keith W. Ross, "Computer Networking – A Top-Down Approach Featuring the Internet", 8th Edition, Pearson Education, 2022.

WEB RESOURCES:

1. https://nmap.org
2. https://www.snort.org
3. https://www.wireshark.org
4. NS2 Projects Tutorials | How to install NS2 Software | Network Simulation Tools
5. Network Simulator 2 (NS2) : Steps For Installing NS2 (tutorialsweb.com)
6. The Network Simulator ns-2: Documentation (isi.edu)
7. Language (tcl.tk)

With effect from AY 2024-25

22EGC03

EMPLOYABILITY SKILLS

(BE/BTech - Common to all Branches)

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Pre-Requisites

Basic Knowledge of Soft skills in the professional setting

Course Objectives: To help the students

1. Learn the art of communication, participate in group discussions and case studies with confidence and to make effective presentations.
2. With- resume packaging, preparing them to face interviews.
3. Build an impressive personality through effective time management, leadership qualities, self-confidence and assertiveness.
4. Understand professional etiquette and to make them learn academic ethics and value system.
5. To be competent in verbal aptitude.

Course Outcomes

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

1. Become effective communicators, participate in group discussions with confidence and be able to make presentations in a professional context.
2. Write resumes, prepare and face interviews confidently.
3. Be assertive and set short term and long term goals, learn to manage time effectively and deal with stress.
4. Make the transition smoothly from campus to work, use media with etiquette and understand the academic ethics.
5. Enrich their vocabulary, frame accurate sentences and comprehend passages confidently.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	-	1	-	-	-	1	2	3	3	1	3	-	-	-
CO2	-	-	-	-	-	-	1	-	2	-	1	-	-	-
CO3	-	-	-	-	-	1	1	2	1	1	3	1	1	-
CO4	-	1	1	-	-	1	2	3	3	1	3	2	2	2
CO5	-	-	-	-	-	-	2	3	2	1	3	-	-	-

Unit – I

Verbal Aptitude: Error Detection, Articles, Prepositions, Tenses, Concord and Transformation of Sentences- Jumbled Words/Sentences- Vocabulary, Synonyms, Antonyms, One Word Substitutes, Idioms and Phrases, Word/Sentence/Text Completion- Reading Comprehension.

Unit – II

Group Discussion & Presentation Skills: Dynamics of Group Discussion-Case Studies- Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Accuracy, Coherence. Elements of Effective Presentation – Structure of a Presentation – Presentation tools – Body language - Preparing an Effective PPT.

Unit – III

Behavioural Skills: Personal strength analysis-Effective Time Management- Goal Setting- Stress management-

Corporate Culture – Grooming and etiquette-Statement of Purpose (SOP).

Unit – IV

Mini Project: Research-Hypothesis-Developing a Questionnaire-Data Collection-Analysis-General and Technical Report - Writing an Abstract –Technical Report Writing-Plagiarism-Project Seminar.

Unit – V

Interview Skills: Cover Letter and Résumé writing – Structure and Presentation, Planning, Defining the Career Objective, Projecting ones Strengths and Skill-sets – Interviews: Concept and Process, Pre-Interview Planning, Opening Strategies, Answering Strategies, Mock Interviews.

Textbook:

1. Leena Sen, ―Communication Skills‖, Prentice-Hall of India, 2005.
2. Gulati and Sarvesh, ―Corporate Soft Skills‖, New Delhi: Rupa and Co., 2006.
3. Edgar Thorpe and Showick Thorpe, ―Objective English‖, 2nd edition, Pearson Education, 2007.
4. Ramesh, Gopalswamy, and Mahadevan Ramesh, ―The ACE of Soft Skills‖, New Delhi: Pearson, 2010.

Reference Books

1. Van Emden, Joan, and Lucinda Becker, ―Presentation Skills for Students‖, New York: Palgrave Macmillan, 2004.
2. R.S. Aggarwal, ―A Modern Approach to Verbal & Non-Verbal Reasoning‖, 2018.
3. Covey and Stephen R, ―The Habits of Highly Effective People‖, New York: Free Press, 1989.
4. Shalini Verma, ―Body Language - Your Success Mantra‖, S Chand, 2006.

With effect from AY 2024-25

22CIE19

DEVOPS ESSENTIALS
(Professional Elective-I)

Instruction	3 Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites:

1. Software Engineering
2. Software Project Management

Course Objectives:

- Understand the skill sets and high-functioning teams involved in Agile, DevOps and related methods to reach a continuous delivery capability.
- Implement automated system update and DevOps lifecycle.
- Comprehend the role of DevOps in enabling continuous integration and continuous delivery (CI/CD).
- Develop proficiency in using version control, build tools, and deployment frameworks.
- implement appropriate testing strategies and automation tools to ensure high software quality.

Course Outcomes:

- Understand the various components of DevOps environment.
- Identify Software development models and architectures of DevOps
- Use different project management and integration tools.
- Select an appropriate testing tool and deployment model for project.

CO-PO Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	-	-	-	-	-	-	1	1	2
CO2	2	3	2	1	-	-	-	-	-	-	-	1	1	2
CO3	3	2	2	1	3	-	-	-	-	-		2	1	1
CO4	3	2	2	2	3	-	-	-	-	-	-	2	2	2

UNIT-I

Introduction to DevOps:

Introduction, Agile development model, DevOps and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, identifying bottlenecks.

UNIT-II

DevOps Principles and practices:

DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing. DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Micro services and the data tier, DevOps, architecture, and resilience. Introduction to DevSecOps, Shift-left security approach, DevSecOps principles and integrates into DevOps lifecycle

UNIT-III

Version control and Project management

The need for source code control, the history of source code management, Roles and code, source code management system and migrations, shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT-IV

Integrating the system

Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

UNIT-V

Testing Tools and Deployment: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development. Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker.Security testing types, Incorporating security tests into CI/CD pipelines, Container and infrastructure security basics.

TEXT BOOKS:

1. Joakim Verona., Practical DevOps, Packt Publishing, 2016
2. Mitesh Soni, "DevOps Bootcamp", Packt Publishing Ltd, 2017.
3. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.
4. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley

REFERENCES:

1. Sanjeev Sharma and Bernie Coyne, " DevOps for Dummies", 3rd Edition, Wiley Publication,2017.
2. Httermann, Michael, "DevOps for Developers", 1st Edition, APress Publication, 2012.
3. Martin Alfke, " Puppet 5 Essentials - Third Edition: A fast-paced guide to automating your infrastructure", 3rd Revised Edition, Packt Publishing, 2017

Web Reference

1. https://www.coursera.org/learn/intro-to-devops

With effect from AY 2024-25

22CIE20

DEVOPS ESSENTIALS LAB

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. Understand the fundamental principles and concepts of DevOps, including its history, evolution, and significance in modern software development
2. Explore and employ a range of DevOps tools and technologies for version control, continuous integration, continuous deployment, and infrastructure automation
3. Develop the skills to design and implement effective CI/CD pipelines that automate the testing, integration, and deployment processes in a DevOps environment.
4. Gain proficiency in containerization technologies like Docker enabling scalable and efficient application deployment.
5. Acquire practical experience in setting up monitoring, logging, and security mechanisms to ensure DevOps systems' reliability, performance, and security

Course Outcomes:

1. Apply to proficiently use Git for version control, understanding its core concepts like commits, branches, and merges, ensuring efficient collaboration and source code management.
2. Apply & Able to a strong command over Git operations, enabling them to confidently perform tasks like creating repositories, branching, merging, and pushing changes to remote repositories.
3. Apply & able to setting up Jenkins, integrating it with build tools (Maven/Ant/Gradle), and creating automated build jobs that facilitate a continuous integration workflow.
4. Demonstrate the ability to create a Jenkins pipeline script that automates the testing and deployment process, ensuring a reliable and repeatable deployment pipeline.
5. Analyze & Understand Docker's architecture, possess the skills to manage Docker images and containers, and be proficient in creating Docker images using Dockerfiles, fostering application portability and consistency.

CO-PO Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	2	2	-	-	-	-	-	-	-	1	1	-
CO2	1	1	2	-	-	-	-	-	-	-	-	1	1	-
CO3	2	1	2	2	1	-	-	-	-	-		2	1	-
CO4	-	1	1	2	1	-	-	-	-	-	-	2	2	-
CO5	1	1	1	1	-	-	-	-	-	-	-	1	1	-

List of Experiments:

1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Install and Explore Selenium for automated testing.
7. Write a simple program in JavaScript and perform testing using Selenium.
8. Develop test cases for the above containerized application using selenium.

9. Explore Docker commands for content management.
10. Develop a simple containerized application using Docker.
11. To install and Configure Pull based Software Configuration Management and provisioning tools using Puppet. /Ansible.
12. To learn Software Configuration Management and provisioning using Puppet Blocks (Manifest, Modules, Classes, Function).
13. To provision a LAMP/MEAN Stack using Puppet Manifest.
14. Develop a simple application using a Low-Code/No-Code platform (e.g., PowerApps, OutSystems, AppSheet) and deploy it.
15. Integrate Low-Code/No-Code application with an API or database and demonstrate basic security testing or validations within the platform.
16. DevOps Project : Final project integrating various DevOps tools and practices.Demonstration of an end-to-end DevOps solution with real-world scenarios

Text Books:

1. Joakim Verona., Practical DevOps, Packt Publishing, 2016.
2. Krief, Mikael. Learning DevOps: The Complete Guide to Accelerate Collaboration with Jenkins, Kubernetes, Terraform and Azure DevOps. United Kingdom: Packt Publishing, 2019.
3. Deepak Gaikwad, Viral Thakkar, “DevOps Tools from Practitioner's Viewpoint”, Wiley,2019

Reference Books:

1. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.
2. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley.
3. Sanjeev Sharma and Bernie Coyne, “ DevOps for Dummies”, 3rd Edition, Wiley Publication,2017.
4. Httermann, Michael, “DevOps for Developers”, 1st Edition, APress Publication, 2012.
5. Joakim Verona, “Practical DevOps”, 2nd Edition Packt publication,2018.
6. Martin Alfke, “ Puppet 5 Essentials - Third Edition: A fast-paced guide to automating your infrastructure”, 3rd Revised Edition, Packt Publishing, 2017.

With effect from AY 2024-25

22ADE65N

SOCIAL NETWORK ANALYTICS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites

1. Web Technologies
2. Computer Networks
3. Data Warehousing and Data Mining

Course Objectives

Understand the concept of Social networks and related applications.

1. Learn Social network analysis software Tools and Libraries.
2. Understand social network Graphs and Community Mining Algorithms.
3. Learn visualization of social networks.
4. Analyze human behavior in social web and related communities.

Course Outcomes

By the end of this course, students should be able to:

1. Design the social networks
2. Gain skills in tracking the social networks and its tools.
3. Use Open source tools to perform social network analysis.
4. Visualize social networks and analysis.
5. Predict human behavior in social network and related communities

CO-PO Articulation Matrix

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	1	2	2	1	-	-	1	1	2	1	1	3
CO2	1	1	1	2	3	1	2	-	1	2	3	2	2	3
CO3	2	2	1	3	-	2	-	-	-	-	-	1	1	2
CO4	2	2	1	3	-	2	3	-	1	-	-	1	-	2
CO5	-	1	-	-	-	2	3	1	1	1	-	1	1	3

Unit – I

Introduction to Social Network Analytics:

Social Networks Perspective – Analysis of Network Data – Interpretation of Network Data – Social Network Analysis in the Social and Behavioral Sciences – Metrics in social network analysis..

Unit – II

Social Network Analysis, Software Tools and Libraries:

Data Representation, network measures, Modeling and aggregating social network data, Social network analysis software Tools and Libraries..

Unit – III

Cliques, Clusters, Components and Community Mining Algorithms Applications:

Components and Sub graphs: Sub graphs – Ego Networks, Triads, Cliques, Hierarchical Clustering, Triads, Network Densityandconflict.

Density: Egocentric and Socio centric – Digression on Absolute Density – Community structure and Density.

Centrality: Local and Global – Centralization and Graph Centers, Cliques and their intersections, Components and Citation Circles – Positions, Sets and Clusters.

Unit – IV

Visualizing Social Networks with Matrix

Matrix and node and link diagrams, Hybrid representations, cover networks, Community welfare, Collaboration networks, Co-Citation networks, Advances in Network Visualization – Elites, Communities and Influence, Applications of Social Network Analysis, Modelling and aggregating social network data- State-of-the-art in network data representation, Aggregating and reasoning with social network data.

Unit – V

Predicting Human Behavior and Privacy Issues:

Understanding and predicting human behavior for social communities – User data management – Inference and Distribution – Enabling new human experiences – Reality mining – Context – Awareness – Privacy in online social networks – Trust in online environment – Trust models based on subjective logic – Trust network analysis – Trust transitivity analysis – Combining trust and reputation – Trust derivation based on trust comparisons – Attack spectrum and countermeasures, Semantic-based Social Network Analysis in the sciences- Case study .

Textbooks:

1. David Easley, Jon Kleinberg, *Networks, Crowds and Markets*, Cambridge Press, 2010.
2. Peter Mika, *Social Networks and the Semantic Web*, First Edition, Springer 2007.

Reference Books:

1. Marshall Sponder, *Social Media Analytics: Effective Tools for Building, Interpreting and Using Metrics*, 1st Edition, McGraw Hill, 2011.
2. Guandong Xu, Yanchun Zhang and Lin Li, *Web Mining and Social Networking – Techniques and applications*, First Edition, Springer, 2011.
3. Borko Furht, *Handbook of Social Network Technologies and Applications*, 1st Edition, Springer, 2010.
4. Hansen, Derek, Ben Shneiderman, Marc Smith, *Analysing Social Media Networks with NodeXL: Insights from a Connected World*, Morgan Kaufmann, 2011.

Web References:

1. https://www.coursera.org/course/sna
2. https://www.coursera.org/course/networks

With effect from AY 2024-25

22ADE67N

SOCIAL NETWORK ANALYTICS LAB

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisite:

1. Web Technologies
2. Computer Networks
3. Data Warehousing and Data Mining

Course Objectives:

This course aims to:

1. Implement the concept of Social Networks and their applications
2. Learn Social Network Analysis (SNA) software tools and libraries
3. Apply social network graph and community mining algorithms
4. Learn visualization of social networks
5. Analyze human behavior in online communities

Course Outcomes:

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

1. Apply programming techniques in R, Python, or Java to construct and manage social network objects.
2. Apply visualization techniques to represent and explore social networks using standard libraries and tools.
3. Analyze node-level and network-level metrics such as centrality, clustering, degree, and density for meaningful interpretation.
4. Analyze spatial characteristics of networks by integrating connectivity data using spatial network models like sfnetworks.
5. Apply social network analysis methods to real-world case studies for deriving patterns and actionable insights.

CO-PO Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	2	3	-	-	1	1	2	2	2	2	1	3
CO2	2	2	2	3	-	-	1	2	2	2	2	2	1	3
CO3	3	2	3	3	-	-	1	1	2	2	3	1	1	2
CO4	3	2	3	3	2	-	-	-	1	2	3	1	-	2
CO5	2	3	2	3	2	1	2	2	3	3	2	3	1	3

List of Lab Programs:

1. Install and load required packages for performing social network analysis.
2. Analyze census tract data to prepare it for network modeling and interpretation.
3. Apply social network data formats, including:
   A) Socio matrix
   B) Node and edge lists
4. Create the network object using imported data and explore its structure.
5. Visualize a real-time social network using appropriate visualization tools.

6. Analyze node characteristics such as various forms of centrality.
7. Explore network characteristics like average degree, centralization, clustering, diameter, and density.
8. Explore social and spatial network models through analytical tools and data sets.
9. Analyze the sfnetworks model to understand spatial network structures.
10. Develop and analyze a real-time case study based on a social network scenario.

Text Books:

1. David Eas ley, Jon Kleinberg, "Networks, Crowds and Markets", Cambridge Press, 2010.
2. Peter Mika, Social Networks and the Semantic Web, First Edition, Springer 2007.

Suggested Reading:

1. Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting and Using Metrics, 1st Edition, McGraw Hill, 2011.
2. Guandong Xu ,Yanchun Zhang and Lin Li,-Web Mining and Social Networking – Techniques and applications, First Edition, Springer, 2011.
3. Borko Furht, Handbook of Social Network Technologies and Applications, 1st Edition, Springer, 2010.
4. Hansen, Derek, Ben Sheiderman, Marc Smith, Analysing Social Media Networks with NodeXL: Insights from a Connected World, Morgan Kaufmann, 2011.

Web Link:

1. https://crd230.github.io/lab9.html#Installing_and_loading_packages

With effect from AY 2024-25

22CSC52

DATA ANALYSIS AND VISUALIZATION

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Python Programming

Course Objectives:

This course aims to:

1. Introduce the Numpy library in Python to support storage and operations on large multi-dimensional arrays and matrices
2. Introduce large collection of mathematical functions to operate on multidimensional sequential data structures
3. Demonstrate the functionality of the Pandas library in Python for open-source data analysis and manipulation
4. Demonstrate Data Aggregation, Grouping and Time Series analysis with Pandas
5. Introduce the Matplotlib library in Python for creating static, animated and interactive visualizations

Course Outcomes:

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

1. Create, manipulate, and analyze numerical data using NumPy arrays and associated functions.
2. Perform various preprocessing operations on datasets using Pandas Series and DataFrame objects.
3. Combine and manipulating complex datasets using a variety of Pandas techniques, including concatenation, merging, grouping, aggregation, and time series analysis,
4. Apply inferential statistics to analyze data, draw valid conclusions about populations, based on hypothesis testing, confidence intervals, and correlation analysis.
5. Create and interpret different types of data visualizations using Matplotlib and Seaborn

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	-	-	-	-	-	-	-	-	-	-	2	1	1
CO 2	3	2	-	1	1	-	-	-	-	-	-	2	1	3
CO 3	3	1	-	3	1	-	-	-	-	-	-	1	1	1
CO 4	3	2	1	3	1	-	-	-	-	-	-	1	-	2
CO 5	2	2	-	2	1	-	-	-	-	-	-	3	1	1

UNIT - I

Introduction to Numpy: Data types in Python - Fixed type arrays, creating arrays, array indexing, array slicing, reshaping arrays, array concatenation and splitting, Universal Functions, Aggregations, Broadcasting rules, Comparisons, Boolean Arrays, Masks Fancy Indexing, Fast Sorting using np.sort and np.argsort, partial sorting Creating Structured Arrays, Compound types and Record Arrays.

UNIT - II

Introduction to Pandas: Series Object, DataFrame Object, Data Indexing and Selecting for Series and DataFrames, Universal Functions for Index Preservation, Index Alignment and Operations between Series and DataFrames, Handling missing data, operating on Null values, Hierarchical Indexing.

UNIT - III

Combining Datasets: Concat, Append, Merge and Joins, Aggregation and Grouping, Pivot Tables, Vectorized String Operations, High-Performance functions - query() and eval()

UNIT - IV

Time Series : Date and Time Data Types and Tools ,Time Series Basics , Date Ranges, Frequencies, and Shifting ,Time Zone Handling , Time Zone Localization and Conversion , Operations with Time Zone-Aware Timestamp Objects , Operations Between Different Time Zones ,Periods and Period Arithmetic ,Resampling and Frequency Conversion , Moving Window Functions.

UNIT - V

Visualization with Matplotlib : Simple Line plots, Scatter plots, Visualizing errors, Density and Contour plots, Histograms, Binnings, Multiple subplots, Three-dimensional plotting with Matplotlib, Geographic data with Basemap, Visualization with Seaborn. **Scikit-learn**: Plotting learning curves Visualizing model performance across hyperparameters **PyTorch:** Plotting training & validation loss over epochs Plotting learning rate schedules

Text Books:

1. Jake VanderPlas, Python Data Science Handbook: Essential Tools for Working with Data, 2nd Edition, O'Reilly Media, 2023. ISBN: 978-1-098-12122-8
2. Wes McKinney, "Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter", 3rd Edition, 2022

Suggested Reading:

1. Samir Madhavan, "Mastering Python for Data Science", Packt Publishing, 2015

Online Resources:

1. https://numpy.org/doc/stable/user/index.html
2. https://pandas.pydata.org/
3. https://matplotlib.org/
4. https://seaborn.pydata.org/tutorial.html
5. https://www.coursera.org/learn/data-analysis-with-python

With effect from AY 2024-25

22CSC53

DATA ANALYSIS AND VISUALIZATION LAB

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisite: Python Programming

Course Objectives:

This course aims to:

1. Introduce the fundamental concepts of NumPy for efficient array creation, manipulation, and broadcasting.
2. Develop proficiency in performing numerical computations using universal and aggregation functions in NumPy.
3. Familiarize students with structured arrays and compound data types for managing heterogeneous data.
4. Enable students to handle and analyze data using Pandas structures such as Series and Data Frames.
5. Equip students with skills to merge, group, and visualize data using advanced Pandas functionalities and perform basic inferential statistical analysis.

Course Outcomes:

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

1. Describe and differentiate between 1D, 2D, and 3D arrays and their attributes such as shape, size, and data type using NumPy.
2. Implement NumPy functions to perform slicing, reshaping, broadcasting, and array-based computations on structured and unstructured data.
3. Analyze and manipulate tabular datasets using Pandas through filtering, indexing, hieratical operations
4. Evaluate and combine datasets using merge, join, and group-based aggregation methods; summarize data using pivot tables.
5. Design and simulate data analysis workflows involving string processing, time series analysis, and statistical testing using NumPy and Pandas.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	1	-	-	2	-	-	-	-	-	-	2	2	2
CO 2	1	1	-	-	1	-	-	-	-	-	-	2	2	1
CO 3	2	1	-	-	-	-	-	-	-	-	-	1	2	2
CO 4	1	1	-	1	1	-	-	-	-	-	-	2	2	2
CO 5	1	1	-	2	1	-	-	-	-	-	-	2	1	1

List of the Experiments:

1. Create and manipulate 1D, 2D, and 3D arrays using NumPy. Inspect array attributes (e.g., shape, size, dtype) and demonstrate slicing, reshaping, and broadcasting operations.
2. Apply NumPy universal functions (e.g., np.sin(), np.exp()), aggregation functions (e.g., np.sum(), np.mean()), Boolean indexing, and fancy indexing. Perform sorting using np.sort() and np.argsort().
3. Create structured arrays using NumPy with compound data types and perform field-based data access and manipulation.
4. Create Pandas Series and DataFrames. Perform data selection (e.g., loc, iloc) and filtering (e.g., Boolean masks), and handle missing values using isnull(), fillna(), and dropna().
5. Perform arithmetic operations on Series and DataFrames. Implement hierarchical indexing,

stack/unstack operations, and demonstrate index alignment in operations.

6. Combine datasets using merge(), join(), and concat(). Demonstrate different join strategies (e.g., inner, outer, left, right). Note: Avoid using the deprecated append() method.
7. Perform group-based aggregation using groupby() and construct pivot tables for summarizing multidimensional data.
8. Apply string operations using the .str accessor (e.g., lower(), split()). Work with time-indexed data by parsing dates, resampling, and applying frequency conversions (e.g., daily to monthly).
9. Use Pandas query() and eval() functions for high-performance filtering and computation.
10. Perform time zone localization, conversion, and arithmetic operations with time zone-aware timestamp objects.
11. Use a dataset with irregular timestamps (e.g., stock prices or sensor readings). Convert the data into different frequencies using aggregations .Apply a rolling mean to reduce noise and highlight trends.Plot the original, resampled, and smoothed data using Matplotlib/Seaborn to observe differences.
12. Create visualizations using Matplotlib and Seaborn, including line plots, bar charts, scatter plots, histograms, kernel density estimates (KDEs), pair plots, violin plots, and heatmaps.

Tools Required:

1. Python (3.7+)
2. Jupyter Notebook or Google Colab
3. Libraries: NumPy, Pandas, Matplotlib, Seaborn, Scipy, Statsmodels

Textbooks:

1. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly Media, 2016.
2. Samir Madhavan, “Mastering Python for Data Science”, Packt Publishing, 2015.

Online Resources:

1. Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Python, O’Reilly Media, 2018.

With effect from AY 2024-25

22CSC24N

COMPILER DESIGN

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Formal Language and Automata Theory, Data Structures.

Course Objectives:

This course aims to:

1. Understand and list the different stages in the process of compilation.
2. Identify different methods of lexical analysis and design top-down and bottom-up parsers.
3. Implement syntax-directed translation schemes and develop algorithms to generate and optimize code for a target machine and advance topics of compilers.

Course Outcomes:

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

1. Identify the concepts related to translators, tokens, bootstrapping, and phases of the compiler.
2. Use grammar specifications and implement a lexical analyzer with the help of compiler tools.
3. Explore the techniques of Top down, bottom-up parsers and apply parsing methods for various grammars.
4. Implement syntax-directed translation schemes and relate Symbol Table organization.
5. Analyze the concepts involved in Intermediate Code, Code Optimization, and Code Generation processes, and understand error recovery strategies and advanced topics in compilers.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	1	1	-	-	-	-	-	-	3	2	2	2
CO 2	2	2	1	2	3	-	-	-	-	--	-	2	2	2
CO 3	2	2	1	1	3	-	-	-	-	-	1	2	2	2
CO 4	2	2	1	2	-	-	-	-	-	-	1	2	2	2
CO 5	2	2	1	2	3	-	-	-	-	-	2	2	3	3

UNIT - I

Introduction to Compilers: Structure of a compiler, Phases of a compiler, Grouping of phases, Compiler writing tools, Bootstrapping, Data structures. Lexical Analysis: The role of Lexical Analyzer, Input Buffering, Specification of Tokens using Regular Expressions, Review of Finite Automata, Recognition of Tokens, Design of Lexical Analyzer Generator (lex, flex).

UNIT - II

Syntax Analysis: Introduction to syntax analysis, Top-Down Parsing, Recursive descent parsing, Predictive parsing, LL (1) Grammars. Bottom-Up Parsing: Shift Reduce parsing, Operator precedence parsing (Concepts only), Constructing SLR parsing tables, Constructing Canonical LR parsing tables, and Constructing LALR parsing tables. Parser generator (YACC, BISON).

UNIT - III

Syntax-Directed Translation: Syntax-directed definitions, Bottom-up evaluation of S-attributed definitions, L-attributed definitions, Top-down translation, Bottom-up evaluation of inherited attributes. **Type Checking:** Type systems, Specification of a simple type checker, Overview of Symbol Table. **Introduction to Runtime Time Environments:** Storage Organizations, Stack, Heap organizations.

UNIT - IV

Intermediate Code Generation: Intermediate languages, Graphical representations, Three Address code, Quadruples, Triples. **Code Optimization:** Principal sources of optimization, Basic Blocks and Flow Graphs, Optimization of basic blocks, Data Flow Analysis, Live Variable Analysis, Loops.

UNIT - V

Code Generation: Issues in the Design of a Code Generator, The Target Machine, a simple Code Generator, Addresses in Target Code, Machine-independent optimization, Peephole optimization, Overview of Register Allocation and Assignment, Error recovery in various phases. Advanced topics: Review of Compiler Structure, Advanced elementary topics, Structure of optimizing compilers.

Text Books:

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman, "Compilers: Principles, Techniques &Tools", Pearson Education, 2nd Edition, 2023.
2. Steven Muchnik, "Advanced Compiler Design and Implementation", Kauffman, 1998.

Suggested Reading:

1. Kenneth C Louden, "Compiler Construction: Principles and Practice", Cengage Learning, 2005.
2. Keith D Cooper & Linda Tarezon, "Engineering a Compiler", Morgan Kaufman, 3rd Edition, 2022.
3. John R Levine, Tony Mason, Doug Brown, "Lex &Yacc", 3rd Edition, Shroff Publisher, 2007.

Online Resources:

1. http://www.nptel.ac.in/courses/106108052.
2. https://web.stanford.edu/class/archive/cs/cs143/cs143.1128/.
3. http://en.wikibooks.org/wiki/Compiler_Construction.
4. http://dinosaur.compilertools.net/.
5. http://epaperpress.com/lexandyacc/.

With effect from AY 2024-25

22CSC25N

COMPILER DESIGN LAB

Instruction	2 P Hours per week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisite: Data Structures, Design and analysis of algorithms, Formal language and automata theory.

Course Objectives:

This course aims to:

1. Define the rules for implementing a lexical analyzer and to understand the concepts behind the working of compiler tools - Lex, Turbo C, Yacc.
2. Analyze and apply regular grammar for various source statements' expressions.
3. Implement the front end of the compiler by means of generating intermediate codes, implementing code optimization techniques, and error handling.

Course Outcomes:

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

1. Implement the rules for the analyzing phases of a compiler.
2. Examine the concepts of compiler tools: Lex, Flex, Yacc, Turbo C.
3. Apply various Syntax techniques on grammars to build the parsers.
4. Generate various intermediate code representations for the source code.
5. Implement the concepts of code optimization, code generation phases.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	1	-	1	-	-	-	-	-	-	3	3	3	3
CO 2	2	2	1	1	3	-	-	-	-	-	3	2	2	3
CO 3	2	2	1	1	3	-	-	-	-	-	3	2	2	2
CO 4	2	2	1	1	2	-	-	-	-	-	3	1	2	2
CO 5	2	2	1	1	2	-	-	-	-	-	3	2	3	3

List of Programs:

1. Tokenization – By constructing a DFA of the Lexical Analyzer.
2. Writing a standalone scanner application using (Tools: Jlex / JFlex / Lex).
3. Implementing a parser with Scanner, without Scanner, or with yacc/bison generators.
4. Program to generate a predictive LL1 parsing table for the Expression grammar.
5. Program to generate the SLR parsing table for the Expression grammar.
6. Implementing a parser for a small language.
7. Implementation of the language to an intermediate form (e.g., three-address code).
8. Demonstration of code improvement with the help of optimization techniques.
9. Generation of target code (in assembly language).
10. Implement a Mini Compiler with Phases.

Text Books:

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman, "Compilers: Principles, Techniques & Tools", Pearson Education, 2nd Edition, 2023.
2. John R Levine, Tony Mason, Doug Brown, "Lex &Yacc", 3rd Edition, Shroff Publisher, 2007.

Suggested Reading:

1. Keith D Cooper & Linda Tarezon, "Engineering a Compiler", Morgan Kaufman, 3rd Edition, 2022.
2. John R Levine," Lex & Yacc", 2nd Edition, O'Reilly Publishers, 2009.

Online Resources:

1. http://www.nptel.ac.in/courses/106108052
2. http://en.wikibooks.org/wiki/Compiler_Construction
3. http://dinosaur.compilertools.net/
4. http://epaperpress.com/lexandyacc/

With effect from AY 2024-25

22CIE05

DISTRIBUTED SYSTEMS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites
Java Programming, Operating Systems, Computer Networks

Course Objectives

1. To provide students with contemporary knowledge in distributed systems
2. To introduce the computation and communication models of distributed systems
3. To describe distributed mutual exclusion techniques
4. To provide master skills to measure the performance of distributed synchronization algorithms
5. To understand the Distributed File System to analyse various file systems like NFS, AFS and the experience in building large-scale distributed applications

Course Outcomes
By the end of this course, students should be able to:

1. Demonstrate knowledge of the basic elements and concepts related to distributed system technologies;
2. Illustrate the middleware technologies that support distributed applications such as RPC, RMI and Object based middleware.
3. Analyse the various techniques used for Process management, synchronization and mutual exclusion
4. Demonstrate the concepts of Consistency and Replication Management
5. Apply the knowledge of Distributed File System to analyse various file systems like NFS, AFS and the experience in building large-scale distributed applications.

CO-PO Articulation Matrix

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	-	-	-	-	-	3	1	2	1
CO2	3	3	3	3	2	-	-	-	-	-	3	3	2	2
CO3	3	3	3	3	3	-	-	-	-	-	3	1	1	2
CO4	3	3	3	3	3	-	-	-	-	-	3	1	1	1
CO5	3	3	3	3	3	-	-	-	-	-	3	1	3	2

Unit – I
Introduction to Distributed Systems:
Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Trends in distributed systems, Focus on resource sharing, Challenges, Case study: The World Wide Web.
System Models: Introduction, Physical models, Architectural models, Fundamental models.

Unit – II
Processes: Threads, Virtualization, Clients, Servers, Code Migration.
Communication: Fundamentals, Remote Procedure Call (RPC), Message Oriented Communication, Stream Oriented Communication, Group Communication. Remote Invocation: Remote Method Invocation (RMI), case study: Java RMI.

Unit – III

Clock Synchronization, Logical Clocks, Mutual Exclusion, Election Algorithms.

Distributed mutual exclusion algorithms:

Non Token based Algorithms: Lamport's Algorithm, Ricart–Agrawala's Algorithm, Singhal's dynamic information-structure Algorithm.

Token Based Algorithms: Suzuki-Kasami's Broadcast Algorithm, Raymond's Tree based Algorithm, Comparative Performance Analysis.

Unit – IV

Consistency, Replication and Fault Tolerance:

Introduction to replication and consistency, Data-Centric and Client-Centric Consistency Models, Replica Management.

Fault Tolerance: Introduction, Process resilience, Reliable client-server and group communication, Recovery.

Unit – V

Distributed File Systems: Introduction, file service architecture. **Case Study:** Network File System (NFS), Andrew File System (AFS).

Name services: Introduction, Name services and Domain Name System, Directory Services, **Case Study:** The Global Name Service, The X.500 Directory Service.

Textbooks:

1. Andrew S. Tanenbaum and Maarten Van Steen, ―Distributed Systems: Principles and Paradigms, 2nd edition, Pearson Education.
2. George Coulouris, Jean Dollimore, Time Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.

Reference Books:

1. M. L. Liu, ―Distributed Computing Principles and Applications‖, Pearson Addison Wesley, 2004.
2. Kshemkalyani Ajay D, Mukesh Singhal, "Distributed Computing: Principles, Algorithms and Systems", Cambridge Press, 2011.
3. Mukesh Singhal, Niranjan G Shivaratri, "Advanced Concepts in Operating systems", Mc-Graw Hill Publishers, 1994.
4. Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers, 2003.
5. Distributed Computing: Fundamentals, Simulations and Advanced Topics-Hagit Attiya and Jennifer Welch.

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_cs87/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs15/preview

With effect from AY 2024-25

22CIE06

DISTRIBUTED SYSTEMS LAB

Instruction	2 L Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Pre-Requisites

Java Programming, Operating Systems, Computer Networks

Course Objectives

1. To introduce the primitive client-server programs.
2. To explore underlying components of distributed systems.
3. To understand the significance of Synchronization.
4. To understand various distributed systems.

Course Outcomes

By the end of this course, students should be able to:

1. Develop, test and debug RPC/RMI based client-server programs.
2. Implement the main underlying components of distributed systems (such as IPC, name resolution, file systems etc.)
3. Implement various techniques of synchronization.
4..Design and implement application programs on distributed systems.

CO-PO Articulation Matrix

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

LIST OF EXPERIMENTS

1. Understanding Distributed operating Systems and Network Operating Systems.
2. Implementation of Client/Server application using RPC/RMI.
3. Implementation of Election Algorithm.
4. Implementation of Inter-process communication.
5. Implementation of Group Communication.
6. Implementation of Clock Synchronization algorithms.
7. Implementation of Mutual Exclusion Algorithm.
8. Implementation of Load Balancing Algorithm.
9. Implementation of Name Resolution protocol.
10. Implementation of Deadlock Detection in Distributed systems.
11. Discussing Different types of Distributed File Systems (NFS, AFS)

Textbooks:

1. Andrew S. Tanenbaum and Maarten Van Steen, ―Distributed Systems: Principles and Paradigms, 2nd edition, Pearson Education.
2. George Coulouris, Jean Dollimore, Time Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.

Reference Books:

1.M. L. Liu, ―Distributed Computing Principles and Applications‖, Pearson Addison Wesley, 2004.
2. Kshemkalyani Ajay D, Mukesh Singhal, "Distributed Computing: Principles, Algorithms and Systems", Cambridge Press, 2011.
3. Mukesh Singhal, Niranjan G Shivaratri, "Advanced Concepts in Operating systems", Mc-Graw Hill Publishers, 1994.
4.Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers, 2003.

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_cs87/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs15/preview

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2026-27
SEMESTER –VI

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22CIC21	Ethical Hacking	3	-	-	3	40	60	3
2	22CIC09	Cryptography and Network Security	3	-	-	3	40	60	3
3	22CIC13N	Design and Development of Blockchain Applications	3	-	-	3	40	60	3
4		Professional Elective – II	3	-	-	3	40	60	3
5		Open Elective-I	3	-	-	3	40	60	3
6	22CSC21N	Software Engineering	3	-	-	3	40	60	3
PRACTICAL									
7	22CIC22	Ethical Hacking Lab	-	-	2	3	50	50	1
8	22CIC14N	Design and Development of Blockchain Applications Lab	-	-	2	3	50	50	1
9		Professional Elective – II Lab	-	-	2	3	50	50	1
10	22CIC60	Mini Project	4 Weeks			-	50	-	2
11	22CICU02	Upskill Certification Course - II	-	-	-	-	25	-	0.5
TOTAL			**18**	**-**	**06**	**-**	**465**	**510**	**23.5**

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Professional Elective – II

S.NO	THEORY	
	Course Code	**Course**
1	22CSE17	Mobile Application Development
2	22CIE21	Vulnerability Assessment and Penetration Testing
3	22CAE14N	Machine Learning
4	22CAE03N	Image Processing
5	22ITE07	Cloud computing
	LAB	
	Course Code	**Course**
1	22CSE18	Mobile Application Development Lab
2	22CIE22	Vulnerability Assessment and Penetration Testing Lab
3	22CAC15N	Principles Of Machine Learning Lab
4	22CAE13N	Image Processing Lab
5	22ITE08	Cloud computing Lab

List of Open Electives

Course Code	Course Name	
22ECO02	Remote Sensing and GIS	ODD/EVEN
22ECO03	Fundamentals of Wireless Communications	ODD/EVEN
22ECO05	Principles of Embedded Systems	ODD/EVEN
22EGO01	Technical Writing Skills	ODD/EVEN
22EGO02	Gender Sensitization	ODD/EVEN
22CEO01	Infrastructure for Smart Cities	ODD
22CEO02	Disaster Risk Reduction and Management	ODD
22EEO01	Energy Management System	ODD/EVEN
22EEO06	Waste Management	ODD/EVEN
22BTO05	Cognitive Neuroscience	ODD/EVEN
22CHO02	Fundamentals of Nano Science and Nano Technology	ODD/EVEN
22CHO03	Industrial Pollution Control	ODD/EVEN
22CHO04	Environmental and Sustainable Development	EVEN
22MEO02	3D Printing	ODD/EVEN
22MEO03	Corporate Organizational Behavior	ODD/EVEN
22MEO05	Research Methodologies and Innovation	ODD/EVEN
22MEO06	Principles of Entrepreneurships and Startups	ODD/EVEN
22MEO01	Principles of Design Thinking	ODD/EVEN

With effect from AY 2024-25

22CIC21

ETHICAL HACKING

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites

Programming and Problem Solving, Database Management System, Web Technologies, Operating System, Computer Networks, Fundamentals of Cyber Security and Tools.

Course Objectives

1. Understand the fundamental concepts and terminologies of ethical hacking, including reconnaissance and foot printing techniques.
2. Apply scanning methodologies to identify network vulnerabilities and perform enumeration.
3. Analyse web-based and wireless network vulnerabilities to understand potential attack vectors.
4. Evaluate different penetration testing methodologies and report writing techniques.
5. Create strategies for remote exploitation and post-exploitation activities to maintain access.

Course Outcomes

By the end of this course, students should be able to:

1. Explain various information-gathering methods and tools used in ethical hacking, such as passive and active foot printing.
2. Demonstrate the use of scanning tools to identify open ports and services, and perform enumeration to gather system information.
3. Assess the security weaknesses in web applications and wireless networks, and identify appropriate exploitation techniques.
4. Develop a comprehensive penetration testing report, including vulnerability assessment summaries and risk evaluations.
5. Apply remote exploitation techniques, such as privilege escalation and backdoor installation, utilizing tools like MSFVenom to gain unauthorized access to target systems.

CO-PO Articulation Matrix

PO/CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	1	-	-	1	2	3	2	1	3
CO2	3	3	3	2	2	1	-	1	1	2	2	1	1	2
CO3	3	3	3	3	2	1	-	1	-	2	2	3	2	2
CO4	3	3	3	3	2	1	-	1	-	1	3	3	2	2
CO5	3	2	2	3	3	3	2	1	1	2	3	2	3	3

Unit – I

Introduction to Ethical Hacking: Hacking Terminology, The Ethical Hacker, Reconnaissance, Information Gathering for the Ethical Hacker, Footprinting, Passive and Active Footprinting, Footprinting Methods and Tools- Search Engines, Website and E-mail Footprinting, DNS Footprinting, Network Footprinting.

Unit – II

TScanning and Enumeration: TCP/IP Networking, Subnetting, Scanning Methodology, Identifying Targets, Port Scanning, Evasion, Vulnerability Scanning, Enumeration, Sniffing, Network Knowledge for sniffing, Active and Passive Sniffing, Sniffing Tools and Techniques.

Unit – III

Web-Based Hacking: Servers and Applications, Web servers, Attacking Web Applications, Wireless Network Hacking, Wireless Networking, Wireless Terminology, Architecture, and Standards, Wireless Hacking.

Unit – IV

Penetration Testing, Categories of Penetration Test, Black Box, White Box, Fray Box, Types of Penetration Tests, Report Writing, Structure of a Penetration Testing Report, Vulnerability Assessment Summary, Risk Assessment, Methodology, Linux Basics.

Unit – V

Remote Exploitation: Attacking Network Remote Services, Common Target Protocols, and Tools of the Trade, Client Side Exploitation, Methods, E-Mails with Malicious Attachments, Post exploitation, Acquiring Situation Awareness, Privilege Escalation, Maintaining Access, Backdoors, MSFPayload/MSFEncode, MSFVenom, Dumping the Hashes.

Textbooks:

1. "CEH Certified Ethical Hacker All-in-One Exam Guide" by Matt Walker, Fourth Edition, McGraw Hill, 2019.
2. Rafay Baloch “Ethical Hacking and Penetration Testing Guide”, CRC Press, 2015.

Reference Books:

1. "The Basics of Hacking and Penetration Testing Ethical Hacking and Penetration Testing Made Easy” by Patrick Engebretson, Second Edition, Syngress publications, 2013.
2. "Penetration Testing: A Hands-On Introduction to Hacking" by Georgia Weidman, No Starch Press, US, 2014.
3. "Hacking: The Art of Exploitation" by Jon Erickson, Second Edition, No Starch Press, US, 2008.

Web References:

1. OWASP (Open Web Application Security Project): https://owasp.org/
2. SANS Institute: https://www.sans.org/
3. Offensive Security: https://www.offensive-security.com/

With effect from AY 2024-25

22CIC09

CRYPTOGRAPHY AND NETWORK SECURITY

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites
Data Communication and Computer Networks.

Course Objectives

1. To provide an understanding of security concepts and cryptographic techniques in the context of network security.
2. To provide with a comprehensive understanding of symmetric and asymmetric key ciphers.
3. To provide an understanding of cryptographic hash functions and key management techniques.
4. To describe IP Security protocols and wireless network security mechanisms.
5. To provide with an in-depth understanding of email security, transport-level security protocols, and emerging trends in cryptography and network security.

Course Outcomes
By the end of this course, students should be able to:

1. Demonstrate knowledge of fundamental security concepts, including the importance of security, common security approaches, principles of security, and types of security attacks.
2. Examine cryptographic techniques, including substitution and transposition techniques, encryption and decryption algorithms, and symmetric and asymmetric key cryptography.
3. Analyse commonly used hash functions, such as the Secure Hash Algorithm (SHA) and Message Digest Algorithm (MD), key management techniques and evaluate their cryptographic properties and suitability for different applications.
4. Analyse the knowledge of IP Security protocols and web security considerations to assess the importance of securing web-based communication channels against common threats.
5. Design and implement secure communication systems and protocols that incorporate email security mechanisms, transport-level security protocols, and emerging cryptographic techniques to address specific security requirements and challenges in networked environments.

CO-PO Articulation Matrix

PO/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	PSO3
CO1	3	3	3	2	1	-	2	1	1	1	2	3	2	2
CO2	3	3	3	3	3	-	2	1	1	1	2	3	3	2
CO3	3	3	3	3	3	-	2	1	1	1	2	3	3	2
CO4	2	2	2	2	3	-	2	2	1	1	2	3	3	2
CO5	2	3	2	3	3	2	2	2	3	3	3	3	3	2

Unit – I
Security Concepts: Introduction: The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security.
Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography,

steganography.

Unit – II

Symmetric key Ciphers: Block Cipher principles, DES, AES, Block cipher operation, Stream ciphers, RC4.
Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Diffie-Hellman Key Exchange, Elgamal Cryptography.

Unit – III

Introduction to Cryptographic Hash Functions: Definition and properties, Commonly Used Hash Functions-Secure Hash Algorithm and Message Digest Algorithm, Applications of Cryptographic Hash Functions-Digital signatures.
Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

Unit – IV

IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations, Internet Key Exchange.
Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security.

Unit – V

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH).
E-Mail Security: Pretty Good Privacy, S/MIME, Privacy Enhanced Mail.
Emerging Trends in Cryptography and Network Security: Quantum Cryptography, Homomorphic Encryption, Blockchain and Distributed Ledger Technology.

Textbooks:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 7th Edition.
2. Cryptography and Network Security: Atul Karate, Mc Graw Hill, 3rd Edition.

Reference Books:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition.
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH.
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning.
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_cs90/preview
2. https://www.coursera.org/courses?query=cryptography

With effect from AY 2024-25

22CIC13N

DESIGN AND DEVELOPMENT OF BLOCKCHAIN APPLICATIONS

Instruction	3 Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: Distributed systems, Computer networks and Basic understanding of programming concepts.

Course Objectives:

This course aims to:

1. Acquaint with the cryptographic principles and mechanisms behind blockchain technology.
2. Gain knowledge of fundamental concepts of a blockchain network.
3. Develop a comprehensive understanding of consensus algorithms and their implementation in different blockchain networks.
4. Explore the features of Hyperledger.
5. Implement real-world applications using blockchain.

Course Outcomes:

By the end of this course, students should be able to:

1. Demonstrate comprehensive understanding of crypto primitives behind blockchain technology.
2. Analyse different consensus mechanisms and their limitations.
3. Ability to demonstrate the comprehensive understanding of Ethereum blockchain network.
4. Design and develop smart contracts using Solidity programming language and understand Hyper ledger Fabric in blockchain technology.
5. Develop, deploy and interact with real-world blockchain applications.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	2	3	1	-	-	1	-	1	3	3	3
CO 2	3	3	2	1	3	2	-	-	2	-	1	3	3	3
CO 3	3	3	2	1	3	2	-	-	1	-	2	3	3	3
CO 4	3	3	2	2	2	1	-	-	2	-	2	3	3	2
CO 5	3	3	2	2	3	2	-	-	2	-	1	3	3	3

Unit – I

Introduction to blockchain and cryptography: Introduction to banking ledger and its properties, Evolution of blockchain, Centralized vs Peer-to-peer Systems, Crypto primitives for blockchain: Cryptographic hash functions, Merkle trees, Elliptic curve cryptography, Digital signatures.

Unit – II

Granules of blockchain: Identities, Ownership, Transaction, Block, Miners/Validators, Transaction execution, Block execution, Ledger (blockchain), Cryptocurrency, Wallet, Nodes, CAP Theorem, Consensus algorithms: Proof-of-Work (PoW), Problems with PoW, Proof-of-Stake (PoS), variants of PoS, Byzantine Generals Problem (BGP), BFT, PBFT.

Unit – III

Ethereum blockchain: Overview of Ethereum blockchain, History of Ethereum, Smart Contracts, Challenges in Implementing smart contracts, Ethereum development tools, Ethereum transactions, Gas and Transaction fees, Introduction to Solidity, Smart contract development environment: Remix.

Unit – IV

Hyperledger: Introduction to Hyperledger, Hyperledger Architecture, Hyperledger Community and Development, Hyperledger smart contracts (Chaincode), The functioning of Hyperledger, Hyperledger Projects, Hyperledger Consortiums and Networks, Hyperledger and Blockchain as a Service (BaaS).

Unit – V

Case Studies Using Blockchain: Blockchain: The Technology for Document Management, India's Income Tax Department's Simplification of Tax Procedures, Retail banking, Beyond blockchain: Blockchain for the Metaverse.

Textbooks:

1. Imran Bashir, "Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained", Packt Publishing Ltd, Second Edition, 2018.
2. Imran Bashir, "Mastering Blockchain - A technical reference guide to the inner workings of blockchain, from cryptography to DeFi and NFTs", Packt Publishing Ltd, Fourth Edition, 2023.
3. Ramchandra Sharad Mangrulkar and Pallavi Vijay Chavan "Blockchain Essentials Core Concepts and Implementations", Apress 2024.

Reference Books:

4. Beginners Guide to Learning Essential Skills to Build Secure Smart Contracts and Decentralized Applications with web3.py", Independently Published, 2024.
5. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and BlockChain", Packt Publishing, 2019.
6. Mackay Hazel, "Python Programming Handbook for Blockchain Technology Development: A Complete.

Web References:

1. https://andersbrownworth.com/blockchain/public-private-keys/
2. https://ethereum.org/en/
3. https://www.hyperledger.org/projects/fabric
4. NPTEL courses:
    a. Blockchain and its Applications,
    b. Blockchain Architecture Design and Use Cases

With effect from AY 2024-25

22CSC21N

SOFTWARE ENGINEERING

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Object-oriented programming, Programming for problem-solving, database management systems.

Course Objectives:

This course aims to:

1. Understand the Software Engineering Practice and Process Models.
2. Understand Design Engineering and Project Management in Software Development.
3. Understand the importance of testing in software development and study various testing strategies and software quality metrics.

Course Outcomes:

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

1. Acquire a working knowledge of software processes and models for each phase of software development.
2. Understand the agile Software process models and demonstrate the skills necessary to specify the requirements.
3. Recall the modelling concepts and estimate the cost of software using empirical models.
4. Enlist the design principles and construct a product using coding principles and standards.
5. Develop test cases and acquire skills necessary for independently developing a complete software project and estimate software quality.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	1	3	3	-	3	3	1	3	2	2	2
CO 2	3	2	3	1	-	2	-	3	3	1	3	2	2	2
CO 3	2	3	3	3	3	1	-	3	3	3	3	2	2	2
CO 4	3	3	3	2	3	2	-	3	3	2	3	2	2	2
CO 5	3	3	1	2	2	1	-	3	3	2	-	2	3	3

UNIT - I

Introduction to Software Engineering: Software Engineering Practice, The Software Process, Software Engineering Practice Process Models: A Generic Process Model, Process assessment and Improvement, Prescriptive Process Models: Waterfall Model, Incremental Process Models, RAD Model, Evolutionary Process Models - Prototyping, The Spiral Model, Specialized Process Models.

UNIT - II

An Agile Development: Agility, Agile Process, and Agile Process Models- Extreme Programming (XP), Adaptive Software Development (ASD), Scrum, Dynamic Systems Development Method (DSDM), Feature Driven Development (FDD), Agile Modelling (AM), Requirement Engineering, Establishing the groundwork, Eliciting Requirements, Negotiating Requirements, and Validating Requirements. Software Requirements Analysis and Specification: Value of a Good SRS, Problem Analysis, Requirements Specification.

UNIT - III

Planning a software Project: Effort Estimation, Project Schedule and Staffing, Quality Planning, Risk Management, Estimation for Software Projects: Decomposition Techniques - Software Sizing, Problem-Based Estimation, An Example of LOC-Based Estimation, An Example of FP-Based Estimation, COCOMO Model

UNIT - IV

Function-oriented modelling, Design Concepts -Coupling, Cohesion, Flow-oriented modelling-DFDs with Examples, Software Architecture, A Brief Taxonomy of Architectural Styles, Component-Level Design: Definition, Basic Design Principles, Design Guidelines, Designing Traditional Components, Coding Principles and guidelines, Incremental Development of Code, Code Inspection – Planning.

UNIT - V

Testing - Testing Concepts, Testing Process, Testing Strategies: A Strategic approach to software testing, strategic issues, test strategies for Conventional Software, Validation Testing, System Testing, White Box Testing, Black Box. Automatic vs. Manual Testing, Software Review Techniques - Informal Reviews Formal Technical Reviews, Quality Concepts - What is Quality, Software Quality, Objectives, Software Quality Attributes (McCall's,HP)Deployment overview, Deployment planning, Deployment Rollback.

Text Books:

1. Roger S. Pressman "Software Engineering: A practitioner's approach", McGraw Hill, 9th Edition, 2023.
2. Pankaj Jalote, "Software Engineering Precise Approach", Wiley Publishers, 2012

Suggested Reading:

1. Sommerville "Software Engineering", 10th Edition, Pearson, 2016.
2. Rajib Mall, *Fundamentals of Software Engineering*, 5th Edition, PHI, 2018.

Online Resources:

1. https://nptel.ac.in/courses/106101061/
2. Udemy:https://www.udemy.com/share/101BHy3@YYJn8BxwvS6cGfnCsiIlxyA-lUjwZmA2xN5WmMbd8hlGxwhc4N0DF7KaEOaz4eDnMg==/

With effect from AY 2024-25

22CIC22

ETHICAL HACKING LAB

Instruction	2 P Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Pre-Requisites

Programming and Problem Solving, Database Management System, Web Technologies, Operating System, Computer Networks, Fundamentals of Cyber Security and Tools.

Course Objectives

1. To provide hands-on skills in information gathering, footprinting, and reconnaissance using popular ethical hacking tools.
2. To develop an understanding of human-centric attack vectors through social engineering and simulate them ethically.
3. To enable learners to identify, exploit, and defend against network- and web-based vulnerabilities using scanning and exploitation frameworks.
4. To provide practical experience in implementing classical and modern cryptographic algorithms including symmetric, asymmetric, and hashing techniques.
5. To equip students with the ability to perform end-to-end penetration testing and post-exploitation analysis on systems and networks.

Course Outcomes

By the end of this course, students should be able to:

1. Apply information gathering, footprinting, and scanning techniques using tools such as Nmap, WHOIS, Shodan, and Maltego.
2. Design and simulate social engineering attack scenarios using ethical tools such as GoPhish, and evaluate their impact on organizational security.
3. Identify and exploit network and web vulnerabilities using tools like OWASP ZAP, Burp Suite, Metasploit, and Wireshark.
4. Implement classical and modern cryptographic algorithms including AES, DES, RSA, and hash functions like MD5 and SHA-512.
5. Conduct and document a complete penetration testing workflow including reconnaissance, scanning, exploitation, and reporting.

CO-PO Articulation Matrix

PO/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	PSO3
CO1	3	3	2	2	3	-	2	1	2	1	2	3	3	3
CO2	3	3	2	2	3	-	3	2	2	1	2	3	3	3
CO3	3	3	3	3	3	-	2	2	1	-	3	3	3	3
CO4	3	3	3	3	3	-	2	1	2	1	3	3	3	3
CO5	3	3	3	3	3	-	3	3	1	-	3	3	3	3

Lab Experiments

1. Demonstrate information-gathering techniques for target domains and networks using tools like Nmap, WHOIS, Shodan, and Maltego.
2. Understand social engineering tactics and their security implications, simulating attacks with tools like phishing frameworks (e.g., GoPhish) or phone call scripts.
3. Explore port scanning and service enumeration methods with tools like Nmap and hping.
4. Demonstrate password-cracking techniques using tools like John the Ripper or Hashcat.

5. Identify and exploit common web application vulnerabilities using tools like OWASP ZAP or Burp Suite.
6. Conduct a comprehensive penetration test on a target system or network using a combination of tools for reconnaissance, scanning, exploitation, and post-exploitation analysis, such as Nmap, Metasploit, and Wireshark.
7. Perform Encryption and Decryption using the following Substitution techniques and Transposition techniques
   (i)Caesar cipher (ii) Playfair cipher (iii) Hill Cipher (iv) Vigenère cipher. (v) Rail Fence
8. Implement Advanced Encryption Standard (AES) and Data Encryption Standard (DES) algorithm for Symmetric key encryption.
9. Implement RSA Asymmetric key encryption algorithm.
10. Implement MD5 and SHA-512 cryptographic hash function.

Textbooks:

1. Harper, A., Regalado, D., & Harris, S. (2018). Gray Hat Hacking: The Ethical Hacker's Handbook (5th Ed.). McGraw-Hill Education.
2. Baloch, R. (2017). Ethical Hacking and Penetration Testing Guide. CRC Press.
3. William Stallings, “Cryptography and Network Security: Principles and Practice” Pearson Education, 6th Edition.

Reference Books

1. Stuttard, D., & Pinto, M. (2011). The Web Application Hacker's Handbook (2nd ed.). Wiley.
2. Erickson, J. (2008). Hacking: The Art of Exploitation (2nd Ed.). No Starch Press.
3. Douglas Robert Stinson.” Cryptography Theory and Practice”. 4th Edition 2017.

Web References:

1. OWASP (Open Web Application Security Project) - https://owasp.org/
2. NIST Computer Security Resource Center - https://csrc.nist.gov/
3. SANS Institute - https://www.sans.org/
4. https://cse29-iiith.vlabs.ac.in/

With effect from AY 2024-25

22CIC14N

DESIGN AND DEVELOPMENT OF BLOCKCHAIN APPLICATIONS LAB

Instruction	2 Periods Per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisites: Distributed systems, Computer networks and Basic understanding of programming concepts.

Course Objectives

1. To familiarize the basic concepts of blockchain.
2. To provide the significance of the Ethereum blockchain.
3. To introduce Solidity programming for developing blockchain applications.
4. To explore Remix tool for developing smart contracts.
5. To explore the features of blockchain for various applications.

Course Outcomes:

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

1. Explore the working of blockchain fundamentals such as cryptography and distributed computing.
2. Implement smart contract on the Ethereum blockchain.
3. Build smart contracts using Solidity programming language.
4. Develop smart contracts using the Remix tool.
5. Acquire thorough knowledge of blockchain applications.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	2	2	-	-	-	-	-	-	3	3	3
CO 2	3	3	2	2	3	-	-	-	-	-	1	3	3	2
CO 3	3	2	2	3	2	2	1	-	-	-	-	3	3	3
CO 4	2	2	2	3	2	1	1	-	-	-	1	3	3	2
CO 5	3	2	2	3	3	1	-	-	-	-	-	3	3	3

List of Experiments:

1. Develop a Java/Python/Go program to create Elliptic curve public and private keys and demonstrate working of hash functions like SHA256 and ECC digital signatures.
2. Setup a bitcoin wallet like Electrum and demonstrate sending and receiving bitcoins on a testnet. Use blockchain explorer to observe the transaction details.
3. Setup MetaMask wallet in a web browser and create wallet and user accounts. Demonstrate sending and receiving ethers on a testnet. Use block explorers like Etherscan to observe the transaction details.
4. Launch Remix web browser and write a smart contract using the Solidity language for the “Hello World program”.
5. Write Solidity program
   (a) For incrementing/decrementing a counter variable in a smart contract.
   (b) To send ether from a MetaMask account to another MetaMask account through a smart contract.
   (c) To simulate a lottery game.
6. Write a Solidity program to demonstrate Multi-signature wallet, Time-locked wallet and Escrow contract.
7. Write a Solidity program to demonstrate ERC20 tokens.
8. Write a Solidity program to track provenance and movement of goods through the supply chain,

ensuring transparency and authenticity.

9. Write a Solidity program that automatically pays out claims based on predefined conditions eliminating the need for intermediate.
10. Write a Solidity program to conduct secure and transparent voting processes without relying on central authority.

Textbooks:

1. Ramchandra Sharad Mangrulkar and Pallavi Vijay Chavan "Blockchain Essentials Core Concepts and Implementations", Apress 2024.
2. Imran Bashir, "Mastering Blockchain - A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies ,Ethereum, and more ",Packt Publishing Ltd, Third Edition, 2020.
3. Mackay Hazel,"Python Programming Handbook for Blockchain Technology Development: A Complete Beginners Guide to Learning Essential Skills to Build Secure Smart Contracts and Decentralized Applications with web3.py", Independently Published, 2024.

Reference Books:

1. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", First Edition, Apress, 2017.
2. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and BlockChain", Packt Publishing, 2019.
3. Ramchandra Sharad Mangrulkar, Pallavi Vijay Chavan, "Blockchain Essentials - Core Concepts and Implementations", APress Publishing, 2024.

Web References:

1. https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html
2. https://www.hyperledger.org/projects/fabric
3. https://www.packtpub.com/big-data-and-business-intelligence/hands-blockchain-hyperledger
4. https://www.amazon.com/Hands-Blockchain-Hyperledger-decentralized-applications/dp/1788994523
5. https://github.com/HyperledgerHandsOn/trade-finance-logistics

With effect from AY 2024-25

22CIC60

MINI PROJECT

Instruction	4 Hours per week
Duration of SEE	-
SEE	-
CIE	50 Marks
Credits	2

Pre-Requisites

Basic Programming Knowledge

Course Objectives

1. To review literature and develop a comprehensive project proposal.
2. To improve presentation skills and proficiency in technical writing.
3. To apply modern tools for developing solutions.
4. To engage students in Project-Based Learning experiences.
5. To develop effective presentation and documentation skills.

Course Outcomes

On Successful completion of the course, student will be able to:

1. Analyze literature to formulate comprehensive project proposals.
2. Design and execute projects using contemporary technological tools.
3. Collaborate effectively in teams to achieve project objectives within specified timelines.
4. Create detailed project reports that synthesize findings and recommendations.
5. Deliver persuasive presentations showcasing project outcomes and insights.

CO-PO Articulation Matrix

PO/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	PSO3
CO1	2	3	1	2	-	1	-	2	2	-	3	1	-	2
CO2	1	3	1	1	2	1	-	2	2	-	3	2	1	2
CO3	2	3	2	2	-	2	2	2	2	2	3	1	-	2
CO4	2	2	2	2	2	1	-	2	2	2	3	2	-	2
CO5	2	2	2	3	-	2	1	2	2	2	3	2	2	2

Students are required to select a mini project topic aligned with current or past semester courses. They must execute and present the project within the specified timeline. Throughout the project implementation phase, adherence to the Software Development Life Cycle is mandatory. A comprehensive project report must be submitted for evaluation upon completion.

Schedule

S.No	Description	Duration
1.	Problem Identification / Selection	2 weeks
2.	Preparation of Abstract	1 week
3.	Design, Implementation and Testing of the Project	7 weeks
4.	Documentation and Project Presentation	4 weeks

Guidelines for the Award of Marks

S.No	Description	Max. Marks
1.	Weekly Assessment	20
2.	PPT Preparation	5
3.	Presentation	10
4.	Question and Answers	5
5.	Report Preparation	10

The final Mini Project demonstration and PowerPoint presentation will be assessed collectively by the faculty responsible for handling the Mini Projects for that class.

With effect from AY 2024-25

22CSE17

MOBILE APPLICATION DEVELOPMENT

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: OOPs concepts, Programming language skills.

Course Objectives:
This course aims to:

1. Introduce Kotlin, Flutter, and Dot Programming for efficient and scalable mobile application development.
2. Demonstrate the development of cross-platform mobile applications using Android (XML) and Flutter (Widgets), along with efficient coding practices using Dot Programming.
3. Implement multimedia, location-based services, and database management in Android applications, and deploy them on Google Play Store.

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

1. Understand the fundamentals of Kotlin, Dot Programming, and Flutter for mobile application development..
2. Design user interfaces for Android applications using XML layouts and Flutter Widgets.
3. Implement efficient application logic using Intents, Broadcast Receivers, and Dot Programming techniques in Android.
4. Use multimedia,camera and Location based services in Android App.
5. Design and manage databases for Android applications using SQLite and SharedPreferences, and publish apps on Google Play Store.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	1	2	2	-	-	-	-	-	1	2	2	2	2
CO 2	2	3	3	2	3	3	3	-	-	1	2	2	2	2
CO 3	2	2	3	3	2	3	3	-	-	1	2	2	2	2
CO 4	2	2	3	2	2	3	3	-	-	1	2	2	2	2
CO 5	2	2	3	3	3	3	3	-	-	1	2	2	3	3

UNIT-I

Introduction to Kotlin - Basic expressions - Control flow statements - null safety – Functions- passing functions as arguments - simple lambdas. Object oriented programming in Kotlin - Classes and Objects – Constructors - Visibility modifiers - Subclasses and Inheritance – Interfaces - Data classes - Singleton class – Pairs- Triples.

UNIT-II

Introduction to Android Architecture: History - Features and Android Architecture – Android SDK Tools - Application Components - User Interface Design - Views - View Groups – Layouts - Event Handling – Listeners – Adapters – Menus - Action Bars – Android Localization**.** Introduction to Flutter: **Features,**

Installation, Flutter SDK, Dart Basics, Creating a Simple Flutter Application, Understanding Flutter Widgets, Layouts, and State Management.

UNIT-III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS. Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity. Notifications – Creating and Displaying notifications, Displaying Toasts. **Dot Programming:** Basics, Advantages, Using Dot Programming for Efficient Coding, Integrating Dot Programming in Kotlin/Android.

UNIT-IV

Camera –Playing audio/video - Media recording - Sensors - Listening to sensor readings – Bluetooth - Android Communications – GPS - Working with Location Manager, Working with Google Maps extensions - Maps via intent - Location based Services - Location Updates - Location Providers - Selecting a Location Provider - Finding Location.

UNIT-V

Content Providers – Uri - CRUD access –Browser – CallLog – Contacts – Media Store - Data Access and Storage - SharedPreferences -Storage External - Network Connection - SQLite Databases - Deploying Android Application to the World.

Text Books:

1. RetoMeier,“ProfessionalAndroid4Development”,JohnWileyandSons,2012.
2. DawnGriffiths andDavidGriffiths,“HeadFirst AndroidDevelopment”,1st Edition, O’ReillySPD Publishers, 2015.

Suggested Reading:

1. JeffMcWherterandScottGowell,"ProfessionalMobileApplicationDevelopment",Wrox,2012
2. Wei-engLee,BeginningAndroid4ApplicationDevelopment,4thEdition,WileyIndia(Wrox), 2013.
3. Beginning Flutter: A Hands On Guide to App Development 1st Edition by Marco L. Napoli, Wrox Professional guides,2019.
4. Dot Net Framework Made Easy: A Beginners Handbook To Easily Learn Dot Net Framework. (Code Dot Net Framework Easily) By Magige Robi,2021.

Online Resources:

1. https://developer.android.com
2. http://www.androidcentral.com/apps
3. https://www.opensesame.com/c/android-app-development-beginners-training-course

With effect from AY 2024-25

22CSE18

MOBILE APPLICATION DEVELOPMENT LAB

Instruction	2 L Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Pre-requisites: Programming language skills, Problem solving skill and OOPs concepts.

Course Objectives:

This course aims to:

1. To develop user-friendly Android applications using Kotlin, Dot Programming, and Flutter, implementing efficient UI components and navigation.
2. To design and implement Android applications with advanced user interactions, including fragments, menus, intents, notifications, and Dot Programming for optimized code.
3. To create, manage, and secure data in Android applications using SQLite, Flutter, and Dot Programming for efficient database management and user authentication.

Course Outcomes:

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

1. Develop and design basic mobile applications using Kotlin, Dot Programming, and Flutter, demonstrating efficient user interactions and UI components.
2. Design and construct user interfaces using appropriate Android layouts and UI components.
3. Implement fragment-based navigation and manage screen orientation changes.
4. Create and manipulate data using databases and file handling techniques for user authentication.
5. Develop and implement real-world applications using Kotlin, integrating core Android components and functionalities.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	2	3	1	3	-	-	1	-	-	-	3	2	3
CO 2	3	2	3	2	3	-	-	1	-	-	-	3	2	3
CO 3	3	2	3	2	3	-	-	2	-	-	-	3	2	3
CO 4	3	3	3	3	3	-	-	2	-	-	-	3	3	3
CO 5	3	3	3	3	3	-	-	3	-	-	-	3	3	3

List of Experiments:

1. a)Create an Android application that shows Hello + name of the user and run it on ankotlinemulator.
2. (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
3. a) Create an Android application with input fields for User Name, Password, Address, Gender (radio buttons), Age (numeric), Date of Birth (Date Picker), State (Spinner), and a Submit button. Use: Linear Layout, Relative Layout, Grid Layout or Table Layout. b) Create the same User Registration Form using Flutter Widgets (Column, Row, TextField, Radio, Dropdown, etc.) and display the submitted data below the form.
    a) Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a “Back” button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
    b) Develop the same application using Flutter with a Master-Detail Layout.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents. Use Dot Programming to optimize the code structure for these actions.

5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification. Extension to this program, create a notification, display it to notification bar, when user receives notification user has to get ringtone, vibrate, when user selected Watsapp activity is to be opened.
6. Create an application for Alarm clock , if user did not off the alarm while its alarming alarm should be ring for every 10 minutes until user off the alarm
7. Develop an application that captures audio and video using the device's camera and microphone. The application should allow the user to play the recorded media, and store the files locally for future playback.
8. Create a user registration application that stores the user details in a database table.
9. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
10. Create an application that displays the user's Call Log and Contact list using Content Providers. The user should be able to search through contacts and view details like name, phone number, and last call duration.

Tools:

1. Android Studio and SDK Tools
2. Genymotion Emulator.
3. Flutter tool.
4. .NET (Xamarin)

Textbooks:

1. Josh Skeen, David Greenhalgh, Kotlin Programming: The Big Nerd Ranch Guide, Big Nerd Ranch, 2018.
2. VenkatSubramaniam, Kotlin Programming: The Comprehensive Guide, O'Reilly Media, 2018.

Suggested Reading:

1. Beginning Flutter: A Hands On Guide to App Development 1st Edition. by Marco L. Napoli, Wrox Professional guides,2019.
2. Dot Net Framework Made Easy: A Beginners Handbook To Easily Learn Dot Net Framework. (Code Dot Net Framework Easily) By Magige Robi,2021.
3. John Horton, *Android Programming with Kotlin for Beginners*, Packt Publishing, 2020.
4. Stephen Samuel, Stefan Bocutiu, *Kotlin for Absolute Beginners*, Apress, 2018.

Online Resources:

1. https://kotlinlang.org/
2. https://www.jetbrains.com/academy/

With effect from AY 2024-25

22CIE21

VULNERABILITY ANALYSIS AND PENETRATION TESTING

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites
Fundamentals of cybersecurity and tools, operating systems, Programming, and problem solving, Cryptography and Network Security, Computer Networks

Course Objectives

1. To provide foundational knowledge of the information security life cycle and introduce the key principles and practices of network vulnerability assessment.
2. To impart practical skills in the use of industry-standard tools and techniques for detecting, analyzing, and reporting vulnerabilities in networked systems.
3. To discover exploitation techniques used in penetration testing, including both system-level and web application vulnerabilities.
4. To introduce methodologies and real-world considerations involved in physical penetration testing, including legal, operational, and strategic aspects.
5. To develop an understanding of organizational security policies, incident response mechanisms, and countermeasures against physical and social engineering attacks.

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

1. Describe the stages of the information security lifecycle and demonstrate the process of conducting a basic network vulnerability assessment and project scoping.
2. Identify system vulnerabilities using tools like Nmap, Nessus, and Wireshark, and interpret captured traffic for signs of compromise or malicious activity.
3. Execute exploitation techniques on identified vulnerabilities and conduct web application testing using tools such as Burp Suite, Metasploit, and manual testing methods.
4. Develop a physical penetration testing plan and implement test procedures aligned with security protocols and legal frameworks.
5. Analyze organizational security policies and formulate appropriate responses to physical and social engineering threats, including baseline protection and incident handling.

CO-PO Articulation Matrix

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	1	1	1	1	1	2	2	2	1
CO2	3	3	3	2	3	1	1	1	2	1	2	3	3	2
CO3	3	3	3	3	3	1	1	1	2	2	2	3	3	2
CO4	2	2	2	2	2	2	2	2	3	2	2	2	3	3
CO5	2	2	2	2	2	3	3	3	2	3	3	2	3	3

Unit – I
Introduction, Information security life cycle, Network vulnerability assessment (NVA), Technical expertise to run an NVA, Skill level.
Vulnerability assessment: Goals of vulnerability assessment, Class of vulnerabilities, Elements of good vulnerability assessment.

Project scoping: Scoping Practices, Developing the project scoping scope and document.

Unit – II

Finding Vulnerabilities: From Nmap Version Scan to Potential Vulnerability, Nessus, The Nmap Scripting Engine, Running a Single NSE Script, Metasploit Scanner Modules, Metasploit Exploit Check Functions, Web Application Scanning, Manual Analysis.

Capturing Traffic: Networking for capturing Traffic, Using Wireshark, ARP Cache Poisoning, DNS Cache Poisoning, SSL Attacks, SSL Stripping.

Unit – III

Exploitation: Exploiting WebDAV Default Credentials, Exploiting Open phpMyAdmin, Downloading Sensitive Files, Exploiting a Buffer Overflow in Third-Party Software, Exploiting Third-Party Web Applications, Exploiting a Compromised Service, Exploiting Open NFS Shares.

Web Application Testing: Using burp proxy, SQL injection, XPath injection, Local File Inclusion, Remote file Inclusion, Command execution, Cross-site scripting, Cross-site request forgery.

Unit – IV

Basics of Physical Penetration Testing: Physical penetration testing, Security testing, Legal and procedural issues, Know the enemy, Engaging a penetration testing team.

Planning Physical Penetration: Building the operating team, Project planning and workflow, Codes, Call signs and communication.

Executing tests: Common paradigms for conducting tests, Conducting site exploration, tactical approaches, Mechanisms of physical security.

Unit – V

Security Policy: Physical Security, Protective Markings in the Corporate World, Communications Security, Staff Background Checks, Data Destruction and Encryption, Outsourcing Risks, Incident Response Policies.

Counter Intelligence: Information Exposure, Social Engineering Attacks, Protecting Against Tailgating and Shoulder Surfing, Performing Penetration Testing, Baseline Physical Security.

Text Books:

1. Thomas R. Peltier, Justin Peltier, John A. Blackley, “Managing a network vulnerability assessment”, Auerbach Publications, 2017.
2. Georgia Weidman, “Penetration Testing: A Hands-on Introduction to Hacking”, No Starch Press, 2014.
3. Wil Allsopp, “Unauthorised Access: Physical Penetration Testing For IT Security Teams”, Wiley, 2009.

Suggested Reading:

1. Patrick Engebretson , “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy" Syngress, 2013.

Web Reference

1. https://www.udemy.com/course/vulnerability-assessment-penetration-testing
2. https://www.hackerschool.in/courses/vulnerability-assessment-and-penetration-testing-vapt/

With effect from AY 2024-25

22CIE22

VULNERABILITY ANALYSIS AND PENETRATION TESTING LAB

Instruction	2 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1

Pre-requisites: Fundamentals of cybersecurity and tools, operating systems, Programming, and problem solving, Cryptography and Network Security, Computer Networks

Course Objectives: The objectives of this course are to

1. To introduce students to hands-on experience with open-source tools used in vulnerability assessment and penetration testing.
2. To enable students to simulate real-world attacks on networks, systems, and applications in a controlled lab environment.
3. To develop students' skills in detecting, analyzing, and mitigating system and application vulnerabilities.
4. To strengthen students' abilities in ethical hacking, logging, and digital forensics using practical tools.
5. To foster an understanding of mobile application and wireless network security through assessment and exploitation.

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

1. Install and configure open-source security tools for network protection and analysis.
2. Perform vulnerability assessments and simulate attacks in LAN and wireless environments.
3. Conduct network and log analysis using tools such as Wireshark and ELK Stack.
4. Execute penetration testing techniques on web and mobile applications using open-source platforms.
5. Analyze and exploit system-level vulnerabilities using Metasploit.

CO-PO Articulation Matrix

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	1	1	1	1	1	2	2	2	1
CO2	3	3	2	3	3	2	1	1	2	1	2	3	3	2
CO3	3	3	2	3	3	2	1	1	2	2	2	3	3	2
CO4	2	2	3	2	3	2	2	2	3	2	2	2	3	3
CO5	2	2	2	2	3	3	2	3	2	3	3	2	3	3

List Of Experiments:

1. Install and configure essential open-source security tools such as Wireshark, OWASP ZAP, and Metasploit to simulate network protection mechanisms and understand their application in cybersecurity environments.

2. Identify and exploit vulnerabilities within a local area network (LAN) using appropriate tools to simulate real-world attack scenarios and evaluate network security posture.

3. Capture and analyze network packets using Wireshark to detect communication anomalies, understand protocol behavior, and assess potential threats.

4. Perform web application penetration testing using OWASP ZAP to uncover security vulnerabilities such as SQL injection, cross-site scripting (XSS), and CSRF.
5. Conduct vulnerability assessment of wireless networks and devices to detect weaknesses in wireless

security protocols and ensure secure configurations.

6. Use the Metasploit Framework to exploit known vulnerabilities in target systems and demonstrate practical aspects of penetration testing.

7. Analyze and visualize system logs using the ELK Stack to monitor network activities, detect anomalies, and gain actionable insights for threat detection.

8. Identify potentially vulnerable Android applications and perform both static and dynamic analysis to assess security flaws in mobile application behavior and design.

Text Books:

1. Ethical Hacking: A Hands-on Introduction to Breaking In by Daniel G. Graham, October 2021, 376 pp.ISBN-13: 9781718501874 No Starch Press.
2. Georgia Weidman, "Penetration Testing: A Hands-on Introduction to Hacking", No Starch Press, 2014.

Suggested Reading:

1. Practical Binary Analysis Build Your Own Linux Tools for Binary Instrumentation, Analysis, and Disassembly by Dennis Andriesse December 2018, 456 pp. ISBN-13:9781593279127. No StarchPress.
2. Designing Secure Software, A Guide for Developers by Loren Kohnfelder November 2021, 312 pp.ISBN-13: 9781718501928 No Starch Press.
3. The Pen Tester Blueprint-Starting a Career as an Ethical Hacker by L. Wylie, Kim Crawly, 1st Edition,Wiley Publications.

Web Resources:

1. https://www.virtualhackinglabs.com/labs/penetration-testing-lab/

With effect from AY 2024-25

22CAE14N

MACHINE LEARNING

Instruction	3 Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

1. To understand the Concepts of Machine Learning.
2. To explore and study various machine learning techniques.
3. To design solutions for real world problems using machine learning techniques.

COURSE OUTCOMES: After completion of this course, students will be able to

1. Understand the basic concepts of machine learning approaches and feature engineering.
2. Apply Regression and Classification techniques.
3. Evaluate and compare Supervised and Unsupervised Learning algorithms
4. Analyze and apply the ensemble methods
5. Analyze neural networks and apply to solve real world problems

CO-PO Articulation Matrix:

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

UNIT-I

Introduction to Machine Learning: Introduction, Well-Posed Learning Problems, Types of Learning, Perspectives and Issues in Machine Learning.

Feature Engineering: Introduction to Features and need of Feature Engineering, Feature Extraction and Selection, Discriminant Analysis (PCA, LDA).

UNIT-II.

Regression: Linear Regression, Multivariate Regression, Non-linear Regression (Independent and Dependent), Lasso and Ridge based regression.

Classification Algorithms: Decision Trees (ID3,C4.5,CART), Naive Bayes Classifier KNN, Logistic regression, SVM, Performance Measures.

UNIT-III

Clustering Algorithms: Similarity measures, Clustering, types of clustering, K-Means clustering, Hierarchical clustering Methods (Birch, Chemelon), Density Based Methods-DBSCAN, Spectral Clustering.

UNIT-IV

Ensemble Learning: Introduction to Ensemble Learning, Bagging, Boosting , Bootstrapping, Adaboosting AdaBoost, Random forest classification, Random Forest Regressor.

UNIT-V

Neural Network: Introduction Neural network, Perceptron, Multi-layer perceptron, Backpropagation, Introduction to reinforcement learning, Scope and Limitations, Examples, Applications of Reinforcement Learning.

Case Studies: House Price Prediction, Weather forecasting, Recommender Systems.

Text Books:

1. Guiseppe Bonaccarco,"Machine Learning Algorithms", 2nd Edition,Packt,2018
2. Abhishek Vijavarigia " Machine Learning using Python", BPB Publications,1st Edition 2018.
3. Tom Mitchel " Machine Learning", Tata MacGraw Hill, 2017.

Suggested Reading:

1. Marsland, S. "Machine Learning: An Algorithmic Perspective" 1st Edition Chapman and Hall/CRC 2009
2. YuxiLiu " Python Machine Learning", Oxford Press, 2017.
3. Reema Thareja " Python Programming ", Oxford Press, 2017.

Online Resource:

1. https://onlinecourses.nptel.ac.in/noc24_cs51/preview
2. https://www.holehouse.org/mlclass
3. https://www.geeksforgeeks.org/machine-learning/
4. https://www.tutorialspoint.com/machine_learning _with python

With effect from AY 2024-25

22CAC15N

PRINCIPLES OF MACHINE LEARNING LAB

Instruction	2 Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

COURSE OBJECTIVES: This course aims to

1. To develop practical skills in applying machine learning techniques using Python.
2. To enable effective data preprocessing and feature engineering for building robust models.
3. To implement and evaluate classification, regression, and clustering algorithms using standard performance metrics.
4. To apply machine learning concepts to real-world datasets through case studies for enhanced problem-solving abilities.

COURSE OUTCOMES: After completion of this course, students will be able to,

1. Set up and utilize Python environments and libraries essential for machine learning applications.
2. Perform comprehensive data preprocessing including handling missing values, encoding, scaling, and outlier detection.
3. Apply feature engineering techniques such as feature selection and dimensionality reduction to optimize model performance.
4. Implement and evaluate supervised learning and regression models using appropriate performance metrics.
5. Apply unsupervised learning methods and conduct real-world case studies demonstrating practical machine learning solutions.

CO-PO Articulation Matrix:

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

LIST OF EXPERIMENTS:

1. Identification and Installation of Python Environment for Machine Learning Using Python Modules and Packages: Scikit-learn, Keras, TensorFlow, PyTorch, Matplotlib, and Seaborn.
2. Implementation of Data Handling Techniques: Conversion of Numerical Data to Categorical Data, Label Encoding, and Splitting of Data into Training and Testing Sets.
3. Implementation of Data Pre-processing Techniques: Handling Duplicate and Missing Values.
4. Implementation of Data Pre-processing Techniques: Feature Scaling and Outlier Detection.
5. Implementation of Feature Engineering Techniques: Feature Selection Using Filter and Wrapper Methods, and Dimensionality Reduction Using Principal Component Analysis (PCA).
6. Implementation of Classification Algorithms: Decision Tree and Support Vector Machine (SVM) with Confusion Matrix and Performance Metrics.

7. Implementation of Random Forest Classification Algorithm with Confusion Matrix and Performance Metrics.
8. Implementation of Regression Algorithms: Linear Regression and Logistic Regression with Error Metrics (MAE, MSE, RMSE, R^2 Score).
9. Implementation of K-Means Clustering Algorithm with Evaluation Metrics.
10. Case Study on Supervised and Unsupervised Learning Using Real-World Dataset.

Textbooks

1. Géron, A. (2019). Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow (2nd ed.). O'Reilly Media.
2. Raschka, S., & Mirjalili, V. (2019). *Python Machine Learning* (3rd ed.). Packt Publishing.
3. Müller, A. C., & Guido, S. (2016). *Introduction to Machine Learning with Python: A Guide for Data Scientists*. O'Reilly Media.
4. Bishop, C. M. (2006). *Pattern Recognition and Machine Learning*. Springer.
5. Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep Learning*. MIT Press.

Online Resources:

1. Scikit-learn developers. (n.d.). Scikit-learn: Machine Learning in Python. Retrieved from https://scikit-learn.org/stable/.
2. TensorFlow Team. (n.d.). *TensorFlow*. Retrieved from https://www.tensorflow.org/.
3. Keras Team. (n.d.). *Keras*. Retrieved from https://keras.io/.Paszke, A., Gross, S., Massa, F., Lerer, A., Bradbury, J., Chanan, G., ... & Chintala, S. (n.d.). *PyTorch*. Retrieved from https://pytorch.org/

With effect from AY 2024-25

22CAE03N

IMAGE PROCESSING

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-requisites: Signal Processing.

Course Objectives: The objectives of this course are
1. To introduce basics of visual perception, sampling, quantization and representation of Digital images.
2. To introduce spatial domain and frequency domain filtering techniques necessary for Image processing operations.
3. To learn advanced image analysis techniques such as image restoration, image Compression, image segmentation.
4. To learn techniques of multi resolution methods, wavelets and morphological Processing.
5. To understand the applications of image processing

Course Outcomes: After completion of course, students would be able to:
1. Understand the basic image enhancement techniques in spatial & frequency domains.
2. Understand the basics of multi-resolution techniques.
3. Understand the basics of segmentation methods.
4. Apply this concept for image handling in various fields.
5. Knowledge about Morphological operations.

CO-PO Articulation Matrix:

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

UNIT-I

Fundamentals of Image Processing: Introduction, , fundamental steps, components, , , image sensing and acquisition, image sampling and quantization, basic relationships between pixels. Intensity Transformations and Spatial Filtering: Background, some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, combining spatial enhancement methods.

UNIT-II

Filtering in the Frequency Domain: Background, preliminary concepts, sampling and Fourier transform of sampled functions, discrete Fourier transform (DFT) of one variable, extension to functions of two variables, some properties of the 2-D discrete Fourier transform, basics of filtering in the frequency domain, image smoothing, image sharpening, homo- morphic filtering.

UNIT-III

Image Restoration: Noise models, restoration in the presence of noise only-spatial filtering, periodic noise reduction by frequency domain filtering, linear degradation, position-invariant degradation, estimating the degradation function, inverse filtering, minimum mean square error filtering, constrained least squares filtering, geometric mean filter.

UNIT-IV

Wavelets and Multi Resolution Processing: Background, multi-resolution expansions, wavelet transforms in one dimension, the fast wavelet transform, wavelet transforms in two dimensions, wavelet packets. Image Compression: Fundamentals, image compression models, , lossy compression,.

UNIT-V

Image Segmentation: Fundamentals, point, line and edge detection, thresholding, region-based segmentation, segmentation using morphological watersheds, the use of motion in segmentation. Morphological Image Processing: Preliminaries, erosion and dilation, opening and closing, the Hit-or-Miss transformation, some basic morphological algorithms, some basic gray-scale morphological algorithms.

Text Books:

1. Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing, PHI Learning Pvt. Limited, 3rd Edition, 2008.
2. Rafael C.Gonzalez, Richard E.Woods and Steven L.Eddins, Digital Image Processing Using MATLAB,2nd Edition, McGraw Hill, 2010.

Suggested Reading:

1. AL. Bovik, The Essential Guide to Image processing, 2 nd Edition, Elsevier, 2009.
2. Anil K.Jain, "Fundamentals of Digital Image Processing", PHI, 2006.
3. William K. Pratt, Digital Image Processing, John Wiley & Sons, Inc., 3rd Edition, 2001

Online Resources:

1. https://www.youtube.com/watch?v=DSGHkvQBMbs&list=PLuv3GM6-gsE08DuaC6pFUvFaDZ7EnWGX8
2. https://archive.nptel.ac.in/courses/117/105/117105135/

With effect from AY 2024-25

22CAE13N

IMAGE PROCESSING LAB

Instruction	2 Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives: The objectives of this course are

1. To understand the fundamental concepts of Image processing.
2. To explore Discrete Fourier Transform for 1-D and 2-D signal.
3. To apply filtering techniques on 1-D and 2-D Images.
4. To apply gray scale morphological algorithms for edge image processing.

Course outcomes: On successful completion of the course learner will be able to:

1. Study the image fundamentals, mathematical transforms necessary for image processing.
2. Apply the concept of spatial filtering techniques.
3. Implement Digital Signal Transform techniques DFT.
4. Use the enhancement techniques for digital Image Processing
5. Implement the concept of gray scale morphological algorithms.

CO-PO Articulation Matrix:

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

List of Programs:

1. Display of Gray scale Images.
2. Histogram Equalization.
3. Design of Non-linear Filtering.
4. 2-D DFT and DCT.
5. Filtering in frequency domain.
6. Display of colour images.
7. Conversion between colour spaces.
8. DWT of images.
9. Segmentation using morphological watershed algorithm.
10. Segmentation using gray-scale morphological algorithms.

Text Books:

1. Rafael.C,Gonzalez, Richard E Woods, “Digital Image Processing”,3rdEdition, Pearson India, 2013.
2. Jain A.K, “Fundamentals of Digital Image Processing”, 4th Edition, Prentice hall of India, 2004.

Reference Books/Other Reading Material

1. B.Chanda, D. DuttaMajumder, “Digital Image Processing and Analysis”, 2ndEdition, Phi learning, 2011.
2. William K Pratt, “Digital Image Processing”, 4th Edition, Wiley, 2012.

Online Resources:

1. https://www.youtube.com/watch?v=DSGHkvQBMbs&list=PLuv3GM6-gsE08DuaC6pFUvFaDZ7EnWGX8
2. https://archive.nptel.ac.in/courses/117/105/117105135/

With effect from AY 2024-25

22ITE07

CLOUD COMPUTING

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Knowledge on Data Bases and computing mechanisms.

Course Objectives:
This course aims to:

1. Gain a comprehensive understanding of fundamental concepts in cloud computing, including its goals, benefits, risks, challenges, service models, and deployment models.
2. Explore cloud-enabling technologies such as cloud data center technology, virtualization, multitenant technology, and containerization, along with their roles and implications in cloud computing environments.
3. Analyze specialized cloud mechanisms and management mechanisms to understand their significance in optimizing cloud performance and resource utilization.
4. Examine various access-oriented and data-oriented security mechanisms implemented in cloud computing environments
5. Evaluate different cloud computing architectures to design scalable, resilient, and efficient cloud solutions aligned with organizational requirements and objectives.

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

1. Understand the fundamental cloud computing concepts, including service models and deployment models.
2. Analyze cloud-enabled technologies and evaluate various cloud infrastructure components, storage technologies, and networking principles.
3. Apply the advanced cloud computing mechanisms and cloud management mechanisms
4. Analyze the security challenges, identify potential risks, and evaluate strategies for securing cloud deployments.
5. Critique different cloud computing architectures, evaluating their scalability, resilience, and suitability for diverse application scenarios leverage emerging trends such as edge computing and fog computing

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	2	1	1	1	1	2	3	1	2	1	3
CO 2	3	3	2	2	1	1	1	1	2	3	1	2	1	3
CO 3	3	3	2	2	1	1	1	1	2	3	1	1	1	2
CO 4	3	3	2	2	1	1	1	1	2	3	1	1	3	2
CO 5	3	3	3	2	1	1	1	1	2	3	1	3	1	3

UNIT - I

Fundamental Concepts of Cloud Computing: Goals and Benefits, Risks and Challenges, Cloud Computing Service and Deployment Models: Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud, Multi-Cloud

UNIT - II

Cloud-Enabling Technology: Cloud Data Center Technology, Modern Virtualization, Multitenant Technology, Service Technology and Service APIs, Fundamental of Containerization,Containers, Container Images, Multi-Container Types. **Cloud Infrastructure Mechanisms:** Logical Network Perimeter, Virtual Server, Hypervisor, Cloud Storage Device, Cloud Usage Monitor, Resource Replication, Ready-Made Environment.

UNIT - III

Specialized Cloud Mechanisms: Automated Scaling Listener, Load Balancer, SLA Monitor, Pay-Per-Use Monitor, Audit Monitor, Failover System, Resource Cluster, Multi-Device Broker, State Management Database

Cloud Management Mechanisms: Remote Administration System, Resource Management System, SLA Management System, Billing Management System**.**

UNIT - IV

Cloud Computing Architectures: Workload Distribution Architecture, Elastic Resource Capacity Architecture, Multi Cloud Architecture, Hypervisor Clustering Architecture, Cloud Balancing Architecture **Specialized Cloud Architectures:** Edge Computing Architecture, Fog Computing Architecture, Metacloud Architecture, Federated Cloud Application Architecture**.**

UNIT - V

Cloud Computing Security: Threat Agents, Common Threats, **Cloud Security and Cybersecurity Access-Oriented Mechanisms:** Cloud-Based Security Groups, Hardened Virtual Server Image, Identity and Access Management (IAM) System, **Cloud Security and Cybersecurity Data-Oriented Mechanisms:** Data Loss Prevention (DLP) System, Trusted Platform Module (TPM). **Cloud Delivery Model Considerations:** Case Study on Cloud Provider and Consumer Perspective.

Text Books:

1. Thomas Erl, Eric Barceló Monroy, “Cloud Computing: Concepts, Technology, Security, and Architecture”, 2nd Edition, 2023, Pearson, ISBN: 9780138052287.

Suggested Reading:

1. Rajkumar Buyya, Christian Vecchiola, and S. Thamarai Selvi, “Cloud Computing: Principles and Practice", 2020.
2. Comer, D, “The Cloud Computing Book: The Future of Computing Explained”, 1st edition,. Chapman and Hall/CRC, 2021. https://doi.org/10.1201/9781003147503.
3. Sean Howard, “Edge Computing with Amazon Web Services: A practical guide to architecting secure edge cloud infrastructure with AWS”, 1st Edition, ISBN: 9781835081082, Packt Publishers, 2024.

With effect from AY 2024-25

22ITE08

CLOUD COMPUTING LAB

Instruction	2P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisite: Knowledge on Data Bases and computing mechanisms.

Course Objectives:

This course aims to familiarize with:

1. Key concepts of virtualization.
2. Various deployment models such as private, public, hybrid and community.
3. Different service models, such as IaaS and PaaS.
4. Security and Privacy issues in the cloud.

Course Outcomes:

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

1. Adapt different types of virtualization and increase resource utilization.
2. Build a private cloud using Iaas technologies.
3. Analyze Containerization , orchestration issues on the cloud.
4. Develop real-world web applications and deploy them on the commercial cloud using Paas.
5. Demonstrate various Database migration in AWS.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	2	2	1	1	1	1	2	3	1	3	2	2
CO 2	3	3	2	2	1	1	1	1	2	3	1	3	2	2
CO 3	3	3	2	2	1	1	1	1	2	3	1	3	2	2
CO 4	3	3	2	2	1	1	1	1	2	3	1	3	2	2
CO 5	3	3	3	2	1	1	1	1	2	3	1	3	3	2

List of Experiments

1. Study of NIST model of cloud computing: Understand deployment models, service models, and advantages of cloud computing.
2. Understand different types of virtualizations, Host and bare metal hypervisors and implement horizontal scalability using technology like XEN, VMware's ESXi ,Oracle Virtual box
3. Explore Infrastructure as a Service using customized resources on a cloud platforms such as AWS,Openstalk,
4. Simulate identity management in your private Cloud using OpenStack technology.
5. Implement Storage as a Service for remote file access using web interface S3 Using AWS.
6. Illustrate containerization using Docker
7. Explore orchestrating the cloud with kubernetes.
8. Implement Platform as a Service by deploying web applications on commercial cloud using technology like AWS lambda .
9. To perform database migration like simpleDB and DynamoDB.
10. Explore Top 10 Vulnerabilities from WSAP on deploying cloud applications in cloud platforms.

Text Books:

1. Enterprise Cloud Computing by Gautam Shroff, Cambridge,2010
2. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley - India, 2010 ,
3. Getting Started with OwnCloud by Aditya Patawar , Packt Publishing Ltd, 2013

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2027-28

SEMESTER -VII

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	22CIC23	Cybersecurity: Attacks & Defenses	3	-	-	3	40	60	3
2		Professional Elective-III	3	-	-	3	40	60	3
3		Professional Elective-IV	3	-	-	3	40	60	3
4		Open Elective-II	3	-	-	3	40	60	3
5		Professional Elective-V	3	-	-	3	40	60	3
6	22EEM01	Universal Human Values-II: Understanding Harmony	-	1	-	-	50	-	1
PRACTICAL									
7	22CIC24	Cybersecurity: Attacks & Defenses Lab	-	-	2	3	50	50	1
8		Professional Elective-III Lab	-	-	2	3	50	50	1
9	22CIC17	Technical Seminar	2	-	-	-	50	-	1
10	22CIC18	Project Part - I	-	-	4	-	50	-	2
		TOTAL	**16**	**1**	**8**	**-**	**410**	**390**	**18**

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

	Professional Elective – III		**Professional Elective - IV**	
S.NO	**THEORY**		**THEORY**	
	Course Code	**Course Name**	**Course Code**	**Course Name**
1	22CSE28	Full Stack Development	22CIE13	3D Modelling and Animation
2	22CIE03N	Digital Forensics	22CIE18N	Social Engineering
3	22CSC54	Deep Learning for Computer Vision	22CSE26	Applied Natural Language Processing
4	22ITE024	Computer Vision	22CAE08N	Reinforcement Learning
5	22ADC71N	Principles of Big data analytics	22CIE23	Graphics Design

	LAB	
	Course Code	**Course Name**
1	22CSE29	Full Stack Development Lab
2	22CIE04N	Digital Forensics Lab
3	22CSC55	Deep Learning for Computer Vision Lab
4	22AITE26	Computer Vision Applications Lab
5	22ADE78N	Foundations of Big Data Analytics Lab

Professional Elective - V	
Course Code	**Course Name**
22CIE24	Immersive Technologies
22CIE25	AI for Cybersecurity
22ADC14	Generative AI
22CSE23	Robotics Process Automation
22CIE26	Free and Open Source Technologies

List of Open Electives

Course Code	**Course Name**	
22ECO02	Remote Sensing and GIS	ODD/EVEN
22ECO03	Fundamentals of Wireless Communications	ODD/EVEN
22ECO05	Principles of Embedded Systems	ODD/EVEN
22EGO01	Technical Writing Skills	ODD/EVEN
22EGO02	Gender Sensitization	ODD/EVEN
22CEO01	Infrastructure for Smart Cities	ODD
22CEO02	Disaster Risk Reduction and Management	ODD
22EEO01	Energy Management System	ODD/EVEN
22EEO06	Waste Management	ODD/EVEN
22BTO05	Cognitive Neuroscience	ODD/EVEN
22CHO02	Fundamentals of Nano Science and Nano Technology	ODD/EVEN
22CHO03	Industrial Pollution Control	ODD/EVEN
22CHO04	Environmental and Sustainable Development	EVEN
22MEO02	3D Printing	ODD/EVEN
22MEO03	Corporate Organizational Behavior	ODD/EVEN
22MEO05	Research Methodologies and Innovation	ODD/EVEN
22MEO06	Principles of Entrepreneurships and Startups	ODD/EVEN
22MEO01	Principles of Design Thinking	ODD/EVEN

With effect from AY 2024-25

22CIC23

CYBER SECURITY : ATTACKS AND DEFENCES

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites

Programming and problem solving, Operating systems, Computer networks, Fundamentals of Cyber Security and Tools, Cryptography and Network Security.

Course Objectives

By the end of this course, students should be able to:

1. Understand the foundational concepts of cybersecurity, including common threats like viruses, trojans, and vulnerabilities.
2. Analyse attacker techniques, motivations, and ant forensics strategies used to bypass detection systems.
3. Apply knowledge of exploitation methods such as buffer overflows, SQL injections, and shellcode to simulate common attack vectors.
4. Evaluate cyber intelligence, warfare strategies, and the implications of international cybersecurity laws like the Tallinn Manual.
5. Create strategic defences against current and emerging threats by integrating knowledge of threat landscapes, next-gen attack techniques, and cybersecurity transformations (IoT, Cloud, Big Data).

Course Outcomes

1. Demonstrate an in-depth understanding of the dark side of computing and key security principles of modern operating systems like Microsoft Windows.
2. Identify and assess various hacking techniques and tunnelling methods used by cybercriminals to cover their tracks.
3. Develop countermeasures by simulating and mitigating exploitation techniques, including format string vulnerabilities, race conditions, and malicious file attacks.
4. Critically evaluate the nature of cyber conflicts and warfare, and propose ethical and legal solutions based on global cybersecurity frameworks.
5. Apply futuristic cybersecurity strategies by incorporating virtualization, IoT, cloud computing, and social engineering trends into secure systems.

CO-PO Articulation Matrix

PO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	2	2	2	-	1	1	1	1	2	3	2	3
CO2	2	3	2	2	2	-	1	1	1	1	3	3	2	3
CO3	2	3	3	2	3	-	1	1	1	1	3	3	2	3
CO4	2	2	2	2	3	-	1	1	1	1	2	3	2	3
CO5	3	3	3	2	3	-	1	1	1	1	3	3	2	3

Unit – I

Introduction: The Dark Side of the Computer, Viruses, Trojans, and Attacks, Vulnerabilities, Risk Assessment, Risk Management, Emerging Field of Cybersecurity, Microsoft Windows Security Principles.

Unit – II

Attackers' Techniques and Motivations: How Hackers Cover Their Tracks (Antiforensics), Tunnelling Techniques, Fraud Techniques, Threat Infrastructure.

Unit – III

Exploitations: Techniques to Gain a Foothold: Shellcode, Integer Overflow Vulnerabilities, Stack-Based Buffer Overflows, Format String Vulnerabilities, SQL Injection, Malicious PDF Files, Race Conditions, Web Exploit Tools, Misdirection, Reconnaissance, and Disruption Methods.

Unit – IV

Cyber Intelligence, Cyber Conflicts, Cyber Warfare and and Cyber Diplomacy: Introduction, Information Warfare Theory and Application, Cyber Intelligence and Counter-Intelligence, DoD-The U.S. Cyber Command, Nation-State Cyber Conflicts, Cyber Warfare and the Tallinn Manual on International Law.

Cyber Diplomacy: Definition, Objectives, and Importance, Role in International Norms and Agreements, Diplomatic Strategies for Cyber Conflict Prevention.

Unit – V

Cybersecurity Threat Landscape and Future Trends: Introduction, Breaches—Global Data, Threat Landscape: Traditional Threats, Social Engineering Threats, Buffer Overflow and Structured Query Language Injection, Next-Generation Threats, Attacker's Need for Information, Transformational Changes for Cybersecurity: Virtualization, social media, Internet of Things, Cloud Computing, Big Data, Preparing Future Generations for Cybersecurity Transformational Challenges.

Textbooks:

1. Johnson, T. A. (2015). Cybersecurity: Protecting Critical Infrastructures from Cyber Attack and Cyber Warfare. CRC Press, Taylor & Francis Group.
2. Graham, J., Howard, R., & Otson, R. (2010). Cyber Security Essentials. CRC Press.

Reference Books

1. Holt, T. J., Bossler, A. M., & Seigfried-Spellar, K. C. (2020). Cybercrime and digital forensics: An introduction (2nd ed.). Routledge.
2. Godbole, N., & Belapure, S. (2011). Understanding cyber-crimes, computer forensics, and legal perspectives. Wiley India.

Web Reference

1.https://nptel.ac.in/courses/106106248

With effect from AY 2024-25

22EEM01

UNIVERSAL HUMAN VALUES-II: UNDERSTANDING HARMONY

(**B.E/B. Tech** - Common to all Branches)

Instruction	1T Hours per week
Duration of SEE	-
SEE	-
CIE	50 Marks
Credits	1

Introduction:
This course discusses the role of human values in one's family, in society and in nature. During the Induction Program, students would get an initial exposure to human values through Universal Human Values–I. This exposure is to be augmented by this compulsory full semester foundation course.

Course Objectives: This course aims to
1. Understand the concept of universal human values
2. Cultivate empathy and respect for diversity
3. Inspire the social responsibility and global citizenship

Course Outcomes After the completion of this course, the student will be able to
1. Become familiar about themselves, and their surroundings (family, society, nature).
2. Develop empathy and respect for diversity by gaining an appreciation for different cultures, perspectives, and identities
3. Exhibit responsible and ethical behavior by adhering to principles of integrity, honesty, compassion, and justice.
4. Recognize their role as global citizens.
5. Exhibit a sense of social responsibility.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	-	-	1	-	-	1	-	1	-	-	1	2	1	1
CO 2	-	-	1	-	-	1	-	1	-	1	1	2	1	1
CO 3	--	-	-	-	-	1	-	-	1	-	-	1	1	2
CO 4	-	-	-	-	-	1	1	-	-	-	-	1	-	2
CO 5	-	-	-	-	-	1	1	-	-	-	-	1	1	1

MODULE -1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and
- Experiential Validation- as the process for self-exploration.
- Natural acceptance of human values.
- Definitiveness of Ethical Human Conduct.
- Continuous Happiness and Prosperity- A look at basic Human Aspirations.
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority.
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current Scenario.
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

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

MODULE- 2: Understanding Harmony in the Human Being - Harmony in Myself

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

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

MODULE-3: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship.
- Understanding the meaning of Trust; Difference between intention and competence.
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.
- Understanding the harmony in society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co -existence as comprehensive Human Goals.
- Strategy for transition from the present state to Universal Human Order:
  a. At the level of individual: as socially and ecologically responsible engineers, technologists, and managers.
  b. At the level of society: as mutually enriching institutions and organizations.

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

MODULE -4: Understanding Harmony in Nature and Existence - Whole existence as Coexistence.

- Understanding the harmony in Nature.
- Interconnectedness and mutual fulfilment among the four orders of nature - recyclability and self-regulation in nature.
- Understanding Existence as Co-existence of mutually interacting units in all - pervasive space.
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.
- Holistic perception of harmony at all levels of existence.
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability Identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability Identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. To discuss the conduct as an engineer or scientist etc.

MODE OF CONDUCT (L-T-P-C 0-1-0-0)

- While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.
- In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection, and self- exploration.
- Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentors, in a group sitting.
- **Tutorials (experiments or practical) are important for this course**. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included.
- The practice sessions would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to the development of commitment, namely behaving and working based on basic human values.
- **It is advised to share the experience of the Faculty to the class in a capsule form.**
- **Involve more in evaluating the student by different activities with proper RUBRCCS**

ASSESSMENT:

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self- assessment, peer assessment etc. will be used in evaluation.

EXAMPLE:

Module-1:	10 M
Module -2:	10 M
Module- 3:	10 M
Module-4:	10 M
Attendance & Attitude:	10 M

The overall pass percentage is 50%. In case the student fails, he/she must repeat the course.

TEXTBOOKS

1. "A Foundation Course in Human Values and Professional Ethics" by R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2022.
2. "Teacher's Manual for A Foundation Course in Human Values and Professional Ethics" by R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2022.

REFERENCE BOOKS

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth – by Mohandas Karamchand Gandhi

With effect from AY 2024-25

22CIC24

CYBERSECURITY: ATTACKS & DEFENSES LAB

Instruction	2 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Pre-Requisites

Programming and problem solving, Operating systems, Computer networks, Fundamentals of Cyber Security and Tools, Cryptography and Network Security.

Course Objectives

1. Master techniques for network reconnaissance using tools like Nmap and Wireshark to identify devices and assess security risks posed by open ports.
2. Configure and manage firewall rules using UFW or iptables, and validate their effectiveness using tools such as Nmap, netcat, or Metasploit.
3. Develop secure web applications, employing OWASP ZAP or Burp Suite to identify and mitigate vulnerabilities, and implement best practices in secure coding.
4. Evaluate and enhance wireless network security using Aircrack-ng or Wireshark, with a focus on understanding and implementing WPA2/WPA3 encryption standards.
5. Perform comprehensive vulnerability assessments using OpenVAS or Nessus, prioritize identified vulnerabilities, and apply effective mitigation strategies.

Course Outcomes

By the end of this course, students should be able to:

1. Ability to proficiently conduct network scans and identify devices and open ports, critically analyzing associated security risks.
2. Competence in configuring and managing firewall rules, and effectively testing their robustness against various penetration testing tools.
3. Skill in developing and testing secure web applications, implementing secure coding practices, and addressing vulnerabilities using leading security assessment tools.
4. Understanding and practical application of wireless network security principles, including encryption standards and configurations.
5. Capability to perform vulnerability scans, prioritize identified vulnerabilities based on their severity, and implement appropriate remediation actions.

CO-PO Articulation Matrix

PO/CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	-	-	1	1	1	-	2	3	2	3
CO2	3	2	2	2	3	-	-	1	1	1	-	2	3	2	3
CO3	3	2	2	2	3	-	-	1	1	1	-	3	3	2	3
CO4	3	3	3	2	3	-	-	1	1	1	-	2	3	2	3
CO5	3	2	3	2	3	-	-	1	1	1	-	2	3	2	3

List of Experiments

1. Identify network devices and open ports using nmap and Wireshark; discuss security risks of exposed ports.
2. Test the wireless network security using Aircrack-ng or Wireshark; understand WPA2/WPA3 encryption.
3. Run vulnerability scans with OpenVAS or Nessus; identify, prioritize, and mitigate vulnerabilities.
4. Establish a secure VPN with OpenVPN and analyze potential vulnerabilities using Wireshark.
5. Use OpenSSL for encryption/decryption and configure SSL/TLS on a web server.
6. Steps to ensure the Security of any one web browser (Mozilla Firefox/Google Chrome).
7. Secure a database (MySQL/PostgreSQL) and test for SQL injection with SQLMap.
8. Create a web scraper in Python to gather data from websites.
9. “How to make strong passwords” and “password cracking techniques”.

Textbooks:

1. "Nmap Network Scanning: The Official Nmap Project Guide to Network Discovery and Security Scanning" by Gordon Fyodor Lyon, Nmap Project, 2009.
2. "Wireshark Network Analysis (Second Edition): The Official Wireshark Certified Network Analyst Study Guide" by Laura Chappell, Gerald Combs, 2012.
3. "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws" by Dafydd Stuttard and Marcus Pinto, Second Edition, Wiley, 2011.
4. "Metasploit: The Penetration Tester's Guide" by David Kennedy, Jim O'Gorman, Devon Kearns, Mati Aharoni, 2011.

Reference Books

1. "Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software" by Michael Sikorski, Andrew Honig, 2012.
2. "Network Security with OpenSSL: Cryptography for Secure Communications" by John Viega, Matt Messier, Pravir Chandra, 2002.
3. "Bulletproof SSL and TLS: Understanding and Deploying SSL/TLS and PKI to Secure Servers and Web Applications" by Ivan Ristic, 2014.
4. "Mastering OpenVPN" by Eric F Crist, Jan Just Keijser, 2015.

Web References:

1. OWASP - Open Web Application Security Project: https://owasp.org
2. NIST Cybersecurity Framework: https://www.nist.gov/cyberframework
3. SANS Institute: https://www.sans.org/
4. CIS - Center for Internet Security: https://www.cisecurity.org
5. ISACA: https://www.isaca.org

With effect from AY 2024-25

22CIC17

TECHNICAL SEMINAR

Instruction	2 Hours per week
Duration of SEE	-
SEE	-
CIE	50 Marks
Credits	1

Pre-Requisites

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state of the art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain

The seminar must be clearly structured and the power point presentation shall include following aspects:

1. Introduction to the topic
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References.

Each student is required to:

1. Submit a one page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

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

1. Study and review research papers of new field/areas and summarize them.
2. Identify promising new directions of various cutting edge technologies in Computer Science and Engineering domain.
3. Impart skills to prepare detailed report describing the selected topic/area.
4. Acquire skills to write technical papers/articles for publication.
5. Effectively communicate by making an oral presentation before the evaluating committee.

Course Articulation Matrix

PO/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	PSO3
CO1	2	2	1	3	-	1	-	3	2	1	3	1	-	2
CO2	2	2	2	2	-	1	-	2	2	1	3	-	-	2
CO3	1	1	1	1	1	1	-	3	2	2	3	2	-	2
CO4	-	1	1	2	1	2	-	3	2	2	3	1	-	2
CO5	-	1	1	2	1	2	-	3	2	2	3	2	-	2

Seminars are to be scheduled **from 3rd week to the last week of the semester** and any change in schedule shall be discouraged. For the award of sessional marks students are **judged by three (3) faculty members** and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation

Note: **Topic of the seminar shall preferably be from any peer reviewed recent journal publications.**

Guidelines for awarding Marks		
S. No.	Description	Max. Marks
1	Contents and Relevance	10
2	Presentation Skills	10
3	Preparation of Presentation slides	05
4	Question and Answers	05
5	Report in prescribed format	20

With effect from AY 2024-25

22CIC18

PROJECT PART- I

Instruction	4 Hours per week
Duration of SEE	-
SEE	-
CIE	50 Marks
Credits	2

Pre-Requisites

The objective of Project Part – I is to enable students to undertake an investigative study within the broad field of Computer Science and Engineering. Projects may be assigned individually or to group of two students, under the guidance of a supervisor. This phase aims to initiate students into research and development (R&D) practices. The project work will encompass the following tasks:

1. Conducting a comprehensive survey and study of published literature relevant to the assigned topic.
2. Developing a preliminary approach to address the problem associated with the assigned topic.
3. Performing initial analysis, modelling, simulation, experimentation, design, or feasibility assessment as applicable.
4. Compiling a detailed written report documenting the conducted study, intended for presentation to the department.
5. Delivering a final seminar as an oral presentation before the Department Review Committee.

Course Outcomes

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

1. Analyse literature relevant to the problem area or selected topic.
2. Apply problem identification, formulation, and solution techniques.
3. Construct a synopsis summarizing the selected topic.
4. Gather necessary data and establish the environment for implementation.
5. Perform preliminary analysis, modelling, simulation, or experimentation.
6. Communicate the work effectively through both oral presentations and written reports.

Course Articulation Matrix

PO/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	PSO3
CO1	2	2	2	1	-	2	-	3	3	2	3	1	-	2
CO2	-	2	3	2	2	2	-	3	3	2	3	1	-	2
CO3	-	2	3	2	-	2	-	3	3	2	3	2	-	2
CO4	1	2	3	3	2	3	1	3	3	2	3	2	-	2
CO5	1	1	2	2	2	1	-	3	3	2	3	1	-	2
CO6	2	2	3	3	3	2	3	3	3	2	3	3	3	3

Guidelines for awarding CIE (Max. Marks: 50)

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Supervisor	15	Project Status / Review
Publication	10	In conference/ Journal
Department Review Committee (DRC)	5	Relevance of the Topic
	5	Presentation Slide Preparation
	5	Presentation
	5	Question and Answers
	5	Quality of Report & Report Submission

With effect from AY 2024-25

22CSE28

FULL STACK DEVELOPMENT

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Web Programming

Course Objectives:

This course aims to:

1. Explore various features of JS and its functionality.
2. Understand the basics of mongodb and its Data Model.
3. Comprehend the new features of JS, role of React JS in responsive web application development.
4. Familiarize with configuration of NPM and backend integration with NODE JS and Express JS.

Course Outcomes:

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

1. Create web pages with a good aesthetic sense of design using ES6.
2. Understand and build logical relationships between documents using MongoDB.
3. Use MongoDB concepts in Web Application Development using React JS.
4. Create real-world React web applications and related tools.
5. Build an end-to-end application from scratch using React JS, NODE JS, Express JS and Mongo DB.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	2	3	1	1	-	-	1	1	1	-	2	1	3
CO 2	1	1	1	1	2	-	-	-	-	1	1	2	1	3
CO 3	-	-	2	1	2	-	-	-	-	-	1	1	1	2
CO 4	-	-	2	1	2	-	-	-	-	-	2	1	1	2
CO 5	-	-	2	2	1	-	-	-	-	-	2	3	1	3

UNIT-I

ES6: Introduction, Variables and Scoping, Arrow Functions and Default Parameters, Template Literals and Destructuring, Spread and Rest Operators, Enhanced Object Literals, Classes and Inheritance, Promises and Async Programming, Modules in ES6, Iterators and Generators.

UNIT-II

MongoDB: Introduction, Importance of NoSQL databases, Data types, Documents, nested Documents, CRUD Operations, Basic cursor methods: map, to Array, pretty, for Each, limit, count, sort, CRUD Operations, Data Modelling & Schema Design, Indexing and Aggregation, Mongo Import/Export and Master/Slave Replication.

UNIT-III

ReactJS: Introduction, Module import and export, State, Props, Components, Lifecycle, Stateful and stateless components, Events, Router, Forms, Tables, Portals, CSS, Hooks.

UNIT-IV

NodeJS: Creating Web Server, Functions, Buffer, Node Modules, Creating Web Server, Handling HTTP requests File System: Operations on file and Other I/O Operations. Events: Event Emitter class, Inheriting Events and Returning event emitter.

UNIT-V

Express JS: API methods - GET, POST, PUT, DELETE, Request & response objects, URL and Query parameters, Routing, The model-view-controller pattern, Middleware Templates: EJS, PUG

Text Books:

1. Vasan Subramanian, "Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node", second Edition, Apress Publications, 2019.
2. David Hows, Peter Membrey, EelcoPlugge – "MongoDB Basics", Apress, 2014.

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Suggested Reading:

1. Ethan Brown, "Web Development with Node and Express", Oreilly Publishers, First Edition, 2014.
2. Shelly Powers, "Learning Node: Moving to the Server-Side", 2nd Edition, O"REILLY, 2016.
3. Simon D. Holmes and Clive Harber, "Getting MEAN with Mongo, Express, Angular, and Node", Second
4. Edition, Manning Publications, 2019
5. Brad Dayley, "Node.js, MongoDB and Angular Web Development", 2nd Edition, Addison-Wesley Professional, 2017.

Online Resources:

1. https://web.stanford.edu/class/cs142/index.html
2. https://nodejs.org/en/docs/
3. https://www.mongodb.com/
4. https://reactjs.org/

With effect from AY 2024-25

22CSE29

FULL STACK DEVELOPMENT LAB

Instruction	3 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1.5

Prerequisite: Web Programming

Course Objectives:

This course aims to:

1. Explore various features of JS and its functionality.
2. Understand the basics of mongodb and its Data Model.
3. Understand core features of JavaScript and React JS.
4. Learn Express JS and Node JS frameworks to develop responsive web applications.

Course Outcomes:

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

1. Create web pages with a good aesthetic sense of design using ES6.
2. Understand and build logical relationships between documents using MongoDB.
3. Use MongoDB concepts in Web Application Development using React JS.
4. Develop single page applications in React Framework.
5. Build an end-to-end application from scratch using React JS, NODE JS, Express JS and Mongo DB.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	2	3	1	1	-	-	1	1	1	-	3	1	1
CO 2	1	1	1	1	2	-	-	-	-	1	1	1	1	2
CO 3	-	-	2	1	2	-	-	-	-	-	1	2	2	2
CO 4	-	-	2	1	2	-	-	-	-	-	2	2	1	2
CO 5	-	-	2	2	1	-	-	-	-	-	2	3	2	1

List of Experiments:

(Note: Setup a Node JS server in Visual Studio to run the following experiments applications)

1. Explore and practice the new features introduced in ES6.
2. Build a class-based system (e.g., Person, Student) demonstrating inheritance, static methods, and arrow functions within methods.
3. Perform basic CRUD operations on a MongoDB collection using the shell.
4. Designing the schema, applying the cursor methods to fetch the data and exporting the data for the given requirements of a collection.
5. Develop React applications to demonstrate the use of class component, functional component, props and routing in React JS.
6. Develop an application to demonstrate the lifecycle of React JS.
7. Write code to understand different hooks in React JS.
8. Create a Node script that performs file operations like reading, writing, appending text.
9. Create a REST API in Express with all CRUD operations (GET, POST, PUT, DELETE).
10. Case Study: Develop an application for Event Scheduling System
11. The Event Scheduling System allows users to create, view, edit, and delete events with details like date, time, description, and location. Users can manage their schedule efficiently. Extra features include a calendar view for easy visualization and the ability to filter upcoming or past events for better organization.

Text Books:

1. Vasan Subramanian, "Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node", second Edition, Apress Publications, 2019.
2. Brad Dayley, Brendan Dayley, Caleb Dayley, “Node.js, MongoDB and React JS Web Development”, 2nd edition, Perason Education, 2018.

Suggested Readings:

1. Alex Banks, Eve Porcello, “Learning React Modern Patterns for Developing React Apps”, 2nd Edition, Oreilly Media Inc, 2020.
2. David Hows, Peter Membrey, EelcoPlugge – “MongoDB Basics”, Apress, 2014.

Online Resources:

1. https://web.stanford.edu/class/cs142/index.html
2. https://nodejs.org/en/docs/
3. https://www.mongodb.com/
4. https://reactjs.or

With effect from AY 2024-25

22CIE03N

DIGITAL FORENSICS

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites

Fundamentals of cybersecurity and tools, operating systems, Programming, and problem solving, Cryptography, and Network Security.

Course Objectives

1. Understand the foundational concepts of digital forensics, including the evolution and principles guiding digital evidence handling.
2. Analyze various digital investigation models and apply the scientific method in the digital investigative process.
3. Demonstrate the ability to handle and process a digital crime scene, including preservation and reconstruction using digital evidence.
4. Evaluate the role of digital evidence in violent crimes and understand the legal and ethical considerations in digital investigations.
5. Develop strategies for conducting network forensics by applying forensic science techniques to identify, collect, and analyze digital network evidence.

Course Outcomes

By the end of this course, students should be able to:

1. Explain the significance and challenges of digital evidence in modern forensic investigations.
2. Apply standardized investigation models to solve real-world digital crime scenarios.
3. Analyze digital crime scenes using forensic tools and reconstruct criminal events based on digital traces.
4. Assess the methods and techniques used to investigate cybercrimes involving violent or sexual offenses, incorporating legal considerations.
5. Design and document a complete network forensic investigation, from evidence collection to reporting.

CO-PO Articulation Matrix

PO/CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	3	-	2	-	2	2	2	2
CO2	3	3	2	3	3	-	2	-	2	-	2	2	2	2
CO3	3	3	3	3	3	-	-	-	2	-	2	2	2	2
CO4	2	3	-	3	-	-	3	-	2	-	2	2	2	2
CO5	3	3	3	3	3	-	-	3	1	-	3	2	2	2

Unit – I

Digital Forensics: Foundations of Digital Forensics- Digital Evidence, increasing Awareness of Digital Evidence, Digital Forensics: past, present, and Future, principles of Digital Forensics, Challenging Aspects of Digital Evidence, Following the Cybertrail.

Unit – II

Digital Investigations: Conducting Digital investigations, Digital investigation process models, Scaffolding for Digital investigations, Applying the Scientific Method in Digital investigations.

Unit – III

Handling a Digital Crime scene: Preparing to handle Digital Crime scenes, Surveying the Digital Crime scene, Preserving the Digital Crime scene, **Investigative reconstruction with Digital Evidence**: Equivocal Forensic Analysis, Victimology, Crime scene Characteristics, Threshold Assessments.

Unit – IV

Apprehending Offenders: Violent Crime and Digital Evidence, the role of Computers in Violent Crime, Processing the Digital Crime Scene, Investigative Reconstruction, **Sex offenders on the Internet-** Old behaviours, New medium, Legal Considerations, Identifying and processing Digital Evidence, Investigating online sexual offenders, Investigative reconstruction.

Unit – V

Network Forensics: Network Basics for Digital investigators, technical overview of networks, connecting networks using Internet protocols, **Applying Forensic Science to Networks:** Preparation and Authorization, Identification, Documentation, Collection, and preservation, Filtering and Data reduction, Class/individual Characteristics and Evaluation of source, Evidence recovery, Investigative reconstruction, Reporting results.

Textbooks:

1. "Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet", Eoghan Casey, 3rd Edition, 2011, ISBN: 978-0123742681, Academic Press, an imprint of Elsevier.
2. "Digital Forensics with Open Source Tools", Cory Altheide and Harlan Carvey, Elsevier publication, 3rd Edition, April 2011.

Reference Books

1. "Handbook of Digital Forensics and Investigation", edited by Eoghan Casey, 1st Edition, 2010, ISBN: 978-0-12-374267-4, Academic Press, an imprint of Elsevier.
2. "Information Security: Guide to Computer Forensics and Investigations", Bill Nelson, Amelia Phillips, Christopher Steuart, Cengage Learning, 6th Edition, 2019. ".

Web References:

1. https://www.forensicnotes.com/dfir-articles-software/
2. https://www.ncjrs.gov/app/publications/alphalist.aspx.
3. https://www.cisco.com
4. https://www.kaspersky.co.in
5. www.cyberforensics.in
6. https://resources.infosecinstitute.com/category/computerforensics/
7. https://www.classcentral.com/course/edx-computer-forensics-7857

With effect from AY 2024-25

22CIE04N

DIGITAL FORENSICS LAB

Instruction	2 P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Pre-Requisites: Fundamentals of cybersecurity and tools, operating systems, Programming, and problem solving, Cryptography, and Network Security.

Course Objectives:

1. To equip students with foundational knowledge of digital forensics principles and the use of tools like Autopsy and ExifReader to acquire, analyse, and recover digital evidence.
2. To develop students' skills in recovering deleted or hidden files and restoring evidence from forensic images using tools like Autopsy.
3. To enable students to extract and analyse digital artifacts such as browser history, system logs, and EXIF metadata to understand user behaviour and support investigations.
4. To provide students with hands-on experience in steganography and in gathering and analysing email evidence for forensic investigations.
5. To enable students to investigate user activity by analysing logs, USB history, and browser artifacts to reconstruct event timelines and identify forensic evidence.

Course Outcomes

By the end of this course, students should be able to:

1. Understand and explain the core concepts of digital forensics and identify appropriate forensic tools used in real-world investigations.
2. Apply tools like Autopsy to recover deleted files, acquire forensic images, and restore evidence from storage devices and disk images.
3. Demonstrate the use of steganography techniques to hide and retrieve information, and analyse email artifacts for investigative purposes.
4. Evaluate digital artifacts such as EXIF metadata, browser history, cookies, and cache to gather clues and evidence.
5. Analyse system logs, registry entries, and Windows activity logs to investigate user actions, USB device usage, and event history.

CO-PO Articulation Matrix

PO/CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	-	2	1	2	-	2	2	2	2
CO2	3	3	2	3	3	-	2	1	2	--	2	2	2	2
CO3	3	3	2	3	3	-	2	1	2	-	2	2	2	2
CO4	3	3	2	3	3	--	2	1	2	-	2	2	2	2
CO5	3	3	2	3	3	-	2	1	2	-	2	2	2	2

Lab Experiments

1. Understand the fundamentals of computer forensics and explore various forensic tools used in real-world investigations.
2. Use digital forensic tools such as Autopsy to recover intentionally or accidentally deleted files from a storage device.
3. Perform basic steganography by hiding text files within image/audio files and retrieving them using the command line.
4. Analyse digital images and extract EXIF Metadata from Image Files Using ExifReader.
5. Demonstrate the process of acquiring a forensic image of a storage device using Autopsy Forensic Tool.
6. Restoring Evidence from a Forensic Image Using Autopsy.
7. Gathering Email Evidence from a Suspect’s Machine using Email Forensics.

8. Identify and analyse browser artifacts (history, cookies, cache), and understand how artifacts can be manually or programmatically deleted.
9. To investigate recent activity logs and usage statistics on a Windows machine to track user actions and events.
10. Analyse system logs and registry entries to determine details about USB devices previously connected to the system.

Textbooks:

1. "Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet", Eoghan Casey, 3rd Edition, 2011, ISBN: 978 -0123742681, Academic Press, an imprint of Elsevier.
2. "Handbook of Digital Forensics and Investigation", edited by Eoghan Casey, 1st Edition, 2010, ISBN: 978-0-12-374267-4, Academic Press, an imprint of Elsevier.
3. "Comprehensive Beginners Guide to Learn the Basics and Effective Methods of Cyber Security", Brian Walker, 1st Edition, 2019, ISBN-10: 1075257670, ISBN-13: 978-1075257674
4. "Information Security: Guide to Computer Forensics and Investigations", Bill Nelson, Amelia Phillips, Christopher Steuart, Cengage Learning, 6th Edition, 2019.

Reference Books

1. "The Internet And Its Protocols", Adrian Farrel, Elsevier Publications,2011.
2. "Digital Forensics with Open Source Tools", Cory Altheide and Harlan Carvey, Elsevier publication, 3rd Edition, April 2011.
3. "Incident Response and Computer Forensics", Kevin Mandia, Chris Prosise, Matt Pepe, TataMcGraw-Hill, New Delhi, 2006.
4. "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009
5. Robert M Slade," Software Forensics", Nelson Phillips and Enfinger Steuart, Tata McGraw-Hill, New Delhi, 2005.
6. "Computer Forensics and Cyber Crime: An Introduction", MarjieT.Britz, 3rd Edition, Prentice Hall, 2013.

Web References:

1. https://www.forensicnotes.com/dfir-articles-software/
2. https://www.ncjrs.gov/app/publications/alphalist.aspx.
3. https://www.cisco.com
4. https://www.kaspersky.co.in
5. www.cyberforensics.in
6. https://resources.infosecinstitute.com/category/computerforensics/
7. https://www.classcentral.com/course/edx-computer-forensics-7857

With effect from AY 2024-25

22CSC54

DEEP LEARNING FOR COMPUTER VISION

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Artificial intelligence, Machine Learning

Course Objectives:
This course aims to

1. To learn the fundamentals of deep learning and the main research activities in this field.
2. To acquire the knowledge of Deep learning methods, models, Optimizations, Regularizations and algorithms.
3. To understand CNN, RNN, Transformers and GANs along with their applications.

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

1. Understand various optimization techniques used in deep learning.
2. Analyze various Autoencoders and Regularization Techniques.
3. Design and Develop various Convolution Neural Networks architectures.
4. Analyze various RNNs and Encoder Decoder Models.
5. Understand the importance of Transformers and GANs to develop real-time applications.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	1	1	2	2	-	-	-	-	-	-	3	1	1
CO 2	-	1	1	1	-	-	-	-	-	-	-	1	1	2
CO 3	2	1	1	1	-	-	-	-	-	-	-	2	1	2
CO 4	1	1	1	1	-	-	-	-	-	-	-	2	1	2
CO 5	-	1	1	1	-	-	-	-	-	-	-	2	2	1

UNIT - I
Introduction: Feedforward Neural Networks, Representation Power of Feedforward Neural Networks, Backpropagation, Historical Trends in Deep Learning. **Optimization**: Challenges in Neural Network Optimization, Gradient Descent (GD), Stochastic GD, Momentum Based GD, Nesterov Accelerated GD, AdaGrad, RMSProp, Adam.

UNIT - II
Autoencoders: relation to PCA, Regularization in autoencoders, Denoising autoencoders, Sparse autoencoders, Contractive autoencoders, **Regularization:** Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout, Greedy Layer wise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization

UNIT - III
Convolutional Neural Network: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types. LeNet, AlexNet, GoogLeNet, Visualizing Convolutional Neural Networks, Guided Backpropagation, Deep Dream, Deep Art.

UNIT – IV

Recurrent Neural Networks, Backpropagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs. Encoder Decoder Models, Attention Mechanism, Attention over images

UNIT – V

Transformers: Introduction to Transformers, BERT, Vision Transformers. **Generative Adversarial Networks (GANs):** Introduction, Discriminator, Generator, Activation functions for GANs, BCE loss, Conditional GANs, Controllable generation, real life GANs.

Text Books:

1. Goodfellow. I., Bengio. Y. and Courville. A., "Deep Learning ", MIT Press, 2016.
2. Rothman, Denis, "Transformers for Natural Language Processing: Build innovative deep neural network architectures for NLP with Python, PyTorch, TensorFlow, BERT, RoBERTa, and more", Packt Publishing Ltd, 2021.

Suggested Reading:

1. Ganguly Kuntal, "Learning generative adversarial networks: next-generation deep learning simplified", Packt Publishing, 2017.
2. Zhang, Aston, Zachary C. Lipton, Mu Li, and Alexander J. Smola. "Dive into deep learning", Cambridge University Press, 2023.
3. Giancarlo Zaccone, Md. RezaulKarim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_cs41/
2. https://onlinecourses.nptel.ac.in/noc22_cs22/
3. https://onlinecourses.nptel.ac.in/noc19_cs85/

With effect from AY 2024-25

22CSC55

DEEP LEARNING FOR COMPUTER VISION LAB

Instruction	2 L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisite: Artificial Intelligence, Machine Learning

Course Objectives:
This course aims to:

1. Understand basic concepts of Deep learning and their applications.
2. Evaluating Deep learning methods, models and algorithms.
3. Analyzing CNN, RNN, Transformers and GAN along with their applications

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

1. Evaluate the performance various optimization techniques used in deep learning.
2. Analyze various Autoencoders and Regularization Techniques.
3. Design and develop various Convolution Neural Networks architectures.
4. Analyze various RNNs and Encoder Decoder Models.
5. Understand the importance of Transformers and GANs to develop real-time applications.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	1	1	2	2	-	-	-	-	-	-	3	1	1
CO 2	-	1	1	1	-	-	-	-	-	-	-	1	1	2
CO 3	2	1	1	2	1	-	-	-	-	-	-	2	1	2
CO 4	1	1	1	2	1	-	-	-	-	-	-	2	1	2
CO 5	-	1	1	2	1	-	-	-	-	-	-	2	2	1

List of Experiments:

1. Implementation of Classification with Multilayer Perceptron using Scikit-learn with MNIST Dataset.
2. Understanding of Deep learning Packages Basics: Tensorflow, Keras, Theano and PyTorch.
3. Compare the Performance of various Optimization techniques of Momentum Based GD, Stochastic GD, Adam.
4. Implementation of Autoencoders.
5. Compare the Performance of the Classification model using various Regularization Techniques.
6. Train a Deep learning model to classify a given image using pre trained models and compare their performance.
7. Implementation of RNN for generation of image captions.
8. Implementation of Encoder Decoder Models
9. Understand the working of Vision Transformers.
10. Implementation of GANs for generating synthetic datasets

Text Books:

1. Goodfellow. I., Bengio. Y. and Courville. A., "Deep Learning ", MIT Press, 2016.
2. Benjamin Planche, Eliot Andres, "Hands-On Computer Vision with TensorFlow 2: Leverage deep learning to create powerful image processing apps with TensorFlow", Packt Publishers, 2019.

Suggested Reading:

1. Rothman, Denis, “Transformers for Natural Language Processing: Build innovative deep neural network architectures for NLP with Python, PyTorch, TensorFlow, BERT, RoBERTa, and more”, Packt Publishing Ltd, 2021
2. Zhang, Aston, Zachary C. Lipton, Mu Li, and Alexander J. Smola. “Dive into deep learning”, Cambridge University Press, 2023.
3. Kuntal Ganguly, “Learning Generative Adversarial Networks: Next-generation deep learning simplified” , Packt Publisher, 2017
4. Giancarlo Zaccone, Md. RezaulKarim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_cs41/
2. https://onlinecourses.nptel.ac.in/noc22_cs22/
3. https://onlinecourses.nptel.ac.in/noc19_cs85/

With effect from AY 2024-25

22ITE024

COMPUTER VISION

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives:

1. To Understand the fundamental concepts related to computer vision and Image formation.
2. To Learn feature detection, matching and detection.
3. To Become familiar with feature based alignment.
4. To Develop skills on 3D reconstruction.
5. To Understand Object Detection Techniques.

Course Outcomes:

Upon completing this Course, Students will be able to:

1. Understand Fundamentals of computer vision and physics of color.
2. Employ Image processing techniques.
3. Illustrate 2D Feature Based Image Alignment, Feature Detection and Segmentation.
4. Apply 3D Image Reconstruction Techniques.
5. Develop Innovative Computer Vision Applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	-	-	-	2	1	3	1	3	2
CO2	3	3	3	2	3	-	1	-	2	1	2	1	3	2
CO3	3	3	2	2	3	-	-	-	1	1	2	3	3	2
CO4	2	3	3	2	3	-	-	-	2	1	2	3	3	3
CO5	2	3	3	2	2	2	-	-	3	1	2	3	3	3

UNIT-I

Introduction to Computer Vision: Computer vision , Applications of computer vision, Computer vision pipeline , Image input, Image preprocessing , Feature extraction , Classifier learning algorithm. **Color:** The Physics of Colour, Human Colour Perception , Representing Colour. **Application:** Finding Specularities, Surface Colour from Image Colour.

UNIT-II

Image Formation and Processing:

Geometric primitives and transformations, Photometric image formation, digital camera, Point operators, Linear filtering, neighborhood operators, Fourier transforms, Pyramids and wavelets, Geometric transformations, Global optimization.

UNIT-III

Feature Detection, Matching and Segmentation: Points and patches, Edges - Lines, Segmentation, Active contours , Split and merge, Mean shift and mode finding, Normalized cuts, Graph cuts and energy-based methods. **Feature-based Alignment:** 2D and 3D Feature Based Alignment, Pose estimation, Geometric intrinsic calibration.

UNIT-IV

3D Reconstruction: Shape from X, Active range finding, Surface representations, Point-based representations, volumetric representations, Model-based reconstruction, Recovering texture maps and albedosos.

UNIT- V

Object detection: General object detection framework, Region-based convolutional neural networks (R-CNNs), Single-shot detector (SSD) , You only look once (YOLO). **Generative adversarial networks (GANs):** GAN architecture , Evaluating GAN models , Popular GAN applications.

Text Books:

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer- Second Edition, 2022.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015
3. Deep Learning for Vision Systems, Mohamed Elgendy, Manning Publications,2020.

Suggested Reading:

1. R. Hartley and A. Zisserman, "Multiple View geometry", Cambridge university Press, 2002.
2. Richard Hartley and Andrew Zisserman, "Multiple View Geometry in Computer Vision", Second Edition, Cambridge University Press, March 2004.
3. E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012.

Web Resources:

1. CV online: http://homepages.inf.ed.ac.uk/rbf/CVonline
2. https://nptel.ac.in/courses/108103174
3. https://opencv.org/opencv-free-course/
4. https://docs.opencv.org/4.x/d9/df8/tutorial_root.html

With effect from AY 2024-25

22AITE26 COMPUTER VISION APPLICATIONS LAB

Instruction	2 Hours per week
Duration of SEE	3 Hours
SEE	50
CIE	50
Credits	1

Course Objectives:

1. To understand the fundamental concepts related to computer vision and Image formation.
2. To learn feature detection, matching and detection.
3. To become familiar with feature-based alignment.
4. To develop skills on 3D reconstruction.
5. To understand Object detection Techniques.

Course Outcomes:

Upon completing this course, students will be able to:

1. Apply fundamental image processing techniques such as cropping, resizing, histogram equalization, and color space.
2. Develop real-time vision applications such as color detection and invisibility cloak using feature extraction and color space principles.
3. Implement edge detection, contour detection, and image segmentation techniques to extract and isolate significant regions and features in images.
4. Perform image transformations and enhancements using Fourier/wavelet transforms, convolution, and smoothing techniques for advanced image analysis.
5. Apply deep learning-based object detection algorithms such as YOLO and SSD for real-time object identification.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	2	1	1	1	1	-	-	-	-	-	2	2	3	2
CO2	2	3	3	2	3	-	-	-	-	-	1	2	3	2
CO3	3	3	2	2	3	-	-	-	-	-	1	2	3	2
CO4	2	3	3	2	3	-	-	-	-	-	2	2	3	3
CO5	2	3	3	2	2	2	2	-	-	-	2	2	3	3

List of Programs

1. Implementation of Basic Image Processing - loading images, Cropping, Resizing, Histogram Equalization.
2. Implementation of Colour Spaces- Understanding Color spaces, color space conversion.
3. Implementation of Color detection and Invisibility cloak.
4. Implementation of Image Enhancement -Convolution, Image smoothing, Gradients.
5. Implementation of Edge & Contour Detection.
6. Implementation of Image transformations – Fourier and wavelet Transformations.
7. Implementation of Image segmentation using Thresholding and Graph cut method.

8. Implementation of Human Pose Detection.
9. Implementation of YOLO Algorithm.
10. Implementation of SSD Algorithm.

Text Books:

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer- Second Edition, 2022.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015
3. Deep Learning for Vision Systems, Mohamed Elgendy, Manning Publications,2020

Suggested Reading:

1. R. Hartley and A. Zisserman, "Multiple View geometry", Cambridge university Press, 2002.
2. Richard Hartley and Andrew Zisserman, "Multiple View Geometry in Computer Vision", Second Edition, Cambridge University Press, March 2004.
3. E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012.

Web Resources:

1. CV online: http://homepages.inf.ed.ac.uk/rbf/CVonline
2. https://nptel.ac.in/courses/108103174
3. https://opencv.org/opencv-free-course/
4. https://opencv.org/opencv-free-course/
5. https://docs.opencv.org/4.x/
6. https://neptune.ai/blog/15-computer-visions-projects

With effect from AY 2024-25

22ADC71N

PRINCIPLES OF BIG DATA ANALYTICS

Instruction	3 Hours per Week 3 Hours
Duration of SEE SEE	60 Marks
CIE	40 Marks
Credits	3

COURSE OBJECTIVES:

1. To introduce the importance of big data and role of Hadoop framework in analyzing large datasets by writing mapper and reducer for a given problem.
2. To familiarize writing queries in Pig and Hive to process big data
3. To present the latest big data frameworks and applications using Spark and Scala.
4. To discuss the concept and writing applications using SparkSQL.
5. To explore methods for extracting insights from massive datasets and kafka streaming.

COURSE OUTCOMES:

Upon completing this course, students will be able to:

1. Comprehend the processing of large datasets in Hadoop framework and Apply MapReduce architecture to solve real world problems.
2. Develop scripts using Pig over large datasets and query using Hive.
3. Explain the Implementation of Spark and the Scala programming.
4. Expertise in using Resilient Distributed Datasets (RDD) for creating applications in Spark and query using SparkSQL.
5. Analyse the mining methods of massive datasets and kafka streaming.

CO-PO Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	2	-	-	-	1	-	1	1	-
CO2	2	2	1	2	2	-	-	1	-	1	-	-	1	-
CO3	2	-	1	2	2	2	-	1	-	-	-	-	-	-
CO4	-	1	1	1	2	-	2	-	-	-	-	-	-	-
CO5	-	-	-	-	-	2	3	1	1	-	-	-	-	-

UNIT-I

Introduction to Big Data: Introduction, Big Data Enabling Technologies, Hadoop Stack for Big Data. **The Hadoop Distributed Files system:** Overview, The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop File systems. **MapReduce:** Overview, Developing a MapReduce Application, How MapReduce works, MapReduce Types and Formats, MapReduce Features, MapReduce Examples.

UNIT-II

Pig: Generating Examples, Comparison with Databases, Pig Latin, User-Defined Functions, Data Processing Operators, Pig in Practice. **Hive:** Comparison with Traditional Databases, HiveQL, Tables, Querying Data, User- Defined Functions, Writing a User Defined Functions, Writing a User Defined Aggregate Function.

UNIT-III

Parallel programming with Spark: Overview of Spark, Fundamentals of Scala and functional programming, Spark concepts - Resilient Distributed Datasets (RDD), creating RDDs, Basic Transformations, Basic Actions, Word Count example, **Spark SQL:** What is SQL, Big Data and SQL: Spark SQL, Creating DataFrames, Dataframes Operations.

UNIT-IV

Spark GraphX & Graph Analytics: *GraphX* : Introduction, Graphs in Machine Learning Landscape, Graph- structured data, PageRank, *Graph Analytics*: Property Graphs, Graph Operators, Distributed Graphs, GraphX Unified Analytics; *Case Study*: Flight Data Analysis using Spark GraphX.

UNIT-V

Big Data Mining: Frequent Pattern Mining, Handling Larger Datasets in Main Memory Basic Algorithm of Park, Chen, and Yu. The SON Algorithm. **Apache Kafka Fundamentals:** Architecture, Brokers,Topics, Partitions, Producers, Consumers, Kafka connect and Kafka Streams.

TEXT BOOKS:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media Inc, 2015.
2. Anand Rajaraman and Jeffrey David Ullman,"Mining of Massive Datasets",2nd Edition,Cambridge University Press, 2014.

SUGGESTED READING:

1. Thilinagunarathne Hadoop MapReduce v2 Cookbook – 2nd Edition, Packet Publishing, 2015.
2. Chuck Lam, Mark Davis, Ajit Gaddam, "Hadoop in Action", Manning Publications Company, 2016.
3. Alex Holmes," Hadoop in Practice", Manning Publications Company, 2012.
4. Alan Gates, "Programming Pig", O'Reilly Media Inc, 2011.
5. Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'Reilly Media Inc, October 2012.
6. Bill Chambers, Matei Zaharia, "Spark: The Definitive Guide", 4th Edition, O'Reilly Media Inc, 2018.
7. Neha Narkhede, Gwen Shapira, Todd Palino, "Kafka: The Definitive Guide", 2nd Edition, O'Reilly Media, 2017.
8. Viktor Gamov, "Kafka Streams in Action", 1st Edition, Manning Publications, 2018.

WEB RESOURCES:

1. http://www.planetcassandra.org/what-is-nosql
2. http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html
3. https://class.coursera.org/datasci-001/lecture
4. http://bigdatauniversity.com

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22ADE78N

FOUNDATIONS OF BIG DATA ANALYTICS LAB

Instruction	2 Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

COURSE OBJECTIVES:

1. To provide the knowledge to set up a Hadoop Cluster and implement applications using MapReduce.
2. To introduce Pig, PigLatin and HiveQL to process big data.
3. To get familiarized with the latest big data frameworks and writing applications using Spark and Scala.
4. To learn querying large datasets with SparkSQL.
5. To gain knowledge to work with the Spark Framework.

COURSE OUTCOMES:

Upon completing this course, students will be able to:

1. Comprehend Hadoop working environment and develop applications using MapReduce framework.
2. Develop scripts using Pig to solve real world problems and query the datasets using Hive.
3. Develop applications in Spark environment using RDDs.
4. Develop queries real-time data using SparkSQL.
5. Implement Data Processing Workflow in Spark Framework.

CO-PO Articulation Matrix:

PO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PSO1	PSO2	PSO3
CO1	2	1	1	2	2	-	-	-	-	-	-	1	1	-
CO2	2	1	1	2	2	-	-	-	-	-	-	-	1	-
CO3	2	1	1	1	-	-	-	-	-	-	-	-	-	-
CO4	2	1	1	1	-	-	-	-	-	-	-	-	-	-
CO5	2	1	1	1	-	-	-	-	-	-	-	-	-	-

List of Programs:

1. Demonstrate the following using HDFS
   i. Basic HDFS commands
   ii. Working with Hadoop file system: Reading, Writing and Copying
2. Develop the following applications using MapReduce
   i. Word count application using Map Reduce on single node cluster
   ii. Analysis of Weather Dataset on Multi node Cluster using Hadoop
   iii. Real world case studies on Map Reduce applications
3. Writing User Defined Functions/Eval functions for filtering unwanted data in Pig.
4. Create and Use Custom UDFs in Hive Queries.
5. Implement the Word count application on Spark framework.

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media Inc, 2015.
2. Anand Rajaraman and Jeffrey David Ullman,"Mining of Massive Datasets", 2nd Edition,Cambridge University Press, 2014.

Suggested Reading:

1. Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'Reilly Media Inc, October 2012.
2. VigneshPrajapati, "Big data Analytics with R and Hadoop", Packt Publishing, November 2013.

Web Resources:

1. https://parthgoelblog.wordpress.com/tag/hadoop-installation
2. http://www.iitr.ac.in/media/facspace/patelfec/16Bit/index.html
3. https://class.coursera.org/datasci-001/lecture

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22CIE13

3D MODELLING AND ANIMATION

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites

Programming in C, C++, Java or Python, Computer Graphics, Working with OS (Windows, Linux or macOS).

Course Objectives

The objectives of this course are

1. Learn the basics of using Maya to transform things in space using Blender's modelling tools.
2. Acquire knowledge of the principles of colour application and polygon tool modelling.
3. Understand the foundations of NURBS and curve-based geometry, as well as how to create NURBS surfaces.
4. Gain expertise in creating complicated materials and lighting, materials, textures, and UVs.
5. Examine the fundamentals of Animation Effects and Practice with the Self-Bouncing Ball.

Course Outcomes

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

1. Utilize fundamental concepts of 3D modelling to proficiently navigate Maya's interface.
2. Understanding the foundational principles of polygonal geometry, including vertices, edges, and faces, and their roles in 3D modelling.
3. Understanding the principles of Non-Uniform Rational B-Splines (NURBS) and curve-based geometry, comprehending their significance in 3D modelling and design.
4. Applying the principles of lighting, materials, textures, and UV mapping in the context of 3D rendering and visualization.
5. Mastering keyframe animation workflows to create smooth and believable motion sequences, including character locomotion, facial expressions, and object interactions..

CO-PO Articulation Matrix

PO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	2	3	-	-	-	-	-	3	1	1	2
CO2	3	1	2	2	3	-	-	-	-	-	3	1	1	2
CO3	3	1	2	2	3	-	-	-	-	-	3	1	1	2
CO4	3	1	2	2	3	-	-	-	-	-	3	2	2	3
CO5	3	1	2	2	3	-	-	-	-	-	3	1	1	2

Unit – I

Introduction: 3D Art, understanding 3D space, Cartesian mapping & 3D Coordinates, The Grid, Global and Local Coordinate systems, Hierarchies and Local Transforms, Pivots & Snaps, Freezing and Resetting Transforms, Exercise: Transforming objects in Space with MAYA.

Unit – II

Polygonal Geometry: Model and Polygon Concepts, Triangulation and Polygons, Create Models: Polygon Primitives, Edit Polygon Models: Sub-object editing, Chamfer & Bevel, Extrude, Combining and merging

multiple polygon objects, Advanced Polygon modelling tools, Smoothing, Exercise: Modelling with Polygon tools.

Unit – III

NURBS & Curve-Based Geometry: Curve, NURBS curves and Create, Edit of NURBS Curves, NURBS Curves uses, NURBS surfaces creation and Edit, Creation of NURBS surfaces out of curved lines, Projected curves and Trim Surfaces, Conversion of NURBS into Polygons, Uses of NURBS, Exercises.

Unit – IV

Lighting, Materials, Textures & UV's: Rendering, GPU Vs CPU Rendering, Things required to render a scene: Light, Camera, Materials, Camera and Camera Attributes in 3D, Shading- Polygon Normal, Lighting and Types of Lights, Common light attributes, Depth map shadows and Ray Tracing Use, Textures and UV mapping, Image rendering using Software, Exercise: Creating a complex material.

Unit – V

Animation: Basic concepts & Definition, Keyframes and Keyframing, Methods of Animation: Pose based animation, Rotoscoping and Motion Capture, Editing Motion Curves, Acceleration and Deceleration: Graph Curves and tangents, Exercise: The Ball that bounces itself.

Textbook:

1. Essential-Skills-Modelling-Rendering-Animation, Author Nicholas Bernhardt Zeman, CRC Press, Taylor and Francis Group

Reference Books:

1. Blender 3D: Characters, Machines, and Scenes for Artists Kindle Edition by Enrico Valenza,Christopher Kuhn, Romain Caudron and Pierre-Armand Nicq (2016)
2. Learning Blender: A Hands-On Guide to Creating 3D Animated Characters" Paperback – 12 April 2017 by Oliver Villar.
3. The Animator's Survival Kit: A Manual of Methods, Principles and Formulas for Classical, Computer, Games, Stop Motion and Internet Animators Paperback – Illustrated, 25 September 2012 by Richard Williams.
4. Blender 3D Basics - Second Edition, 31 August 2014, by Gordon Fisher.
5. The Art of 3D Computer Animation and Effects 4th Revised & enlarged Edition, by Isaac Kerlow.
6. Maya Character Creation: Modeling and Animation Controls Paperback – 11 September 2003, by Chris Maraffi.
7. ZBrush Character Sculpting: 1 Paperback – Import, 3 May 2012, by Rafael Grassetti.

Web References:

1. https://www.coursera.org/courses?query=3d%20modeling
2. https://www.udemy.com/topic/3d-animation/

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22CIE18N

SOCIAL ENGINEERING

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites

Programming and Problem Solving, Operating System, Computer Networks, Fundamentals of Cyber Security and Tools.

Course Objectives

1. To understand the fundamental principles of social engineering, including psychological triggers and ethical considerations involved in manipulating human behaviour.
2. To explore open-source intelligence (OSINT) techniques and analyse social media for extracting actionable insights while understanding associated legal and ethical issues.
3. To examine various online tools like people, search engines, public records, and technical foot printing methods for gathering personal and organizational information.
4. To study different types of social engineering attacks and understand the techniques for their detection, measurement, and reporting.
5. To develop knowledge on defence strategies against social engineering attacks and adopt best practices for communication, network, and device safety.

Course Outcomes

On Successful completion of the course, student will able to,

1. Explain the core concepts and process of social engineering and evaluate ethical challenges in social engineering scenarios.
2. Apply OSINT techniques and perform social media psychological analysis to gather intelligence for ethical hacking or investigative purposes.
3. Demonstrate the use of WHOIS, DNS reconnaissance, and online mapping tools for identifying and analysing geospatial and technical information.
4. Identify various social engineering attack methods and use relevant tools to detect and report these attacks effectively.
5. Design and recommend proactive defense mechanisms and safe practices to prevent and respond to social engineering threats.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	3	-	1	-	2	1	2	-	3	3	2	2
CO 2	3	3	2	3	3	1	-	2	2	2	-	2	3	2	2
CO 3	3	3	2	3	3	1	-	2	2	2	-	2	3	2	2
CO 4	3	3	2	3	3	1	-	3	2	2	-	2	3	2	2
CO 5	2	2	2	3	1	1	-	2	1	2	-	2	3	2	2

Unit – I

Introduction: Social Engineering, Psychological Concepts in Social Engineering, Ethical Considerations in Social Engineering, Social Engineering Process.

Unit – II

OSINT: Open-Source Information Categories, OSINT Types, OSINT Organizations, Parties Interested in OSINT Information, Information Gathering Types, OSINT Process, Benefits of OSINT, Challenges of Open-Source Intelligence, Legal and Ethical Constraints. **Social Media Intelligence:** Social Media Content Types, Classifications of Social Media Platforms, General Resources, social media Psychological Analysis.

Unit – III

People Search Engines and Public Records: People Search Engine, Public Records, Searching for Personal Details. **Online Maps:** Geolocation Tracking, General Geospatial Research Tools, Location-Based Social Media, Transport Tracking, **Technical Foot printing:** Investigate the Target Website, WHOIS Lookup, DNS dumpster, Subdomain Discovery, DNS Reconnaissance.

Unit – IV

Types of Social Engineering Attacks: Phishing, Watering hole attacks, Business email compromise attacks, Physical social engineering, USB baiting, DNS Spoofing and Cache Poisoning Attacks, Scareware Attacks, Worm Attacks, Malware Link Delivery Channels, Peer-to-Peer (P2P) Network Attacks, Shaming Infected Users out of Reporting an Attack, Deepfake-Driven Social Engineering Attack **Social Engineering Attacks Detection:** Detection, Measurement, And Reporting, Open-Source Intelligence analysis software and tools.

Unit – V

Social Engineering Attack Defence: Proactive Défense Techniques: Awareness Programs, Reputation and OSINT Monitoring, Incident Response. How to Prevent Social Engineering Attacks- Safe Communication and Account Management Habits, Safe Network Use Habits, Safe Device Use Habits.

Textbooks:

1. Practical Social Engineering A Primer for the Ethical Hacker By: Joe Gray,14th June 2022, ISBN: 9781718500983 No Starch Press.
2. Open-Source Intelligence Methods and Tools: A Practical Guide to Online Intelligence by Nihad A. Hassan, Rami Hijazi, 1 July 2018, ISBN-13 (electronic): 978-1-4842-3213-2 1 Apress.

Reference books:

1. Social Engineering: The Science of Human Hacking By: Christopher Hadnagy, 25th June 2018, ISBN: 9781119433385, Wiley.
2. Hacking the Human: Social Engineering Techniques and Security Countermeasures By: Ian Mann, 28th July 2008, ISBN: 9780566087731, Gower Publishing Ltd.

Web References:

1. https://www.cisco.com/c/en/us/products/security/what-is-social-engineering.html#~types-of-attacks
2. https://www.kaspersky.co.in/resource-center/definitions/what-is-social-engineering
3. https://www.imperva.com/learn/application-security/social-engineering-attack/
4. https://www.itgovernance.co.uk/social-engineering-attacks
5. https://en.wikipedia.org/wiki/Open-source_intelligence
6. https://www.aura.com/learn/types-of-social-engineering-attacks
7. https://www.safeguardcyber.com/identify-prevent-social-engineering-attacks
8. https://www.horangi.com/horangipedia/what-is-social-engineering

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22CSE26

APPLIED NATURAL LANGUAGE PROCESSING

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-requisites: Artificial Intelligence, Machine Learning

Course Objectives:

This course aims to:

1. Learn the fundamentals of natural language processing.
2. Understand the various text processing techniques in NLP.
3. Understand the role Text Classification Deep Learning for Text Classification techniques of NLP
4. Use Topic Modelling, Case Studies and apply the NLP techniques to IR applications.

Course Outcomes:

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

1. Understand the fundamental concepts of the Natural Language Processing (NLP) pipeline and its real-world applications.
2. Illustrate and compare various text representation techniques used in NLP, including traditional and modern embeddings.
3. Apply and analyze text classification techniques and basic deep learning models for natural language tasks.
4. Evaluate different text summarization methods and examine example systems for effective information distillation.
5. Design and implement NLP pipelines to solve real-world problems .

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	1	-	-	-	-	-	-	-	-	-	3	1	2
CO 2	1	2	-	-	-	-	-	-	-	-	-	1	1	2
CO 3	-	-	3	2	2	-	-	-	-	-	-	2	3	2
CO 4	-	-	-	2	2	-	-	-	-	-	-	2	1	2
CO 5	-	-	1	-	-	1	-	3	3	2	-	2	2	3

UNIT - I

NLP: A Primer, NLP in the Real World, NLP Tasks, NLP Levels, What Is Language? Building Blocks of Language, Challenges in NLP, Machine Learning and Overview Approaches to NLP, Heuristics-Based, Machine Learning, Deep Learning for NLP. **NLP Pipeline:** Data Acquisition, Pre-Processing Preliminaries Frequent Steps, Advanced Processing Feature Engineering Classical NLP/ML Pipeline DL Pipeline Modeling, Evaluation of Models, Post-Modeling Phases.

UNIT - II

Text Representation: Vector Space Models Basic Vectorization Approaches, One-Hot Encoding Bag of Words, Bag of N-Grams, TF-IDF. **Distributed Representations**: Word Embedding, Going Beyond Words, Distributed Representations,Word2Vec, Glove.

UNIT - III

Traditional Text Classification Applications One Pipeline, Many Classifiers, Using Neural Embeddings in Text Classification Deep Learning for Text Classification Interpreting Text Classification Models. **Deep Learning for Text Classification** CNNs for Text Classification, LSTMs for Text Classification

UNIT - IV

Chatbots : Applications, A Taxonomy of Chatbots ,Goal-Oriented Dialog ,A Pipeline for Building Dialog Systems ,Deep Dive into Components of a Dialog System, Dialog Act Classification ,Identifying Slots ,Response Generation, Other Dialog Pipelines, End-to-End Approach, Deep Reinforcement Learning for Dialogue Generation ,Rasa NLU.

UNIT - V

Real World NLP Applications: Topic Modelling, Text Summarization, Use Cases Setting Up a Summarizer: An Example Recommender Systems for Textual Data Machine Translation Question-Answering Systems, Social Media, E-Commerce and Retail, Healthcare, Finance, and Law.

Text Books:

1. Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta & Harshit Surana "Practical Natural Language Processing: A Comprehensive Guide to Building Real world NLP Systems", O'Reilly Media, Inc., 1st Edition, 2020.
2. James Allen, "Natural Language Understanding", Bejamin Cummings, 2nd edition, 1995.

Suggested Reading:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

Online Resources:

1. https://nptel.ac.in/courses/106101007/
2. http://www.cs.colorado.edu/~martin/sp2.html
3. https://web.standford.edu/~jurafsky/sp3/

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22CAE08N

REINFORCEMENT LEARNING
(Professional Elective-IV)

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: Probability and Statistics, Machine Learning, Data Structures

Course Objectives:

1. To Understand the fundamental principles of Reinforcement Learning and MDP Process
2. To Analyze Monte Carlo Methods and Temporal-Difference learning techniques.
3. Evaluate the use of Eligibility Traces in reinforcement learning through case studies

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

1. Acquire the fundamental concepts of Reinforcement Learning.
2. Apply the concepts of Finite Markov Decision Process to solve the complex problems.
3. Analyze and evaluate the effectiveness of Monte Carlo methods and On/Off Policy methods
4. Analyze and apply Temporal Difference Learning for real world problems.
5. Evaluate eligibility traces and novel reinforcement learning solutions.

CO-PO Articulation Matrix:

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

UNIT-I:

Introduction to Reinforcement Learning:-Examples, History of RL, Limitations, Scope, Elements of Reinforcement Learning, An n-armed bandit problem, Action-value methods, Incremental Implementation, Tracking a nonstationary problem, Optimistic initial values, Upper- Confidence-Bound Action Selection, Gradient bandits.

UNIT-II:

Finite Markov Decision Processes: The Agent-Environment Interface, Goals and Rewards, Returns, Unified Notation for Episodic and Continuing Tasks, The Markov Property, Markov Decision Processes, Value Functions, Optimal Value Functions, Optimality and Approximation.

UNIT-III:

Monte Carlo Methods: Monte Carlo Prediction, Monte Carlo Estimation of Action Values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Off- Policy prediction via importance sampling, Incremental implementation, Off-policy monte carlo control

UNIT-IV:

Temporal-Difference learning: TD prediction, Advantages of TD prediction methods, Optimality of TD(0), Sarsa: On-policy TD control, Q-Learning: Off-policy TD control

UNIT-V:

Eligibility Traces: n-step TD prediction, The forward view of TD(λ),the backward view of TD(λ), Equivalences of forward and backward views, Sarsa(λ), Watkin's Q(λ), Off-policy eligibility traces using importance sampling.

Casestudies: TD-Gammon, Samuel's Checkers Player.

Text Books:

1. "Reinforcement learning: An introduction," First Edition, Sutton, Richard S., and Andrew G. Barto, MIT press 2020.
2. "Statistical reinforcement learning: modern machine learning approaches," First Edition, Sugiyama, Masashi. CRC Press 2015.

Reference Books:

1. "Bandit algorithms," First Edition, Lattimore, T. and C. Szepesvári. Cambridge University Press. 2020.
2. "Reinforcement Learning Algorithms: Analysis and Applications," Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone Parisi, and Jan Peters First Edition, Springer 2021.
3. Alexander Zai and Brandon Brown "Deep Reinforcement Learning in Action," First Edition, Manning Publications 2020.

Online Resources:

1. https://nptel.ac.in/courses/106106143
2. https://www.coursera.org/specializations/reinforcement-learning

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22CIE23

GRAPHICS DESIGN

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites
Data Communication and Computer Networks.

Course Objectives

1. To develop the ability to conduct research and generate design concepts
2. To understand and apply the principles of composition in visual communication
3. To explore the fundamentals of typography and color theory in design
4. To gain hands-on proficiency in industry-standard design tools and technologies
5. To apply design skills in print production, presentations, and web design contexts

Course Outcomes
By the end of this course, students should be able to:

1. Analyse design problems and generate creative visual concepts through structured research and ideation processes.
2. Apply principles of visual composition, spatial organization, and layout to create balanced and engaging designs.
3. Demonstrate an understanding of typography and color theory in the context of effective visual communication.
4. Use industry-standard graphic design tools to develop digital and print-ready design solutions.
5. Design visually coherent and user-friendly interfaces for websites and screen-based media.

CO-PO Articulation Matrix

PO/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	PSO3
CO1	2	3	2	-	-	-	-	1	2	-	3	2	3	3
CO2	2	2	3	-	-	-	-	-	2	-	2	3	1	2
CO3	2	-	3	-	-	-	-	-	2	-	2	1	2	2
CO4	1	-	3	-	3	-	-	2	2	-	3	2	3	2
CO5	2	2	3	-	3	-	-	2	3	-	3	2	3	2

Unit – I
Research And Concepts: Basics of research - Linear reasoning/lateral thinking - Exploratory drawing - Visualizing ideas - Theories of image and text - Audiences, markets, and concepts - Scheduling, organizing, and finalizing - **Fundamentals Of Composition**: Basics of composition - Form and space - Symmetry/asymmetry

Unit – II
Basic principles of design layout - Styles of layout - Pace and contrast- Size and format - Identity and extended systems - Photography and illustration - **FUNDAMENTALS OF TYPOGRAPHY** - Typography and meaning - The anatomy of type - Understanding and selecting typefaces - Spacing - Readability and

legibility - Typographic emphasis and hierarchy - Typographic rules/boxes and ornaments - Text as image

Unit – III

Fundamentals Of Color: Color terminology - Color legibility, contrast, and harmony - Color associations - Color as information. **Tools And Technologies**: Photography basics and sourcing images - InDesign - Photoshop - Illustrator - Animate and After Effects.

Unit – IV

Print Production And Presentations: Preparing files for print - Creating a convincing presentation - Paper stocks and finishing - Printed color - Print media - Digital printing - Correcting color proofs and press checks. **WEB DESIGN**: Project development process overview - Project structures - Web tools - Initial consultations - Information architecture (IA).

Unit – V

Flowcharts and wireframes - Common elements of a web layout - Designing for the Web - Mobile application design - Working with content management system - Search engine optimization (SEO).

Textbook:

1. Graphic Design School: The Principles and Practice of Graphic Design, 8th Edition, David Dabner, Sandra Stewart, Abbie Vickress, ISBN: 978-1-394-18568-9, November 2023.

Reference Books:

1. Making and Breaking the Grid: A Graphic Design Layout Workshop by Timothy Samara, Publisher: Rockport Pub, ISBN-10: 9781564968937
2. Interaction of Color, by Josef Albers & Nicholas Fox Weber, Publisher: Yale University Press, ISBN-13:978-0300179354
3. Adobe Photoshop Classroom in a Book, by Conrad Chavez, Publisher: Adobe Pr, ISBN-13: 978-0137965892
4. Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability (Voices That Matter), by Steve Krug, Publisher: New Riders,3rd Ed, ISBN-13: 978-0321965516

Web References:

1. https://design.tutsplus.com/categories/design-fundamentals
2. https://thinkingwithtype.com/
3. https://color.adobe.com/
4. https://helpx.adobe.com/photoshop/tutorials.html
5. https://99designs.com/blog/tips/printing-basics/
6. https://university.webflow.com/
7. https://grow.google/certificates/ux-design/

With effect from AY 2024-25

22CIE24

IMMERSIVE TECHNOLOGIES

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites

Basic knowledge on XR devices (Oculus Quest, HoloLens, HTC Vive), linear algebra, vectors, and 3D geometry and Python, C++, C#, or JavaScript — especially for Unity or Unreal Engine development

Course Objectives

1. To provide an understanding of Virtual Reality, its core concepts, and its role as a medium for immersive communication and interaction.
2. To explore the role of human perception, interaction, and presence in virtual environments, emphasizing the concept of the human-in-the-loop in immersive systems.
3. To understand the methods and technologies used to interface participants with virtual environments and effectively present immersive experiences.
4. To examine interaction techniques and system components that enable dynamic engagement and realism within virtual environments.
5. To understand the principles of designing meaningful VR experiences for real-world applications and to explore the evolution and future potential of virtual reality technology.

Course Outcomes

By the end of this course, students should be able to:

1. Describe the fundamental principles of Virtual Reality and analyse its role as a medium for immersive communication and interaction.
2. Evaluate the impact of human perception, presence, and interaction in virtual environments with a focus on the human-in-the-loop paradigm.
3. Identify and explain the technologies used for interfacing users with virtual environments, including output presentation techniques.
4. Apply interaction models and system components to create responsive and engaging virtual experiences.
5. Design context-based VR solutions for real-world problems and assess the past developments and future scope of VR technologies.

CO-PO Articulation Matrix

PO/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	PSO3
CO1	3	3	3	3	1	-	-	-	-	-	3	1	1	1
CO2	3	3	3	3	2	-	-	-	-	-	3	1	2	2
CO3	3	3	3	3	3	-	-	-	-	-	3	2	1	1
CO4	3	3	3	3	3	-	-	-	-	-	3	1	2	1
CO5	3	3	3	3	3	-	-	-	-	-	3	3	2	2

Unit – I

Introduction to Virtual Reality: Definition – Elements of VR experience-VR, Telepresence, AR and Cyberspace. **VR: The Medium:** A Mediums content – Communication: Conveyance of Ideas – Common Issues of Human Communication media- The study of the medium of VR.

Unit – II

The Human in the Loop: Connecting humans to simulation – The Human perceptual system – Presence and Embodiment: Self perceptions within the virtual world. **Input: Interfacing the Participant(s) With the Virtual World:** Input Technologies – Using inputs within a VR system

Unit – III

Output: Interfacing the Virtual World with the Participant(s): Visual Displays – Aural Displays – Haptic Displays- Vestibular and other Sensory Displays. **Presenting the Virtual World:** Representation of Virtual world – Visual representation in VR – Aural representation in VR - Haptic representation in VR – Representation of other senses – Visual rendering systems – Sonic Rendering systems – Haptic Rendering systems – Rendering of other senses.

Unit – IV

Interacting With the Virtual World: Interaction design Basics – User Interface Metaphors – Manipulating and Navigating in a virtual world – Interacting with others and with VR system (Meta commands). **Bringing the Virtual World to Life:** Immersion – Providing the context – The virtual world – Rules of the virtual world: Physics – S/w to manifest the VR experience – The experience creation process.

Unit – V

Experience Conception and Design: Applying VR to a Problem: Conceiving a New VR applications – Exemplary VR Experience – Designing a VR experience – The past and the future of VR design. **Virtual Reality: Past, Present, Future:** The state of VR – The maturation of VR – Trends – Technology the future and past predictions.

Textbook:

1. "Understanding Virtual Reality: Interface, Application, and Design", Authors: William R. Sherman & Alan B. Craig, Publisher: Morgan Kaufmann, Edition: 2nd Edition (latest)

Reference Books:

1. Immersive Realm of Extended Reality, Author Suman Dutta, First Edition 2024, Copyright © BPB Publications, India, ISBN: 978-93-55517-227.
2. VIRTUAL REALITY, Steven M. LaValle, University of Oulu, Cambridge University Press.
3. Virtual and Augmented Reality- An Educational Handbook, By Zeynep Tacgin, Cambridge Scholars Publishing Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK
4. Virtual Reality Technology, Grigore C. Burdea, Philippe Coiffet, John Wiley & Sons, 30 Jun 2003 - Computers - 464 pages
5. Handbook of Augmented Reality, Borko Furht, Springer New York, NY, Hardcover ISBN 978-1-4614-0063-9, eBook ISBN 978-1-4614-0064-6

Web Reference:

1. https://www.edx.org/certificates/professional-certificate/ucsandiegox-virtual-reality-app-development

22CIE25

AI for CYBER SECURITY

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites
Fundamentals of cybersecurity and tools, operating systems, Programming, and problem solving, Cryptography, and Network Security, Principles of AI.

Course Objectives

1. Understand the fundamental concepts and types of machine learning techniques, including supervised, unsupervised, and reinforcement learning, with a focus on their application in cybersecurity
2. Analyse the different machine learning models and techniques, such as classification, regression, and dimensionality reduction, and their relevance to cybersecurity challenges.
3. Evaluate the vulnerabilities in machine learning systems, including adversarial attacks and data poisoning, and assess their impact on cybersecurity applications.
4. Apply AI techniques and machine learning models to detect network-based attacks and classify intrusions using binary and multi-class classifiers.
5. Design and implement machine learning models for network intrusion detection systems (NIDS), incorporating both signature-based and anomaly-based detection methodologies.

Course Outcomes
By the end of this course, students should be able to:

1. Define key machine learning concepts like supervised, unsupervised learning, overfitting, underfitting, and hyperparameter tuning and explain their relevance to cybersecurity.
2. Demonstrate the application of machine learning models (e.g., Logistic Regression, SVM, K-Means) in cybersecurity tasks such as classification and anomaly detection.
3. Assess threats like adversarial attacks and data poisoning in machine learning systems, and propose corresponding defence strategies.
4. Analyse and compare the effectiveness of machine learning models in detecting and mitigating network attacks.
5. Design and train machine learning models for network intrusion detection systems (NIDS) and evaluate their performance using metrics like precision and recall.

CO-PO Articulation Matrix

PO/ CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	2	2	2	2	-	1	1	1	-	2	3	2	3
CO2	3	3	2	2	3	-	1	2	1	-	2	3	2	3
CO3	3	3	2	3	3	-	2	1	1	-	3	3	2	3
CO4	3	3	2	3	3	-	1	2	1	-	2	3	2	3
CO5	3	3	3	3	3	-	1	2	1	-	3	3	2	3

Unit – I

Fundamentals of Machine Learning: Definition and scope of machine learning, Types of machine learning systems: supervised, unsupervised, batch vs. online, instance-based vs. model-based, Challenges in machine learning: data quality, overfitting, underfitting, Training data, Testing, validation, and hyperparameter tuning.

Unit – II

Machine Learning Models and Techniques for Cybersecurity: Classification: Binary and multiclass classification, Confusion matrix, Precision, recall, ROC curves, Model Training: Linear and logistic regression, Support Vector Machines, Dimensionality Reduction: PCA, Kernel PCA, Curse of dimensionality. Unsupervised Learning: K-Means, DBSCAN, Clustering for anomaly detection.

Unit – III

Adversarial Machine Learning and Cybersecurity Ontologies: Machine Learning Algorithms in Adversarial Settings, Types of Threats: by attacker capabilities, goals, knowledge, and attack strategies, Threat Models in AI for Security. Data Poisoning Attacks: Scenarios, optimal attack design, transferability, and defences. Cybersecurity Ontologies: Intrusion detection ontologies, Malware behaviour and classification.

Unit – IV

AI Techniques for Network Attack Detection: Introduction to AI-based Network Security, Binary Classifiers in Attack Detection: Neural Networks, Neuro-Fuzzy Networks, and Support Vector Machines, Design and Training of Binary Classifiers for Intrusion Detection, Detection Algorithms: Step-by-step attack detection logic using trained classifiers. Ensemble Approaches: Combining Binary Classifiers using Low-Level Schemes and Aggregating Compositions.

Unit – V

Machine Learning for Network Intrusion Detection: Introduction to ML in Intrusion Detection, Architecture and Function of Network Intrusion Detection Systems (NIDS). Detection Methodologies: Signature-Based and Anomaly-Based Detection. Application of Machine Learning Techniques: Artificial Neural Networks: Training approaches, learning types (supervised, unsupervised), and their roles in NIDS.

Textbooks:

1. Géron, A. (2019). Hands-on machine learning with Scikit-Learn, Keras, and TensorFlow: Concepts, tools, and techniques to build intelligent systems (2nd ed.).
2. Sikos, L. F. (2018). *AI in cybersecurity*. Springer International Publishing.

Reference Books:

1. Bhardwaj, T., Upadhyay, H., Sharma, T. K., & Fernandes, S. L. (Eds.). (2023). Artificial Intelligence in Cyber Security: Theories and Applications (Intelligent Systems Reference Library, Vol. 240). Springer. ISBN: 978-3-031-28580-6.
2. Priyadarshini, I., & Sharma, R. (Eds.). (2021). Artificial Intelligence and Cybersecurity: Advances and Innovations. CRC Press. ISBN: 978-1-003-09751-8.

Web References:

1. https://www.kaggle.com/code/kanncaa1/machine-learning-tutorial-for-beginners
2. https://www.machinelearningmastery.com/roc-curves-and-precision-recall-curves-for-classification-in-python/
3. https://www.sciencedirect.com/science/article/pii/S2665917423001630

With effect from AY 2024-25

22ADC14

GENERATIVE AI
(Professional Elective - V)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-requisites: Python Programming, Deep Learning

Course Objectives:

This course aims to:

1. Introduce the fundamentals of generative modeling and deep learning.
2. Explore key architectures including VAEs, GANs, and Diffusion Models.
3. Apply TensorFlow/Keras to build generative models
4. Understand applications of generative AI in text, image, music, and multimodal domains.
5. Examine current and future trends in generative AI and its real-world impact.

Course Outcomes:

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

1. Understand foundational concepts of generative modelling, probability theory, and Variational Autoencoders.
2. Analyze and implement various GAN architectures for generating synthetic data and images.
3. Explore and evaluate diffusion models including training, sampling, and analysis processes.
4. Apply transformer-based architectures for language modelling and fine-tune encoder/decoder models.
5. Develop effective prompting strategies to control and enhance outputs from generative language models.

CO- PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	1	1			-	-	-	-	-	-	2	1	3
CO 2	2	3	2	3	3	-	-	-	-	-	-	3	1	3
CO 3	2	3	2	3	3	-	-	-	-	-	-	2	1	3
CO 4	2	3	2	3	3	-	-	-	-	-	-	2	1	3
CO 5	1	2	2	3	3	-	-	-	-	-	-	2	1	3

UNIT - I

Generative Modelling: What is Generative Modelling, Generative vs. Discriminative Models, The Rise of Generative Modelling, Generative Modelling Framework, **Core Probability Theory**: Sample Space, Probability Density Function, Parametric Modeling, Likelihood, Maximum Likelihood Estimation, **Variational Autoencoder**: Architecture, Exploring the Latent Space,

UNIT- II

Generative Adversarial network : Introduction, Deep Convolution GAN, Wasserstein GAN with Gradient Penalty (WGAN-GP), Conditional GAN (CGAN), **Advanced GAN**: Progressive GAN, StyleGAN, StyleGAN2

UNIT- III

Diffusion Models: Introduction, Denoising Diffusion Models (DDM) and its process, Diffusion Schedules, The Reverse Diffusion Process,The U-Net Denoising Model- Training, Sampling and Analysis, Stable Diffusion, DALL.E 2- Architecture, training Process, GLIDE, ImageGen

UNIT - IV

Transformers: Introduction, Architecture- Attention, Multi head Attention, Masking, Transformer Block, Encoder Based only Transformers Architectures and Fine Tuning : BERT, **Generative LLMs**: Introduction to LLMs, Decoder-only Transformers, Training LLMs, Fine-tuning LLMs, Introduction to various LLM: GPT, Falcon, LLaMA2

UNIT- V

Prompt Engineering: Introduction, Prompt Engineering Strategies, **Advanced Prompting Methods**: Chain of Thought, Problem Decomposition, Self-refinement, Ensembling, RAG and Tool Use, **Learning to Prompt:** Prompt Optimization,Soft Prompts

Text Books:

1. David Foster, Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play, Second Edition, O'Reilly Media, 2023.
2. Tong Xiao, Jingbo Zhu. *Foundations of Large Language Models*. arXiv:2501.09223 [cs.CL], January 16, 2025.

Suggested Books:

1. Joseph Babcock Raghav Bali, Generative AI with Python and Tensor flow 2, Packt Publishing Ltd. UK, 2021

Web Resources:

1. https://paperswithcode.com
2. https://huggingface.co/
3. https://arxiv.org/pdf/2501.09223

22CSE23

ROBOTIC PROCESS AUTOMATION

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: -

Course Objectives:

This course aims to:

1. Provide insights on robotic process automation (RPA) technology and its value proposition
2. Introduce different platforms for RPA
3. Learn different types of variables, control flow and data manipulation techniques
4. Familiarize with Image, Text and data Tables Automation
5. Describe various types of Exceptions and strategies to handle them.

Course Outcomes:

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

1. Gain insights into Robotic Process Automation Technology
2. Acquire knowledge of RPA Platforms and components
3. Identify and understand Image, Text and Data Tables Automation
4. Understand various control techniques and OCR in RPA
5. Describe Exception Handling and Debugging techniques

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	-	-	-	-	-	-	-	-	-	-	2	2	1
CO 2	2	1	1	-	2	-	-	-	1	2	-	3	1	2
CO 3	2	1	1	2	2	-	-	-	1	1	-	1	2	2
CO 4	2	1	1	1	2	-	-	-	1	-	-	2	3	2
CO 5	2	1	-	1	1	-	-	-	-	-	-	3	1	2

UNIT– I

RPA Foundations- What is RPA - flavors of RPA- history of RPA- The Benefits of RPA- The downsides of RPA- RPA Compared to BPO, BPM and BPA - Consumer Willingness for Automation- The Workforce of the Future- RPA Skills- On-Premise Vs. the Cloud- Web Technology- Programming Languages and Low Code OCR-Databases-APls- Al- Cognitive Automation-Agile, Scrum, Kanban and Waterfall Devops Flowcharts.

UNIT–II

RPA Platforms- Components of RPA- RPA Platforms-About Ui Path- About UiPath - The future of automation - Record and PIay - Downloading and installing UiPath Studio -Learning Ui Path Studio- - Task recorder - Step by step examples using the recorder.

UNIT–III

Sequence, Flowchart, and Control Flow-sequencing the workflow- Activities-Control flow, various types of loops, and decision making-Step-by step example using Sequence and Flowchart-Step-by-step example using Sequence and Control Flow-Data Manipulation-Variables and Scope Collections-Arguments – Purpose and useData table usage

with examples Clipboard Management-File operation with step-by-step exampleCSV/Excel to data table and vice versa [with a step-by-step example).

UNIT–IV

Handling Events -Taking Control of the Controls- Finding and attaching windows- Finding the 08 controlTechniques for waiting for a control- Act on controls - mouse and keyboard activities- Working with Ui Explorer- Handling eventsRevisit recorder- Screen Scraping- When to use OCR- Types of OCR availableHow to use OCR- Avoiding typical failure points.

UNIT–V

Exception Handling, Debugging, and Logging- Exception handling- Common exceptions and ways to handle them- Logging and taking screenshots Debugging techniques- Collecting crash dumps- Error reporting, Industry Use case, Future of RPA.

Text Books:

1. Tom Taulli, ―The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems‖, Apress Publishing, 2020
2. Alok Mani Tripathi, ―Learning Robotic Process Automation‖, Packt Publishing, 2018.

Suggested Reading:

1. Richard Murdoch, Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant, Independently Published, 1st Edition 2018.
2. Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston, ―Introduction to Robotic Process Automation: a Primer‖, Institute of Robotic Process Automation,1st Edition 2015.
3. Srikanth Merianda,‖Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation‖, Consulting Opportunity Holdings LLC, 1st Edition, 2018

Online Resources:

1. https://www.uipath.com/rpa/robotic-process-automation
2. https://www.academy.uipath.com

With effect from AY 2024-25

22CIE26

FREE AND OPEN SOURCE TECHNOLOGIES
(Professional Elective – V)

Instruction	3 Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisites
Programming for problem solving, Object Oriented Programming

Course Objectives
The objectives of this course are:
1. To familiarize the students with Open Source Technologies.
2. To expose students to the advantages of Open Source Software (OSS) by enabling them to work on various OSS Projects.
3. To make the students understand the principles, methodologies, policies, licensing procedures and ethics of Free and Open Source Technologies (FOST).

Course Outcomes
On Successful completion of this course, students will be able to:
1. Identify the significance of open source, free and proprietary softwares.
2. Understand the principles and methodologies of open source.
3. Analyze the need to deal with licences and copyrights.
4. Initiate and maintain various open source projects.
5. Practice social, financial and ethical implications of open source technology.
6. Evaluate various Open Source projects like Linux, GIT, Wikipedia etc.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	-	-	1	-	-	1	-	-	-	-	1	2	1	-
CO2	-	-	1	-	-	1	-	-	-	-	1	2	1	-
CO3	-	-	1	-	-	1	-	-	-	-	1	2	1	-
CO4	-	-	1	-	-	1	-	-	-	-	1	2	1	-
CO5	-	-	1	-	-	1	1	-	-	1	1	2	1	2
CO6	-	-	2	1	1	1	1	1	1	1	1	2	1	2

Unit-I
Introduction to Open Source: Open Source, need and principles of OSS, Open Source Standards, Requirements for Software, Free Software, Examples, Free Vs. Proprietary Software, Public Domain software, History of free software, Proprietary Vs Open Source, uses and advantages of Free and Open Source Software.

Unit-II
Principles and Open Source Methodology: Open Source Initiatives, Open Standards Principles, Methodologies, Software freedom, Open Source Software Development.
Licenses: Licenses, Copyright vs. Copyleft, How to create your own Licenses, Important FOSS Licenses (Apache, BSD, GPL and Creative Commons), Patents.

Unit-III

Open Source Project: Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Open Source Teaching (OST), Open Source Media, Zero marginal cost, Internationalization.

Unit-IV

Open Source Ethics: Open Source Government, Ethics of Open Source, Social and Financial Impact of Open Source Technology, Open Source as a Business Strategy, Income-generation Opportunities.

Unit-V

Open Source Tools and Softwares: nginx, matplotlib, Linux, Wikipedia (MediaWiki), GIT, GNU CC, LibreOffice, Moodle, SQLAlchemy.

Text Books:

1. Fadi P. Deek and James A. M. McHugh, Open Source Technology and Policy, Cambridge University Press.
2. Brock, Amanda. Open Source Law, Policy and Practice. Oxford University Press, 2022.
3. Brown, Amy, and Greg Wilson. The Architecture of Open Source Applications, volume II. Vol. 2. Lulu.com, 2012.

Suggested Readings:

1. Wale Soyinka, “Linux Administration- A beginner‟s Guide”, Tata McGraw Hills.
2. Andrew M. St. Laurent, “Understanding Open Source and Free Software Licensing”, O'Reilly Media.
3. Dan Woods, Gautam Guliani, “Open Source for the Enterprise”, O'Reilly Media.
4. Bernard Golden, “Succeeding with Open Source”, Addison-Wesley Professional.

Online Resources:

1. https://aosabook.org/en/index.html
2. https://fossee.in/
3. https://www.gnu.org/
4. https://opensource.org/

COMPUTER ENGINEERING AND TECHNOLOGY

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

Model Curriculum(R-22A) 2027-28

SEMESTER -VIII

S. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per Week			Duration of SEE in Hrs	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1		Open Elective-III	3	-	-	3	40	60	3
2	22CEM01	Environmental Science	2	-	-	2	-	50	No Credits
PRACTICAL									
3	22CIC20	Project Part – II	0	0	8	-	100	100	4
		TOTAL	**5**	**-**	**8**	-	**140**	**210**	**7**

L: Lecture T: Tutorial D: Drawing
P: Practical CIE - Continuous Internal Evaluation
SEE - Semester End Exam

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

List of Open Electives

Course Code	Course Name	
22ECO02	Remote Sensing and GIS	ODD/EVEN
22ECO03	Fundamentals of Wireless Communications	ODD/EVEN
22ECO05	Principles of Embedded Systems	ODD/EVEN
22EGO01	Technical Writing Skills	ODD/EVEN
22EGO02	Gender Sensitization	ODD/EVEN
22CEO01	Infrastructure for Smart Cities	ODD
22CEO02	Disaster Risk Reduction and Management	ODD
22EEO01	Energy Management System	ODD/EVEN
22EEO06	Waste Management	ODD/EVEN
22BTO05	Cognitive Neuroscience	ODD/EVEN
22CHO02	Fundamentals of Nano Science and Nano Technology	ODD/EVEN
22CHO03	Industrial Pollution Control	ODD/EVEN
22CHO04	Environmental and Sustainable Development	EVEN
22MEO02	3D Printing	ODD/EVEN
22MEO03	Corporate Organizational Behavior	ODD/EVEN
22MEO05	Research Methodologies and Innovation	ODD/EVEN
22MEO06	Principles of Entrepreneurships and Startups	ODD/EVEN
22MEO01	Principles of Design Thinking	ODD/EVEN

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

List of Open Electives offered to other departments

	ODD SEMESTER		**EVEN SEMESTER**	
S.NO	**THEORY**		**THEORY**	
	Course Code	**Course Name**	**Course Code**	**Course Name**
1	22CIO01	Fundamentals of Internet of Things	22CIO02N	Fundamentals of Blockchain Technology
2	22CIO03	Basics of Cybersecurity	22CIO04	Fundamentals of AR and VR

With effect from AY 2024-25

22CEM01

ENVIRONMENTAL SCIENCE

Instruction	2L Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	0 Marks
Credits	0

Course Objectives: To enable the students to

1. Identify environmental problems arising due to engineering and technological activities and the science behind those problems.
2. Become aware about the importance of eco system and biodiversity for maintaining ecological balance.
3. To identify the importance of interlinking of food chain.
4. Learn about various attributes of pollution management and waste management practices.
5. To make the students contribute for capacity building of nation for arresting and/or managing environmental disasters.

Course Outcomes: At the end of the course, student is able to

1. Identify various natural resources and effects of their over utilization.
2. Outline the working mechanism of ecosystem.
3. Illustrate the importance of bio-diversity conservation.
4. Identify remediation measures for environmental pollution through legislations.
5. Explain environmental issues and possible sustainable solutions.

CO-PO Articulation Matrix

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	-	-	-	2	2	-	-	-	1	2	1	3
CO2	3	1	-	-	-	1	1	-	-	-	1	3	1	2
CO3	3	1	-	-	-	2	2	-	-	-	1	1	1	2
CO4	3	1	-	-	-	2	2	2	-	-	1	2	1	2
CO5	3	1	-	-	-	2	3	-	-		1	2	1	2

UNIT- I:

Environmental Studies: Definition, Scope and importance, need for public awareness.

Natural resources: Use and over utilization of Natural Resources - Water resources, Food resources, Forest resources, Mineral resources, Energy resources, Land resources.

UNIT – II:

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, role of producers, consumers and decomposers, energy flow in an ecosystem, food chains, food webs, ecological pyramids, Nutrient cycling, Bio-geo chemical cycles, Terrestrial and Aquatic ecosystems.

UNIT – III:

Biodiversity: Genetic, species and ecosystem biodiversity, Bio-geographical classification of India, India as a Mega diversity nation. Values of biodiversity, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India, methods of conservation of biodiversity.

UNIT – IV:

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, marine pollution, soil pollution, noise pollution and Solid waste management, nuclear hazards

Environmental Legislations: Environment protection Act, Air, Water, Forest & Wild life Acts, issues involved in enforcement of environmental legislation, responsibilities of state and central pollution control boards

UNIT – V:

Social issues and the environment: Water conservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development and Climate change: Global warming, Ozone layer depletion, forest fires, and Contemporary issues.

Text Books:

1. Y. Anjaneyulu, "Introduction to Environmental Science", B S Publications, 2004.
2. Suresh K. Dhameja, "Environmental Studies", S. K. Kataria & Sons, 2009.

Suggested Reading:

1. C. S. Rao," Environmental Pollution Control Engineering", Wiley, 1991.
2. S. S. Dara, "A Text Book of Environmental Chemistry &Pollution Control", S. Chand Limited, 2006

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview
2. https://archive.nptel.ac.in/courses/120/108/120108004/

With effect from AY 2024-25

22CIC20

PROJECT PART – II

Instruction	8 Hours per week
Duration of SEE	-
SEE	100 Marks
CIE	100 Marks
Credits	4

Pre-Requisites

The objective of Project: Part - 2 is to allow students to further expand on their investigative study, under the guidance of a Supervisor from the department alone or jointly with a Supervisor from an R&D laboratory/Industry. This phase aims to provide advanced training for students in R&D work and technical leadership. The assignment typically includes:

1. Conducting an in-depth study of the assigned topic.
2. Reviewing and finalizing the approach to address the problem associated with the assigned topic.
3. Developing an action plan for conducting the investigation, emphasizing teamwork.
4. Performing detailed analysis, modeling, simulation, design, problem-solving, or experimentation as required.
5. Finalizing the development of the product/process, conducting testing, documenting results, drawing conclusions, and suggesting future directions.
6. Preparing a paper for conference presentation or publication in journals, where feasible.
7. Compiling a dissertation in the prescribed format for evaluation by the Department.
8. Delivering a final seminar presentation before the Department Review Committee.

Course Outcomes

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

1. Demonstrate a sound technical knowledge of their selected topic.
2. Design engineering solutions to complex problems utilizing a systematic approach.
3. Conduct investigations using research-based knowledge and methods to provide valid conclusions.
4. Create/select/use modern tools for modelling, prediction, and understanding the limitations of complex engineering solutions.
5. Communicate with engineers and the community at large in written and oral forms.
6. Demonstrate the knowledge, skills, and attitudes of a professional engineer.

Course Articulation Matrix

PO/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	PSO3
CO1	2	2	1	2	1	1	1	3	3	2	3	-	-	2
CO2	2	2	1	2	2	1	1	2	2	1	3	-	-	2
CO3	2	2	2	2	2	2	1	3	3	2	3	2	2	2
CO4	1	1	2	3	2	2	1	3	3	2	3	3	2	2
CO5	1	1	2	1	1	1	1	2	2	1	3	2	1	2
CO6	1	1	1	1	1	1	1	3	3	2	3	3	1	2

Guidelines for awarding CIE (Max. Marks: 100)

Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Department Review Committee (DRC)	10	Review 1
	15	Review 2
	25	Report Submission
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Report Preparation
	10	Analytical/ Programming/Experimentation Skills
Publication	10	Quality of the work which may lead to • Publication Submitted/ Published • Products/ Prototypes/Working Models • IPR(Patent) Submitted/ Published • Projects showcased/ Presentations • Prizes won/ If any like best projects • Leading to a Start-Up

Guidelines for awarding SEE (Max. Marks: 100)

Evaluation by	Max. Marks	Evaluation Criteria/Parameter
External and Internal Examiners together	20	Power Point Presentation
	40	Report Evaluation
	20	Quality of the Project • Innovation, • Applications, • Live Research Projects, • Scope for further study, • Applications to Society
	20	Viva-Voce

With effect from AY 2024-25

22ECO02

REMOTE SENSING AND GIS

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Basic knowledge of Geography

is required Course Objectives:
This course is aims to:

1. Explain the fundamental concepts of remote sensing and digital imaging techniques.
2. Make the students to understand the principles of thermal and microwave remote sensing.
3. Make the students understand the significance of GIS and the process of GIS.

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

1. Demonstrate the understanding of basic concepts of remote sensing and interpreting energy interactions.
2. Choose an appropriate technique for a given scenario by appreciating the types of remote sensing.
3. Distinguish the principle behind the working of microwave and LiDAR sensing.
4. Apply Microwave remote sensing techniques
5. Explain the procedure for encoding data and geospatial data analysis.

Course Articulation Matrix

PO/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	PSO3
CO1	3	1	1	1	-	1	1	-	1	-	2	1	1	1
CO2	3	1	1	1	-	1	1	-	1	-	2	1	1	1
CO3	3	1	1	1	-	1	1	-	1	-	2	1	1	1
CO4	2	1	1	1	-	1	1	-	1	-	2	1	1	1
CO5	3	1	1	1	-	1	1	-	1	-	2	1	1	1
CO6	3	1	1	1	-	1	1	-	1	-	2	1	1	1

UNIT-I

Concept of Remote Sensing: Remote sensing definition, data, process, EM bands used in remote sensing, Interactions and recording of energy: interaction with atmosphere, interaction with earth surface features (soil, water, vegetation), recording of energy by sensors, Transmission, reception and processing, Image interpretation and analysis, Applications, Advantages, and limitations of Remote sensing.

UNIT-II

Digital Imaging: Types of Remote sensing, Sensor resolutions, Digital Image, Sensor components, Principle of a long-track and across-track scanning, Hyperspectral Imaging, Thermal Remote Sensing.

UNIT-III

Microwave Remote Sensing: Active and Passive Microwave Remote Sensing, Radar Imaging: Key components of imaging radar, viewing geometry, spatial resolution, principle of RAR, SAR and their range resolution, Satellite

Radar Imaging, LIDAR.

UNIT-IV

Concept of Geographic Information Systems: Key components of GIS, joining spatial and attribute data, functions, advantages and applications of GIS, Spatial data model, Raster data model, Vector data model.

UNIT-V

Process of GIS and Geospatial analysis: Data sources, encoding raster data, encoding vector data, encoding attribute data, linking spatial and attribute data, Geospatial data analysis methods database query, geospatial measurement, overlay operations, network analysis and surface analysis. Integration of GIS and remote sensing.

Text Books:

1. Basudeb Bhatta, "Remote Sensing and GIS", 2/e, Oxford University Press, 2012.
2. Lillesand T.M., and Kiefer R.W. "Remote Sensing and Image Interpretation", 6/e, John Wiley &Sons, 2000.

Suggested Reading:

1. James B. Campbell and Randolph H. Wynne, "Introduction to Remote Sensing", the Guilford Press, 2011.
2. Michael N DeMers, "Fundamentals of GIS", 2/e, John Wiley, 2008.

With effect from AY 2024-25

22ECO03

FUNDAMENTALS OF WIRELESS COMMUNICATIONS

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: A course on basics of electronics is required.

Course Objectives:

1. To familiarize the concepts related to cellular communication and its capacity.
2. To teach students the fundamentals of propagation models and multipath fading.
3. To describe diversity schemes applied in wireless communication and
4. understand the latest Wireless technologies

Course Outcomes:

1. Understand the overview of Wireless Communication.
2. Relate the cellular concepts like frequency reuse, hand off, coverage and capacity.
3. Analyse the mobile radio propagation with large scale and small scale fading.
4. Select the suitable diversity technique to combat the multipath fading effects.
5. Compare the multiple access techniques and apply to wireless standards.

Course Articulation Matrix

PO/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	PSO3
CO1	3	2	2	1	1	-	-	-	-	-	1	1	1	1
CO2	2	1	1	2	1	-	-	-	-	-	1	1	1	1
CO3	2	2	1	2	2	-	-	-	-	-	1	1	1	1
CO4	2	1	1	1	1	1	-	-	2	-	2	1	1	1
CO5	2	1	1	1	1	1	-	-	1	-	1	1	1	1
CO6	3	2	2	1	1	-	-	-	-	-	1	1	1	1

UNIT-I

An overview of wireless communications: Roadmap of cellular communications. First-Generation systems. Second-Generation systems. Third-Generation systems, Fourth-Generation systems and Fifth-Generation Systems.

UNIT-II

The Cellular Concept-System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies. Handoff Strategies. Interference and System Capacity. Power Control for Reducing Interference.

UNIT-III

Mobile Radio Propagation: Large-Scale Path Loss, Introduction to Radio Wave Propagation, Free Space Propagation Model, the Three Basic Propagation Mechanisms, Small-Scale Fading and Multipath: Small-Scale Multipath Propagation, Factors Influencing Small-Scale Fading, Doppler Shift, Types of Small-Scale Fading.

UNIT-IV

Diversity Techniques: Practical Space Diversity Considerations- Selection Diversity, Feedback or Scanning, Maximal Ratio Combining Diversity Equal Gain Combining. Orthogonal frequency division multiplexing: Introduction, Principle of OFDM. OFDM transceivers Cyclic prefix, Spectrum of OFDM, Fading mitigation in OFDM. Intercarrier interference.

UNIT-V

Multiple access techniques: Duplexing: FDD versus TDD. FDMA. TDMA. CDMA . OFDMA. SDMA

Wireless Standards: Global System for Mobile (GSM). GSM Services and Features, GSM System Architecture, GSM Radio Subsystem. GPRS and EDGE- features.

Text Books:

1. Theodore S. Rappaport - Wireless Communications Principles and Practice, 2nd Edition, Pearson Education, 2003.
2. Andreas F.Molisch - Wireless Communications John Wiley, 2nd Edition, 2006.
3. Ke-Lin Du, Concordia University, Montréal,M. N. S. Swamy- Wireless Communication Systems.From RF Subsystems to 4G Enabling Technologies. April 2010

Reference Books:

1. Sanjay Kumar, “Wireless Communication the Fundamental and Advanced Concepts” River Publishers, Denmark, 2015
2. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, First Edition, 2005.
3. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.

With effect from AY 2024-25

22ECO05

PRINCIPLES OF EMBEDDED SYSTEMS

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Knowledge about computer Architectures, Microprocessors and Microcontrollers**.**

Course Objectives:
This course aims to:

1. Learn the fundamentals of the embedded system design.
2. Learn architecture details of embedded processors
3. Analyze various embedded applications and debugging tools.

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

1. Understand hardware and software details of embedded system.
2. Analyze the architecture and instruction set of embedded processors.
3. Develop the embedded system design cycle
4. Apply various debugging tools for embedded system applications.
5. Design different case studies for embedded applications.

Course Articulation Matrix

PO/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	PSO3
CO1	3	3	3	2	3	2	-	2	2	-	2	1	1	1
CO2	3	3	3	2	2	2	-	2	2	-	2	1	1	1
CO3	3	3	3	2	3	2	-	2	2	-	2	1	1	1
CO4	3	3	3	2	2	2	-	2	2	-	2	1	1	1
CO5	3	3	3	2	3	2	-	2	2	-	2	1	1	1
CO6	3	3	3	2	3	2	-	2	2	-	2	1	1	1

UNIT-I

Introduction to Embedded systems: Embedded systems vs General computing systems, Classifications, Applications areas, Processor embedded into a system, Processor selection for embedded system, Embedded hardware units and devices in a system, Design metrics and Challenges in embedded system design.

UNIT-II

Embedded Processors: PIC 18 Family Overview, Architecture, Instruction Set, Addressing modes, Timers and Interrupts of PIC 18. Capture/Compare and PWM modules of PIC 18.

UNIT-III

Introduction to advanced processor architectures: ARM design philosophy. ARM data flow model, Register organization, Program Status Register, Pipeline, Introduction to exceptions. ARM instruction set, Introduction ARM cortex series, salient features.

UNIT-IV

Embedded System Design Cycle: Embedded system design and co-design issues in system development process, Design cycle in the development phase for an embedded system. Embedded software development tools: Host and Target machines, Linker/Locators for embedded software, Embedded software into the target system.

UNIT-V

Debugging tools and Applications: Integration and testing of embedded hardware, testing methods, Debugging techniques, Laboratory tools and target hardware debugging: Logic Analyzer, Simulator, Emulator and In-Circuit Emulator, IDE.

Case Studies: Design of Embedded Systems using Microcontrollers – for applications in the area of communications and automotives. (GSM/GPRS, CAN, Zigbee).

Text Books:

1. Raj Kamal, "Embedded Systems-Architecture, Programming and Design," 3/e, Tata McGraw Hill Education, 2015.
2. Andrew N.SLOSS, DomonicSymes Chris Wright "ARM System Developers Guide- Designing and optimizing system software" ELSEVIER 1st Edition2004.
3. Mazidi, MCKinlay and Danny Causey, "PIC Microcontrollers and Embedded Systems", Pearson Education. 2008

Suggested Readings:

1. David E.Simon, "An Embedded software primer", Pearson Education,2004.
2. Steve Furber "ARM System on Chip Architecture" 2/e Pearson education, 2000.

With effect from AY 2024-25

22EGO01

TECHNICAL WRITING SKILLS
(Open Elective -BE/B.Tech - Common to all Branches)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Language proficiency and the ability to simplify complex technical concepts for a diverse audience.

Course Objectives:
The course will introduce the students to:
1. Process of communication and channels of communication in general writing and technical writing in particular.
2. Learn Technical Writing including sentence structure and be able to understand and use technology specific words.
3. Write business letters and technical articles.
4. Write technical reports and technical proposals.
5. Learn to write agenda, record minutes of a meeting, draft memos. Understand how to make technical presentations.

Course Outcomes:
After successful completion of the course students will be able to:
1. Communicate effectively, without barriers and understand aspects of technical communication.
2. Differentiate between general writing and technical writing and write error free sentences using technology specific words.
3. Apply techniques of writing in business correspondence and in writing articles.
4. Draft technical reports and technical proposals.
5. Prepare agenda and minutes of a meeting and demonstrate effective technical presentation skills.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	-	2	1	1	-	1	2	3	3	2	3	1	1	1
CO 2	-	1	-	1	-	-	1	2	2	1	2	-	-	-
CO 3	-	2	-	2	-	1	1	2	3	2	2	1	1	1
CO 4	2	2	1	3	-	2	1	3	3	2	2	1	1	2
CO 5	1	1	1	1	-	1	1	3	3	2	2	1	1	1

Unit - I
Communication – Nature and process.
Channels of Communication – Downward, upward and horizontal communication. Barriers to communication.
Technical Communication – Definition, oral and written communication. Importance and need for Technical communication. Nature of Technical Communication. Aspects and forms of Technical communication. Technical communication Skills – Listening, Speaking, Reading & Writing.

Unit II

Technical Writing – Techniques of writing. Selection of words and phrases in technical writing. Differences between technical writing and general writing. Abstract and specific words. Sentence structure and requisites of sentence construction. Paragraph length and structure.

Unit III

Business correspondence – Sales letters, letters of Quotation, Claim and Adjustment letters.
Technical Articles: Nature and significance, types. Journal articles and Conference papers, elements of technical articles.

Unit IV

Technical Reports: Types, significance, structure, style and writing of reports. Routine reports, Project reports.
Technical Proposals: Definition, types, characteristics, structure and significance.

Unit V

Mechanics of Meetings: Preparation of agenda, participation, chairing and writing minutes of a meeting. Memorandum. Seminars, workshops and conferences.
Technical Presentations: Defining purpose, audience and locale, organizing content, preparing an outline, use of Audio Visual Aids, nuances of delivery, importance of body language and voice dynamics.

Textbooks:

1. Meenakshi Raman & Sangeeta Sharma, "Technical Communications-Principles and Practice", Oxford University Press, Second Edition, 2012.
2. M Ashraf Rizvi, "Effective Technical Communication", Tata McGraw Hill Education Pvt Ltd, 2012.

Suggested Reading:

1. Kavita Tyagi & Padma Misra, "Basic Technical Communication", PHI Learning Pvt Ltd, 2012.
2. R.C Sharma & Krishna Mohan, "Business Correspondence and Report Writing", Tata McGraw Hill, 2003

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc18_mg13/preview
2. https://www.technical-writing-training-and-certification.com/
3. https://academy.whatfix.com/technical-writing-skills

With effect from AY 2024-25

22EGO02

GENDER SENSITIZATION
(Open Elective – II)

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: No specific prerequisite is required.

Course Objectives: This course will introduce the students to:

1. Sensibility regarding issues of gender in contemporary India.
2. A critical perspective on the socialization of men and women.
3. Popular debates on the politics and economics of work while helping them reflect critically on gender violence.

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

1. Understand the difference between "Sex" and "Gender" and be able to explain socially constructed theories of identity.
2. Recognize shifting definitions of "Man" and "Women" in relation to evolving notions of "Masculinity" and "Femininity".
3. Appreciate women's contributions to society historically, culturally and politically.
4. Analyze the contemporary system of privilege and oppressions, with special attention to the ways in which gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality.
5. Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning.

CO-PO/PSO ARTICULATION MATRIX

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	-	1	-	-	2	1	1	-	-	1	1	1	1
CO2	-	-	1	-	-	2	1	1	-	-	1	1	1	1
CO3	-	-	1	-	-	2	2	2	1	1	1	1	1	1
CO4	-	-	1	-	-	3	2	2	1	1	1	1	1	2
CO5	-	-	1	-	-	2	2	3	1	1	1	1	1	2

UNIT I

Understanding Gender:

Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)

Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)

Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT II
Gender and Biology:
Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4) Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10) Two or Many? Struggles with Discrimination.

UNIT III
Gender and Labour:
Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3) "My Mother doesn't Work." "Share the Load."
Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7) Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT IV
Issues of Violence
Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6) Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".
Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8) Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.
Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11) Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT V
Gender: Co - Existence
Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12) Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

Textbook:
1. A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu"Towards a World of Equals: A Bilingual Textbook on Gender"**,** Telugu Akademi, Hyderabad, 2015.

SUGGESTED READINGS:
1. Menon, Nivedita. "Seeing like a Feminist", Zubaan-Penguin Books, New Delhi, 2012.
2. Abdulali Sohaila, "I Fought For My Life…and Won", Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

Web Resources:
1. https://aifs.gov.au/publications/gender-equality-and-violence-against-women/introduction
2. https://theconversation.com/achieving-gender-equality-in-india

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

With effect from AY 2024-25

22CEO01

INFRASTRUCTURE FOR SMART CITIES

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: To enable the students to

1. Comprehend the Necessity of Infrastructural Development for Smart Cities.
2. Illustrate the Components and Planning Aspects of a Smart City.
3. Outline Smart Transportation Systems for Smart Cities.
4. Summarize the Significance of Disaster Resilient Infrastructure in Smart Cities.
5. Review Policies and Implementation of Smart Cities at National and Global Perspectives.

Course Outcomes: At the end of the course, Student will be able to

1. Understand the necessity of infrastructural development for smart cities.
2. Illustrate the components and planning aspects of a smart city.
3. Outline smart transportation systems for smart cities.
4. Summarize the significance of disaster resilient infrastructure in smart cities.
5. Review policies and implementation of smart cities at national and global perspective.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	2	-	-	-	-	1	-	-	-	-	-	2	-	3
CO2	2	-	-	-	-	1	-	-	-	-	-	2	-	3
CO3	2	-	-	-	3	1	-	-	-	-	-	2	-	3
CO4	2	3	-	-	3	1	-	-	-	-	-	2	-	3
CO5	2	-	-	-	-	1	-	-	-	-	3	2	-	3

UNIT I

Fundamental of smart city & Infrastructure: Introduction of Smart City, Concept of smart city, Objective for smart cities. Need to develop smart city, Challenges of managing infrastructure in India and world, various types of Infrastructure systems, Infrastructures need assessment

UNIT II

Planning and development of Smart city Infrastructure: Energy and ecology, solar energy for smart city, Housing, sustainable green building, safety, security, disaster management, economy, cyber security.

UNIT III

Intelligent transport systems: Connected vehicles, autonomous vehicles, GPS, Navigation system, traffic safety management, mobility services, E-ticketing.

UNIT IV

Disaster resilient Infrastructure: Electricity, sanitation and water supply systems, fire hazard management, earthquake resilient structures, ICT tools.

UNIT V

Infrastructure Management: System and Policy for Smart city, integrated infrastructure management systems, worldwide policies for smart city, Government of India - policy for smart city, Smart cities in India, Case studies of smart cities.

Text Books:

1. John S. Pipkin, Mark E. La Gory, Judith R. Balu (Editors); “Remaking the city: Social science perspective on urban design”; State University of New York Press, Albany (ISBN: 0-87395-678-8)
2. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of Regional Science

References:

1. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of Regional Science.
2. Mission statement &guidelines on Smart City Scheme". Government of India - Ministry of Urban Development http://smartcities.gov.in/upload/uploadfiles/files/Smart City Guidelines (1).pdf
3. Grig N.S., Infrastructure engineering and management, Wiley-Interseience, 1988 5. Hudson W.R., Haas R., Uddin W., Infrastructure Management, McGraw-Hill, 1997.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc23_ar12/preview
2. http://acl.digimat.in/nptel/courses/video/105105160/L01.html

With effect from AY 2024-25

22CEO02

DISASTER RISK REDUCTION AND MANAGEMENT

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Course Objectives: To enable the students to

1. To learn about the types, causes, impacts and management concept of disaster.
2. To learn about the disaster management cycle and early warning systems
3. To make the students become aware of stress and trauma management during a disastér.
4. To identify the role of technology and institutional framework behind disaster management in India.
5. To identify the structural and non-structural measures of disaster mitigation and learn about the provisions of Disaster management Act.

Course Outcomes: Upon completion of this course, the student will be able to,

1. Explain the fundamental concepts of disaster management.
2. Demonstrate the principles and practices of disaster risk reduction management.
3. Identify stress and its management during disaster.
4. Outline institutional frame work at different levels of administration.
5. Evaluate disaster management study including data search, analysis and presentation as a case study.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	2	-	-	-	-	3	-	-	-	-	-	1	-	-
CO2	2	-	-	-	-	3	-	-	-	-	-	1	-	-
CO3	2	-	-	-	-	3	-	-	-	-	-	1	-	-
CO4	2	-	-	-	2	3	-	-	-	-	-	1	-	-
CO5	2	-	-	-	-	3	-	-	-	-	-	1	-	-

UNIT I

Fundamental concepts in disaster management: Hazard and disaster-concepts, vulnerability and risk, Hazard and disaster type – Natural, Water- related, pandemic and Human induced hazards disasters. Causes and Impacts of disasters – Impacts on natural eco systems: physical, psychological and social impact. Disaster and financial resilience. Disaster vulnerability profile of India –Specific to geographical regions and states (as per regional significance)

UNIT II

Disaster Management Cycle: Rescue, Relief, Rehabilitation, Prevention, Mitigation and Preparedness. Disaster risk reduction (DRR). Community based DRR, institutions concerned with safety, disaster mitigation and construction techniques as per Indian standards and Early warning systems

UNIT III

Disaster Impacts Management: Trauma and stress management, First aid and emergency procedures Awareness generation strategies for the community on safe practices in disaster (as per regional significance)

UNIT IV

Institutional framework of disaster management in India: NDMA-SDMA, NDRF, civic volunteers, and NIDM. Phases of disaster/risk management and post-disaster responses. Compensation and insurance Applications of remote sensing & GIS in disaster management. Components of disaster management. Preparedness of rescue and relief, mitigation, rehabilitation & reconstruction. Institutional frame work of disaster management in India

UNIT V

Capacity building for disaster/damage mitigation: Structural and Nonstructural measures forcapacity building for disaster/damage mitigation. Disaster risk reduction strategies and national disaster management guidelines. Disaster management Act -2005. Regional issues as per regional requirement/university can take minimum two topics as per high powered committee

Text Books:

1. Singh, R. (2017), "Disaster management Guidelines for Earth quakes, Landslides, Avalanches andTsunami". Horizon Press publications.
2. Taimpo (2016), "Disaster management and preparedness". CRC Press Publications

Suggested Reading:

1. Nidhi, G.D. (2014), "Disaster management preparedness" .CBS Publications Pvt. Ltd.
2. Gupta, A.K.,Nair, S.S., Shiraz, A. and Dey, S. (2013), "Flood Disaster Risk Management-CBS Publications Pvt Ltd.
3. Singh, R. (2016), "Disaster management Guidelines for Natural Disasters" Oxford University PressPvt. Ltd

Web Resources:

1. https://nptel.ac.in/courses/124107010
2. https://onlinecourses.swayam2.ac.in/cec19_hs20/preview

With effect from AY 2024-25

22EEO01

ENERGY MANAGEMENT SYSTEM

(Open Elective)

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: None.

Course Objectives: This course aims to

1. Know the concept of Energy Management.
2. Understand the formulation of efficiency for various Engineering Systems
3. Enable the students to develop managerial skills to assess feasibility of alternative approaches and drive strategies regarding Energy Management

Course Outcomes: After the completion of this course, the student will be able to

1. Know the current Energy Scenario and importance of Energy Conservation.
2. Understand the concepts of Energy Management, Energy Auditing.
3. Interpret the Energy Management methodology, Energy security and Energy Strategy.
4. Identify the importance of Energy Efficiency for Engineers and explore the methods of improving Energy Efficiency in mechanical systems, Electrical Engineering systems
5. Illustrate the Energy Efficient Technologies in Civil and Chemical engineering systems

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	1	-	-	1	-	2	1	-	-	-	1	-	-	-
CO 2	2	1	1	1	-	2	1	-	-	-	1	-	-	-
CO 3	2	2	2	1	-	2	1	-	-	-	1	1	2	1
CO 4	2	2	1	2	2	2	1	-	-	-	1	1	2	1
CO 5	1	1	2	1	1	2	2	-	-	-	1	1	2	1

Unit –I

Various forms of Energy and its features: Electricity generation methods using different energy sources such as Solar energy, wind energy, Bio-mass energy, and Chemical energy such as fuel cells. Energy Scenario in India, Impact of Energy on economy, development, and environment sectors of national and international perspective.

Unit –II

Energy Management-I: Defining Energy Management, need for Energy Management, Energy management techniques, importance of Energy Management, managing the Energy consumption, Energy Audit and Types, Energy Audit Instruments.

Unit –III

Energy Management-II: understanding Energy costs, bench marking, Energy performance, matching energy use to requirement, optimizing the input, fuel & Energy substitution, material and Energy balance diagrams, Energy pricing, Energy and Environment, Energy Security

Unit –IV

Energy Efficient Technologies-I: Importance of Energy Efficiency for Engineers, Energy Efficient Technology in Mechanical engineering: Compressed Air System, Heating, ventilation and air-conditioning, Fans and blowers, Pumps and Pumping Systems.

Energy Efficient Technology in Electrical engineering: Automatic Power Factor Controllers, Energy Efficient Motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, space cooling, energy efficiency of lifts and escalator, energy saving potential of each technology.

Unit –V

Energy Efficient Technologies-II: Energy Efficient Technology in Civil Engineering: Intelligent Buildings, And Various Energy Efficiency Rating Systems for Buildings, Green Buildings Energy Efficiency: management of green buildings, importance of embodied energy in selection of sustainable materials, green building design, waste reduction/recycling, rainwater harvesting, maintenance of the green buildings, green building certification, Renewable energy applications.

Energy Efficient Technology in Chemical Engineering: Green chemistry, Low carbon cements, recycling paper.

Text Books:

1. Umesh Rathore, 'Energy Management', Kataria publications, 2nd ediiton, 2014.
2. G Hariharaiyer, “Green Building Fundamentals”, Notion press.com
3. K V Shama, P Venkataseshaiah, "Energy management and conservation", I. K. International Publishing agency pvt. ltd., 2011, ISBN: 978-93-81141-29-8.

Suggested Reading:

1. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects
2. Hargroves, K., Gockowiak, K., Wilson, K., Lawry, N., and Desha, C. (2014) An Overview of Energy Efficiency Opportunities in Mechanical/civil/electrical/chemical Engineering, The University of Adelaide and Queensland Universityof Technology.
3. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

With effect from AY 2024-25

22EEO06

WASTE MANAGEMENT

(Open Elective)

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: None.

Course Objectives: This course aims to

1. Provide the concept of effective utilization of any scrap
2. Dispense the processes of all disciplines of engineering.
3. Impart the technique of connectivity from waste to utility.

Course Outcomes: After the completion of this course, the student will be able to

1. Categorize the waste based on the physical and chemical properties.
2. Explain the hazardous waste management and treatment process.
3. Illustrate the environmental risk assessment, methods, mitigation and control.
4. Interpret the biological treatment of solid and hazardous waste.
5. Identify the waste disposal options; describe the design and construction, operation, monitoring, closure of landfills.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	1	2	-	-	2	-	-	-	-	1	-	-	-
CO 2	2	1	2	-	-	2	-	-	-	-	1	-	-	-
CO 3	2	1	3	-	-	2	-	-	-	-	1	1	1	1
CO 4	2	3	3	-	-	2	-	-	-	-	1	1	1	1
CO 5	2	3	3	-	-	2	-	-	-	-	1	1	1	1

Unit –I

Introduction to Waste Management and Municipal Solid Waste Management: Classification of waste: Agro based, Forest residue, Industrial waste, e-Waste, Municipal Solid Waste Management: Fundamentals Sources, composition, Generation rates, Collection of waste, Separation, Transfer and Transport of waste, Treatment and Disposal options.

Unit –II

Hazardous Waste Management and Treatment: Hazardous Waste Identification and Classification, Hazardous Waste Management: Generation, Storage and collection, Transfer and transport, Processing, Disposal, Hazardous Waste Treatment: Physical and Chemical treatment, Thermal treatment, Biological treatment, Pollution Prevention and Waste Minimisation, Hazardous Wastes Management in India.

Unit –III

Environmental Risk Assessment: Defining risk and environmental risk, Parameters for toxicity quantification, Types of exposure, Biomagnifications, Effects of exposure to toxic chemicals, Risk analysis and Risk matrix, Methods of risk assessment, Mitigation and control of the risk, Case studies.

Unit –IV

Biological Treatment: Solid and Hazardous Waste Composting, Bioreactors, Anaerobic decomposition of solid waste, Principles of biodegradation of toxic waste, Inhibition, Co-Metabolism, Oxidative and Reductive processes, Slurry phase Bioreactor, In-situ-remediation.

Unit –V

Waste Disposal: Key Issues in Waste Disposal, Disposal Options and Selection Criteria: Disposal options, Selection criteria, Sanitary Landfill: Principle, Landfill processes, Landfill Gas Emission: Composition and properties, Hazards, Migration, Control, Leach ate Formation: Composition and properties. Leach ate migration, Control, Treatment, Environmental Effects of Landfill, Landfill Operation Issues, Design and construction, Operation, Monitoring, Closure of Landfills-Landfill Remediation, National and International Waste Management programs.

Text Books:

1. John Pichtel, Waste Management Practices CRC Press, Taylor and Francis Group 2005.
2. LaGrega, M.D.Buckingham, P.L. and Evans, J.C. Hazardous Waste Management, McGraw Hill International Editions, NewYork, 1994
3. Richard J. Watts, Hazardous Wastes - Sources, Pathways, Receptors John Wiley and Sons, NewYork, 1997.

Suggested Reading:

1. Basics of Solid and Hazardous Waste Mgmt. Tech. by KantiL.Shah 1999, Prentice Hall.
2. Solid and Hazardous Waste Management 2007 by S.C.Bhatia Atlantic Publishers & Dist.

With effect from AY 2024-25

22BTO05

COGNITIVE NEUROSCIENCE
(Open Elective)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: The school level basic knowledge in Fundamental science is required

Course Objectives: The main objectives of this course are to:

1. Understanding the brain effects that give rise to our abilities to perceive, act and think
2. Gain skills on the way that cognition is associated with neural activity
3. Compare and contrast the organization and function of numerous systems within the brain

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

1. Gain familiarity and basic knowledge about brain systems and functions.
2. Understand brain's neuro-transimitter system.
3. Understanding the brain's methods gives rise to behaviour whether we engage in any activity (e.g., walking, talking, etc.).
4. Identify the patterns of varied activities in neurons that correspond to a person's attempts to move in particular ways.
5. Understand the feedback system and brain disorders.

Mapping of Course Outcomes with Program Outcomes:

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	1	0	2	0	0	2	0	3	1	2	1
CO 2	1	1	1	1	0	2	0	0	2	0	3	1	-	1
CO 3	1	1	1	1	0	2	0	0	2	0	3	1	1	1
CO 4	1	2	2	3	3	3	3	1	3	0	3	1	1	1
CO 5	1	1	2	3	3	3	3	1	3	0	3	1	1	1

UNIT-I

Introduction to neuroscience: Outline of neuroanatomical; Neurogenesis, migration Axon path-finding; cell death; Role of neural activity in development; Membranes and membrane potentials.

UNIT-II

Action potential: Conductance mechanisms; Chemical and electrical transmission; Postsynaptic potentials; neural integration; Energy consumption in the brain; Attention; Methods jigsaw; Executive Control; Evolution/development; Sheep's brain dissection.

UNIT-III

Neurotransmitter systems: Visual information processing; Visual cortex; Visual plasticity; critical periods; Somatosensory system; Pain; Chemoreception; Auditory system; Spinal mechanisms; Brain mechanisms.

UNIT-IV

Human and Animal Memory: Pattern completion and separation; LTP and synapses; Spatial cognition; Social cognition; Cellular mechanisms of neural plasticity.

UNIT-V

Feedback System and Brain Disorders: Endocrine systems; feeding behaviour, Stress, Addiction, Depression, Schizophrenia, Alzheimer's, Huntington's disease, Parkinson's disease.

Text books:

1. Principles of Neural Science, 6th Edition (2021) Eric R. Kandel, James Harris Schwartz, Thomas M. Jessell, McGraw Hill.
2. Principles of Cognitive Neuroscience, 2nd Edition (2013) Dale Purves, Roberto Cabeza, Scott A. Huettel, Kevin S. LaBar, Michael L. Platt, and Marty G. Woldorff. Sinauer Associates, Inc.
3. Mark Bear, Brian Connors, and Michael Paradiso (2007) Neuroscience: Exploring the Brain. 3rd ed. Baltimore: Lippincott, Williams & Wilkins.

With effect from AY 2024-25

22CHO02

FUNDAMENTALS OF NANO SCIENCE AND NANO TECHNOLOGY
(Open Elective)

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives This course aims to give some understanding on

1. The introduction and classification of nanoscience and nanomaterials
2. Explain the unique properties of nanomaterials.
3. The various synthesis routes of nanomaterials
4. The tools required for the characterization of nanomaterials.
5. The applications of nanomaterials.

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

1. Explain the types of nanomaterials and classify them.
2. Understand various defects, and the effect of nano dimensions on the material behavior.
3. Discuss the bottom up and top-down synthesis of nanomaterials.
4. Explain the characterization of nanomaterials using various techniques.
5. Enlist and explain various applications of nanomaterials in diversified fields and areas.

CO-PO-PSO Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	1	1	-	-	1	-	-	-	-	2	1	2	1
CO 2	2	1	1	-	-	1	-	-	-	-	2	1	-	1
CO 3	2	1	1	-	-	1	-	-	-	-	2	1	1	1
CO 4	2	1	1	-	-	1	-	-	-	-	2	1	1	1
CO 5	2	1	1	-	-	1	-	-	-	-	2	1	1	1

Unit I: Introduction
History and scope, classification of nanostructured materials, Fascinating nanostructures, applications of nanomaterials

Unit II: Unique properties of nanomaterials
Microstructure and defects in nanocrystalline materials – dislocations, Twins, stacking faults and voids, Grain boundaries, triple junctions and disclinations. Effect of nano-dimensions on materials behavior – Elastic properties, magnetic properties, electrical properties, optical properties, thermal properties, and mechanical properties.

Unit III: Synthesis Routes
Bottom-up approaches – PVD, CVD, sol-gel process, wet chemical synthesis and self-assembly.
Top-down approaches – mechanical alloying, nanolithography.

Unit IV: Tools to Characterize Nanomaterials
Scanning electron microscopy, transmission electron microscopy, x-ray diffraction, atomic force microscopy, nanoindentation

Unit V: Applications of Nanomaterials
Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nano sensors, Nano catalyst, Food and Agriculture Industry, Cosmetics and Consumer Goods, Structure and Engineering,

Automotive Industry, Water Treatment and the Environment, Nano-medical Applications, Textiles, Paints, Energy, Defense and Space Applications.

Textbooks:

1. Murty BS, Shankar P, Baldev Raj, Rath BB, James Murday. Textbook of Nanoscience and Nanotechnology. Bangalore: Springer; 2013.
2. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wiley India Edition, 2012.

Suggested Readings:

1. Nano: The Essentials by T. Pradeep, Mc Graw- Hill Education.
2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira, and Daniel L. Schodek
3. Transport in Nano structures- David Ferry, Cambridge University press 2000.
4. Nanofabrication towards biomedical application: Techniques, tools, Application, and impact – Ed. Challa S., S. R. Kumar, J. H. Carola.
5. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
6. Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University press.

Online Resources:

1. Nanotechnology, Science and Applications by Prof. Prathap Haridoss, IIT Madras https://onlinecourses.nptel.ac.in/noc22_mm33/preview
2. Introduction to Nanoscience and Nanotechnology, Prof. Dr. Swapna Nair, Central University of Kerala

   https://onlinecourses.swayam2.ac.in/cec24_cy03/preview

With effect from AY 2024-25

22CHO03

INDUSTRIAL POLLUTION CONTROL
(Open Elective)

Instruction	3 Hours per week
Duration of SEE	3 Hrs
CIE	40 Marks
SEE	60 Marks
Credits	3

Course Objectives: This course will help the students to understand the:

1. Effects of pollution on environment and ecosystems
2. Types and sources of pollution
3. Measurement of air and water pollution
4. Different methods and equipment used in pollution abatement
5. Management practices in solid and hazardous wastes.

Course Outcomes: After the completion of this course, students will be able to

1. Differentiate the types of wastes generated in an industry, their effects on living and non-living things
2. Understand the effect of climate changes, atmospheric dispersion of air pollutants, and operating principles.
3. Understand working principles of particulate control devices.
4. Quantify wastewater and Assess treatment technologies for wastewater
5. Select treatment methodologies for hazardous and E-waste

CO-PO-PSO Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	1	1	1	1	2	1	1	1	1	2	1	2	1
CO 2	2	2	2	2	1	2	1	1	1	1	2	1	-	2
CO 3	2	2	1	1	1	2	1	1	1	1	2	2	1	1
CO 4	2	1	2	1	1	3	1	1	1	1	2	1	1	1
CO 5	2	2	2	2	1	3	1	1	1	1	2	2	1	1

UNIT- I: Introduction

Definition and types of pollution. Effects of pollution on environment and ecosystems - global warming - greenhouse effect. Laws and standards for pollution. Sources, types, characteristics and effects of air pollutants, liquid effluents, solid wastes industries.

UNIT- II: Air Pollution

Meteorological aspects of pollution dispersion, Temperature lapse rates, Turbulence and stability of atmosphere. Indoor air pollution - smoke and hydrocarbons. Richardson Number, Plume raise, plume behavior and characteristics, effective stack height.

UNIT III: **Air Pollution General Control Methods and Equipment:**

Removal of sulphur dioxide, oxides of nitrogen and carbon, organic vapors from gaseous effluents. Removal of particulate matter - principle and working of settling chambers cyclone separators solid traps, fabric and fiber filters, electro-static precipitators.

UNIT IV: Introduction to water pollution –Origin of wastewater, types of water pollutants and their effects., Determination of organic matter, Determination of inorganic substances, Physical characteristics, Bacteriological measurement, Zero liquid discharge, wastewater treatment methods – RO, UF, Grey water recycling.

UNIT –V: Solid and Hazardous Waste

Solid waste management: Sources and classification, Public health aspects, Methods of collection, Disposal Methods,. Hazardous waste management: Definition and sources, Hazardous waste classification, Treatment methods, Disposal methods. E-waste: Sources, environmental and social issues, management practices.

Text Books

1. C.S.Rao, "Environmental Pollution Control Engineering", 3rd Ed, New Age International, 2018.
2. S.C. Bhatia, " Solid And Hazardous Waste Management ", Atlantic Publishers, 2021

Suggested Reading:

1. Metcalf and Eddy, "Wastewater Engineering: Treatment and Reuse", 4th Ed, MGH publishing, 2004.
2. M.N Rao and H.V.N Rao, "Air Pollution", Tata McGraw- Hill Publishing Company Limited, New Delhi, 2000.
3. Lakshmi Raghupathy**, "**Introduction to E-Waste Management" TERI Press,
4. Peavy, H.S., Rowe, D.R. and Technobanolous, G., "Environmental Engineering", McGraw Hill, 1985.

Online resources:

1. Basic Environmental Engineering and Pollution Abatement

2 . https://archive.nptel.ac.in/courses/103/107/103107215/

With effect from AY 2024-25

22CH O04

ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT

(Open Elective)

Instruction	3L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Course Objectives: This course will help the students:

1. To have an increased awareness on issues in areas of sustainability
2. To understand the role of engineering & technology within sustainable development
3. To know the methods, tools and incentives for sustainable product service system development
4. To establish a clear understanding of the role and impact of various aspects of engineering decisions on environmental, societal and economic problems.
5. To communicate results related to their research on sustainable engineering

Course Outcomes: At the completion of this course, students will be able to:

1. Understand the concept of sustainable engineering and its significance in addressing contemporary environmental challenges.
2. Explore the 4R concept of solid waste management and examine various tools and methodologies to assess and mitigate the environmental impacts of engineering activities.
3. To be aware of the principles and requirements of environmental management standards and their application in promoting environmental sustainability.
4. Analyze the challenges and opportunities associated with promoting sustainable habitats such as sustainable cities, sustainable transport, sustainable sources of energy conventional and sustainable materials for green buildings
5. Understand and evaluate the industrial processes through the principles of industrial ecology and industrial symbiosis.

CO-PO-PSO Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	1	3	1	1	3	2	1	1	1	3	1	2	1
CO 2	2	2	3	2	1	3	2	1	1	1	3	1	-	1
CO 3	2	1	3	1	2	3	2	1	2	1	3	2	1	1
CO 4	3	1	3	3	1	3	2	2	1	1	3	1	1	1
CO 5	3	3	3	1	2	3	2	1	1	2	3	1	1	1

UNIT I

Introduction of sustainability- Need and concept of Sustainable Engineering, Social-environmental and economic sustainability concepts, Sustainable development and challenges, Sustainable Development Goals, Environmental acts and protocols – Clean Development Mechanism (CDM).

UNIT II

Economic and social factors affecting sustainability, Effects of pollution from natural sources, Solid waste-sources, impacts, 4R (Reduce, Reuse, Recycling, Recover) concept, Ozone layer depletion, Global warming, Tools used to ensure sustainability in engineering activities such as environmental management systems and environmental impact assessment studies.

UNIT III

Global, Regional and Local environmental issues, Carbon credits and Carbon trading, Carbon foot print, Environmental management standards, ISO 14000 series, Life cycle Analysis (LCA)-scope and goal, Procedures of EIA (Environment Impact Assessment) in India.

UNIT IV

Basic concept of sustainable habitat-Sustainable cities, Sustainable transport, Sustainable sources of energy conventional and renewable sources, Green Engineering: Green buildings, Green materials for sustainable design, Methods for increasing energy efficiencies of buildings**.**

UNIT V

Technology and sustainable development, Sustainable urbanization, Industrialization and poverty reduction, Social and Technological change, Industrial processes-material selection, Pollution prevention, Industrial ecology, Industrial symbiosis.

Text book:

1. Rag R. L., Introduction to Sustainable Engineering, 2nd Ed, PHI Learning Pvt Ltd, 2016.
2. Allen D. T and Shonnard D. R., Sustainability Engineering Concepts, Design and Case Studies, 1 st Ed, Prentice Hall, 2011.

Suggested Reading

1. Bradley A. S, Adebayo A. O and Maria. P., Engineering Applications in Sustainable Design and Development, 1st Ed, Cengage Learning, 2016.
2. Krishna R. Reddy, Claudio Cameselle, Jeffrey A. Adams., Sustainable Engineering,1st Ed, Wiley, 2019.

Online resources:

1. Sustainable Engineering concepts and Life cycle analysis
   https://archive.nptel.ac.in/courses/105/105/105105157/
2. Sustainable Energy Technology
   https://onlinecourses.nptel.ac.in/noc23_me138/preview

With effect from AY 2024-25

22MEO02

3D PRINTING

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: Nil

Course Objectives

This course aims to

1. Make students understand the basic concept of digital manufacturing.
2. Teach different processes involved in digital fabrication of products.
3. Demonstrate the STL file generation and manipulations.
4. Demonstrate various post processing techniques.
5. Demonstrate the applications of RP in different fields of engineering

Course Outcomes

Upon completion of this course, students will be able to

1. Understand the concept of 3D printing processes, advantages, and limitations.
2. Evaluate real-life scenarios and recommend the appropriate 3D printing technology.
3. Analyze various pre-processing and post processing techniques.
4. Identify components and construct basic 3D printer.
5. Explain current and emerging 3D printing technologies in diversified applications

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	1	1	-	3	1	2	-	2	1	2	1	2	1
CO 2	2	2	3	2	2	3	2	2	2	2	2	1	-	1
CO 3	2	1	1	2	2	2	2	1	1	1	1	2	1	1
CO 4	2	2	2	1	2	1	2	2	2	2	2	1	1	1
CO 5	2	1	2	1	1	2	2	-	1	-	1	1	1	1

Unit –I

Introduction to 3D Printing: Introduction to 3D printing, evolution, distinction between 3D printing and CNC machining. Design considerations: Materials, size, resolution, mass customization. additive vs. subtractive manufacturing, its advantages and limitations.

Unit –II

Photo polymerization processes: Photo polymerization, Stereolithography Apparatus (SLA), Applications, advantages and disadvantages. **Powder bed fusion processes:** Introduction, Selective laser Sintering (SLS), Materials, Applications, advantage and disadvantages. **Extrusionbased systems:** Fused deposition modeling (FDM), principles, Materials, Process Benefits and Drawbacks. **Laminated Object Manufacturing (LOM),** Principles, Materials, Process Benefits and Drawbacks. **Material Jetting AM Processes**: Evolution of Printing as an Additive Manufacturing Process, Materials, Process Benefits and Drawbacks, Applications of Material Jetting Process.

Unit –III

Pre processing in AM: Modeling and viewing 3D scanning; Model preparation – STL conversion, STL error diagnostics, STL file Repairs, generic solution, slicing, newly proposed file formats.

Post processing in AM: Support material removal, surface texture improvement, accuracy improvement, aesthetic improvement, preparation for use as a pattern, property enhancements using non thermal and thermal techniques.

Unit –IV

Construction of basic 3D printer: Construction of 3D printing machine – axes, linear motion guide ways, ball screws, motors, bearings, encoders, process chamber, safety interlocks, sensors.

Unit –V

Applications of AM: Application in construction and architectural engineering, aerospace industry, automotive industry, jewelry industry, coin industry. medical and bioengineering applications: planning and simulation of complex surgery, forensic science.

Text Books:

1. Gibson, DW. Rosen and B.Stucker; Additive manufacturing methodologies: Rapid prototyping to direct digital manufacturing, Springer, 2010.
2. Chee Kai Chua, Kah Fai Leong, 3D printing and additive manufacturing: principles and application, 4 th edition of rapid prototyping, World scientific publishing company, 2014.
3. P.K. Venuvinod, Rapid prototyping – Laser based and other technologies, Kluwer, 2004.

Suggested Reading:

1. Jacob, Paul, Rapid tooling: Technologies and industrial applications, Taylor & Francis Group, 2000.
2. Alain Bernard, Georges Taillandier, Additive Manufacturing, Wiley, 2014

With effect from AY 2024-25

22MEO03

CORPORATE ORGANIZATIONAL BEHAVIOR

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: Nil

Course Objectives

This course aims to

1. Define the basic corporate organizational behaviour principles and analyze how these influence behaviour in the work place.
2. Provide knowledge on different organizational structures; and concepts of culture, climate and organizational development and make the students familiarize with individual behavior.
3. Discuss the theories of Motivation and Leadership.
4. Describe the interpersonal and their intrapersonal reactions within the context of the group and also demonstrate effective communication and decision making skills in small group settings
5. Describe the basic concepts of Power, Politics, Conflict and Negotiations.

Course Outcomes

Upon completion of this course, students will be able to

1. Understand the Corporate Organizational Behaviour principles and practices.
2. Compare the various corporate organizational designs and structures enabling organizational development.
3. Apply motivational theories and leadership styles in resolving employee_s problems and decision making processes.
4. Analyze the behaviour, perception and personality of individuals and groups in organizations in terms of the key factors that influence organizational behavior.
5. Understand the aspects of power, politics, and apply the skills needed to resolve organizational conflicts.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	1	2	1	1	1	1	1	1	1	1	1	2	1
CO 2	3	2	3	2	2	1	1	1	-	1	2	1	-	1
CO 3	3	2	2	3	2	-	-	2	-	-	2	2	1	1
CO 4	3	2	3	2	2	-	-	1	-	2	3	1	1	1
CO 5	3	2	2	1	2	-	-	1	-	-	1	1	1	1

Unit –I

Introduction: Organizational Behaviour, Nature and Levels of Organizational Behaviour, Role of Individuals in an Organization, Individual Differences: Personality and Ability, The Big Five Personality Traits, Perception and the Nature of Perception, Characteristics of the Perceiver, Target and Situation, Perceptual Problems.

Unit –II

Organization Structure: Organizational Designs and Structures, Traditional and Contemporary

Organizational Designs, Corporate Organization: Definition and Structure, Organizational Culture and Ethical Behaviour, Creating an Ethical Culture, Organization Change and Development.

Unit –III

Motivation and Leadership: Motivation, Nature of Motivation, Motivation Process, Early and Contemporary Theories of Motivation, Leadership: Importance and Functions, Early and Contemporary Approaches to Leadership.

Unit –IV

Group Dynamics: Groups and Interpersonal Dynamics, Nature of Groups, Types of Groups, Stages of Group Development, Turning Groups into Effective Teams, **Communication**: The Nature and Importance of Communication in Organizations, Communication Process, Barriers to Communication, Overcoming Barriers to Effective Communication.

Unit –V

Power, Politics, Conflict and Negotiations: Power: The Nature and Types of Power, Sources of Individual, Functional and Divisional Power, Politics and Political Behaviour, Managing Political Behaviour, Organizational Conflict: Nature, Common Forms and Causes of Conflict, Pondy_s model of organizational conflict, Conflict Resolution Strategies, Negotiations in Organizations.

Text Books:

1. Jennifer George and Gareth Jones, Understanding and Managing Organizational Behaviour, Pearson Education Inc., 2012.
2. Jon L Pierce and Donald G. Gardner, Management and Organizational behaviour, Cengage Learning India (P) Limited, 2001.
3. Richard Pettinger, Organizational Behaviour, Routledge, 2010

Suggested Reading:

1. Stephen P. Robbins, Jennifer George and Gareth Jones, Management and Organizational Behaviour, Pearson Education Inc., 2009.
2. John Schermerhorn, Jr., James G. Hunt and Richard N. Osborn, Organizational Behaviour, 10th edition, Wiley India Edition, 2009.

With effect from AY 2024-25

22MEO05

RESEARCH METHODOLOGIES AND INNOVATION

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: Nil

Course Objectives

This course aims to

1. Make the students to formulate the research problem
2. Identify various sources for literature review and data collection.
3. Prepare the research design
4. Equip the students with good methods to analyze the collected data
5. Introduce students to the concepts of innovation

Course Outcomes

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

1. Define research problem
2. Review and assess the quality of literature from various sources.
3. Understand and develop various research designs.
4. Collect and analyze the data using statistical techniques.
5. Apply creative thinking and innovative skills.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	1	2	1	1	-	1	-	1	2	2	2	1	2	1
CO 2	-	2	1	2	1	1	1	1	3	2	2	1	-	1
CO 3	1	2	3	2	2	1	-	1	2	-	1	2	1	1
CO 4	2	2	-	3	2	-	-	-	2	1	1	1	1	2
CO 5	1	2	3	2	2	1	-	1	2	-	1	2	1	1

Unit –I

Research Methodology: Objectives, Motivation and Significance of Research, Types of Research, Research Methods verses Methodology, Research process, Criteria of Good Research, Problems Encountered by Researchers in India, Technique involved in defining a problem.

Unit –II

Literature Survey: Importance of Literature Survey, Sources of Information Primary, Secondary and tertiary, Assessment of Quality of Journals and Articles, Information through Internet

Research writing: Format of the Research report, Writing a Synopsis, Dissertation, Research Proposal and Research Report

Unit –III

Research Design: Meaning and Need of Research Design, Terminology used in Research Design, Features of a Good Research Design, Formulation of hypothesis, Operationalizing the research question, Different Research Designs – exploratory, descriptive, diagnostic and hypothesistesting research studies, Basic Principles of Experimental Design, Steps in Sample design

Unit –IV

Data Collection and Analysis: Collection of primary dataObservation, Interview and Questionnaire methods, Secondary data, Measures of central tendency, Measures of dispersion, Measures of asymmetry, Important parametric testsz, t, F, ChiSquare, ANOVA significance.

Unit –V

Innovation: Creativity, Innovation and its difference, Blocks for creativity and innovation, overcoming obstacles, Examples of innovation, Being innovative, Steps for Innovation, right climate for innovation, Design led innovation, Gross root innovation, Frugal and flexible approach to innovation.

Text Books:

1. C.R Kothari, ―Research Methodology Methods & Technique‖, New Age International Publishers, 2004.
2. R. Ganesan, ―Research Methodology for Engineers‖, MJP Publishers, 2011
3. The Art of Innovation, Tom Kelley & Jonathan Littman, Profile Books Ltd, UK, 2008

Suggested Reading:

1. Vijay Upagade and Aravind Shende, ―Research Methodology‖, S. Chand & Company Ltd., New Delhi, 2009.
2. G. Nageswara Rao, ―Research Methodology and Quantitative methods‖, BS Publications, Hyderabad, 2012.
3. JUGAAD Innovation, Navi Radjou, Jaideep Prabhu, Simone Ahuja Random house India, Noida, 2012.

Online Resources:

1. https://archive.nptel.ac.in/courses/127/106/127106227/
2. https://archive.nptel.ac.in/courses/107/101/107101088/

With effect from AY 2024-25

22MEO06

PRINCIPLES OF ENTREPRENEURSHIP AND STARTUPS
(Open Elective-I)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Nil

Course Objectives: This course aims to:
1. Impart basic concepts and procedure of idea generation.
2. Familiarize the nature of industry and related opportunities and challenges.
3. Familiarize with elements of business plan and its procedure.
4. Learn the project management and its techniques.
5. Know the behavioral issues and time management.

Course Outcomes: Upon completion of this course, the students will be able to:
1. Understand the concept and essence of entrepreneurship.
2. Identify business opportunities and nature of enterprise.
3. Analyze the feasibility of new business plan.
4. Apply project management techniques like PERT and CPM for effective planning and execution of projects.
5. Use behavioral, leadership and time management aspects in entrepreneurial journey.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	1	-	1	1	1	2	2	1	1	1	1	1	2	1
CO 2	1	1	1	1	1	2	2	2	2	3	1	1	-	1
CO 3	1	1	1	2	2	2	2	2	2	3	1	2	1	1
CO 4	2	1	1	2	2	2	2	1	2	3	1	1	1	2
CO 5	1	-	1	1	1	-	2	1	1	1	1	2	1	1

UNIT - I

Entrepreneurship: Definition, Characteristics of an Entrepreneur, Functions of Entrepreneurs, Entrepreneur vs. Intrapreneur, First Generation Entrepreneur, Women Entrepreneurship, Ideas and their Sources, Conception and Evaluation of Ideas.

Behavioral Aspects of Entrepreneurs: Personality: Determinants, Attributes and Models, Leadership: Concepts and Models, Values and Attitudes, Motivation Aspects.

UNIT - II

Indian Industrial Environment: Competence, Opportunities and Challenges, Entrepreneurship and Economic Growth, Small Scale Industry in India, objectives, Linkage among Small, Medium and Heavy Industries, Types of Enterprises, Corporate Social Responsibility.

UNIT - III

Business Plan: Introduction, Elements of Business Plan and its salient features, Business Model Canvas, Technical Analysis, Profitability and Financial Analysis, Marketing Analysis, Feasibility Studies, Executive Summary.

UNIT - IV

Project Management: During construction phase, project organization, project planning and control using CPM, PERT techniques, human aspects of project management.

Time Management: Approaches of Time Management, their strengths and weaknesses. Time Management Matrix, Urgency Addiction.

UNIT - V

Startup: Definition, Startup Ecosystem, Startup Incubator, Need and Importance of Startups and Incubation Centers. Sources of Finance and Incentives for Startups. Innovation, Creativity, Intellectual Property in Entrepreneurial Journey. Business firm Registration Process in INDIA.

Text Books:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "Project-Planning, Analysis, Selection, Implementation and Review", Tata Mcgraw-Hill Publishing Company Ltd, 1995.
3. S.S. Khanka, "Entrepreneurial Development", S. Chand & Co. Pvt. Ltd., New Delhi, 2015.

Suggested Reading:

1. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", 5th edition, Tata Mc Graw Hill Publishing Company. Ltd., 2005.
2. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster Publication, 1994.

With effect from AY 2024-25

22MEO01

PRINCIPLES OF DESIGN THINKING

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite: Nil

COURSE OBJECTIVES: This course aims to

1. Create awareness of design thinking approaches
2. Identify a systematic approach for defining/identifying a problem
3. Create design thinking teams and conduct design thinking sessions collaboratively
4. Apply both critical thinking and design thinking in parallel to solve problems
5. Motivate to apply design thinking concepts to their real life scenarios

COURSE OUTCOMES: After the completion of this course, the student will be able upon completion of this course, the students are able to

1. Understand design thinking and its phases as a tool of innovation
2. Empathize on the needs of the users
3. Define the problems for stimulating ideation
4. Ideate on problems to propose solutions by working as a design thinking team
5. Prototype and test the proposed solutions focusing on local or global societal problems

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	1	1	1	1	1	2	2	2	2	2	2	1	2	1
CO 2	1	1	2	1	2	2	2	1	2	2	2	2	2	1
CO 3	1	1	2	2	1	2	2	1	2	2	1	2	1	1
CO 4	2	1	2	2	1	2	2	1	2	2	2	1	1	2
CO 5	2	1	2	2	1	2	2	1	2	2	2	1	1	2

UNIT – I

Introduction to Engineering & Thinking: Engineering for social and economic development; impact of science/engineering. Thinking and behaviour; Types of thinking – Linear thinking, lateral thinking, systems thinking, design thinking.

Introduction to Design Thinking: Importance of Design Thinking & Human centric approach – Phases in design thinking process, five-stage model as iterative method, applications of design thinking in various domains.

UNIT – II

Empathize phase: Understanding the unique needs of the user, empathize with the users, steps in empathize

phase, developing empathy towards people, assuming a beginner's mind-set (what? why?), steps in immersion activity, body storming; Case studies.

UNIT – III

Define phase: Define the problem and interpret the result, analysis and synthesis, Personas – Four different perspectives on Personas, steps to creating personas, problem statement, affinity diagrams, empathy mapping; Point of View – "How might we" questions, Why-how laddering; Case studies.

UNIT – IV

Ideation phase: What is ideation, need, uses, ideation methods; Brainstorming, rules for brainstorming; Mind maps, guidelines to create mind maps; Ideation games; Six Thinking Hats; Doodling, use of doodling in expressing creative ideas; Case studies.

UNIT – V

Prototyping phase: Types of prototyping, guidelines for prototyping, storytelling, characteristics of good stories, reaching users through stories, importance of prototyping in design thinking; Value proposition, guidelines to write value proposition; Case studies.

Testing phase: Necessity to test, user feedback, conducting a user test, guidelines for planning a test, how to test, desirable, feasible and viable solutions, iterate phase.

Text Books:

1. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires, 1st Edition, HarperCollins, 2009.
2. Michael Luchs, Scott Swan, Abbie Griffin, Design thinking: New product development essentials from the PDMA. John Wiley & Sons, 2015.
3. Pavan Soni, Design Your Thinking: The Mindsets, Toolsets and Skill Sets for Creative Problem- solv ing, Penguin Random House India Private Limited, 2020.

Suggested Reading:

1. Jeanne Liedtka, Andrew King, Kevin Bennett, Solving problems with design thinking: Ten stories of what works. Columbia University Press, 2013.
2. Bala Ramadurai, Karmic Design Thinking - A Buddhism-Inspired Method to Help Create Human-Centered Products & Services, Edition 1, 2020.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Department of Computer Engineering and Technology

Scheme of Instructions B.E. –CSE (IoT & Cyber Security including Block Chain Technology)

List of Open Electives offered to other departments

	ODD SEMESTER		**EVEN SEMESTER**	
S.NO	**THEORY**		**THEORY**	
	Course Code	**Course Name**	**Course Code**	**Course Name**
1	22CIO01	Fundamentals of Internet of Things	22CIO02N	Fundamentals of Blockchain Technology
2	22CIO03	Basics of Cybersecurity	22CIO04	Fundamentals of AR and VR

With effect from AY 2024-25

22CIO01

FUNDAMENTALS OF INTERNET OF THINGS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Prerequisites: Programming Basics, Computer Architecture and Microprocessor

Course Objectives: The main objectives of this course are:

1. Impart necessary and practical knowledge of components in the Internet of Things.
2. Understand working of IoT Systems.
3. Develop skills required to build IoT based systems.

Course outcome: At the end of the course the student will be able to:

1. Understand the various concepts, terminologies and architecture of IoT systems.
2. Classify various sensing devices and actuator types.
3. Understand the Associated IOT Technologies.
4. Develop the IoT application using a different board.
5. Understand and apply various protocols for design of IoT systems.

CO-PO ARTICULATION MATRIX

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	-	-	-	-	-	1	1	1	1
CO2	1	1	-	1	-	-	-	-	-	-	1	1	1	-
CO3	1	1	-	1	2	-	-	-	-	-	1	1	1	-
CO4	2	2	1	1	1	1	1	-	1	1	2	2	2	1
CO5	2	2	2	1	1	-	-	-	-	-	1	2	2	2

Unit 1:

Introduction to IoT: IoT Definition,IoT Characteristics,IoT Applications,Key Components of IoT System Things/Device, Gateway, Cloud/Server, Analytics, User Interface,Architecture of IoT

IoT Challenges: Design Challenges,Security Challenges.

Unit:2

Machine-to-Machine Communications, Difference between IoT and M2M.

IoT Sensing and Actuation: Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators,Actuator Characteristics.

ASSOCIATED IOT TECHNOLOGIES: Cloud Computing: Introduction, Virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Cloud Implementation, Sensor-Cloud: Sensors-as-a-Service.

Unit:3

Programming with Arduino Uno: ARDUINO UNO board Block diagram,Sketch Structure,Data types & Built in Constants,Operators: Arithmetic, Bitwise, Compound, Comparison, and Boolean,Control statements and Loops,Functions and library functions,LED Blinking using Arduino,Serial Communication Functions,
Introduction to Raspberry Pi Programming, Sample Implementation of IoT with Raspberry Pi

Unit 4:

IoT Protocols: MQTT,CoAP,XMPP,AMQP, Bluetooth Low Energy (BLE),ZigBee,
Z-Wave,RPL.

Unit 5:

Iot Case Studies And Future Trends:

Vehicular IoT – Introduction, Healthcare IoT – Introduction, CaseStudies, IoT Analytics – Introduction
Smart City-Smart Lighting, Smart Parking Environment, Agricultural IoT – Introduction and Case Studies.

Text Books:

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, “Introduction to IoT”, Cambridge University Press 2021.
2. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Readings:

1. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc24_cs35/preview
2. https://www.nabto.com/guide-iot-protocols-standards/

With effect from AY 2024-25

22CIO02N

FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	3

Prerequisites: Distributed systems, Computer networks and Basic understanding of programming concepts.

Course Objectives:

1. To provide an understanding of blockchain benefits and limitations.
2. To familiarize with decentralization and cryptography.
3. To understand consensus algorithms and explore theoretical foundations of bitcoin.
4. To equip with the knowledge of smart contracts.
5. To analyze real-world case studies and applications of blockchain technology across various industries.

Course Outcomes:

By the end of this course, students should be able to:

1. Explain the fundamental concepts and principles of blockchain technology.
2. Describe the decentralization and cryptographic primitives.
3. Develop a comprehensive understanding of consensus algorithms, Understand bitcoin and its limitations.
4. Analyse smart contracts and Ethereum blockchain.
5. Evaluate the potential applications and impact of blockchain technology in different sectors.

CO-PO Articulation Matrix

PO/PSO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	1	-	-	-	-	-	3
CO2	3	3	3	3	1	-	-	-	-	-	3
CO3	3	3	3	3	2	-	-	-	-	-	3
CO4	3	3	3	3	2	-	-	-	-	-	3
CO5	3	3	3	3	3	-	-	-	-	-	3

Unit – I

Introduction to Blockchain Technology: Distributed systems, History of blockchain, Blockchain architecture, Generic elements of a blockchain, Benefits, Features and Limitations of blockchain, Types of blockchain, CAP theorem.

Unit – II

Decentralization and Cryptography: Decentralization, Methods of decentralization, Routes to decentralization, Decentralized applications, Cryptographic primitives: Cryptographic hash functions, Merkle trees, Asymmetric cryptography: Integer factorization, Discrete logarithm, Public and private keys, RSA, Elliptic curve cryptography, Digital signatures.

Unit – III

Consensus Algorithms and Bitcoin: Introducing the consensus problem, Analysis and design: Model, Processes, Timing assumptions, Classification, Algorithms: CFT and BFT, Bitcoin:an overview, Cryptographic keys, Transactions, Blockchain, Mining.

Unit – IV

Smart Contracts and Ethereum: Definition, Ricardian contracts, Smart contract templates, Introduction to Ethereum, Cryptocurrency, Keys and addresses, Accounts, Transactions and messages, Ethereum virtual machine, Blocks and blockchain, Nodes and miners, The Ethereum network.

Unit – V

Blockchain-Outside of Currencies: Blockchain for Internet of Things, Government: Voting, Citizen identification (ID cards), Health, Finance: Insurance, Post-trade settlement, Financial crime prevention, Payments, Cross-border payments, Peer-to-peer loans, Media.

Textbooks:

1. Imran Bashir, “Mastering Blockchain - A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more ”, Packt Publishing Ltd, Third Edition, 2020.
2. Imran Bashir, “Mastering Blockchain - A technical reference guide to the inner workings of blockchain, from cryptography to DeFi and NFTs”, Packt Publishing Ltd, Fourth Edition, 2023.

Reference Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction".
2. Daniel Drescher, “Blockchain Basics: A Non-Technical Introduction in 25 Steps”, Apress, First Edition, 2017.

Web References:

1. https://nptel.ac.in/courses/106/104/106104220/
2. https://nptel.ac.in/courses/106/105/106105184/

With effect from AY 2024-25

22CIO04

FUNDAMENTALS OF AR AND VR

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	3

Pre-Requisites

Basic knowledge on computer hardware and software components.

Course Objectives

1. Learn a ton about virtual and augmented reality; get familiar with the latest technology and software,
2. Virtual reality in different object & applications
3. To understand key elements of virtual Reality with the components in VR systems.
4. To gain knowledge of various input and output devices required for interacting in virtual world along with rendering and modelling.

Course Outcomes

By the end of this course, students should be able to:

1. Understand the components of the virtual reality system.
2. Describe various input and output devices used for virtual reality.
3. Apply the different modelling concepts to visual virtualization.
4. Understand the concepts of the augmented reality system.
5. Analyse the performance of given simple applications related to virtual reality.

CO-PO Articulation Matrix

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

Unit – I

Introduction to Augmented and Virtual Reality-: AR- VR, Understanding Virtual Space- Defining Visual Space and Content- Defining Position and Orientation in Three Dimensions- Navigation. **The Understanding the Human Senses and Their Relationship to Output/Input Devices**- - The Mechanics of Sight - The Visual Pathway - Spatial Vision and Depth Cues.

Unit – II

Component Technologies of Head-Mounted Displays- Display Fundamentals- Related Terminology and Concepts- Optical Architectures. Augmenting Displays- Binocular Augmenting Displays- Monocular Augmenting Displays. **Fully Immersive Displays** - PC-Console Driven Displays- Smartphone-Based Displays- CAVES and Walls -Hemispheres and Domes

Unit – III

The Mechanics of Hearing: -Defining Sound -The Auditory Pathway-Sound Cues and 3D Localization-The Vestibular System**. Audio Displays**-Conventional Audio- The Mechanics of Feeling-The Science of Feeling -Anatomy and Composition of the Skin.

Unit – IV

Tactile and Force Feedback Devices: -Haptic Illusions -Tactile Feedback Devices- Force Feedback Devices-Sensors for Tracking Position, Orientation, and Motion -Introduction to Sensor Technologies- Optical Trackers - Beacon Trackers - Electromagnetic Trackers - Inertial Sensors- Acoustic Sensors. **Devices to Enable Navigation and Interaction**: -2D Versus 3D Interaction and Navigation -The Importance of a Manual Interface - Hand and Gesture Tracking Gloves- Whole Body Tracking - Gaming and Entertainment Interfaces.

Unit – V

Applications of Augmented and Virtual Reality: Gaming and Entertainment - Virtual Reality and the Arts- Immersive Video/Cinematic Virtual Reality- Health and Medicine -Advancing the Field of Medicine- Training Applications- Treatment Applications. **Aerospace and Défense**:- Flight Simulation and Training- Mission Planning and Rehearsal- Dismounted Soldier Situational Awareness- Advanced Cockpit Avionics- Space Operations. Education - Tangible Skills Education- Theory, Knowledge Acquisition, and Concept Formation.

Textbook:

1. Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR, by Steve Aukstakalnis, Released September 2016, Publisher(s): Addison-Wesley Professional, ISBN: 9780134094328

Reference Books

1. Augmented Reality: Principles and Practice" by Dieter Schmalstieg and Tobias Hollerer (2021)
2. Virtual Reality: Concepts and Technologies" by Philippe Fuchs, Pascal Guitton, and Eric Marchand (2021)
3. Virtual Reality: Concepts, Methodologies, Tools, and Applications" edited by Information Resources Management Association (2023)
4. Handbook of Augmented Reality and Virtual Reality" edited by Leila Alem and Christoph Bartneck (2024)

Web Reference

1. https://learn.unity.com/courses
2. https://www.coursera.org/learn/intro-augmented-virtual-mixed-extended-reality-technologies-applications-issues
3. https://www.udemy.com/topic/virtual-reality/?srsltid=AfmBOooAIP_vbJmKBCPjrCYNTmYe_DnHDWqsl43uqEQwUqaX5MwgevV-
4. https://www.youtube.com/playlist?list=PLihwab7Zw-Kx3WwFnH_5YjU0oz1JEKm_-

With effect from AY 2024-25

22CIO03

BASICS OF CYBER SECURITY

Instruction	3 L Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	3

Pre-Requisites
Basic knowledge on computer hardware and software components.

Course Objectives

1. To describe the foundational concepts of cybersecurity, including the CIA triad (Confidentiality, Integrity, Availability), and explain their importance in information security practices.
2. To demonstrate understanding of various cyber offenses by explaining the methods used by criminals to plan and execute cyber-attacks.
3. To understand the legal perspective of Cyber Security.
4. To collect, process, analyse and present Computer Forensics Evidence.
5. To understand organizational implications of Cyber Security.

Course Outcomes
By the end of this course, students should be able to:

1. Demonstrate an understanding of cybersecurity by effectively analysing and evaluating the security implications of various scenarios.
2. Identify and describe different types of cyber offenses, understand the techniques used by cybercriminals, and analyse the potential impact of these attacks on individuals, organizations, and society.
3. Analyse and evaluate the legal framework of cyber laws in India.
4. Analyse the significance of digital evidence in cyber forensics.
5. Evaluate the organizational implications of cyber security by assessing the costs associated with cybercrimes.

CO-PO Articulation Matrix

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO 1	2	2	2	2	2	3	1	3	3	3	2
CO 2	2	3	2	2	3	3	1	3	3	3	2
CO 3	1	2	2	2	1	3	1	3	2	3	3
CO 4	2	2	2	2	3	3	1	3	3	3	3
CO 5	2	2	2	2	2	3	1	3	3	3	3

Unit – I

Introduction to Cyber Crime: Cyber Crime: Definition and Origins of the Word, Cybercrime and Information Security, Classification of Cyber Crimes.

Cyber Security Fundamentals: Definition and importance of cybersecurity, CIA triad: Confidentiality, Integrity, Availability, Security design principles: defence-in-depth, least privilege, separation of duties.

Unit – II

Cyber Offenses: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector.

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing,

Password Cracking, Password Managers, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

Unit – III

Cyber Laws: The Legal Perspectives, Need of Cyber laws: the Indian Context, The Indian IT Act, Amendments of Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India.

Unit – IV

Understanding Cyber Forensics: Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Cyber Forensics Investigation, Challenges in Computer Forensics.

Unit – V

Cyber Security Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations.

Capstone Project: Group project: analyse a real-world cyber-attack, develop a mitigation strategy, and present findings to the class.

Textbooks:

1. Sunit Belpre and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India Pvt.Ltd, 2011.
2. William Stallings,” Cryptography and Network Security - Principles and Practice”, Pearson Education, 6th Edition,2013.
3. Whitman, M., & Mattord, H.”Principles of information security” (6th ed.). CENGAGE Learning Custom Publishing, 2017.

Reference Books:

1. Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, “Cyber Security and Cyber Laws”, Paperback – 2018.
2. Kevin Mandia, Chris Prosise, “Incident Response and computer forensics”, Tata McGraw Hill, 2006.

Web References:

1. https://www.coursera.org/courses?query=cybersecurity&productDifficultyLevel=Beginner
2. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview