SCHEME OF INSTRUCTION AND SYLLABI R-22

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

COMPUTER ENGINEERING AND TECHNOLOGY

(Inline with AICTE Model Curriculum with effect from AY 2022-23)

R-22 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 THE DEPARTMENT:

Department of CSE has started its UG program BE (CSE) in the year 1985 with an intake of 20. At present the department has expanded to 300 students with 3 UG programs B.E (CSE), B.E CSE (AI& ML) AI&ML, B.E-CSE (IoT with Cyber Security Including Blockchain Technology). M. Tech. CSE was started in the year 2002 with an intake of 18 and increased to 36 in 2011. The intellectual ambiance in CSE Department is conducive to the holistic development of the students with well-equipped labs. BE-CSE program was first accredited by the NBA (AICTE) in 1998 with 'A' grade for 3 years. Later, the BE-CSE program was further accredited during 2004, 2008, 2013, and 2017 consecutively. CSE department is a recognized research center under Osmania University. Faculty and students have few patents to their credit. Department of CSE has centers of excellence in IoT, AI/ML, Cyber Security, AAiHC. Department is also having MoU's with MSME, Robotic Process Automation, KernelSphere Technologies, Telangana State Council of Science and Technology, and DSCI.

Department has committed well qualified and professionally active staff and the majority of the staff are pursuing Ph.D. in emerging areas like AI, ML, Cyber Security, Data Science, Data Mining, and Blockchain.

Department is conducting the workshops and certifications under Microsoft and IBM. Various activities are conducted in collaboration with professional bodies like CSI, ISTE along with student branches of IEEE and CSI.

Department encourages the use of open-source software and has a technical CBIT Open Source (COSC) Club, security club.

The placement records of the CSE department are so phenomenal that they will blow your mind. Our placement record has been consistent with the placement record of more than 90% of students placed every year. Top companies that visited the campus for placements include Microsoft, JP Morgan, Accolite, NCR, Oracle, SalesForce, etc., with salaries going well beyond twenty-four lakhs per annum. The number of students who are doing internships is gradually increasing every year.

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) As per AICTE Model Curriculum 2022-23

Model Curriculum(R-22) 2022-23

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	0	-	3	40	60	3
3	22CSC01	Problem Solving and Programming	2	1	-	3	40	60	3
4	22EGC01	English	2	0	-	3	40	60	2
PRACTICAL									
5	22PYC03	Optics and Semiconductor PhysicsLab	-	-	3	3	50	50	1.5
6	22EGC02	English lab	-	-	2	3	50	50	1
7	22CSC02	Problem Solving and Programming Lab	-	-	3	3	50	50	1.5
8	22MEC01	CAD and drafting Lab	-	1	3	3	50	50	2.5
9	22MEC38	Digital Fabrication Lab	-	-	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)

As per AICTE Model Curriculum 2022-23

Model Curriculum(R-22) 2022-23

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	0	-	3	40	60	3
3	22EEC01	Basic Electrical Engineering	2	1	-	3	40	60	3
4	22CSC03	Object Oriented Programming	2	1	-	3	40	60	3
PRACTICAL									
5	22CYC02	Chemistry Lab	-	-	3	3	50	50	1.5
6	22MBC02	Community Engagement	-	-	3	-	50	-	1.5
7	22CSC04	Object Oriented Programming Lab	-	-	2	3	50	50	1
8	22MEC37	Robotics & Drones Lab	-	2	2	-	100	-	3
9	22EEC02	Basic Electrical Engineering Lab	-	-	2	3	50	50	1
TOTAL			**10**	**5**	**12**	**-**	**460**	**390**	**21**

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)

As per AICTE Model Curriculum 2022-23

Model Curriculum(R-22) 2023-24

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	22CSC11	Database Management Systems	3	-	-	3	40	60	3
2	22CSC20	Computer Networks	3	-	-	3	40	60	3
3	22CSC05	Data Structures	3	-	-	3	40	60	3
4	22CSC32	Discrete Mathematics	3	-	-	3	40	60	3
5	22ITC01	Digital Logic and Computer Architecture	3	-	-	3	40	60	3
6	22CIC01	Fundamentals of Cyber Security and Tools	2	-	-	3	40	60	2
PRACTICAL									
7	22CSC33	Data Base Management Systems Lab	-	-	2	3	50	50	1
8	22CSC37	Networks Lab	-	-	2	3	50	50	1
9	22CSC31	Data Structures Lab	-	-	2	3	50	50	1
10	22CIC02	Fundamentals of Cyber Security and Tools Lab	-	-	2	3	50	50	1
11	22INT01	MOOCs / Training / Internship	-	-	3-4 Weeks 90 Hours -		50	-	2
12	22ACT	Activity Points	-	-	-	-	-	-	-
TOTAL			**17**	**-**	**8**	**-**	**490**	**560**	**23**

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)

As per AICTE Model Curriculum 2022-23

Model Curriculum(R-22) 2023-24

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	22CSC14	Design and Analysis of Algorithms	3	-	-	3	40	60	3
3	22ECC36	Basic Electronics and Sensors	3	-	-	3	40	60	3
4	22ITC17	Web Technologies	3	-	-	3	40	60	3
5	22CIC03	AI Tools, Techniques and Applications	2	1	-	3	40	60	3
6	22MBC01	Engineering Economics and Accountancy	3	-	-	3	40	60	3
PRACTICAL									
7	22CIC04	AI Tools, Techniques and Applications Lab	-	-	2	3	50	50	1
8	22CSC34	Design and Analysis of Algorithms Lab	-	-	2	3	50	50	1
9	22ITC19	Internet Technologies Lab	-	-	2	3	50	50	1
10	22ECC37	Basic Electronics and Sensors Lab	-	-	2	3	50	50	1
11	22CICU01	Upskill Certification course – I	-	-	-	-	25	-	0.5
12	22ACT	Activity Points	-	-	-	-	-	-	-
TOTAL			**17**	**1**	**8**	**30**	**465**	**560**	**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)

As per AICTE Model Curriculum 2022-23

Model Curriculum(R-22) 2024-25

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	22CIC06	Cyber Threat Intelligence	3	-	-	3	40	60	3
3	22CIC07	Industrial Internet of Things Systems	3	-	-	3	40	60	3
4	22CIC09	Cryptography and Network Security	3	-	-	3	40	60	3
5	22CSC15N	Operating Systems	3	-	-	3	40	60	3
6		Professional Elective – I	3	-	-	3	40	60	3
PRACTICAL									
7	22CSC18N	Operating Systems Lab	-	-	2	3	50	50	1
8	22CIC08	Industrial Internet of Things Systems Lab	-	-	2	3	50	50	1
9	22CIC10	Cryptography and Network Security Lab	-	-	2	3	50	50	1
10		Professional Elective – I Lab			2	3	50	50	1
	22CII02	Internship-II (Industrial/ Rural Internship)	3-4 weeks / 90 hours			-	50	-	2
TOTAL			**18**	**-**	**8**	**-**	**490**	**560**	**24**

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)

As per AICTE Model Curriculum 2022-23

Professional Elective - I

S.NO	THEORY	
	Course Code	**Course**
1	22CIE01	OOPS through Java
2	22CIE03	Digital Forensics
3	22CAE12	Artificial Intelligence and Machine Learning
4	22ITE04	Mobile Application Development
5	22CIE05	Distributed Systems
	LAB	
	Course Code	**Course**
1	22CIE02	OOPS through Java Lab
2	22CIE04	Digital Forensics Lab
3	22CAE13	Artificial Intelligence and Machine Learning Lab
4	22ITE21	Mobile Application Development Lab
5	22CIE06	Distributed Systems Lab

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Model Curriculum(R-22) 2024-25

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	22CIC11	Mobile Security	3	-	-	3	40	60	3
2	22CSC21	Software Engineering	3	-	-	3	40	60	3
3	22CIC13	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	22EEM01	Universal Human Values-II : Understanding Harmony	1	-	-	3	40	60	1
PRACTICAL									
7	22CIC12	Mobile Security Lab	-	-	2	3	50	50	1
8	22CIC14	Design and Development of Blockchain Applications Lab	-	-	2	3	50	50	1
9		Professional Elective – II Lab	-	-	2	3	50	50	1
10	22EGC03	Employability Skills	-	-	2	2	50	50	1
11	22CICU02	Upskill Certification course – II	-	-	-	-	25	-	0.5
		TOTAL	**16**	**00**	08	**-**	**465**	**560**	**20.5**

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

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Department of Computer Engineering and Technology

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

As per AICTE Model Curriculum 2022-23

Professional Elective – II

S.NO	THEORY	
	Course Code	**Course**
1	22ITE18	Enterprise application Development
2	22CIE07	Ethical Hacking
3	22CAE16	Deep Learning
4	22CIE09	Sensor Technology and Applications
5	22ITE07	Cloud computing
	LAB	
	Course Code	**Course**
1	22ITE19	Enterprise application Development Lab
2	22CIE08	Ethical Hacking Lab
3	22CAE23	Deep Learning Lab
4	22CIE10	Sensor Technology and Applications 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
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

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

As per AICTE Model Curriculum 2022-23

Model Curriculum(R-22) 2025-26

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	22CIC15	Cyber Security	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	22EGM01	Indian Constitution and Fundamental Principles	2	-	-	2	-	50	No Credit
PRACTICAL									
7	22CIC16	Cyber Security 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 - 1	-	-	4	-	50	-	2
11	22CIC19	Internship - III	3-4 weeks / 90 hours			-	50	-	2
TOTAL			**14**	**-**	**10**	**-**	**410**	**390**	**19**

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)

As per AICTE Model Curriculum 2022-23

	Professional Elective - III		**Professional Elective - IV**	
S.NO	**THEORY**		**THEORY**	
	Course Code	**Course Name**	**Course Code**	**Course Name**
1	22CIE11	Writing Secure Code	22CIE13	3D Modelling and Animation
2	22ADE32	Social Network Analytics	22CIE18	Social Engineering
3	22ADE14	Generative AI	22CAE19	Natural Language Processing
4	22CAE17	Image Processing	22CIE14	Robotic process and Automation
5	22ADE06	Exploratory Data Analytics and Visualization	22CSE14	Software Defined Networks
	LAB			
	Course Code	**Course Name**		
1	22CIE12	Writing Secure Code Lab		
2	22ADE34	Social Network Analytics Lab		
3	22ADE15	Generative AI Lab		
4	22CAE18	Image Processing Lab		
5	22ADE07	Exploratory Data Analytics and Visualization 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
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

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)

As per AICTE Model Curriculum 2022-23

Model Curriculum(R-22) 2025-26

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		Professional Elective-V	3	-	-	3	40	60	3
2		Open Elective-III	3	-	-	3	40	60	3
3	22CEM01	Environmental Science	2	-	-	2	-	50	No Credits
PRACTICAL									
4	22CIC20	Project Part – 2	0	0	8	-	100	100	4
		TOTAL	**8**	**-**	**8**	-	**180**	**270**	**10**

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)

As per AICTE Model Curriculum 2022-23

Professional Elective – V

S.NO	THEORY	
	Course Code	**Course**
1	22CIE15	Extended Reality
2	22CIE16	Emerging Threats and Defenses
3	22ADE29	Computer vision
4	22CSE13	Human Computer Interaction
5	22CSE08	User Interface and User Experience Design

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
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

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)

As per AICTE Model Curriculum 2022-23

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	22CIO02	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)

As per AICTE Model Curriculum 2022-23

Model Curriculum(R-22) 2022-23

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	0	-	3	40	60	3
3	22CSC01	Problem Solving and Programming	2	1	-	3	40	60	3
4	22EGC01	English	2	0	-	3	40	60	2
PRACTICAL									
5	22PYC03	Optics and Semiconductor PhysicsLab	-	-	3	3	50	50	1.5
6	22EGC02	English lab	-	-	2	3	50	50	1
7	22CSC02	Problem Solving and Programming Lab	-	-	3	3	50	50	1.5
8	22MEC01	CAD and drafting	-	1	3	3	50	50	2.5
9	22MEC38	Digital Fabrication Lab	-	-	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

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/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.

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

CO/PO	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	2	2	3	2	2	1	1	-	-	2	-	-	-
CO2	3	3	3	3	3	3	3	2	-	3	2	-	-	-
CO3	3	3	3	3	3	2	2	1	-	-	2	-	-	-
CO4	2	2	2	1	2	2	2	1	-	2	2	-	-	-
CO5	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.

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.

22CSC01

PROBLEM SOLVING AND PROGRAMMING

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

Course Objectives: The objectives of this course are to:

1. Develop logical skills and basic technical skills so that students should be able to solve basic computational problems.
2. Learn any basic programming language.

Course Outcomes: After completion of course, students would be able to:

1. Understand real world problems and develop computer solutions for those problems.
2. Understand the basics of Python.
3. Apply Python for solving basic programming solutions.
4. Create algorithms/flowcharts for solving real-time problems.
5. Build and manage dictionaries to manage data
6. Handle data using files

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	1	1	-	1	-	-	-	-	-	1	2	1	-
CO2	3	1	1	-	1	-	-	-	-	-	1	2	1	-
CO3	3	1	1	-	1	-	-	-	-	-	1	2	1	-
CO4	3	1	1	-	1	-	-	-	-	-	1	2	1	-
CO5	3	1	1	-	1	-	-	-	-	-	1	2	1	-
CO6	3	1	1	-	1	-	-	-	-	-	1	2	1	-

UNIT I:

Introduction to Programming - *Evolution of languages*: Machine, Assembly and High-level languages. *Software requirements for programming*: OS, compiler, linker, loader, editor. Design specification: Algorithms and Flowcharts.

UNIT II:

Data Types and Operators, Variable, Sequences and Iteration - Data types, Expressions, Precedence Rules, Operators: arithmetic, relational, logical, bit-wise and miscellaneous operators; local variable, global variables, List, String, Tuples, Sequence mutation and accumulating patterns.

UNIT III:

Conditional Statement, Loops, Arrays and Strings, user-defined Data Types -if..else, for, while, nested iteration, Concept and use of arrays, declaration and usage of arrays, 2-dimensional arrays, different types of user defined data types.

UNIT IV:

Dictionaries and Dictionary Accumulation, Functions/Methods - Dictionary basics, operations, methods, accumulation, advantages of modularizing program into functions, function definition and function invocation. Positional parameters passing arrays to functions, recursion, library functions.

UNIT V:

File Handling and Memory Management - Concepts of files and basic file operations, writing/reading data to/from a .csv file, Memory Management Operations.

Text Books and References:

1. R.S. Salaria, Khanna , “Programming for Problem Solving”, Book Publishing Co., Delhi.
2. Jeeva Jose, Khanna , “Taming Python by Programming”, Book Publishing Co., Delhi.
3. Mark Lutz, “Learning Python”, 5th Edition, , O'Reilly Media, Inc.,
4. Python Crash Course: A Hands-On, Project-Based Introduction to Programming by No Starch Press.
5. Eric Matthes,, “Programming in Python”, R.S. Salaria, Khanna Book Publishing Co., Delhi.
6. https://www.coursera.org/specializations/python-3-programming.

NPTEL/SWAYAM Course:

1. Introduction to Problem Solving and Programming, Video Lectures, Prof. D Gupta , IIT Delhi.

Problem Solving Aspects and Python Programming, Dr. S Malinga, Dr Thangarajan, Dr. S V Kogilavani, Kongu Engineering College.

22EGC01

ENGLISH
(Common to All Branches)

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

Course Objectives: This course will introduce the students:

1. To the role and importance of communication while developing their basic communication skills in English.
2. To basics of writing coherent paragraphs and formal emails.
3. To techniques of writing a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. To description, definition and classification of processes while enabling them to draft formal reports following a proper structure.
5. To gaining adequate reading comprehension techniques.

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

1. Illustrate the nature, process and types of communication and communicate effectively without barriers.
2. Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
3. Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
4. Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
5. Critique passages by applying effective reading techniques

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	1	2	2	3	3	2	3	1	1	3
CO 2	1	1	1	1	-	2	1	2	2	1	2	1	1	2
CO 3	-	2	1	1	-	3	1	2	2	1	2	1	1	2
CO 4	1	2	1	2	1	3	1	2	2	1	2	1	2	3
CO 5	1	2	1	2	1	2	1	1	2	1	2	2	1	2

UNIT-I

Understanding Communication in English:

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

Vocabulary &Grammar: The concept of Word Formation; Use of appropriate prepositions and articles.

UNIT-II

Developing Writing Skills I:

Paragraph writing. – Structure and features of a paragraph; Cohesion and coherence. Rearranging jumbled sentences. Email and Mobile etiquette.

Vocabulary & Grammar: Use of cohesive devices and correct punctuation.

UNIT-III

Developing Writing Skills II:

Précis Writing; Techniques of writing precisely. Letter Writing – Structure, format of a formal

letter; Letter of request and the response
Vocabulary and Grammar: Subject-verb agreement. Use of prefixes and suffixes to form derivatives. Avoiding redundancies.

UNIT-IV

Developing Writing Skills III:

Report writing – Importance, structure, elements of style of formal reports; Writing a formal report.
Vocabulary and Grammar: Avoiding ambiguity - Misplaced modifiers. Use of synonyms and antonyms.

UNIT-V

Developing Reading Skills:

The reading process, purpose, different kinds of texts; Reading comprehension; Techniques of comprehension – skimming, scanning, drawing inferences and conclusions.
Vocabulary and Grammar: Words often confused; Use of standard abbreviations.

Text Books:

1. Language and Life: A Skills Approach, Board of Editors, Orient Black Swan,2017.
2. Swan Michael, Practical English Usage.OUP.1995.

Suggested Readings:

1. Wood F.T, Remedial English Grammar,Macmillan,2007
2. Zinsser William, On Writing Well, Harper Resource Book, 2001

Sanjay Kumar and PushpLata, Communication Skills. Oxford University Press,2011.

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

CO/PO	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	3	1	3	3	3	-	1	2	-	-	-
CO2	3	3	2	2	2	2	3	3	-	1	3	-	-	-
CO3	3	3	3	3	3	1	3	3	-	1	2	-	-	-
CO4	3	3	3	2	2	1	3	3	-	1	3	-	-	-
CO5	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.

22EGC02

ENGLISH LAB

(Common to All Branches)

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

Course Objectives: This course will introduce the students:

1. To nuances of Phonetics and give them sufficient practice in correct pronunciation.
2. To word stress and intonation.
3. To listen to listening comprehension material for honing their listening skills.
4. To activities enabling them overcome their inhibitions while speaking in English with the focus being on fluency rather than accuracy.
5. To team work, role behavior while developing their ability to discuss in groups and making oral 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. Apply stress correctly and speak with the proper tone, intonation and rhythm.
3. Analyze listening comprehension texts to enhance their listening skills.
4. Determine the context and speak appropriately in various situations.
5. Design and present effective posters while working in teams, and discuss and participate in Group discussions.

CO-PO-PSO ARTICULATION MATRIX

CO/PO	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	-	2	2
CO2	-	-	-	-	-	1	1	2	2	1	2	-	2	2
CO3	-	-	-	-	-	1	1	2	1	1	2	1	2	2
CO4	1	-	-	-	-	2	2	2	3	1	3	1	3	3
CO5	1	1	1	1	1	2	2	3	3	2	3	1	3	3

LIST OF EXERCISES:

1. **Introduction to English Phonetics**: Introduction to auditory, acoustic and articulatory phonetics, organs of speech: the respiratory, articulatory and phonatory systems.
2. **Sound system of English**: Phonetic sounds and phonemic sounds, introduction to international phonetic alphabet, classification and description of English phonemic sounds, minimal pairs . The syllable: types of syllables, consonant clusters.
3. **Word stress**: Primary stress, secondary stress, functional stress, rules of word stress.
4. **Rhythm & Intonation** : Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
5. **Listening skills** – Practice with Software available in (K-van solutions)
6. **Public speaking –** Speaking with confidence and clarity in different contexts on various issues.
7. **Group Discussions -** Dynamics of a group discussion, group discussion techniques, body language.
8. **Pictionary –** weaving an imaginative story around a given picture.
9. **Information Gap Activity –** Writing a brief report on a newspaper headline by building on the hints given
10. **Poster presentation –** Theme, poster preparation, team work and representation.

Suggested Reading

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students, Macmillan,2008.
2. J Sethi et al. A Practical Course in English Pronunciation (with CD), Prentice Hall

India,2005.
3. PriyadarshiPatnaik. Group Discussions and Interviews, Cambridge University Press Pvt Ltd2011

ArunaKoneru, Professional Speaking Skills, Oxford University Press,2016

22CSC02

PROBLEM SOLVING AND PROGRAMMING LAB

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

Course Objectives: The objectives of this course are to:

1. Master the fundamentals of writing Python scripts
2. Learn Python elements such as variables, flow controls structures, and functions
3. Discover how to work with lists and sequence data, and files

Course Outcomes: After completion of course, students would be able to:

1. Understand various Python program development Environments
2. Demonstrate the concepts of Python.
3. Implement algorithms/flowcharts using Python to solve real-world problems.
4. Build and manage dictionaries to manage data.
5. Write Python functions to facilitate code reuse.
6. Use Python to handle files and 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	3	2	1	-	-	-	-	-	-	-	1	1	1	-
CO 2	3	3	2	2	3	-	-	-	-	-	1	2	1	-
CO 3	2	3	3	2	3	-	-	-	-	-	1	2	1	-
CO 4	2	3	3	2	2	-	-	-	-	-	1	2	1	-
CO 5	2	3	3	3	3	-	-	-	-	-	1	2	1	-
CO 6	2	3	3	3	3	-	-	-	-	-	1	2	1	-

Laboratory / Practical Experiments:

1. Explore various Python Program Development Environments.
2. Demonstration of input/output operations
3. Demonstration of operators
4. Demonstration of selective control structures
5. Demonstration of looping control structures
6. Demonstration of Python Dictionaries.
7. Implementation of searching and sorting techniques.
8. Implementation of string manipulation operations
9. File handling and memory management operations

Text Books and References:

1. R.S Salaria, Khanna, (Programming for Problem Solving", Book Publishing Co., Delhi
2. Jeeva Jose, Khanna,, "Taming Python by Programming", Book Publishing Co., Delhi

22MEC01

CAD AND DRAFTING

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

Course Objectives:

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

Outcomes: At the end of the course, the Students are able to

1. Become conversant with appropriate use of CAD software for drafting.
2. Recognize BIS, ISO Standards and conventions in Engineering Drafting.
3. Construct the projections of points, lines, planes, solids
4. Analyse the internal details of solids through sectional views
5. Create an isometric projections and views

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	3	2	1	2	2	1	2	3	1	3	-	-	-
CO2	3	2	2	1	2	2	1	2	2	1	2	-	-	-
CO3	3	3	2	1	2	2	1	2	2	1	2	-	-	-
CO4	3	3	3	2	2	2	1	2	2	1	2	-	-	-
CO5	3	2	2	1	2	2	1	2	2	1	2	-	-	-

List of Exercises:

1. Introduction to CAD package: Settings, draw, modify tools, dimensioning and documentation
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
5. Projection of straight lines inclined to both the planes (without traces and mid-point)
6. Projection of planes: Perpendicular planes
7. Projection of planes: Oblique planes
8. Projection of solids: Simple position
9. Projection of solids: Inclined to one plane
10. Sections of solids: Prism, pyramid in simple position
11. Sections of solids: Cone and cylinder in simple position
12. Isometric projections and views
13. 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.

22MEC38

DIGITAL FABRICATION LAB

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

Objectives: The objectives of this course are to:

1. Give a feel of Engineering Practices & develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive &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, welding, casting, manufacturing, metrology, and allied skills.
5. Advance important hard & 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.

Outcomes: After completion of course, students would be able to:

1. Understand safety measures to be followed in workshop to avoid accidents.
2. Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes.
3. Make a given model by using workshop trades including fitting, carpentry, tinsmithy and House
   wiring.
4. Perform various operations in welding, machining and casting processes.
5. Conceptualize and produce simple device/mechanism of their choice.

CO-PO ARTICULATION MATRIX

CO/PO	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	-	-	-
CO3	1	-	1	-	-	1	-	-	-	-	1	-	-	-
CO4	1	-	1	-	-	1	-	-	-	-	1	-	-	-
CO5	2	2	2	1	3	1	1	1	2	-	2	-	-	

List of exercises:

Group-1

1. To make a lap joint on the given wooden piece according to the given dimensions.
2. To make a dove tail-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 pole 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-wiring of one light point controlled from two different places independently using two 2- way switches.
5. To make external threads for GI pipes using die and connect the GI pipes as per the given diagram using taps, couplings & bends.
6. a. To connect the GI pipes as per the given diagram using, couplings, unions, reducer & bends.

b. To connect the GI pipes as per the given diagram using shower, tap & valves and Demonstrate by giving water connection

Group- 2

1. To Study the method of Additive Manufacturing process using a 3D printer
2. To create a 3D CAD model of a door bracket using a modeling software
3. To print a door bracket using an extruder type 3D Printer.
4. To create a 3D CAD model by reverse Engineering
5. To Design an innovative component using the CAD software
6. To print the selected innovative component by the students 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.
3. Sachidanand Jha , 3D PRINTING PROJECTS: 200 3D Practice Drawings For 3D Printing On Your 3D Printer , June 7, 2019.

Suggested Reading:

1. Gowri P. Hariharan and A. Suresh Babu, Manufacturing Technology – I, Pearson Education, 2008.
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)

As per AICTE Model Curriculum 2022-23

Model Curriculum(R-22) 2022-23

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	0	-	3	40	60	3
3	22EEC01	Basic Electrical Engineering	2	1	-	3	40	60	3
4	22CSC03	Object Oriented Programming	2	1	-	3	40	60	3
PRACTICAL									
5	22CYC02	Chemistry Lab	-	-	3	3	50	50	1.5
6	22MBC02	Community Engagement	-	-	3	-	50	-	1.5
7	22CSC04	Object Oriented Programming Lab	-	-	2	3	50	50	1
8	22MEC37	Robotics & Drones Lab	-	2	2	-	100	-	3
9	22EEC02	Basic Electrical Engineering Lab	-	-	2	3	50	50	1
TOTAL			**10**	**5**	**12**	**-**	**460**	**390**	**21**

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

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.

22CYC01

CHEMISTRY
(Common to All Branches)

Instruction:	3L 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).

Text Books:

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).

Suggested Readings:

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).
4. P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8th edition (2006).

22EEC01

BASIC ELECTRICAL ENGINEERING

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

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	-	-	-
CO 4	2	1	-	-	-	-	-	1	2	-	3	-	-	-
CO 5	2	-	2	-	-	-	-	1	2	-	3	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

Text Books:

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

Suggested Reading:

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

P.V. Prasad, S. Sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 20

22CSC03

OBJECT ORIENTED PROGRAMMING

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

Course Objectives: The objectives of this course are to:

1. Explore the concepts object-oriented programming like classes, constructors, Polymorphism, Inheritance, and File handling.
2. Prepare student for solving real-world problems using OOPs concepts.

Course Outcomes: After completion of course, students would be able to:

1. Understand the concepts of Object-Oriented features.
2. Apply OOPs concepts and different libraries to solve programming problems.
3. Understand the advanced concepts of Python.
4. Develop programs to access databases and web data.
5. Understand APIs and third-party libraries to be used with Python.

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	3	1	-
CO 2	3	1	3	2	2	-	-	-	-	-	2	3	2	-
CO 3	3	1	2	1	1	-	-	-	-	-	1	3	2	-
CO 4	3	2	3	1	2	-	-	-	-	-	2	3	3	-
CO 5	3	2	3	1	2	-	-	-	-	-	2	3	2	-

UNIT I:

Introduction to Object Oriented Programming Paradigms - Programming paradigms, advantages of OOP, comparison of OOP with Procedural Paradigms; Classes and Objects: Prototyping, referencing the variables in functions, inline, static and friend functions. Memory allocation for classes and objects, arrays of objects, constructors.

UNIT II :

Polymorphism and Inheritance: Overriding methods, type conversions, base classes and derived classes, types of inheritance, various types of classes, invocation of constructors and destructors inheritance, aggregation, composition, classification hierarchies, metaclass/ abstract classes, unit testing and exceptions.

UNIT III:

Python Libraries -Basics of Open Source libraries for data pre-processing, modeling and visualization.

UNIT IV:

Python to access Web Data - Regular Expressions, extracting data, sockets, using the Developer Console to Explore HTTP, Retrieving Web Page, and Passing Web Pages.

UNIT V:

Using Databases with Python - Using Databases, Single Table CRUD, Designing and representing a data model, reconstructing data with JOIN, many-to-many relationships.

Text Books and References:

1. Allen Downey, Jeff Elkner, Chris Meyers, "How to Think Like a Computer Scientist: Learning with Python", SoHo Books, 2009.
2. R.S. Salaria , "Mastering Object-Oriented Programming", Khanna Book Publishing Co., Delhi
3. Jeeva Jose, "Introduction to Computing & Problem Solving with Python", Khanna Book Publishing, 2019.
4. https://www.coursera.org/specializations/python-3-programming#courses
5. Paul Barry , "Head First Python", O′Reilly, 2010

NPTEL/SWAYAM Course:

1. Python for Data Science, Prof. Raghunathan Rengasamy, IIT Madras
2. The Joy of Computing using Python Prof. Sudarshan, Prof. Yayati Guptaingar, IIT Ropar, IIIT Dharwad.

22CYC02

CHEMISTRY LAB
(Common to All Branches)

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

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.

Text Books:

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

Suggested Readings:

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, 9th revised edition, 2015.

22MBC02

COMMUNITY ENGAGEMENT

Instruction	3P Hours per week
CIE	50 Marks
Credits	1.5

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	-	-	-
CO 2	-	1	2	2	-	2	-	2	1	-	1	-	-	-
CO 3	-	1	1	2	-	3	1	3	1	2	1	-	-	-
CO 4	2	2	3	2	-	2	1	2	2	1	-	-	-	-
CO 5	1	2	2	1	-	2	-	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, elaboration of 'soul of India lies in villages' (Gandhi), Rural Infrastructure.

Module II Understanding Rural Economy and Livelihood

Agriculture, Farming, Landownership, Water management, Animal Husbandry, 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, Local Civil Society, Local Administration.

Module IV Rural Development Programmes

History of Rural Development in India, Current National Programmes: SarvaShiksha Abhiyan, BetiBhachao, BetiPadhao, Ayushman, Bharat, Swachh Bharat, PM Awas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA etc.

Text Books:

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).

22CSC04

OBJECT ORIENTED PROGRAMMING LAB

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

Course Objectives: The objectives of this course are to:

1. Master the concepts of Object Oriented Programming.
2. Explore the OOPs features of Python and build applications.

Course Outcomes: After completion of course, students would be able to:

1. Demonstrate the features of Object-Oriented Programming.
2. Understand APIs and third-party libraries to be used with Python.
3. Use Python libraries to solve real-world problems.
4. Write scripts to solve data science/machine leaning problems using NumPy and Pandas.
5. Develop applications by accessing web data and databases.

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	-	-	-	-	-	2	3	1	-
CO 2	3	3	2	2	2	-	-	-	-	-	2	3	3	-
CO 3	3	3	3	2	3	-	-	-	-	-	2	3	3	-
CO 4	3	3	3	3	3	-	-	-	-	-	2	3	3	-
CO 5	3	3	3	3	3	-	-	-	-	-	2	3	3	-

Laboratory / Practical:

1. Write a NumPy program to compute the cross product of two given vectors.
2. Write NumPy program to calculate the QR decomposition of a given matrix.
3. Write a Pandas program to convert a Panda Module Series to Python list and its type.
4. Write a Pandas program to convert a NumPy array to a Pandas series.
5. Create a Python project to get the citation from Google scholar using title and year of publication and volume and pages of journal.
6. Create a Python project to get total COVID-19 cases, total deaths due to COVID-19, total COVID-19 patients recovered in the world.

Text Book:

1. Reema Thareja, "Python Programming", Oxford Press, 2017.

Online Resources:

1. https://vknight.org/cfm/labsheets/04-object-oriented-programming/
2. http://learning-python.com/class/Workbook/x-exercises.htm
3. https://inst.eecs.berkeley.edu/~cs61a/fa14/lab/lab06/#inheritance
4. https://anandology.com/python-practice-book/object_oriented_programming.html
5. http://stanfordpython.com/
6. https://docs.python.org/3/

22MEC37

ROBOTICS AND DRONES LAB

(Common to All Branches)

Instruction	2T + 2P Hours per week
CIE	100
Credits	3

Objectives: The objectives of this course are to:

1. To develop the students' knowledge in various robot and drone structures and their workspace.
2. To develop multidisciplinary robotics that have practical importance by participating in robotics competitions
3. To develop students' skills in performing spatial transformations associated with rigid body motions, kinematic and dynamatic analysis of robot systems.
4. Through projects done in lab, increase the true hands-on student learning experience and enhance their conceptual understanding, increase students' ability, competence and teamwork skills on dealing with real-life engineering problems

Outcomes: After completion of course, students would be able to:

1. Demonstrate knowledge of the relationship between mechanical structures of robotics and their operational workspace characteristics
2. Understand mechanical components, motors, sensors and electronic circuits of robots and build robots.
3. Demonstrate knowledge of robot controllers.
4. Use Linux environment for robotic programming.
5. Write Python scripts to control robots using Python and Open CV.

CO-PO ARTICULATION MATRIX

PO/CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P0 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	2	2	2	1	1	-	1	3	3	1	2	-	-	-
CO2	1	2	2	1	1	-	1	3	3	1	2	-	-	-
CO3	1	2	2	1	1	-	1	3	3	1	2	-	-	-
CO4	2	2	2	1	1	-	1	3	3	1	2	-	-	-
CO5	2	2	2	1	1	-	1	3	3	1	2	-	-	-

Lab Experiments:

1. Assembling of robot mechanical components, mounting of motors, sensors, electronic circuits to the chassis.
2. Connecting to electronic circuitry: motor drivers, incremental encoders proximity sensors, micro controller,
3. Different types of batteries, selection of suitable battery for application, safety precaution.
4. Introduction to Linux Command Line Interface: basic file and directory management and other useful commands
5. Controlling robot using Python: i) Move robot using Python code, ii) Make robot move in patterns using Python
6. Robot programming with Sensor inputs:i) Read sensor data using Python, ii) Visualize sensor data using Python, iii) Code robot to avoid obstacles by using sensor data
7. Open CV: i) Create an Image and display an image; ii) Read and change pixel values; iii) Create colored shapes and save image; iv) Extract the RGB values of a pixel; v) Reading and Writing Videos
8. Open CV: i) Extraction of Regions of Interest; ii) Extraction of RGB values of a pixel
9. Coding robot to work with colors, follow colored objects, identifying shape of the object-oriented
10. Projects: i)Making a line follower robot using a Camera; ii) Writing code for a complex function
11. Assembly of a drone

Suggested readings

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

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	-	-	-
CO 2	3	2	1	-	-	2	-	-	-	-	2	-	-	-
CO 3	3	2	3	-	-	2	-	-	-	-	2	-	-	-
CO 4	3	2	2	-	-	2	-	-	-	-	2	-	1	1
CO 5	3	2	3	-	-	2	-	-	-	-	2	-	1	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) As per AICTE Model Curriculum 2022-23

Model Curriculum(R-22) 2023-24

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	22CSC11	Database Management Systems	3	-	-	3	40	60	3
2	22CSC20	Computer Networks	3	-	-	3	40	60	3
3	22CSC05	Data Structures	3	-	-	3	40	60	3
4	22CSC32	Discrete Mathematics	3	-	-	3	40	60	3
5	22ITC01	Digital Logic and Computer Architecture	3	-	-	3	40	60	3
6	22CIC01	Fundamentals of Cyber Security and Tools	2	-	-	3	40	60	2
PRACTICAL									
7	22CSC33	Database Management Systems Lab	-	-	2	3	50	50	1
8	22CSC37	Networks Lab	-	-	2	3	50	50	1
9	22CSC31	Data Structures Lab	-	-	2	3	50	50	1
10	22CIC02	Fundamentals of Cyber Security and Tools Lab	-	-	2	3	50	50	1
11	22INT01	MOOCs / Training / Internship	-	-	3-4 Weeks 90 Hours -		50	-	2
12	22ACT	Activity Points	-	-	-	-	-	-	-
TOTAL			**17**	**-**	**8**	**-**	**490**	**560**	**23**

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

22CSC11

DATABASE MANAGEMENT SYSTEMS
(Common to CSE,CSE-AIML,AIML,CET,IT,AIDS)

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

Pre-requisites: Discrete mathematics of computer science, 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 andindexing.
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. Design database schema for an application using RDBMS concepts.
2. Write SQL queries for tasks of various complexities.
3. Build applications using database system as backend.
4. Understand internal working of a DBMS including data storage, indexing, query processing, transaction processing, concurrency control and recovery mechanisms.
5. Analyze non-relational and parallel/distributed data management systems with a focus on scalability.

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	2	2	3
CO 2	2	3	2	2	3	-	-	-	-	-	1	2	2	2
CO 3	2	1	2	1	3	-	-	-	-	-	-	2	3	2
CO 4	2	1	1	-	-	-	-	-	-	-	-	3	3	3
CO 5	2	1	-	1	-	-	-	-	-	-	-	3	3	2

UNIT - I

Introduction: Motivation, Introduction to Data Models (Relational, Semi structured, ER). **Relational Data Bases:** Relational Data Model, Relational Algebra, Relational Calculus.

UNIT - II

SQL + Interaction with Database: 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, Index Definition in SQL.

Simple Queries: (select/project/join/ aggregate queries), Complex queries (With Clause, Nested Sub-queries, Views), Programming in a standard language and interfacing with a DB backend.

UNIT- III

Big Data: Key-value Stores and Semi structured Data, using JSON and MongoDB, or other combinations. Database Design: Introduction to ER model, Mapping from ER to relational model, Functional Dependencies, Normalization.

UNIT - IV

Physical Design: Overview of Physical Storage (Hard Disks, Flash/SSD/RAM), sequential vs random I/O, Reliability via RAID, Storage Organization (Records, Pages and Files), Database Buffers, Database Metadata, Indexing, B+-Trees.

UNIT - V

Query Processing and Optimization: Query Processing, External sort, Joins using nested loops, indexed nested loops.

Overview of Query Optimization: Equivalent expressions and concept of cost based optimization.

Transaction Processing: Concept of transactions and schedules, ACID properties, Conflict-serializability. C**oncurrency control:** locks, 2PL, Strict 2PL, optional: isolation levels, Recovery using undo and redo logs.

Text Books:

1. Silberschatz, Korth and Sudarshan, "Database System Concepts", 7th Edition, McGraw-Hill. Indian Edition, 2021.
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. RP Mahapatra, "Database Management Systems", Khanna Publishing House, 2020.
5. Krishnan, "Database Management Systems", McGraw Hill.

Suggested Reading:

1. MySQL Explained: Your Step By Step Guide To Database Design
2. Pro SQL Server 2008 Relational Database Design and Implementation (Expert's Voice in SQL Server) 1st Edition

Online Resources:

1. http://www.nptelvideos.in/2012/11/database-managementsystem.html
2. https://www.oracle.com/news/connect/json-database-semistructured-sql.html

22CSC20

COMPUTER NETWORKS
(Common to CSE, CET)

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

Pre-requisites: Programming for problem solving and data structures.

Course Objectives:
This course aims to:
1. To understand the principles of data communication and organization of computer networks,
2. To analyze various routing protocols and congestion control algorithms.
3. To study the functions of the transport layer and to understand application layer protocols.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Learn the communication protocol suites like ISO-OSI and TCP/IP.
2. Illustrate and explain Data Communications System and its components.
3. Identify and analyze various congestion control algorithms.
4. Distinguish the internet protocols and understand transport layer protocols like IP, ARP, ICMP, TCP, UDP, RTCP.
5. Identify various application layer protocols like HTTP, WWW, DNS, Email Protocols, FTP and the underlying 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	3	2	1	1	-	-	-	-	-	-	1	-	-	-
CO 2	2	2	2	2	-	-	-	-	-	-	1	-	-	-
CO 3	3	1	1	-	-	-	-	-	-	-	-	-	1	-
CO 4	2	1	-	-	-	-	-	-	-	-	-	-	-	1
CO 5	1	-	-	-	-	-	-	-	-	-	-	-	-	1

UNIT-I
Introduction: Data communication, network types and models, TCP/IP and OSI Protocol Suite, transmission media (wired and wireless), switching.

UNIT-II
Data Link Layer: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, HDLC, multiple access protocols.
LAN: Wired LAN, wireless LAN, Virtual LAN.

UNIT-III
Network Layer: Network layer design issues, routing algorithms, congestion control algorithms, Quality of service, IPV4, IPV6, network layer protocols: ARP, RARP, ICMP, IGMP and DHCP.

UNIT-IV
Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP, congestion control, quality of service.

UNIT-V

Application Layer: DNS, DDNS, SMTP, POP, IMAP, SSH, SFTP, WWW, HTTP, SNMP, Firewalls.

Text Books:

1. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw Hill, Fifth Edition, 2017.
2. S. Tanenbaum, "Computer Networks", Pearson Education, Fifth Edition, 2013.
3. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2007.

Suggested Reading:

1. Larry L. Peterson, Peter S. Davie, “Computer Networks”, Elsevier, Fifth Edition, 2012.
2. James F. Kurose, Keith W. Ross, “Computer Networking: A Top–Down Approach Featuring the Internet”, Pearson Education, 2005.

Online Resources:

1. https://nptel.ac.in/courses/106/105/106105081/
2. https://nptel.ac.in/courses/106/106/106106091/

22CSC05

DATA STRUCTURES
(Common to CSE, CSE-AIML, AIML, CET, IT, AIDS)

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

Pre-requisites: Basic knowledge of programming language such as python.

Course Objectives:
This course aims to:
1. Study various linear and non-linear data structures.
2. Understand the performance of operations on data structures.
3. Explore various searching and sorting techniques.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Understand the basic concepts and types of data structures.
2. Analyze various linear and nonlinear datastructures.
3. Identify the applications of linear and nonlinear data structures and significance of balanced search trees, hashing.
4. Evaluate various searching and sorting techniques.
5. Use appropriate data structures to design efficient algorithms.

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	1	-
CO 2	3	3	-	-	-	-	-	-	-	-	-	1	1	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	1	1	-
CO 4	3	2	-	-	-	-	-	-	-	-	-	1	1	-
CO 5	3	3	1	-	-	-	-	-	-	-	-	1	1	-

UNIT-I
Introduction: Data structures, Classification of data structures, Abstract Data Types, Analysis of Algorithms. Recursion: Examples illustrating Recursion (Factorial, Binary Search), Analyzing Recursive Algorithms. Sorting: Quick sort, Merge Sort, Selection Sort, Radix sort, Comparison of Sorting Algorithms.

UNIT–II
Stacks: Stack ADT, Applications of stack, Array based stack implementation.
Queues: Queue ADT, applications of queues, Array based queue implementation, Double Ended Queues, Circular queues.

UNIT-III
Linked Lists: Introduction, Linked lists, Representation of linked list, types of linked list, singly linked lists, implementing stack with a singly linked list and Queue, Circular linked lists, doubly linked lists, Applications of linked lists.

UNIT-IV

Trees: General Trees, Binary Trees, Implementing Trees, Tree traversals.
Search Trees: Binary Search Trees, Balanced search trees- AVL trees, B-trees.
Priority Queue and Heaps: Priority queue ADT, Priority queue applications, Heap Trees, implementing a priority queue with a Heap, Heap Sort.

UNIT-V

Graphs: Introduction, Applications of graphs, Graph representations, graph traversals**.**
Hashing: Introduction, Hash Functions-Modulo, Middle of Square, Folding, Collision Resolution Techniques-Separate Chaining, Open addressing, Linear Probing, Quadratic Probing, Double Hashing.

Text Books:

1. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structure and Algorithms in Python”, Wiley, 2021.
2. Narasimha Karumanchi, “Data Structures and Algorithms Made Easy”, Career Monk Publications, 2020.
3. S. Sahni and Susan Anderson-Freed, “Fundamentals of Data structures in C”, E. Horowitz, Universities Press, 2nd Edition.
4. Reema Thareja, “Data Structures using C”, Oxford University Press, 2nd Edition, 2014.

Suggested Reading:

1. D. S. Kushwaha and A K. Misra, “Data structures A Programming Approach with C”, PHI, 2nd edition, 2014.
2. Seymour Lipschutz, “Data Structures with C”, Schaums Outlines, MGH, Kindle Edition, 2017.
3. Kenneth A. Lambert, " Fundamentals of Python: Data Structures", Cengage Learning, 2018.
4. D. Samantha, “Classic Data Structures”, Prentice Hall India, 2nd Edition, 2013.

Online Resources:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data-structures-#DS
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.coursera.org/specializations/data-structures-algorithms

22CSC32

DISCRETE MATHEMATICS

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

Course Outcomes

Upon 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	-	2	1	-
CO 2	3	3	1	3	-	-	-	-	-	-	1	1	1	-
CO 3	2	3	1	3	1	-	-	-	-	-	-	2	-	-
CO 4	3	3	2	3	1	-	-	-	-	-	1	2	1	-
CO 5	3	3	1	1	-	-	-	-	-	-	-	2	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, 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 Prims.

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. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics- An Applied Introduction", 5th Edition, Pearson Education, 2016.
2. Rosen, K. H. (2019). Discrete Mathematics and Its Applications. (8th Edition) ISBN10: 125967651X ISBN13: 9781259676512.
3. J. P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TATA Mc Graw-Hill Edition, 1995.

Suggested Reading:

1. Singh, S.B., Discrete Mathematics, Khanna Book Publishing Company, New Delhi. SBN: 9789382609407, 9789382609407, 3rd Edition, 2019
2. R. K. Bisht, H. S. Dhami, "Discrete Mathematics", Oxford University Press, Published in 2015.
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

Online Resources:

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

22ITC01

DIGITAL LOGIC AND COMPUTER ARCHITECTURE
(Common to IT, AI&DS and CET branches)

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. To familiarize with logic gates, combinational and Sequential logic circuits.
2. To provide understanding of Digital Counters, registers and Data representation.
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	2	1	-	1	-	-	-	1	-	1	-	-	-
CO 2	2	1	1	-	1	-	-	-	-	-	1	-	-	-
CO 3	2	2	1	-	-	-	-	-	-	-	2	-	-	-
CO 4	2	1	-	-	-	-	-	-	-	-	2	2	2	2
CO 5	2	2	1	-	-	-	1	-	1	-	2	-	-	-

UNIT–I
Data Representation: Number Systems, Octal and Hexadecimal Numbers, Decimal Representation, Complements: (r-1)'s Complement, r's Complement, Subtraction of Unsigned Numbers, Fixed–Point Representation, and Floating –Point Representation.
Digital Logic Circuits : Digital Computers, Logic Gates, Boolean Algebra, Map simplification, 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: General register Organization, Instruction Formats: Three Address Instructions, Two-Address Instructions, One-Address Instructions, and Zero-Address Instructions. Addressing Modes: Data Transfer and Manipulation, Program Control, Multi core Processors and their Performance.

UNIT–IV

Input-Output Organization: Peripheral Devices: ASCII Alphanumeric Characters, Input-output Interface: I/O Bus and Interface Modules, Asynchronous Data Transfer: Strobe Control, Handshaking, Asynchronous Communication Interface, First-In- First-Out Buffer, Modes of Transfer: Interrupt-Initiated I/O, Priority Interrupt: Daisy Chaining, 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, Solid State Drive, Associative Memory: Hardware Organization, Read and Write Operations, Cache Memory: Associative Mapping, Direct Mapping, Set-Associative Mapping, Virtual Memory: Address Space and Memory Space, Address Mapping using Pages, Associative Memory Page Table.

Text Book:

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

Suggested Reading:

1. Stephen Brown, Zvonko Vranesic, "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 Architecture", 8th Edition, PHI.2010.
4. Carl Hamachar, Vranesic, Zaky, "Computer Organization", 5th Edition, McGraw Hill.2002.

Web Resources:

1. https://nptel.ac.in/courses/117106114Week1%20Slides1.1Introduction.pdf
2. https://ece.gmu.edu/coursewebpages/ECE/ECE545/F10/viewg raphs/ ECE545_lecture1_digital_logic_review.ppt
3. http://www.nptelvideos.in/2012/11/computer-organization.html

22CIC01

FUNDAMENTALS OF CYBER SECURITY AND TOOLS

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

Pre-Requisites
Basic computer knowledge.

Course Objectives

1. To Identify and present indicators that a cybercrime has occurred and understand methods and tools used in cybercrimes,
2. To collect, Process, Analyze and Present Computer Forensics Evidence
3. To understand the legal perspectives and Organizational implications of Cyber Security.

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

1. Discuss different types of cybercrimes and analyze 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. Analyze and resolve cyber security issues in various domains.
5. Understand the importance of Cyber Laws and their Legal perspective.

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	2	1	2	1	-	-	1	1	-	1	1	1	1
CO2	3	2	2	-	-	2	-	2	-	1	1	-	-	1
CO3	2	2	1	-	-	-	-	-	-	2	1	-	1	-
CO4	2	-	1	-	2	-	-	-	-	-	1	2	1	-
CO5	1	-	1	-	-	-	-	-	-	-	1	-	1	1

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, Cyber café 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, Introduction to Cloud Security, Web threats for Organizations.

Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges 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, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber Law.

Technology and Students: The Indian Scenario

Textbook:

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 Reference

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

22CSC33

DATABASE MANAGEMENT SYSTEMS LAB
(Common to CSE-AIML,AIML,CET,IT,AIDS)

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

Pre-requisites: Discrete mathematics of computer science, Programming and Data

Structures. 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. Become familiar with generation of form and open database connectivity.
4. Add constraints on Databases implement DCL, TCL and advanced SQL commands.
5. Develop programs using 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 apply these functions to write simple and complex queries using SQL operators.
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, SQL Plus Reports and formulate the Queries for Creating, Dropping and Altering Tables, Views, constraints.
4. Develop queries using Joins, Sub-Queries and Working with Index, Sequence, Synonym, Controlling Access and Locking Rows for Update, Creating Password and Security features.
5. Develop PL/SQL code using Cursors, Exception, Composite Data Types and Procedures, Functions and Packages.

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	3	-	-	-	-	-	1	2	2	3
CO 2	3	3	2	2	3	-	-	-	-	-	1	2	2	2
CO 3	3	2	2	1	3	-	-	-	-	-	-	3	3	2
CO 4	3	1	1	-	-	-	-	-	-	-	-	3	3	3
CO 5	3	1	-	1	-	-	-	-	-	-	-	3	3	2

List of Experiments:
SQL:

1. Queries using Built-In functions, like aggregate functions, String Functions, Numeric Functions, Data Functions, Conversion Functions and other miscellaneous.
2. Queries using operators in SQL.
3. Queries to Retrieve and Change Data: Select Insert, Delete and Update.
4. Queries using Group By, Order By and Having Clauses.
5. Queries on Controlling Data: Commit, Rollback and Save point.
6. Queries to Build Report in SQL *PLUS.
7. Queries for Creating, Dropping and Altering Tables, Views and Constraints.
8. Queries on Joins and Correlated Sub-Queries.
9. Queries on Working with Index, Sequence, Synonym, Controlling Access and Locking Rows for Update.
10. Creating Password and Security features.
11. Querying in NoSql.

PL/SQL:

1. Write a PL/SQL code using Basic Variable, Anchored Declarations and Usage of Assignment Operation.
2. Write a PL/SQL code Bind and Substitution Variables, Printing in PL/SQL.
3. Write a PL/SQL block using SQL and Control Structures in PL/SQL.
4. Write a PL/SQL code using Cursors, Exception and Composite Data Types.
5. Write a PL/SQL code using Procedures, Functions and Packages.

Note: **The creation of sample database for the purpose of the experiments is expected to be pre- decided by the instructor.**

Text Books / Suggested Reading:

1. "Oracle: The complete Reference", by Oracle Press.
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007.
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

22CSC37

NETWORKS LAB
(Common to CET)

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

Pre-requisites: Operating Systems, Data Communication and Computer Networks.

Course Objectives:
This course aims to:

1. To familiarize students with the communication media, devices, and protocols.
2. To expose students to gain practical knowledge of computer networks and its configuration.
3. To create simple network topologies using simulation tools.

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

1. Identify the different types of wiring equipment used in the network lab.
2. Understand the various network devices like repeater, hub, switch, and routers.
3. Practice the basic network configuration commands like ifconfig, ping, traceroute, nslookup, dig, arp, netstat, nmap.
4. Design the network topologies using GNS3 and examine the packet transfer.
5. Design the network using various routing 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	3	2	1	1	-	-	-	-	-	-	1	2	2	2
CO 2	3	3	2	2	-	-	-	-	-	-	1	2	2	1
CO 3	3	1	1	-	-	-	-	-	-	-	-	1	1	-
CO 4	2	1	-	-	-	-	-	-	-	-	-	3	3	2
CO 5	1	1	-	-	-	-	-	-	-	-	-	1	1	2

List of Experiments:

1. Study of Network media, cables, and devices and Cable Construction.
2. Demonstration of basic network commands/utilities (both in Windows and Linux).
3. PC Network Configuration.
4. Building a switch-based network / Configuration of Cisco Switch CBS250-24T-4G 24-Port.
5. Configuration of Cisco Router ISR-4331.
6. Configuration of VLAN in Cisco switch.
7. Develop different local area networks using GNS3. Connect two or more Local area networks. Explore various sub-netting options.
8. Configure Static routing using GNS3 tool.
9. Basic OSPF configuration using GNS3 tool.
10. Basic EIGRP Configuration using GNS3 tool

Text Books:

1. S. Tanenbaum, "Computer Networks", Pearson Education, Fifth Edition, 2013.

Online Resources:

1. https://learningnetwork.cisco.com/s/question/0D53i00000Kt7EkCAJ/tools-for-ccnp-network- simulator-lab-tasks
2. https://www.packettracernetwork.com/
3. https://www.ghacks.net/2019/11/13/gns3-is-an-open-source-graphical-network-simulator-for- windows-linux-and- macos/
4. https://www.imedita.com/blog/top-10-list-of-network-simulation-tools/
5. https://www.gns3.com/

22CSC31

DATA STRUCTURES LAB
(Common to CSE-AIML,AIML,CET,IT,AIDS)

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

Pre-requisites: Any Programming Language.

Course Objectives:
This course aims to:
1. Understand the basic concepts of data structures and abstract datatypes.
2. Explore linear and non-linear data structures.
3. Study various searching, sorting and hashing techniques.

Course Outcomes:
Upon completion of this course, students will be able to:
1. Implement the abstract data type.
2. Implement linear and non-linear data structures.
3. Evaluate various sorting techniques.
4. Analyze various algorithms of linear and nonlinear data structures.
5. Choose or create appropriate data structures 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	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	2	3	1	-	-	-	-	-	-	-	-	-	1	1

List of Experiments
1. Implementation of Quick sort, Merge sort and Selection sort.
2. Implementing Stack using array.
3. Conversion of Infix expression to Postfix expression.
4. Implement the algorithm for Evaluation of Postfix.
5. Implementing Queues using array.
6. Implementation of Insert, Delete and Display operations on Single Linked List.
7. Implementation of Stack and Queue using linked list.
8. Implementation of Insert, Delete and Display operations on doubly Linked List.
9. Implementation of Binary Search Tree operations.
10. Implementation of Heap Sort.

Text Books:
1. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structure and Algorithms in Python”, Wiley, 2021.
2. Narasimha Karumanchi, “Data Structures and Algorithms Made Easy”, Career Monk Publications, 2020.

22CIC02

FUNDAMENTALS OF CYBER SECURITY AND TOOLS LAB

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

Pre-Requisites
Basic computer knowledge.

Course Objectives

1. To understand the tools used in Cyber Crimes.
2. To understand the phases involved in planning Cyber Crimes.
3. To configure the Defense Security System.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. Use Foot Printing Tools for Information Gathering.
2. Scan and scrutinize the information gathered.
3. Understand the usage of Sniffer Tools.
4. Become familiar with Attack Launching Tools.
5. Configure the proactive Défense system

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	2	-	2	3	1	-	1	3	3	1	1	1	1
CO2	2	3	1	3	3	1	-	1	2	2	1	-	-	1
CO3	2	2	2	3	3	1	-	1	2	2	1	-	1	-
CO4	2	2	2	3	3	2	-	1	2	2	1	2	1	-
CO5	2	3	3	2	2	2	-	1	1	1	1	-	1	1

LIST OF EXPERIMENTS:

1. Explore Information Gathering Tools (Foot Printing – Network Foot Printing, Website Foot Printing, DNS Footprinting, Social Network Footprinting, Email Footprinting).
2. Explore the tools for Scanning and Scrutinizing the gathered information. (IP Scanner, Port Scanner, Vulnerability Scanner, Web Application Scanner).
3. Introduction to Password Hacking Tools.
4. Analysis of Keylogger Software.
5. Introduction to Malware tools. (Virus dissemination tools, Trojans).
6. Introduction to Phishing & Sniffer Tools.
7. Study and Exploration of Different Attack Launching Tools. (DoS Attacks).
8. Study of Ransomware.

Textbook:

1. Sunit Belpre and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India Pvt. Ltd, 2011.
2. Zoom, “Cyber Security Professional Lab Manual”.
3. Dr. Eric Cole, Dr. Ronald Krutz and James W. Conley, “Network Security Bible”, Edition 2, Wiley India Pvt. Ltd, 2010.

Web Reference

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

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)

As per AICTE Model Curriculum 2022-23

Model Curriculum(R-22) 2023-24

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	22CSC14	Design and Analysis of Algorithms	3	-	-	3	40	60	3
3	22ECC36	Basic Electronics and Sensors	3	-	-	3	40	60	3
4	22ITC17	Web Technologies	3	-	-	3	40	60	3
5	22CIC03	AI Tools, Techniques and Applications	2	1	-	3	40	60	3
6	22MBC01	Engineering Economics and Accountancy	3	-	-	3	40	60	3
PRACTICAL									
7	22CIC04	AI Tools, Techniques and Applications Lab	-	-	2	3	50	50	1
8	22CSC34	Design and Analysis of Algorithms Lab	-	-	2	3	50	50	1
9	22ITC19	Internet Technologies Lab	-	-	2	3	50	50	1
10	22ECC37	Basic Electronics and Sensors Lab	-	-	2	3	50	50	1
11	22CICU01	Upskill Certification course – I	-	-	-	-	25	-	0.5
12	22ACT	Activity Points	-	-	-	-	-	-	-
TOTAL			**17**	**1**	**8**	**30**	**465**	**560**	**22.5**

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

22MTC13

Mathematical Foundation for Data Science and Security

Instruction	3 L Hours per Week
Duration of SEE	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	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	1	-
CO 2	3	3	2	3	-	-	-	-	-	-	2	1	1	-
CO 3	3	3	2	3	-	-	-	-	-	-	2	1	1	-
CO 4	3	3	3	3	-	-	-	-	-	-	2	1	1	-
CO 5	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

Textbook:

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

Reference Books

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.

22CSC14

DESIGN AND ANALYSIS OF ALGORITHMS

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

Pre-Requisites
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. Analyzing performance of algorithms using asymptotic notations.
2. Demonstrate familiarity with major algorithms and importance of algorithm design techniques.
3. Apply algorithm design techniques on different problems.
4. Analyze the efficiency of the algorithms.
5. Understanding limits of efficient computation with the help of 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	2	1	1	-	-	-	-	-	-	-	-	2	1	-
CO 2	3	3	2	-	-	-	-	-	-	-	-	2	1	-
CO 3	2	2	2	-	-	-	-	-	-	-	-	2	1	-
CO 4	2	2	1	-	-	-	-	-	-	-	-	2	1	-
CO 5	2	2	1	-	-	-	-	-	-	-	-	2	1	-
CO 6	2	3	1	-	-	-	-	-	-	-	-	2	1	-

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.
Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem, Randomized Quicksort.

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, Optimal Binary Search Tree.

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, Travelling Salesperson problem.

Unit –IV

Graph Algorithms:

Applications of DFS: Bi-Connected components, Strongly Connected Components, Topological Sorting.

Shortest Path Algorithms: Dijkstra's, Bellman-Ford, Floyd-Warshall and Johnson's algorithms.

Minimum Spanning Tree Algorithms: Prims and Kruskal.

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 and Subset Sum Problem.

Text Books:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms",MIT Press/McGraw-Hill, 3rd Edition, 2009.
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 InternetExamples, Wiley Second Edition.

Online Resources:

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

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. Analyze 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.

22ITC17

WEB TECHNOLOGIES

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

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. To understand how HTML, CSS, JavaScript and Bootstrap work together.
2. To explore various features of JS and its functionality.
3. To understand the basics of MongoDB and its Data Model.
4. To comprehend the new features of JS, role of React JS in responsive web application development.
5. To familiarize with configuration of NPM and backend integration with NODE JS and Express JS.

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

1. Create web pages with good aesthetic sense of design using HTML CSS3, Bootstrap and popular themes.
2. Use JS in Validations and DOM manipulation.
3. Design Schema and perform CRUD operations from UI components.
4. Become an agile practitioner with the ability to quickly complete projects using ReactJS.
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	-	3
CO 2	2	1	2	1	2	-	-	-	-	1	-	2	-	3
CO 3	2	1	2	2	1	-	-	-	-	-	-	3	-	3
CO 4	2	1	1	1	1	-	-	-	-	-	1	1	-	3
CO 5	2	1	1	1	1	-	-	-	-	-	1	1	-	3

UNIT-I
Introduction: Web Fundamentals, HTML 5.0: basic tags, Images, Tables, Lists, Forms, Layout, Graphics, span and div tags. Grid.
Introduction to Cascading Style Sheets: Types of CSS**,** text and font, color**,** CSS Selectors, CSS BOX Model, CSS Positioning, and CSS floating.
Bootstrap: Introduction of Bootstrap, Container and Container-fluid, Jumbotron, Grid, Table, Form, Alert, Navbar, Modals.

UNIT-II
Java Script: Introduction, data types, control structures, functions, arrays, objects, regular expressions, working with events, form validation, DOM Elements, Accessing and modifying Elements using DOM, Dynamic document with Java script.

UNIT-III
Mongo DB: Introduction, Importance of NoSQL databases, Data types, Documents, nested Documents, CRUD Operations.

Basic cursor methods: map, toArray, pretty, forEach, limit, count, sort, Columnar Databases, Indexing and Aggregation, MongoDB Node JS Drivers and CAP theorem.

UNIT-IV

React Js: ES5 vs Es6, Scoping - var vs let vs const, Arrow functions, Use of this keyword (lexical scoping), Spread & rest parameter, Array & object destructure, module import and export, State, Props, Components, Lifecycle, Stateful and stateless components, Events, Router, Forms, Tables, Portals, CSS, Hook and new Features added in recent versions.

UNIT-V

Node JS: Creating Web Server, Functions, Buffer, Node Modules, Creating Web Server, Handling HTTP requests. Express JS: API methods - GET, POST, PUT, DELETE, Request & response objects, URL and Query parameters, Routing, Templates, middleware and the model-view-controller pattern.

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.

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 Edition, Manning Publications, 2019
4. 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/
5. https://getbootstrap.com/docs/5.0/utilities/api/
6. https://edu.anarchocopy.org/Programming%20Languages/Node/Pro%20MERN%20Stack,%202nd%20Edition.pdf

22CIC03

AI TOOLS, TECHNIQUES AND APPLICATIONS

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

Prerequisite: Basic computer fundamentals

Course Objectives:
The objectives of this course are to:

1. Introduce fundamental concepts of AI.
2. Demonstrate the capabilities of AI applications.
3. Present various modeling and formulation techniques to solve problems using AI.
4. Introduce state-of-art tools and techniques.

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

1. Understand fundamental concepts of AI and its importance.
2. Identify various Machine Learning algorithms and their limitations.
3. Develop Chatbots based on requirements.
4. Analyze complex problems involving image processing, Computer Vision and HCI.
5. Understand smart solutions for 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
CO 1	2	-	-	-	2	-	-	-	-	-	-	-	-	-
CO 2	2	2	-	-	-	-	-	-	-	-	-	-	1	1
CO 3	-	-	2	-	-	-	-	-	-	-	-	1	3	1
CO 4	-	-	2	3	2	-	-	-	-	-	-	-	1	2
CO 5	2	2	2	-	-	-	1	-	-	-	-	2	2	3

UNIT-I:
Introduction to Artificial Intelligence: Definition, importance of AI, application areas, state – of – the art in AI, overview of hard AI problems and challenges facing in the field of AI;
Machine Learning: Introduction, machine learning algorithms, machine learning in practice, testing, problems with machine learning, dangers of machine learning and benefits.

UNIT-II:
Natural Language Processing: Overview of NLP and components, applications, use cases of NLP and challenges.
Computer Vision: capabilities of computer vision, use of computer vision, computer vision on mobile devices, best practices and use cases, challenges.

UNIT – III
Building AI and Machine Learning Projects: Workflow of a ML project, data science project, data collection, data set preparation.
AI Technologies, Tools, Platforms: Tensor Flow, Scikit, PyTorch, Keras, Rapid Miner, AWS, Google Cloud AI, Azure, IBM Watson.

UNIT – IV

Chatbots: Introduction to chatbots, architecture of a chatbot, process build Chatbots, challenges in building successful Chatbots, best practices, industry case studies, Virtual assistants.

UNIT – V

Applications and Impact of AI: Smart applications, Current challenges, trends, opportunities, scalability, adversarial attacks on AI, adverse uses of AI, impact of AI on world's economy and its social implications.

AI Tools and Applications: Scikit-Learn, Tensor-Flow comparison and real applications.

Text Books:

1. Tom Markiewicz & Josh Zheng, "Getting Started with Artificial Intelligence – A Practical Guide to Building Enterprise Applications" O'Reilly, 2017.
2. Stuart J. Russell and Peter Norvig, "Artificial Intelligence A Modern Approach".

Suggested Reading:

1. Aurélien Géron, "Hands on Machine Learning with Scikit-Learn and Tensor Flow [Concepts, Tools, and Techniques to Build Intelligent Systems]", Published by O'Reilly Media,2017
2. Joseph Howse, Prateek Joshi, Michael Beyeler - Opencv_ Computer Vision Projects with Python- PacktPublishing (2016)

Online Resources:

1. https://medium.com/@salisuwy/build-an-ai-assistant-with-wolfram-alpha-and-wikipedia-in-python- d9bc8ac838fe
2. https://www.coursera.org/learn/uol-machine-learning-for-all
3. https://www.coursera.org/learn/uol-machine-learning-for-all#syllabus
4. http://aws.amazon.com 2.http://code.google.com/appsengine
5. http://scikit-learn.org/stable
6. https://opencv.org/
7. https://github.com/qqwweee/keras-yolo3
8. https://www.pyimagesearch.com/2018/11/12/yolo-object-detection-with-opencv/

22MBC01

ENGINEERING ECONOMICS AND ACCOUNTANCY

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. 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:
Upon completion of this 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 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	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	3	1	1	1	-	1	1	1	-	1	-	-
CO 2	2	2	2	2	-	1	-	1	-	1	-	1	-	-
CO 3	1	2	1	2	2	1	-	1	-	1	-	1	-	1
CO 4	2	2	1	2	2	1	-	3	-	1	-	1	-	-
CO 5	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, Equimarginal 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 Isocosts, 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 India Pvt Ltd, 2007.
4. A. R. Aryasri, "Managerial Economics and Financial Analysis", McGraw-Hill, 2018.

22CIC04

AI TOOLS, TECHNIQUES AND APPLICATIONS LAB

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

Course Objectives:

The main objectives of this course are to:

1. Expose the students to AI related real worldproblems.
2. Familiarize students with AI tools and techniques.
3. Expose students with AI technologies and platforms.

Course Outcomes:

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

1. Demonstrate the capabilities of AI.
2. Build models for various real time problems using AI/ML Tools.
3. Develop Chatbots, programs for simple applications.
4. Analyze and interpret the experimentation results.
5. Develop skills to communicate the experimentation results.

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	-	-	-	-	-	-	-	-	-
CO 2	2	2	2	2	-	-	-	-	-	-	-	-	1	1
CO 3	-	-	2	-	-	-	-	-	-	-	-	-	2	1
CO 4	-	2	2	3	-	-	-	-	-	-	-	-	-	-
CO 5	-	-	-	-	2	-	-	-	-	2	-	-	-	-

Lab Experiments:

1. Overview of AI, AI/ML project life cycle
2. Design/construct the workflow of a general AI project using draw.io
3. Train a ML model to recognize a Person or Object including gestures
4. Train a ML model to recognize various sound bytes and speech
5. Develop an app to recognize objects using imageclassification
6. Develop an Expression Match app using the trained ML model for facial expressions
7. Develop a Voice Authentication app tat uses a trained audio model of the user using audio classification to recognize the user's voice to authentication
8. Develop a conversational chatbot to automatically recognize speech, understand the intent of the user and generate a response accordingly using Amazon Lex
9. Design a program using Wolfram Language to classify Data (Numbers, Images, Colors) using automatic model selection
10. Design a program using the Wolfram Language to demonstrate Vector Encoding based Feature Extraction and Clustering for a dog image dataset

Text Books:

1. Tom Markiewicz & Josh Zheng, "Getting Started with Artificial Intelligence – A Practical Guide to Building Enterprise Applications" O'Reilly, 2017

Online Resources:

1. https://teachablemachine.withgoogle.com/v1/
2. https://appinventor.mit.edu/
3. https://aws.amazon.com/lex/
4. https://www.wolfram.com/
5. https://www.coursera.org/

22CSC34

DESIGN AND ANALYSIS OF ALGORITHMS LAB

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

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. Implement greedy, dynamic programming, backtracking and branch and bound techniques.
2. Demonstrate various algorithmic design techniques.
3. Analyze the performance of various algorithms.
4. Compare various design strategies.
5. Formulate solutions to solve real world problems use acquired knowledge.

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	2	1	-	-	-	-	1	1	1	1
CO 2	3	2	-	1	1	1	-	-	1	-	2	-	-	-
CO 3	3	3	2	2	1	2	-	-	1	-	1	-	1	1
CO 4	3	1	1	2	-	1	-	-	-	-	1	-	1	1
CO 5	3	3	2	2	2	2	1	-	1	-	2	1	2	2

The following task should be carried out by the students in the laboratory for each experiment:

1. Setup the environment for the experiment.
2. Select appropriate design technique to implement the problem.
3. Represent the solution using algorithm
4. Analyze the performance of the algorithm (Time and Space complexity)

Justify the performance of your solution is better than other strategies

1. You are given the task of choosing the optimal path to connect 'N' devices. The devices are connected withthe minimum required N-1 wires into a tree structure, and each device is connected with the other with a wire of length 'L' i.e 'D_1'connected to 'D_2' with a wire of length 'L_1'. This information will be available forall 'N' devices.

    a. Determine the minimum length of the wire which consists of N-1 wires that will connect all devices.
    b. Determine the minimum length of the wire which connects D_i to all other devices where

$1 \leq i \leq N$.

2. CSE department of CBIT want to generate a time table for 'N' subjects. The following information is given- subject name, subject code and list of subjects code which clashes with this subject. The problem is to identify the list of subjects which can be scheduled on the same time line such that clashes among them do not exist.
3. A Test has 'N' questions with a heterogeneous distribution of points. The test-taker has a choice as to which questions can be answered. Each question Q_i has points P_i and time T_i to answer the question, where $1 \leq i \leq N$. The students are asked to answer the possible subsets of problems whose total point values add up to a maximum score within the time limit 'T'. Determine which subset of questions gives student the highest possible score.
4. Given N items with their corresponding weights and values, and a package of capacity C, choose either the entire item or fractional part of the item among these N unique items to fill the package such that the package has maximum value.
5. Given a bunch of projects, where every project has a deadline and associated profit if the project is finished before the deadline. It is also given that every project takes one month duration, so the minimum possible deadline for any project is 1 month. In what way the total profits can be maximized if only one project can be scheduled at a time.
6. N-Queen is the problem of placing 'N' chess queens on an N×N chessboard. Design a solution for this problem so that no two queens attack each other.
   Note: A queen can attack when an opponent is on the same row, column or diagonal.
7. Bi-connected graphs are used in the design of power grid networks. Consider the nodes as cities and the edges as electrical connections between them, you would like the network to be robust and a failure at one city should not result in a loss of power in other cities.

Text Books:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms",3rd Edition, MIT Press/McGraw-Hill, 2009.
2. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis, and Internet Examples", Second Edition, Wiley, 2001

22ITC19

INTERNET TECHNOLOGIES LAB
(Only for CET branch)

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

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. Comprehend NoSQL Databases and MongoDB
4. Understand core features of JavaScript and React JS.
5. Learn Express JS and Node JS frameworks to develop responsive web applications.

Course Outcomes:

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

1. Build interactive and user-friendly static frontend UI applications using HTML, CSS and JavaScript.
2. Develop a web page based on Bootstrap.
3. Use MongoDB concepts in Web Application Development using React JS.
4. Create Single Page and multi-page Applications using React, Node JS, Express JS and MongoDB.
5. Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone.

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	3	3
CO 2	2	1	2	1	2	-	-	-	-	-	1	3	3	3
CO 3	2	1	2	2	1	-	-	-	-	-	-	3	3	3
CO 4	2	1	1	1	1	-	-	-	-	-	1	3	3	3
CO 5	2	1	1	2	2	-	-	-	-	-	2	3	3	3

(Note: Setup a Node JS server in Visual Studio to run the following experiments applications)

List of Experiments:

1. Build a basic static website using HTML5, CSS3 and bootstrap components.
2. Explore the new features introduced in ES5 to recent.
3. Develop Functional and class components in React JS.
4. Demonstrate state and props in React JS.
5. Create an example component that implements Routing in Node JS
6. Design Blogging Platform using MERN (Mongo, Express, React JS and Node JS) and implement CRUD Operations.

Text Books:

1. Brad Dayley, Brendan Dayley, Caleb Dayley, “Node.js, MongoDB and React JS Web Development”, 2nd edition, Perason Education, 2018.
2. Alex Banks, Eve Porcello, “Learning React Modern Patterns for Developing React Apps”, 2nd Edition, Oreilly Media Inc, 2020.

Suggested Reading:

1. Vasan Subramanian, "Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node", second Edition, Apress Publications, 2019.

Web References:

1. https://github.com/eggheadio/illustrated-dev/blob/master/content/explainers/react-vdom/index.mdx
2. https://legacy.reactjs.org/docs/jsx-in-depth.html#props-default-to-true
3. https://react.dev/learn/tutorial-tic-tac-toe

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

1. Familiarize with basic electronic components, devices, and systems.
2. Formulate the research problems associate with Transistor or Op-amp circuits.
3. Examine the Interfacing of myRIO with various sensors/transducers, Motors.
4. Examine and Measure the problems encountered in Robots or sensor related systems.
5. Justify the solutions related with transistorized circuits for 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	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)

As per AICTE Model Curriculum 2022-23

Model Curriculum(R-22) 2024-25

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	22CIC06	Cyber Threat Intelligence	3	-	-	3	40	60	3
3	22CIC07	Industrial Internet of Things Systems	3	-	-	3	40	60	3
4	22CIC09	Cryptography and Network Security	3	-	-	3	40	60	3
5	22CSC15N	Operating Systems	3	-	-	3	40	60	3
6		Professional Elective – I	3	-	-	3	40	60	3
PRACTICAL									
7	22CSC18N	Operating Systems Lab	-	-	2	3	50	50	1
8	22CIC08	Industrial Internet of Things Systems Lab	-	-	2	3	50	50	1
9	22CIC10	Cryptography and Network Security Lab	-	-	2	3	50	50	1
10		Professional Elective – I			2	3	50	50	1
	22CII02	Internship-II (Industrial/ Rural Internship)	3-4 weeks / 90 hours			-	50	-	2
TOTAL			**18**	**-**	**8**	**-**	**490**	**560**	**24**

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)

As per AICTE Model Curriculum 2022-23

Professional Elective - I

S.NO	THEORY	
	Course Code	**Course**
1	22CIE01	OOPS through Java
2	22CIE03	Digital Forensics
3	22CAE12	Artificial Intelligence and Machine Learning
4	22ITE04	Mobile Application Development
5	22CIE05	Distributed Systems
	LAB	
	Course Code	**Course**
1	22CIE02	OOPS through Java Lab
2	22CIE04	Digital Forensics Lab
3	22CAE13	Artificial Intelligence and Machine Learning Lab
4	22ITE21	Mobile Application Development Lab
5	22CIE06	Distributed Systems Lab

22CIC05

BLOCKCHAIN TECHNOLOGY

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

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. Define 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.

Mapping of Course Outcomes with Program Outcomes and Program Specific 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	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

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

Permissionless Blockchain Ethereum: 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 and clients, Applications developed on Ethereum

UNIT-IV

Permissioned Blockchain Hyperledger Fabric : Introduction to Hyperledger Fabric, Hyperledger Fabric architecture, Membership services, Hyperledger Projects- Fabric, Sawtooth lake, Iroha , Components of the Fabric, Peers or nodes, Applications on Blockchain, Alternate Blockchains- Ripple, Corda.

UNIT-V

Case studies using Blockchain: Cross border payments, Know Your Customer (KYC), Food supplychain, Mortgage over Blockchain, Identity on Blockchain, Blockchain in Insurance Industry, Education, Healthcare, realestate management and Metaverse

Textbooks:

1. Imran Bashir, “Mastering Blockchain”, Second Edition, Packt Publishing, 2018
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 BuildSmart 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://archive.trufflesuite.com/guides/pet-shop/
3. https://ethereum.org/en/
4. https://www.hyperledger.org/projects/fabric
5. NPTEL courses:
    a. Blockchain and its Applications,
    b. Blockchain Architecture Design and Use Cases

22CIC06

CYBER THREAT INTELLIGENCE

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

Pre-Requisites
Introduction to Cybersecurity, Basic Networking Concepts, Foundations of Information Security

Course Objectives

1. Provide a foundational understanding of cyber threat intelligence concepts, including definitions, importance, and lifecycle.
2. Teach the process of developing and implementing effective cyber threat intelligence programs, including requirement gathering and partner selection.
3. Equip with practical skills for targeting threats and managing incidents through hands-on exercises and real-world scenarios.
4. Train in gathering, storing, analyzing threat information, and producing actionable intelligence products.
5. Prepare for strategic roles in building, planning, and managing intelligence programs, and demonstrating their value to stakeholders.

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

1. Define and explain key concepts of cyber threat intelligence, including its importance and lifecycle.
2. Develop and implement cyber threat intelligence programs, including gathering requirements and selecting partners.
3. Demonstrate practical skills in targeting threats, managing security incidents, and conducting investigations through applied exercises.
4. Adept at gathering, and analyzing threat information, and creating actionable intelligence products for various audiences.
5. Build, plan, and manage strategic intelligence programs, engage stakeholders, and demonstrate the value of these programs.

CO-PO Articulation Matrix

PO/CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	1	1	-	1	-	-	-	2	2	1	1	3
CO2	2	3	-	1	1	-	1	-	-	-	2	2	1	1	3
CO3	1	3	2	2	-	-	1	-	-	-	2	2	2	1	3
CO4	2	3	2	1	-	1	1	-	-	-	2	2	3	2	3
CO5	1	2	1	1	2	2	1	-	-	-	2	2	3	2	3

Unit – I
Cyber Threat Intelligence - Definition, Introduction, Basics of Intelligence, Basics of Incident Response, Intelligence for Security Teams, Types and Sources, The Threat Intelligence Lifecycle, Applications of Threat Intelligence.

Unit – II
Developing Cyber Threat Intelligence Requirements, Collecting Cyber Threat Information, Analyzing and Disseminating Cyber Threat Intelligence, Using Cyber Threat Intelligence, Implementing an Intelligence Program, Selecting the Right Cyber Threat Intelligence Partner,

Unit – III

Practical Application Part -I, Find, Actor-Centric Targeting, Asset-Centric Targeting, News-Centric Targeting, Targeting Based on Third-party notification, Prioritizing Targeting, Organizing Targeting Activities, The Request for Information Process, Fix, Intrusion Detection, Intrusion Investigation, Scoping, Hunting, Finish, Stages of Finish, Taking Action, Organizing Incident Data, Assessing the Damage, Monitioirng Life Cycle.

Unit – IV

Practical Application Part -II, Exploit, Gathering Information, Storing Threat Information, Analyze, The Fundamentals of Analysis, Conducting the Analysis, Analytical Processes and Methods, Disseminate, Intelligence Consumer Goals, Audience, Authors, Actionability, Intelligence Product Formats, Establishing a Rhythm.

Unit – V

The Way Forward, Strategic Intelligence, The Strategic Intelligence Cycle, Building an Intelligence Program, Planning the Program, Stakeholder Personas, Tactical Use Cases, Operational Use Cases, Strategic Use Cases, Hiring an Intelligence Team, and Demonstrating Intelligence Program Value.

Textbook:

1. Intelligence-Driven Incident Response: Outwitting the Adversary by Scott J. Roberts and Rebekah Brown, 1st edition, 2017, O'Reilly Media.
2. Definitive Guide to Cyber Threat Intelligence Using Knowledge about Adversaries to Win the War against Targeted Attacks, Jon Friedman, Mark Bouchard, CISSP, Foreword by John P. Watters, iSIGHT Partners.

Reference Books

1. The Threat Intelligence Handbook- Moving Toward a Security Intelligence Program, Christopher Ahlberg Zane Pokorny, CyberEdge Press, 2nd Edition, 2019.
2. The Intelligence Handbook: A Roadmap for Building an Intelligence-Led Security Program, CyberEdge Press, 4th Edition, 2022.

Web Reference

1. MITRE ATT&CK Framework: https://attack.mitre.org/
2. AlienVault Open Threat Exchange (OTX): https://otx.alienvault.com/
3. The Recorded Future Blog: https://www.recordedfuture.com/blog/
4. "Cyber Threat Intelligence" on Coursera, offered by IBM.
5. "Introduction to Cybersecurity Tools & Cyber Attacks" on Coursera.
6. "Threat Intelligence: The Big Picture" on Pluralsight.
7. "Advanced Threat Intelligence" on Cybrary.

22CIC07

Industrial Internet of Things Systems

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. Illustrate working of I/O devices, sensors & communication module.
3. Analyse the use of protocols in IoT.
4. Interface I/O devices, Sensors & communication module
5. Develop real time IoT based projects.

CO-PO Articulation Matrix

PO/CO	PO 1	PO2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO3
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? Advantages and Disadvantages of IoT.
The Industrial Internet of Things (IIoT): Definition of IIoT, IoT, and M2M, IIoT Challenges, IIoT Requirements, IIoT Benefits.
Internet of Things: More than Smart "Things": IoT key attributes, Three Major Challenges Facing IoT: Technology, Technological Challenges, Business, Categories of IoT, Architecture of IoT.

Unit – II
IoT Implementation and Challenges: Components of IoT Implementation: Sensors, Networks, Standards, Intelligent analysis, Intelligent actions.
IoT Standardization and Implementation Challenges, Communication modules, I/O interfaces, Programming API's.

Unit – III
Configuring Raspberry Pi, MicroPython Pyboard, and Jetson Nano for Python: Raspberry Pi Board Feature, Configuration of Raspberry Pi, Simple Applications with Raspberry Pi: OLED Display Interface, Camera Interfacing, Motor Control (DC Motor, Stepper Motor, and Servo Motor), Raspberry Pi and Mobile Interface Through Bluetooth.

Unit – IV

IoT data protocols: MQTT, CoAP, AMQP, DDS, HTTP, WebSocket.
Network Protocols for IoT: 6LowPAN, RPL, WiFi, Bluetooth, ZigBee, Z-Wave, LoRaWan, , XMPP.

Unit – V

IIoT Case Studies: Smart Grids for Energy Management, Connected Agriculture, Smart Buildings and Facilities Management, Supply Chain Optimization, Connected Healthcare, Smart Retail, Smart Transportation, Water Management

Textbook:

1. Ahmed Banafa by Introduction to Internet of Things (IoT) Published 2023 by River Publishers
2. Jivan S. Parab · Madhusudan Ganuji Lanjewar · Marlon Darius Sequeira · Gourish Naik · Arman Yusuf Shaikh by Python Programming Recipes for IoT Applications , Springer Nature Singapore Pte Ltd. 2023.
3. ArshdeepBahga, Vijay Madisetti, Internet of Things: A hands on approach, 2014, VPT publishers

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", O Reilly Media, 2011.

Web Reference

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.

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/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	2	1	-	2	1	1	1	2	3	2	2
CO 2	3	3	3	3	3	-	2	1	1	1	2	3	3	2
CO 3	3	3	3	3	3	-	2	1	1	1	2	3	3	2
CO 4	2	2	2	2	3	-	2	2	1	1	2	3	3	2
CO 5	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.

Textbook:

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 Reference

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

22CSC15N

OPERATING SYSTEMS

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

Pre-Requisites
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 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
CO 1	2	1	1	-	-	-	-	-	-	-	-	1	1	2
CO 2	3	3	-	3	1	-	-	-	-	-	-	2	1	2
CO 3	3	3	2	1	1	-	-	-	-	-	-	2	2	2
CO 4	3	3	1	3	-	-	-	-	-	-	-	1	2	1
CO 5	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.

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. **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. **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 Case Studies:** Types of threats in OS, basic security mechanisms, malware taxonomy, viruses, worms, and rootkits; Defense: overview, logging, auditing, and recovery, OS-level memory protection. Linux/Unix OS Design and architecture, Unix Shell.

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.
3. EktaWalia Khanna, “Operating System Concepts”, Publishing House; 2nd Edition, 2019.
4. DhananjayDhamdhare, “Operating Systems-A Concept Based Approach”, 3rd Edition, McGraw Hill Education, 2017.

Suggested Reading:

1. W. Richard Stevens, Stephen A. Rago, “Advanced Programming in the UNIX® Environment” Pearson Education India; 3rd Edition, 2013.
2. Maurice J. Bach, “Design of the UNIX Operating System”, Pearson Education India; 1st Edition, 2015.

Online Resources:

1. Remzi H. Arpaci-Dusseau and Andrea C. , “Three Easy Pieces”, Arpaci-DusseauArpaci-Dusseau Books, LLC https://pages.cs.wisc.edu/~remzi/OSTEP/ (online version).
2. FransKaashoek, 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).

22CSC18N

OPERATING SYSTEMS LAB

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

Pre-Requisites
Operating systems, Programming for problem solving.

Course Objectives
This course aims to:
1. Explore Unix/Linux operating system.
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	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	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:
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, setuidbrk, 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.
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.
11. Development of applications using Linux/Unix system calls: signal, socket, accept, snd, recv, connect.

Text Books:
1. Galvin, Silberschatz, “Operating System Concepts”, 10th Edition, John Wiley & Sons, 2018.

2. DhananjayDhamdhare, “Operating Systems-A Concept Based Approach”, 3rd Edition, McGraw Hill Education, 2017.

Suggested Reading:

1. EktaWalia, “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.

22CIC08

Industrial Internet of Things Systems 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 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	-	-	1	-	-	1	1	1	-
CO 2	1	1	1	1	1	-	-	-	-	-	1	1	1	-
CO 3	1	1	1	1	-	-	-	-	-	-	1	-	1	-
CO 4	1	1	1	1	1	-	-	-	1	-	1	1	1	-
CO 5	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 Reference

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.

22CIC10

CRYPTOGRAPHY AND NETWORK SECURITY LAB

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

Pre-Requisites

Data Communication and Computer Networks, Programming and Problem Solving.

Course Objectives

1. To implement various substitution and transposition techniques used in encryption and decryption.
2. To implement the algorithms for Symmetric and Asymmetric encryption.
3. To implement Diffie-Hellman key exchange algorithm to securely exchange secret keys between two parties.
4. To analyse the properties and applications of cryptographic hash functions in data integrity verification and digital signatures.
5. To demonstrate the use of Intrusion Detection Systems (IDS) using tools like Snort for network security monitoring.

Course Outcomes

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

1. Demonstrate the ability to apply encryption and decryption methods utilizing substitution and transposition techniques.
2. Apply symmetric and asymmetric key Algorithms, for secure data encryption/decryption, and analyse their performance and security in real-world encryption contexts.
3. Implement the Diffie-Hellman key exchange algorithm for secure key exchange over insecure channels and develop/test digital signature systems using the Digital Signature Standard (DSS).
4. Evaluate the security properties and suitability of cryptographic hash functions (MD5, SHA-512) for different applications.
5. Demonstrate the ability to deploy and configure Intrusion Detection Systems (IDS) for network security monitoring.

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	0	0	0	0	0	0	0	3	3	3
CO 2	2	2	3	2	1	0	0	0	0	0	0	3	3	3
CO 3	3	2	2	3	2	0	0	0	0	0	0	3	3	3
CO 4	3	2	3	3	2	0	0	0	0	0	0	3	3	3
CO 5	3	2	2	2	3	2	3	2	3	3	3	3	3	3

LIST OF EXPERIMENTS

1. Perform Encryption and Decryption using the following Substitution techniques (i) Caesar cipher (ii) Playfair cipher (iii) Hill Cipher (iv) Vigenère cipher.
2. Implement Transposition Cipher using Rail Fence Technique.
3. Implement Data Encryption Standard (DES) algorithm for Symmetric key encryption.
4. Implement Advanced Encryption Standard (AES) algorithm for Symmetric key encryption.
5. Implement RSA Asymmetric key encryption algorithm.
6. Demonstrate how two parties can securely exchange secret keys over an insecure

communication channel using the Diffie-Hellman key exchange algorithm.
7. Implement MD5 cryptographic hash function.
8. Implement SHA-512 cryptographic hash function.
9. Implement Digital Signature Standard (DSS) Algorithm.
10. Demonstrate Intrusion Detection System (ids) using any tool eg. Snort or any other s/w.

Textbook:

1. William Stallings, "Cryptography and Network Security: Principles and Practice" Pearson Education, 6th Edition.
2. Chris Brenton, "Mastering Network Security" Bk & Cd-Rom Edition 2017.
3. Douglas Robert Stinson." Cryptography Theory and Practice". 4th Edition 2017.

Reference Books

1. J.W. Rittiaghouse and William M.Hancok "Cyber Security Operations Handbook" Elseviers.
2. Bruce Schneier" Applied Cryptography: Protocols, Algorithms and Source Code in C", 2015, Wiley
3. Jean-Philippe Aumasson "Serious Cryptography: A Practical Introduction to Modern Encryption", 2017.

Web Reference

1. https://cse29-iiith.vlabs.ac.in/

22CIE01

OOPS THROUGH JAVA

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

Pre-Requisites

Basic programming skills and an understanding of fundamental concepts like variables, loops, and functions are recommended.

Course Objectives

1. Learn the fundamental concepts of OOP such as classes, objects, encapsulation, inheritance, and polymorphism, and how they are implemented in Java.
2. Design and implement Java applications using OOP principles, applying effective programming practices such as encapsulation, modularity, and reusability.
3. Utilize exception handling techniques like try-catch blocks and custom exceptions, and understand multithreading concepts to create Java applications that handle errors and can perform concurrent tasks.
4. Use Java's collection interfaces and classes, including List, Set, and Map, to organize, manage, and manipulate data in Java applications.
5. Design simple GUIs using Java Swing components such as buttons, text fields, and labels, and implement event handling to make interactive Java applications.

Course Outcomes

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

1. Understand the foundational principles of Object-Oriented Programming.
2. Design and implement Java applications using OOP concepts.
3. Apply exception handling and multithreading in Java applications.
4. Utilize the Java Collection Framework to manage data.
5. Create simple graphical user interfaces (GUIs) with Swing.

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	1	2	-	-	-	-	2	3	1	1	2
CO2	3	3	3	2	3	-	1	-	-	1	2	1	2	2
CO3	3	3	3	3	3	-	1	-	-	1	2	2	2	3
CO4	3	3	2	3	2	-	1	-	-	-	2	2	1	1
CO5	3	3	2	3	3	-	2	-	2	2	3	1	1	2

Unit – I

Introduction to Java and OOP Principles, Bytecode and Java Virtual Machine (JVM), Setup of development environments, Concepts of Classes and Objects, Encapsulation, Inheritance, and Polymorphism, Java Data Types, Variables, and Scope, Control Structures and Type Casting, Operators and Control Statements, Type Conversion and Type Casting, Arrays.

Unit – II

Classes, Objects, and Methods, Defining and Using Classes, Creating and using custom classes, Static variables and methods, Understanding garbage collection, Methods, and Overloading, Creating methods and constructors, Method overloading and constructor overloading, Usage of ‘this’ keyword, Working with the String class, String manipulation, and String Tokenizer.

Unit – III

Inheritance, Abstract Classes, and Interfaces- Inheritance and Superclasses, Inheritance Ttypes, Usage of the 'super' keyword, Method overriding and the 'final' keyword, Abstract Classes and Interfaces, Implementing interfaces in Java, Packages and Access Control, Creating and importing packages.

Unit – IV

Exception Handling and Multithreading- Exception Handling in Java, Concepts of exception handling, Usage of try-catch, throw, throws, and finally, Creating custom exceptions, Concepts of Multithreading, Creating threads using Thread and Runnable Synchronization and Thread communication.

Unit – V

Overview of collection interfaces, List, Set, Map-Using ArrayList, LinkedList, HashSet, and HashMap-Accessing collections with iterators, GUI Programming with Swing-Basic GUI concepts and Swing components, Handling events and creating applets, Simple GUI programs with JButton, JLabel, and JTextField.

Textbook:

1. Java: The Complete Reference, Eleventh Edition by Herbert Schildt, McGraw-Hill Education, 19 March 2019
2. Horstmann, C. S., & Cornell, G. (2019). Core Java, Volume I—Fundamentals (11th ed.). Pearson.
3. Bloch, J. (2018). Effective Java (3rd ed.). Addison-Wesley.

Reference Books

1. Deitel, P. J., & Deitel, H. M. (2017). Java: How to Program (11th ed.). Pearson.
2. Sierra, K., & Bates, B. (2019). Head First Java (2nd ed.). O'Reilly Media.

Web Reference

1. Oracle. (n.d.). The Java Tutorials. Retrieved from https://docs.oracle.com/javase/tutorial/
2. GeeksforGeeks. (n.d.). Java Programming Language. Retrieved from https://www.geeksforgeeks.org/java/
3. W3Schools. (n.d.). Java Tutorial : https://www.w3schools.com/java/
4. ACM Digital Library. (n.d.). Java Programming Articles: https://dl.acm.org/
5. IEEE Xplore. (n.d.). Java Programming and Software Engineering. Retrieved from https://ieeexplore.ieee.org/
6. GitHub. (n.d.). Java Open Source Projects. Retrieved from https://github.com/
7. LeetCode. (n.d.). Java Coding Challenges. Retrieved from https://leetcode.com/

22CIE02

OOPS THROUGH JAVA LAB

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

Pre-Requisites

Basic programming skills and an understanding of fundamental concepts like variables, loops, and functions are recommended.

Course Objectives

1. Set Up and Use Java Development Tools to write, compile, and run Java programs.
2. Apply control structures, arrays, and other basic Java syntax to solve programming problems.
3. Design and implement Java programs using classes, objects, inheritance, and polymorphism.
4. Apply exception-handling techniques and create multithreaded programs in Java.
5. Develop Java Collection Framework, file input/output, serialization, and create GUI applications

Course Outcomes

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

1. Demonstrate proficiency in using integrated development environments (IDEs) for Java development.
2. Develop Basic Java programs that include control structures, arrays, and basic data manipulation.
3. Implement Java applications using object-oriented principles, including classes, objects, inheritance, and interfaces.
4. Create Java applications with exception handling and multithreading capabilities.
5. Design and implement graphical user interfaces using Java Swing and handle events.

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	2	-	-	-	-	1	2	1	1	1
CO2	3	3	3	2	2	-	-	-	-	1	2	1	1	1
CO3	3	3	3	3	3	-	1	-	-	2	2	2	1	2
CO4	3	3	3	3	3	-	2	-	2	2	2	2	2	1
CO5	3	3	3	3	3	-	2	-	2	2	3	2	2	2

Lab Experiments

1. Set up Java environment, print 'Hello, World!', and handle input.
2. Write a Java Program to calculate factorial and sum arrays with if-else and switch.
3. Write a Java Program that Defines Person classes, and constructors that manipulate objects.
4. Write a Java Program to demonstrate constructors and method overloading.
5. Implement inheritance, and polymorphism with Person, Student.
6. Create abstract class Animal, interface Pet, Dog subclass.
7. Write a Java Program to handle exceptions, custom exceptions, try-catch, throw, and finally.
8. Write a Java Program to implement multithreading.
9. Write a Java Program to implement the Producer and Consumer Problem.
10. Write a Java Program to utilize collection interfaces (ArrayList, HashMap, Set).
11. Design Java Swing GUIs, Event Handling.

Textbook:

1. Java: The Complete Reference, Eleventh Edition by Herbert Schildt, McGraw-Hill Education, 19 March 2019.
1. Horstmann, C. S., & Cornell, G. (2019). Core Java, Volume I—Fundamentals (11th ed.). Pearson.
2. Bloch, J. (2018). Effective Java (3rd ed.). Addison-Wesley.

Reference Books

1. Deitel, P. J., & Deitel, H. M. (2017). Java: How to Program (11th ed.). Pearson.
2. Sierra, K., & Bates, B. (2019). Head First Java (2nd ed.). O'Reilly Media.

Web Reference

1. Oracle. (n.d.). The Java Tutorials. Retrieved from https://docs.oracle.com/javase/tutorial/
2. GeeksforGeeks. (n.d.). Java Programming Language. https://www.geeksforgeeks.org/java/
3. W3Schools. (n.d.). Java Tutorial. Retrieved from https://www.w3schools.com/java/

22CIE03

DIGITAL FORENSICS

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

Pre-Requisites

A foundational grasp of computer hardware, software, networking, basic programming (Python, C++, Java), cryptography, and virtual machines.

Course Objectives

1. Gain a thorough understanding of digital forensics principles, and various types of digital evidence, and Understand the history, principles, and challenges of digital forensics.
2. Study the cybercrime laws in the United States and Europe.
3. Master techniques for conducting digital investigations.
4. Analyze the use of digital evidence in criminal investigations.
5. Develop skills in network forensics and evidence recovery.

Course Outcomes

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

1. Articulate the development and trends in digital forensics.
2. Compare and contrast cybercrime laws across regions.
3. Execute digital investigations using process models.
4. Preserve, survey, and reconstruct digital crime scenes.
5. Apply forensic techniques to network investigations and 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, Digital Forensics research, language of Computer Crime Investigation, Digital Evidence in the Courtroom- Duty of Experts, Admissibility, levels of Certainty in Digital Forensics, Direct versus Circumstantial Evidence, Scientific Evidence, Presenting Digital Evidence.

Unit – II

Cybercrime law: A United States perspective, Federal Cybercrime law, State Cybercrime law, Constitutional law, Fourth Amendment, Fifth Amendment, and Encryption, Cybercrime law: A European perspective, The European and national legal Frameworks, Progression of Cybercrime legislation in Europe. Specific Cybercrime offenses, Computer-integrity Crimes, Computer-Assisted Crimes, Content-related Cybercrimes, Jurisdiction

Unit – III

Digital Investigations: Conducting Digital investigations, Digital investigation process models, Scaffolding for Digital investigations, Applying the Scientific Method in Digital investigations, 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, Cyberstalking, How Cyberstalkers operate, Investigating Cyberstalking, Cyberstalking Case Example.

Unit – V

Network Forensics: network Basics for Digital investigators, technical overview of networks, Network technologies, 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.

Textbook:

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. "Computer Forensics and Cyber Crime: An Introduction", MarjieT.Britz, 3rd Edition, Prentice Hall, 2013.

Web Reference

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

22CIE04

DIGITAL FORENSICS LAB

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

Pre-Requisites

A comprehensive grasp of computer fundamentals including hardware, software, networking, basic programming in languages like Python, C++, Java, fundamental cryptography concepts, and virtual machine operation.

Course Objectives

1. Provide hands-on experience in setting up and using a digital forensics laboratory for investigative purposes.
2. Develop practical skills for securely acquiring and analyzing digital evidence.
3. Deepen understanding of internet artifacts and their significance in digital investigations.
4. Apply advanced forensic techniques for analyzing and authenticating various forms of digital data.
5. Develop a comprehensive knowledge of network forensics, incident response protocols, and ethical practices in cybersecurity.

Course Outcomes

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

1. Set up and effectively use a digital forensics laboratory to conduct investigations.
2. Securely acquire and analyze digital evidence in compliance with industry standards.
3. Examine internet artifacts and related digital evidence to draw insights into user behavior and potential cybercrimes.
4. Utilize advanced forensic tools and techniques for data recovery, analysis, and digital data authentication.
5. Conduct network forensics, implement incident response procedures, and apply ethical principles in cybersecurity practices.

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. Set up a digital forensics' lab with tools like Autopsy and FTK Imager to create a foundational environment for conducting forensic analysis.
2. Ensure secure digital evidence acquisition through disk imaging techniques using tools like dd and FTK Imager to prevent data contamination.

3. Utilize Autopsy to recover and analyze deleted files, focusing on understanding the file system structure and identifying recoverable data.
4. Extract and analyze internet artifacts such as browser history and emails to reconstruct user activity and identify potential evidence.
5. Classify different types of evidence, including direct and circumstantial, through case studies to enhance understanding of their forensic significance.
6. Apply advanced data recovery techniques, including file carving and signature analysis, using tools like Foremost or Scalpel to retrieve hidden or fragmented data.
7. Authenticate multimedia files by extracting and analyzing metadata, checking for signs of tampering, and confirming the originality of digital content.
8. Investigate mobile device forensics by analyzing data from a mobile device emulator to understand the challenges unique to mobile platforms.
9. Capture and analyze network traffic using Wireshark to detect unusual patterns, identify potential threats, and trace malicious activities.
10. Examine web application attacks through log analysis, focusing on detecting signs of intrusion and identifying vulnerable components in a web application.

Textbook:

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 Reference

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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

22CAE12

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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

Pre-Requisites

Knowledge on linear algebra, algorithms

Course Objectives

This course aims to

1. To get the students acquainted with the concepts of different searching techniques of AI systems.
2. To understand the various Machine Learning Algorithms.
3. To familiarize various Classification and Regression techniques.

Course Outcomes

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

1. Define the concept of Artificial Intelligence.
2. Apply real life problems in a state space representation so as to solve them.
3. Understand the features of machine learning to apply on real world problems.
4. Compare and contrast Classification and Regression problems.
5. Apply unsupervised learning algorithms 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	3	2	2	-	-	-	-	-	-	2	2	1	1
CO 2	3	3	2	1	-	-	-	-	-	-	2	2	1	2
CO 3	3	3	3	1	-	-	-	-	-	-	2	1	3	2
CO 4	3	3	2	1	-	-	-	-	-	-	2	1	1	2
CO 5	3	2	3	1	-	-	-	-	-	-	2	3	1	3

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: Breadth-first search, Uniform cost search, Depth- first search, Iterative deepening Depth-first search, Bidirectional search.**Informed (Heuristic) Search Strategies**: Heuristic Functions, Hill- climbing, Greedy best-first search, A* search, **Adversarial Search:** Game Theory, Alpha–Beta Pruning, Constraint Satisfaction Problems.

Unit – III

Machine Learning : What is Machine Learning, Types of Machine Learning Algorithms- Supervised, Unsupervised and Reinforcement Learning.**Feature Selection and Feature Engineering:** Data sets, Creating training and test sets, managing categorical data, missing features, data scaling and normalization,

Whitening, Feature selection and filtering, PCA, Visualization of high-dimensional datasets; **Regression Algorithms:** Linear models for regression, Regression types, Evaluation Metrics, Hyper parameter tuning, Grid and Random search.

Unit – IV

Linear Classification Algorithms: KNN, logistic regression, classification metrics, ROC curve.**Naïve Bayes :** Bayes theorem, Naïve Bayes classifiers- Multinomial, Bernoulli and Gaussian .**Support Vector Machines:** Linear SVM, Kernel-based classification. **Decision Trees and Ensemble Learning:** Binary Decision trees, Introduction to Ensemble Learning-Bagging, Random Forests, AdaBoost, Gradient Tree Boosting, Voting classifier.

Unit – V

Clustering Fundamentals: Basics, Gaussian mixture, K-means, Evaluation methods, DBSCAN, Spectral Clustering, Hierarchical Clustering. **Introduction to Neural Networks:** Introduction to deep learning, MLPs with Keras, deep learning model layers, introduction to Tensorflow.

Textbook:

1. Russell, Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 2nd Ed., 2015.
2. Giuseppe Bonaccorso, "Machine Learning Algorithms", 2nd Edition, Packt, 2018

Reference Books

1. Tom M. Mitchell, "Machine Learning", McGraw Hill, 4th Ed., 2017.
2. Rich, Knight, Nair, "Artificial Intelligence", Tata McGraw Hill, 3rd Ed., 2017.
3. Puneet Mathur, "Machine Learning Applications Using Python: Cases Studies from Healthcare, Retail, and Finance", 1st Ed., Apress, 2019.
4. Stephen Marsland, Machine Learning - An Algorithmic Perspective, 2nd Ed., CRC Press, 2014.
5. Saroj Kaushik, "Artificial Intelligence", 1st Ed., Cengage Learning India, 2011.

Web Reference

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2. https://onlinecourses.nptel.ac.in/noc24_cs81/preview
3. https://onlinecourses.nptel.ac.in/noc24_cs51/preview
4. https://www.holehouse.org/mlclass
5. https://www.geeksforgeeks.org/machine-learning/

22CAE13

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LAB

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

Pre-Requisites

Course Objectives

1. Make use of Data sets in implementing the machine learning algorithms.
2. Implement the machine learning concepts and algorithms in any suitable language of choice.
3. Make use of real world data to implement machine learning models.

Course Outcomes

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

1. Understand basic components of library environment and installations and design heuristics to solve real world problems.
2. Implement problems using game search algorithms.
3. Recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.
4. Implement and evaluate various Machine Learning approaches.
5. Design and develop solutions to real world problems using ML 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	3	2	1	2	1	-	-	-	-	-	1	2	1	1
CO 2	3	2	1	3	2	-	-	-	-	-	2	2	1	2
CO 3	3	3	1	3	2	-	-	-	-	-	2	1	3	2
CO 4	3	3	1	3	3	-	-	-	-	-	2	1	1	2
CO 5	3	3	1	3	3	-	-	-	-	-	2	3	1	3

LIST OF EXPERIMENTS:

1. Identification and Installation of python environment towards the artificial intelligence and machine learning, installing python modules/Packages Import scikitlearn, keras etc.
2. Implement A* algorithm on any problem.
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. Build linear regression model using gradient descent, least squares, polynomial, LASSO and RIDGE approaches also compare all the algorithms and draw a table for all the metrics.
7. Demonstration of Logistic Regression for a sample training data set stored as a .CSV file. Calculate the accuracy, precision, and recall for your dataset.
8. Demonstration of Naïve Bayesian classifier for a sample training data set stored as a .CSV file. Calculate the accuracy, precision, and recall for your dataset.
9. Build the decision tree classifier compare its performance with ensemble techniques like random forest, bagging, boosting and stacking Demonstrate it with different decision trees.
10. Demonstration of SVM and use for character recognition task.
11. Demonstration of Clustering algorithms - k-Means, Agglomerative and DBSCAN to classify for the standard datasets

Textbook:

1. Russell, Norvig, “Artificial Intelligence: A Modern Approach”, Pearson Education, 2nd Ed., 2015.
1. Giuseppe Bonaccorso, “Machine Learning Algorithms”, 2nd Edition, Packt, 2018.

Reference Books

1. Tom M. Mitchell, “Machine Learning”, McGraw Hill, 4th Ed., 2017.
2. Rich, Knight, Nair, “Artificial Intelligence”, Tata McGraw Hill, 3rd Ed., 2017.
3. Puneet Mathur, “Machine Learning Applications Using Python: Cases Studies from Healthcare, Retail, and Finance”, 1st Ed., Apress, 2019.
4. Stephen Marsland, Machine Learning - An Algorithmic Perspective, 2nd Ed., CRC Press, 2014.
5. Saroj Kaushik, “Artificial Intelligence”, 1st Ed., Cengage Learning India, 2011.

Web Reference

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22ITE04

MOBILE APPLICATION DEVELOPMENT
(Professional Elective – I)

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

Course Objectives:

1. To Introduce the Kotlin Programming Language for Mobile Application Development.
2. To demonstrate the development of basic mobile applications on android operating system.
3. To implement the design using specific mobile development frameworks.
4. To Demonstrate the Location based services in mobile application design.
5. To demonstrate their ability to deploy the mobile applications in marketplace for distribution.

Course Outcomes:

Upon completing this course, students will be able to:

1. Understand the benefits of using Kotlin for Mobile application development.
2. Design user interface for mobile applications.
3. Use Intent, Broadcast receivers and Internet services in Android App.
4. Use multimedia, camera and Location based services in Android App.
5. Apply best practices to implement database and publish apps on Playstore.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO/ PO	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	2	2	-	-	-	-	-	1	2	2	2	2
CO2	2	3	3	2	3	3	3	-	-	1	2	2	2	2
CO3	2	2	3	3	2	3	3	-	-	1	2	2	2	2
CO4	2	2	3	2	2	3	3	-	-	1	2	2	2	2
CO5	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.

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.

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 - Shared Preferences - Storage External - Network Connection - SQLite Databases - Deploying Android Application to the World.

Text Books:

1. Reto Meier, “Professional Android 4 Development”, John Wiley and Sons, 2012.
2. Dawn Griffiths and David Griffiths, “Head First Android Development”, 3rd Edition, O'Reilly Media Publishers, 2021.

References:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
2. Wei-Meng Lee, Beginning Android 4 Application Development, 4th Edition, Wiley India (Wrox), 2013.

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

22ITE21

MOBILE APPLICATION DEVELOPMENT LAB
(Professional Elective – I)

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

Course Objectives

1. To understand the Kotlin Programming Language for Mobile Application Development.
2. To design and implement user interfaces and handle events in Android applications.
3. To effectively use intents for inter-component communication in Android.
4. To work with multimedia and location services in Android applications.
5. To understand data storage and retrieval mechanisms in Android.

Course Outcomes

Upon completing this course, students will be able to:

1. Implement null safety and object-oriented programming concepts in Kotlin.
2. Design user-friendly interfaces and handle user interactions efficiently.
3. Use intents to facilitate communication between different components of an Android App.
4. Integrate multimedia functionalities and location-based services into Android App.
5. Implement data storage and retrieval using Shared Preferences and SQLite databases.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

CO/ PO	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	3	1	3	-	-	1	-	-	-	3	2	3
CO2	3	2	3	2	3	-	-	1	-	-	-	3	2	3
CO3	3	2	3	2	3	-	-	2	-	-	-	3	2	3
CO4	3	3	3	3	3	-	-	2	-	-	-	3	3	3
CO5	3	3	3	3	3	-	-	3	-	-	-	3	3	3

List of Experiments:

1. Implement null safety using nullable and non-nullable types, safe calls (?.) and the Elvis operator (? :).
2. Implement a basic class with constructors, visibility modifiers, subclasses, and inheritance.
3. Design a basic UI with various Views and ViewGroups with basic event handling using listeners.
4. Implement Android localization to support multiple languages.
5. Use implicit intents to dial a number and sending an SMS.
6. Implement notifications and toasts to display messages to the user.
7. Create an Android application to play audio and video files.
8. Implement location services to get current location using GPS and display it on Google Maps.
9. Create an android application to store the data by using Shared Preferences.
10. Create an SQLite database and perform CRUD operations.

Text Books:

1. Reto Meier, "Professional Android 4 Development", John Wiley and Sons, 2012.
2. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O'Reilly SPD Publishers, 2015.

References:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.
2. Wei-Meng Lee, Beginning Android 4 Application Development, 4th Edition, Wiley India (Wrox), 2013.

Web Resources:

1. https://developer.android.com
2. http://www.androidcentral.com/apps
3. https://www.opensesame.com/c/android-app-development-beginners-training-course

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	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	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.

Textbook:

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 Reference

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

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	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	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	1	-	-	-	-	-	3	1	2	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)

Textbook:

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 Reference

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)

As per AICTE Model Curriculum 2022-23

Model Curriculum(R-22) 2024-25

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	22CIC11	Mobile Security	3	-	-	3	40	60	3
2	22CSC21	Software Engineering	3	-	-	3	40	60	3
3	22CIC13	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	22EEM01	Universal Human Values-II: Understanding Harmony	1	-	-	3	40	60	1
PRACTICAL									
7	22CIC12	Mobile Security Lab	-	-	2	3	50	50	1
8	22CIC14	Design and Development of Blockchain Applications Lab	-	-	2	3	50	50	1
9		Professional Elective – II Lab	-	-	2	3	50	50	1
10	22EGC03	Employability Skills	-	-	2	2	50	50	1
11	22CICU02	Upskill Certification course – II	-	-	-	-	25	-	0.5
		TOTAL	**16**	**00**	08	**-**	**465**	**560**	**20.5**

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)

As per AICTE Model Curriculum 2022-23

Professional Elective – II

S.NO	THEORY	
	Course Code	**Course**
1	22ITE18	Enterprise application Development
2	22CIE07	Ethical Hacking
3	22CAE16	Deep Learning
4	22CIE09	Sensor Technology and Applications
5	22ITE07	Cloud computing
	LAB	
	Course Code	**Course**
1	22ITE19	Enterprise application Development Lab
2	22CIE08	Ethical Hacking Lab
3	22CAE23	Deep Learning Lab
4	22CIE10	Sensor Technology and Applications 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
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

22CIC11

MOBILE SECURITY

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

Pre-Requisites
Understanding basic computer security, familiarity with operating systems (Windows/Linux), and basic programming skills including Java for Android and Swift for iOS.

Course Objectives

1. Understand the fundamentals of mobile and wireless networks, including cellular networks, IEEE wireless networks, and mobile Internet networks.
2. Analyze vulnerabilities in wired and wireless networks, focusing on threat models and security risks in telecommunications systems.
3. Explore Wi-Fi security and mobile device threats, including man-in-the-middle attacks, malware, and wireless intrusion detection systems.
4. Examine Bluetooth security and the IEEE 802.11 standard, focusing on authentication and layer 3 security mechanisms.
5. Investigate mobile operating system security focusing on Android and iOS security models, permissions, and advanced threat protections.

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

1. Identify and describe various mobile and wireless network structures and their associated vulnerabilities.
2. Evaluate and mitigate risks and threats to both wired and wireless telecommunications systems.
3. Implement security measures for Wi-Fi networks and mobile devices to protect against common attack vectors.
4. Assess and apply security protocols** in Bluetooth and Wi-Fi environments, ensuring robust authentication and data protection.
5. Understand and critique the security models of Android and iOS, including permission management, cryptographic providers, and sandboxing techniques.

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	-	-	-	-	1	2	1	1
CO2	3	3	-	1	3	2	-	-	-	-	2	3	2	2
CO3	3	3	3	2	3	2	1	-	-	-	3	3	2	3
CO4	2	3	-	2	2	2	-	-	-	-	2	3	2	2
CO5	3	3	-	3	3	3	1	-	-	-	2	3	1	3

Unit – I
Introduction to Mobile and Wireless Networks: Mobile cellular networks, IEEE wireless networks, Mobile Internet networks, Vulnerabilities of Wired and Wireless Networks: Security in the digital age, Threats and

risks to telecommunications systems, Role of telecommunications systems, Threat models in telecommunications systems, From wireline vulnerabilities to vulnerabilities in wireless communications.

Unit – II

Wi-Fi Security and Mobile Devices: How Attackers Get on a Protected Network, Wireless Man-in-the-Middle Attacks, Apps Behaving Badly, Mobile Exploits and Malware, Advanced Persistent Threats Go Mobile, Hot spot architecture: captive portals, Wireless intrusion detection systems, Wireless honeypots.

Unit – III

Bluetooth Security, Bluetooth technical specification, Wi-Fi Security, Attacks on wireless networks, Security in the IEEE 802.11 standard, Security in 802.1x, Security in 802.11i, Authentication in wireless networks, Layer 3 security mechanisms,

Unit – IV

Android's Security Modek: Android's Architecture, Android's Security Model, Permissions, Package Management, User Management, Cryptographic Providers.

Unit – V

iOS Security Basics, iOS in the Enterprise, Code Signing and Memory Protection, Sandboxing, Fuzzing iOS Applications, Exploitation, Jailbreaking, Baseband Attacks.

Textbook:

1. Chaouchi, Hakima, and Maryline Laurent-Maknavicius. *Wireless and Mobile Networks Security*. John Wiley & Sons, 2009.
2. "Android Security Internals" by Nikolay Elenkov, 1st edition, 2014, No Starch Press
3. "iOS Hacker's Handbook" by Charlie Miller, Dionysius Blazakis, Dino Dai Zovi, Stefan Esser, Vincenzo Iozzo, Ralf-Philipp Weinmann, 1st edition, 2012, John Wiley & Sons

Reference Books

1. Mobile Security for Dummies, Lawrence C. Miller, CISSP, Palo Alto Networks Edition, A Wiley Brand, 2014
2. "Mobile and Wireless Network Security and Privacy" by Kami Makki, Peter Reiher, Kia Makki, 1st edition, 2006, Springer
3. "Mobile Security: How to Secure, Privatize, and Recover Your Devices" by Rich Campagna, 1st edition, 2016, CreateSpace Independent Publishing Platform.

Web Reference

1. OWASP Mobile Security Project: https://owasp.org/www-project-mobile-app-security/
2. NIST Mobile Security Guidelines (https://csrc.nist.gov/publications/detail/sp/1800/4/final
3. Android Developers Security Tips: https://developer.android.com/privacy-and-security/security-tips
4. Apple Security: https://support.apple.com/en-gb/guide/security/welcome/web

22CSC21

SOFTWARE ENGINEERING

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

Pre-Requisites
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

Design Concepts: Flow-oriented modelling (DFDs), Coupling, Cohesion, Function-Oriented Design - Structure Charts, Structured Design Methodology, An Example, 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, 7th Edition, 2010.
2. Pankaj Jalote, "Software Engineering Precise Approach", Wiley Publishers, 2012

Suggested Reading:

1. Sommerville "Software Engineering", 10th Edition, Pearson, 2016.
2. Rajib Mal "Fundamental of Software Engineering", 4th Edition, PHI Learning, 2014.
3. Software Engineering Fundamentals - Hardcover - Ali Behforooz; Frederick J. Hudson

Online Resources:

1. https://nptel.ac.in/courses/106101061/
2. Udemy:https://www.udemy.com/share/101BHy3@YYJn8BxwvS6cGfnCsiIlxyA-lUjwZmA2xN5WmMbd8hlGxwhc4N0DF7KaEOaz4eDnMg==/

22CIC13

DESIGN AND DEVELOPMENT OF BLOCKCHAIN APPLICATIONS

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 aquaint with the cryptographic principles and mechanisms behind Blockchain technology.
2. To gain knowledge of fundamental concepts of a Blockchain network.
3. To develop a comprehensive understanding of consensus algorithms and their implementation in different Blockchain networks.
4. To explore programmability of Blockchain through smart contracts and implement simple smart contracts.
5. To learn and implement real-world applications of smart contracts and Blockchain.

Course Outcomes

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

1. To demonstrate comprehensive understanding of crypto primitives behind Blockchain technology.
2. To analyze different consensus mechanisms and their limitations.
3. Ability to demonstrate the comprehensive understanding of Ethereum Blockchain network.
4. To design and develop smart contracts using Solidity programming language.
5. To develop, deploy and interact with real-world smart contracts and 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 and how it has become disruptive technology, Centralized vs Peer-to-peer Systems, Byzantine Generals Problem (BGP), 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, Bitcoin Architecture Consensus algorithms: Proof-of-work (PoW) - Problems with PoW -Proof-of-stake (PoS) - variants of PoS - PBFT, CAP Theorem.

Unit – III

Ethereum: Introduction to Ethereum and world computer, Accounts, Ethereum state and storage structures (Tries), Types of transactions, Transaction life-cycle, Ethereum Virtual Machine (EVM), Turing completeness, Gas and Gas Price, introduction to smart contracts, smart contract development environment - Remix

Unit – IV

Decentralizes Autonomous Organizations and Smart contracts: Hardhat development environment, Introduction to solidity, Simple smart contracts, Testnets, ERC20 contracts, ERC721 standard for representing ownership of non-fungible tokens, DAO contracts.

Unit – V

Case Studies - DeCentralized Finance - DeCentralized exchanges - Liquidity Pools, Other Blockchain case studies DeCentralized Identity management - FileCoin - DeCentralized Games, risks of cryptocurrencies and digital assets regulation in India, Blockchain for the Metaverse.

Textbook:

1. Imran Bashir, “Mastering Blockchain”, Second Edition, Packt Publishing, 2018
2. Melanie Swan, "Blockchain: Blueprint for a New Economy", First Edition, O'Reilly, 2018
3. Arjuna Sky Kok, “Hands-On Blockchain for Python Developers: Gain blockchain programming skills to build decentralized applications using Python”, Packt Publishing, 2019

Reference Books

1. Andreas M. Antonopoulos, “Mastering Bitcoin Unlocking Digital Cryptocurrencies”, First Edition Apress, 2017
2. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to BuildSmart Contracts for Ethereum and BlockChain”, Packt Publishing, 2019.
3. Mackay Hazel, “Python Programming Handbook for Blockchain Technology Development : A Complete
4. Beginners Guide to Learning Essential Skills to Build Secure Smart Contracts and Decentralized Applications with web3.py”, Independently Published, 2024

Web Reference

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

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

1 - Slightly, 2 - Moderately, 3 - Substantially

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

22CIC12

MOBILE SECURITY LAB

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

Pre-Requisites

Basic grasp of networking concepts, knowledge of wireless communication technologies, familiarity with Linux, understanding of cybersecurity fundamentals, programming skills in languages like Python or Java, and experience with tools such as Wireshark, Kali Linux for penetration testing, and Android Studio for app security analysis.

Course Objectives

1. Gain practical knowledge in setting up and simulating Mobile networks and analyzing Wi-Fi traffic.
2. Develop skills to configure and test mobile security mechanisms and VPN tunnels.
3. Acquire proficiency in scanning and identifying vulnerabilities in mobile networks.
4. Gain insights into performing wireless man-in-the-middle attacks.
5. Understand Bluetooth security mechanisms, and Android app security and explore iOS security mechanisms.

Course Outcomes

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

1. Demonstrate proficiency in setting up and simulating mobile networks and analyzing Wi-Fi network traffic.
2. Identify vulnerabilities conduct thorough network scans and test captive portals for Wi-Fi networks.
3. Perform wireless man-in-the-middle attacks and monitor wireless intrusion detection systems.
4. Pair devices and analyze Bluetooth security mechanisms, and security features in Android and iOS mobile apps.
5. Implement layer 3 security by setting up and securing VPN tunnels for wireless networks, apply security models and features to mitigate risks in Android and iOS platforms.

CO-PO Articulation Matrix

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

List of Experiments

1. Analyze mobile cellular networks by setting up and simulating an LTE network using OpenAirInterface.
2. Explore IEEE wireless networks by capturing and analyzing Wi-Fi network traffic with Wireshark.
3. Assess network vulnerabilities by scanning and identifying network vulnerabilities using Kali Linux tools.
4. Implement a captive portal for Wi-Fi by configuring and testing it with CoovaChilli.
5. Perform wireless man-in-the-middle attacks by executing them using Ettercap.
6. Detect wireless intrusions by setting up and monitoring a wireless intrusion detection system with Snort.

7. Analyze Bluetooth security by pairing devices and analyzing Bluetooth security mechanisms using BlueZ.
8. Implement layer 3 security by setting up and securing a VPN tunnel for wireless networks using OpenVPN.
9. Analyze the Android security model by developing and testing security features in an Android app using Android Studio.
10. Explore iOS security mechanisms by inspecting and manipulating iOS apps for security analysis using Frida.

Textbook:

1. Holma, H., & Toskala, A. (2009). “LTE for UMTS - OFDMA and SC-FDMA Based Radio Access”. John Wiley & Sons.
2. Elenkov, N. (2014). “Android Security Internals: An In-Depth Guide to Android's Security Architecture”. No Starch Press.
3. Miller, C., Blazakis, D., Dai Zovi, D., Esser, S., Iozzo, V., & Weinmann, R.-P. (2012). “iOS Hacker's Handbook”. John Wiley & Sons.

Reference Books

1. Chappell, L. (2012). “Wireshark Network Analysis: The Official Wireshark Certified Network Analyst Study Guide”. Syngress.
2. Weidman, G. (2014). “Penetration Testing: A Hands-On Introduction to Hacking”. No Starch Press.
3. Miller, S. (2005). “Wi-Fi Security”. McGraw-Hill Education.
4. Cache, J., Liu, V., & Wright, J. (2010). ”Hacking Exposed Wireless: Wireless Security Secrets & Solutions”. McGraw-Hill Education.
5. Koziol, J., Caswell, B., & Beale, J. (2007). “Intrusion Detection with Snort”. Syngress.
6. Huang, A. S. (2007). “Bluetooth Essentials for Programmers”. Cambridge University Press.
7. Crist, E. F. (2014). “Mastering OpenVPN”. Packt Publishing.

Web Reference

1. OWASP Mobile Security Project: https://owasp.org/www-project-mobile-app-security/
2. NIST Mobile Security Guidelines (https://csrc.nist.gov/publications/detail/sp/1800/4/final
3. Android Developers Security Tips: https://developer.android.com/privacy-and-security/security-tips
4. Apple Security: https://support.apple.com/en-gb/guide/security/welcome/web

22CIC14

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

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 (Sepolia). 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 Meta-mask account to another Meta-mask account through a smart contract.
   (c) To simulate a lottery game

(d) To demonstrate ERC20 tokens and to create a bank which deals with ERC20 tokens. The bank should provide lending, and borrowing of ERC20 tokens.
(e) To demonstrate ERC721 and ERC1155 tokens, access controls in a smart contract.

6. Write a Solidity program to demonstrate Decentralized Autonomous Organizations (DAO) and liquidity pools.
7. Write a Solidity program to demonstrate Multi-signature wallet, Time-locked wallet and Escrow contract.
8. Write a Solidity program to track provenance and movement of goods through the supply chain, ensuring transparency and authenticity **(Supply-Chain)**
9. Write a Solidity program that automatically pays out claims based on predefined conditions eliminating the need for intermediate **(Insurance)**
10. Write a Solidity program to conduct secure and transparent voting processes without relying on central authority **(Voting Systems)**

Textbook:

1. Imran Bashir “Mastering Blockchain”, Second Edition, Packt Publishers, 2018.
2. Melanie Swan, "Blockchain: Blueprint for a New Economy", First Edition O'Reilly, 2018.
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”, st Edition, Apress, 2017.
2. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to BuildSmart 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 Reference

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

22EGC03

EMPLOYABILITY SKILLS

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
CO 1	-	1	-	-	-	1	2	3	3	1	3	-	-	-
CO 2	-	-	-	-	-	-	1	-	2	-	1	-	-	-
CO 3	-	-	-	-	-	1	1	2	1	1	3	1	1	-
CO 4	-	1	1	-	-	1	2	3	3	1	3	2	2	2
CO 5	-	-	-	-	-	-	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.

Web Reference

22ITE18

ENTERPRISE APPLICATION DEVELOPMENT

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

Course Objectives:

1. To provide knowledge about web pages design and development.
2. To understand how the HTML, CSS and JavaScript components of Bootstrap work.
3. To explore the basic architecture of a React application and develop applications in agile mode.
4. To gain the basics of frond-end and back-end application development using Nodejs.
5. To understand the basics of MongoDB and its Data Model.

Course Outcomes:

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

1. Create web pages with good aesthetic sense of design using HTML and CSS.
2. Create real-world React web applications and related tools.
3. Become an agile practitioner with the ability to quickly complete projects.
4. Build an end-to-end application from scratch using NODE JS.
5. Understand and build logical relationships between documents using MongoDB.

Mapping of Course Outcomes with Program Outcomes and Program Specific 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	2	1	1	2	0	0	0	0	0	0	0	0	0	3
CO 2	2	2	3	3	3	2	2	2	0	1	2	3	0	3
CO 3	2	3	3	3	3	2	2	2	0	1	2	3	0	3
CO 4	2	3	3	3	3	2	2	2	0	1	2	3	0	3
CO 5	2	2	2	3	3	0	0	0	0	0	1	2	0	3

Unit –I

Introduction to full stack: MVC pattern**,** Web Fundamentals. **HTML 5.0:** Basic tags, HTML DOM**,** Images, Tables, Lists, Forms, Layout, Graphics, span and div tags.
Introduction to Cascading Style Sheets: Types of CSS**,** CSS Selectors, CSS BOX Model, Text and Font, Color, CSS Positioning and CSS floating, CSS Grid layout Module, CSS Media Queries.

Unit –II

Java Script: Data Types & Type Conversion, JSON, Events, String and Date Functions, Local Storage, Object Oriented Programming (OOP) in JS, JavaScript Regular Expressions.
Bootstrap: Introduction of Bootstrap, Container and Container-fluid, Bootstrap Carousel.
Bootstrap Component: Button, Grid, Table, Form, Alert, Image, Tabs/Pill, Navbar, Modals.

Unit –III

React JS: Introduction to React, React with JSX, Actual DOM vs React VDOM, Components, Lifecycle, State, Props, Fragments, Events, Router, Forms, Pagination, Tables, Portals, Hook, Signals. React 18 New features.
Redux and MUI: Introduction to Redux, State, Actions, Reducers, Color Reducer, Sort Reducer, Store, Action Creators, Middleware. React Material UI Introduction and Installation, MUI Input Components.
Integration of Google MAP API and GPS Location Tracking: Incorporating Google MAP API and GPS Location Tracking for location-based services.

Unit –IV

Node JS: Modules, Node Package Manager(npm),Creating Web Server, Sending Requests and Handling HTTP requests, Handling User authentication with NodeJS, File System, Writing a file asynchronously and Other I/O Operations.

Events: Event Emitter class, Inheriting Events and Returning event emitter.

Express JS: Introduction to the Express framework-Server-side rendering with Templating Engines, Routing, Middleware, Custom Middleware, static files.

Unit –V

Mongo DB: Introduction, Importance of NoSQL databases, JSON Vs BSON,Data types and examples. CRUD Operations, Data Modelling & Schema Design, Indexing and Aggregation, MongoDB Replication and Sharding.

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.

Suggested Reading:

1. Ethan Brown, “Web Development with Node and Express”, Oreilly Publishers, First Edition, 2014.

Web 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/
5. https://getbootstrap.com/docs/5.0/utilities/api/
6. https://edu.anarcho-copy.org/Programming%20Languages/Node/

22ITE19

ENTERPRISE APPLICATION DEVELOPMENT LAB

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

Course Objectives:

1. To understand and practice HTML5 and CSS.
2. To introduce the fundamental concepts of JavaScript and Bootstrap.
3. To understand the concepts of Client-side JS Framework.
4. To work with the concepts of Server-side JS Framework.
5. To be familiar with real time database.

Course Outcomes:

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

1. Apply HTML and CSS effectively to create dynamic websites.
2. Describe and utilize JavaScript concepts in real-world applications.
3. Develop single page applications in React Framework.
4. Use Node.js for server-side application development.
5. Design the Realtime database applications based on the requirements.

Mapping of Course Outcomes with Program Outcomes and Program Specific 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	2	3	1	2	2	0	2	2	0	1	2	3	0	3
CO 2	2	3	3	3	3	2	2	2	0	1	2	3	0	3
CO 3	2	3	3	3	3	2	2	2	0	1	2	3	0	3
CO 4	2	3	3	3	3	2	2	2	0	1	2	3	0	3
CO 5	2	3	2	3	3	0	2	2	0	1	2	2	0	3

List of Experiments:

1. Design a Login Page using HTML, CSS (Media Query) and JavaScript.
2. Design a chessboard pattern using HTML and CSS.
3. Design a calculator application using JavaScript
4. Create a responsive web page of your class time table by using bootstrap grid system.
5. Create a timer component to start, pause and reset using ReactJS.
6. Create a React component that checks the strength of a password and displays the result to the user. The component will take user input and use a set of rules to determine the strength of the password.
7. Design the authorized end points using JWT (JSON Web Token)
8. Develop a backend application with REST API to perform CRUD operations on student data. (Use Postman Tool)
9. Design replica set of student database and insert records in primary node and display the records in secondary nodes.
10. Create Real-Time Chat Features in a Web Application Using React, Node.js, Socket.io, and MongoDB.

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.

Suggested Reading:

1. Ethan Brown, “Web Development with Node and Express”, Oreilly Publishers, First Edition, 2014.

Web 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/
5. https://getbootstrap.com/docs/5.0/utilities/api/
6. https://edu.anarcho-copy.org/Programming%20Languages/Node/

22CIE07

ETHICAL HACKING

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

Pre-Requisites

Basic understanding of computer networks and operating systems, familiarity with programming languages like Python or C/C++, and knowledge of cybersecurity fundamentals.

Course Objectives

1. Understand the principles and methodologies of ethical hacking.
2. Learn various techniques for reconnaissance, scanning, and enumeration.
3. Develop skills to identify and exploit web and wireless security vulnerabilities.
4. Gain proficiency in vulnerability assessment and penetration testing.
5. Acquire knowledge of various Exploitation and Post exploitation Methods and Tools

Course Outcomes

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

1. Understand the ethical and legal implications of hacking activities.
2. Demonstrate proficiency in conducting reconnaissance and scanning.
3. Identify and exploit vulnerabilities in web and wireless systems.
4. Perform penetration tests to assess the security posture of an organization.
5. Explore various Exploitation and Post exploitation Methods, Protocols, Tools, and Techniques.

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.

Textbook:

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 Reference

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/

22CIE08

ETHICAL HACKING LAB

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

Pre-Requisites

Basic understanding of computer networks and operating systems, familiarity with programming languages like Python or C/C++, and knowledge of cybersecurity fundamentals.

Course Objectives

1. Understand the principles and ethics of ethical hacking.
2. Use common tools and techniques for footprinting, port scanning, and vulnerability assessment.
3. Demonstrate knowledge of social engineering attacks and identify strategies to mitigate them.
4. Explore advanced hacking techniques, including privilege escalation, rootkits, and malware analysis.
5. Conduct comprehensive penetration tests and develop reports that outline vulnerabilities and remediation strategies.

Course Outcomes

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

1. Conduct information gathering and reconnaissance on a target system or network.
2. Perform various port scanning and service enumeration techniques.
3. Identify and mitigate common vulnerabilities in networks and systems.
4. Apply different password cracking methods and recommend best practices for password security.
5. Conduct comprehensive penetration tests and document the findings in a detailed report.

CO-PO Articulation Matrix

PO/CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	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. Learn 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. Identify vulnerabilities in networks and systems using vulnerability scanning tools like Nessus, OpenVAS, or Nexpose.
5. Familiarize yourself with password-cracking techniques using tools like John the Ripper or Hashcat.
6. Understand privilege escalation and its impact on system security through hands-on exercises with tools like Metasploit or PowerShell scripts.

7. Analyze rootkits and malware for detection and removal using tools like GMER, Wireshark, or antivirus software.
8. Explore network sniffing and spoofing techniques with packet sniffers like Wireshark and tools for ARP spoofing like Ettercap or Bettercap.
9. Identify and exploit common web application vulnerabilities using tools like OWASP ZAP or Burp Suite.
10. 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.

Textbook:

1. "CEH Certified Ethical Hacker All-in-One Exam Guide" by Matt Walker, Fourth Edition, McGraw Hill, 2019.
2. Harper, A., Regalado, D., & Harris, S. (2018). Gray Hat Hacking: The Ethical Hacker's Handbook (5th ed.). McGraw-Hill Education.
3. Baloch, R. (2017). Ethical Hacking and Penetration Testing Guide. CRC Press.

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.

Web Reference

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/

22CAE16

DEEP LEARNING

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
The objectives of this course are

1. Provide students with a strong foundation in the history, concepts, and mathematical principles of deep learning.
2. Develop students' skills in gradient descent methods and regularization techniques for effective model training.
3. Equip students to design and implement convolutional and recurrent neural network architectures.
4. Enhance students' understanding and application of autoencoders and regularization methods for robust models.
5. Expose students to the latest deep learning models and trends, preparing them for future advancements

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

1. Demonstrate comprehensive understanding of foundational deep learning concepts and neural network architectures.
2. Design and apply sophisticated neural network models to solve complex real-world problems.
3. Utilize diverse training algorithms and optimization methods to enhance deep learning model performance.
4. Implement innovative techniques for model development and regularization to improve generalization and robustness.
5. Investigate and apply recent advancements in deep learning, including transformers and GANs, to stay current in the field..

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	2	1	1	1	1	1	2	1	1	3
CO 2	3	3	2	2	3	1	1	1	1	1	2	1	2	1
CO 3	3	3	3	3	3	1	1	1	2	2	3	1	1	2
CO 4	3	3	3	3	3	1	1	1	2	2	3	1	1	1
CO 5	3	3	3	3	3	1	1	1	2	2	3	1	2	1

Unit – I
Neural Networks: History of Deep Learning, Deep Learning Success Stories, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Gradient Descent

Unit – II
Backpropagation Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Eigenvalues and eigenvectors, Eigenvalue Decomposition. **Regularization:** Bias Variance Tradeoff, L2 regularization, early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout.

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. **Pre-trained models:** LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet. Visualizing Convolutional Neural Networks, Guided Backpropagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks.

Unit – IV

Auto encoders: relation to PCA, Regularization in auto encoders, Denoising auto encoders, sparse auto encoders, Contractive auto encoders **Recurrent Neural Networks**: Vanishing and Exploding Gradients, GRU, LSTMs. Encoder Decoder Models, Attention Mechanism.

Unit – V

Transformers: ViT and BERT models. **Generative Adversarial Networks (GANs):** Introduction, Discriminator, Generator, Activation, Common Activation functions for GANs**. Recent Trends:** Zero-shot, One-shot, Few-shot Learning; Self-supervised Learning.

Textbook:

1. 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.
3. Ganguly Kuntal, "Learning generative adversarial networks: next-generation deep learning simplified", Packt Publishing, 2017.

Reference Books

1. Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995. ISBN: 9780198538646.
2. Bishop, Christopher M. Pattern Recognition and Machine Learning. Springer, 2006. ISBN 978-0-387-31073-2
3. Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd ed. New York, NY: Wiley-Interscience, 2000. ISBN: 9780471056690.
4. Mitchell, Tom. Machine Learning. New York, NY: McGraw-Hill, 1997. ISBN: 9780070428072.
5. Richard Hartley, Andrew Zisserman, Multiple View Geometry in Computer Vision, 2004. David Marr, Vision, 1982.

Web Reference

1. https://onlinecourses.nptel.ac.in/noc18_cs41/
2. https://onlinecourses.nptel.ac.in/noc22_cs22/
3. https://onlinecourses.nptel.ac.in/noc19_cs85/

22CAE23

DEEP LEARNING LAB

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

Pre-Requisites
Artificial Intelligence, Machine Learning.

Course Objectives
The objectives of this course are
1. Implement fundamental image processing techniques like linear filtering and edge detection.
2. Learn to extract features such as blobs, corners, and scale space representations from images.
3. Understand and implement feature descriptors like SIFT, SURF, HoG, and LBP for image analysis.
4. Develop skills in image matching using bag-of-words approach and estimating optical flow in video sequences.
5. Gain basic understanding of Convolutional Neural Networks (CNNs) and apply them for image classification tasks.

Course Outcomes
On Successful completion of the course, students will be able to:
1. Ability to apply various image processing techniques to manipulate and enhance images.
2. Skill in extracting and understanding different types of features from images.
3. Ability to implement and use feature descriptors for image analysis tasks.
4. Proficiency in image matching and estimating optical flow, important for motion analysis and object tracking.
5. Understanding of basic CNN architecture and ability to apply it for image classification on real-world datasets

CO-PO Articulation Matrix

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

LIST OF EXPERIMENTS:
1. Implement a program to apply a given kernel to an image for linear filtering.
2. Write a program to detect edges in an image using techniques like Sobel, Prewitt, or Canny edge detection.
3. Implement a program to detect blobs in an image using techniques like Laplacian of Gaussian.
4. Write a program to detect corners in an image using techniques like Harris corner detection.
5. Implement a program to create a scale space representation of an image using Gaussian blurring at different scales.
6. Write a program to extract SIFT (Scale-Invariant Feature Transform) features from an image.
7. Implement a program to extract SURF (Speeded-Up Robust Features) features from an image.
8. Write a program to compute the HoG descriptor for an image.
9. Implement a program to compute the LBP (Local Binary Patterns) for an image.
10. Write a program to perform image matching using a bag-of-words approach.
11. Implement a program to estimate optical flow in a video sequence using techniques like Lucas-Kanade method.

12. Implement a basic CNN model using a deep learning framework like TensorFlow or PyTorch for image classification on a dataset like CIFAR-10.

Textbook:

1. Goodfellow. I., Bengio. Y. and Courville. A., "Deep Learning ", MIT Press, 2016.
2. .Learning Generative Adversarial Networks: Next-generation deep learning simplified by Kuntal Ganguly, Packt, 2017
3. Giancarlo Zaccone, Md. RezaulKarim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
4. Hands-On Computer Vision with TensorFlow 2: Leverage deep learning to create powerful image processing apps with TensorFlow by Benjamin Planche, Eliot Andres, Packt Publishers, 2019
5. Huang, Shih-Chia, and Trung-Hieu Le. Principles and labs for deep learning. Academic Press, 2021.

Web Reference

1. https://onlinecourses.nptel.ac.in/noc18_cs41/
2. https://onlinecourses.nptel.ac.in/noc22_cs22/
3. https://onlinecourses.nptel.ac.in/noc19_cs85

22CIE09

SENSOR TECHNOLOGY AND APPLICATIONS

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

Pre-Requisites

1. Internet of Things
2. Operating systems and Computer Networks.
3. C, C++, Python

Course Objectives

1. To introduce various types of sensors and the design of basic circuit building blocks.
2. Classification of sensors based on their working principles, sensing mechanisms, and applications
3. Explore the design considerations and fabrication techniques involved in developing sensors for specific applications
4. Understand the integration of sensors with electronic circuits and systems to create sensor networks, smart systems, and Internet of Things (IoT) applications
5. Gain practical experience through laboratory sessions, projects, and case studies involving sensor design, testing, and implementation

Course Outcomes

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

1. Define the various sensors and the fundamentals of sensor technology.
2. Describe knowledge of sensor characterization, classification, and principle
3. Apply the fundamental ideas behind smart sensors
4. Analysis and interpretation of sensor data, Knowledge of sensor types and applications:
5. Evaluate sensor performance and limitation

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	3	3
CO 2	2	1	2	1	2	-	-	-	-	-	1	3	3	3
CO 3	2	1	2	2	1	-	-	-	-	-	-	3	3	3
CO 4	2	1	1	1	1	-	-	-	-	-	-	3	3	3
CO 5	2	1	1	2	2	-	-	-	-	-	-	3	3	3

Unit – I

Sensors Fundamentals and Characteristics: Sensor, actuator and transducer, Signals and Systems; Sensor Classification: passive and active Sensor, absolute and relative Sensor; Units of Measurements;

Sensors Characteristics: Basic Sensor Technology, Sensors, Sensor Systems, modern sensor devices, Limit Switches, Sensors and the measurement process

Unit – II

Sensor Classifications: Classifying sensor devices, Other Sensor Classifications, Sensor Characteristics, Static and dynamic characteristics.

Reluctance change type, LVDT, Capacitive Sensors, Thermal Sensors, Magnetic Sensors, Proximity Sensor, Piezoelectric Effect

Unit – III

Multimedia Sensor Networks: Basic Concepts, Conceptual Architecture, Sensing Layer, Transmission Layer, and Processing Layer.

Unit – IV

Smart Sensor Technologies: Biosensor, Applications of Biosensor, Chemical Sensors, Applications, Electromagnetism in Sensing, Sensor Application, Force, Load and Weight Sensors, Agriculture, Applications on Agriculture.

Unit – V

Smart Sensors: Introduction, Primary Sensors, Excitation, Sensors –Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing, Sensors for Environmental Monitoring

Textbook:

1. Sensors and Actuators, D. Patranabis, 2nd Ed., PHI, 2013.
2. Sensor Technology Handbook, Jon S. Wilson, Chandler, Arizona October, 2005
3 Donald Parnell, P.E., An Introduction to Modern Sensor Technology E05-015

Reference Books

1. Fei HU, Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations, CRC Press, 2016.)
2. Sensors handbook- Sabrie Soloman, 2nd Ed McGraw-Hill

Web Reference

1. Emerging tools for nutrient monitoring networks: Sensors advancing science and water resources protection BA Pellerin, BA Stauffer, DA Young… - … Water Resources …, 2016.Sensing as a service model for smart cities supported by the Internet of Things C Perera, A Zaslavsky, P Christen… - … technologies, 2014 - Wiley Online Library.
2. Development and progress in sensors and technologies for human emotion recognition S Pal, S Mukhopadhyay, N Suryadevara - Sensors, 2021

22CIE10

SENSOR TECHNOLOGY AND APPLICATIONS LAB

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

Pre-Requisites

1. Internet of Things
2. C, C++, Python

Course Objectives

1. To introduce various types of sensors and the design of basic circuit building blocks.
2. Classification of sensors based on their working principles, sensing mechanisms, and applications
3. Explore the design considerations and fabrication techniques involved in developing sensors for specific applications
4. Understand the integration of sensors with electronic circuits and systems to create sensor networks, smart systems, and Internet of Things (IoT) applications
5. Gain practical experience through laboratory sessions, projects, and case studies involving sensor design, testing, and implementation

Course Outcomes

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

1. Develop an understanding of the constructional features of sensors & transducers
2. Develop an understanding of the input-output characteristics of sensors & transducers
3. Acquire teamwork skills for working effectively in groups
4. Prepare an organized technical report on experiments conducted in the laboratory...

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	3	3
CO 2	2	1	2	1	2	-	-	-	-	-	1	3	3	3
CO 3	2	1	2	2	1	-	-	-	-	-	-	3	3	3
CO 4	2	1	1	1	1	-	-	-	-	-	-	3	3	3

List of Programs

1. Glow the combinations of different colors of **LEDs**
2. Speed control of servo motor
3. Display the numbers from 0000 to 9999 using 4 digit 7-segment display
4. Identify the card details using RFID technology
5. Sense and measure the light using photosensor
6. Develop a displacement measurement system with the following sensors: i. Inductive transducer (LVDT)

Textbook:

1. Sensors and Actuators, D. Patranabis, 2nd Ed., PHI, 2013.
2. Sensor Technology Handbook, Jon S. Wilson, Chandler, Arizona October, 2005
3 Donald Parnell, P.E., An Introduction to Modern Sensor Technology E05-015

Reference Books

1. Fei HU, Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations, CRC Press, 2016.)
2. Sensors handbook- Sabrie Soloman, 2nd Ed McGraw-Hill

22ITE07

CLOUD COMPUTING

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. 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, 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 open-source technologies.
3. Analyze security issues on the cloud.
4. Develop real-world web applications and deploy them on the commercial cloud.
5. Demonstrate various service models such as IaaS, PaaS, and SaaS

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
3. Implement Infrastructure as a Service using your resources using technologylike OpenStack, Eucalyptus.
4. Simulate identity management in your private Cloud using OpenStack technology.
5. Explore Storage as a Service for remote file access using web interface.
6. Cloud Security Objective: Understand Cloud Security of web server and data directory using ownCloud
7. Implement Platform as a Service by deploying web applications on commercial cloud using technology like Google App Engine, and Windows Azure .

8. To create and access VM instances and demonstrate various components such as EC2, S3, Simple DB, and DynamoDB on AWS platform.
9. Illustrate Software as a Service to understand on-demand application delivery and Virtual desktop infrastructure using technology like Ulteo
10. Case Study on Fog Computing to gain a basic understanding of implementation/applications of fog computing.

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)

As per AICTE Model Curriculum 2022-23

Model Curriculum(R-22) 2025-26

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	22CIC15	Cyber Security	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	22EGM01	Indian Constitution and Fundamental Principles	2	-	-	2	-	50	No Credit
PRACTICAL									
7	22CIC16	Cyber Security 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
11	22CIC19	Internship - III	3-4 weeks / 90 hours			-	50	-	2
TOTAL			**14**	**-**	**10**	**-**	**410**	**390**	**19**

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)

As per AICTE Model Curriculum 2022-23

	Professional Elective - III		**Professional Elective - IV**	
S.NO	**THEORY**		**THEORY**	
	Course Code	**Course Name**	**Course Code**	**Course Name**
1	22CIE11	Writing Secure Code	22CIE13	3D Modelling and Animation
2	22ADE32	Social Network Analytics	22CIE18	Social Engineering
3	22ADE14	Generative AI	22CAE19	Natural Language Processing
4	22CAE17	Image Processing	22CIE14	Robotic process and Automation
5	22ADE06	Exploratory Data Analytics and Visualization	22CSE14	Software Defined Networks
	LAB			
	Course Code	**Course Name**		
1	22CIE12	Writing Secure Code Lab		
2	22ADE34	Social Network Analytics Lab		
3	22ADE15	Generative AI Lab		
4	22CAE18	Image Processing Lab		
5	22ADE07	Exploratory Data Analytics and Visualization 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
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

22CIC15

CYBER SECURITY

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

Pre-Requisites

A foundational understanding of computer science principles, basic programming skills, knowledge of operating systems, familiarity with network fundamentals, prior coursework or experience in IT (network security, software development), and comfort with technical terminology and cybersecurity concepts.

Course Objectives

1. Gain a comprehensive understanding of cybersecurity principles, including definitions, challenges, and human factors.
2. Analyze the origins, categories, and methods of cybercrimes, including tools and defenses.
3. Examine vulnerabilities in software platforms and operating systems, and strategies for prevention, detection, and mitigation.
4. Educate on the security requirements and risk management strategies for databases and cloud environments.
5. Introduce security concerns of cyber-physical systems (CPS) and guide on using threat intelligence tools and recovery processes.

Course Outcomes

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

1. Understand and articulate key principles and challenges of cybersecurity, including human factors and the cybersecurity kill chain.
2. Identify and describe various categories of cybercrimes and implement appropriate tools and methods for defense.
3. Recognize, prevent, and mitigate vulnerabilities in software and operating systems, ensuring secure software lifecycle processes.
4. Understand security requirements for databases and cloud environments, employing risk analysis and security tools to protect data and services.
5. Assess security and privacy concerns of CPS, apply threat intelligence tools, and manage investigation and recovery processes following cybersecurity incidents.

CO-PO Articulation Matrix

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

Unit – I

Cybersecurity: Definition, Principles. **Cybersecurity challenges**: old techniques and broader results, the shift in the threat landscape. **Cybercrime:** Definition and Origins of the word. **Cyberoffenses:** Categories of Cybercrime. **Tools and Methods Used in Cybercrime**: Introduction, Proxy servers and Anonymizers,

Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDos Attacks, SQL Injection, Buffer Overflow. **Understanding the Cybersecurity Kill Chain:** External reconnaissance, Access, and privilege escalation. **Authentication, Authorization, and Accountability (AAA):** Access control, Identity management, user authentication, and technical aspects of accountability.

Unit – II

Software Security: Categories of Vulnerabilities, Prevention and Detection of Vulnerabilities, Mitigating Exploitation of Vulnerabilities. **Security in the Design of Operating Systems:** Simplicity of Design Layered Design Kernelized Design Reference Monitor Correctness and Completeness Secure Design Principles Trusted Systems Trusted System Functions.

Unit – III

Web and Mobile Security: Fundamental Concepts and Approaches, Sandboxing, Client-Side and Server-Side Vulnerabilities and Mitigations. **Cybercrime: Mobile and Wireless Devices**: Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security challenges posed by mobile devices, registry settings for mobile devices, Authentication Service Security, Attacks on Mobile phones**.**

Unit – IV

Database Security: Security Requirements of Databases, Reliability, and Integrity, Database Disclosure. **Cloud Computing Security**: Introduction to Cloud Computing, Service and Deployment Models, Risk Analysis, Cloud as a Security Control, Cloud Security Tools and Techniques, Cloud Identity Management, Securing IaaS.

Unit – V

Threat Intelligence: Introduction, Open-Source Tools, Microsoft Threat Intelligence, Leveraging Threat Intelligence to Investigate Suspicious Activity. **Investigating an Incident**: Investigating an Incident, Scoping the issue, Key artifacts, investigating a compromised system on-premises, Investigating a compromised system in a hybrid cloud. **Recovery Process**: Disaster recovery planning process, challenges. **Cyber-Physical Systems (CPS):** Characteristics, Risks, Security and Privacy Concerns.

Textbook:

1. Nina Godbole, Sunit Belapure, “Cyber Security: Understanding Cybercrimes, Computer Forensics, and Legal Perspectives”, First Edition, Wiley India, 2011.
2. Security in Computing, Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, Fifth Edition, Prentice Hall, 2018.
3. The Cyber Security Body of Knowledge, Awais Rashid, Howard Chivers, George Danezis, Emil Lupu, Andrew Martin, First Edition, 2019
4. Cybersecurity - Attack and Defense Strategies, Yuri Diogenes, Erdal Ozkaya - Third Edition, Packt Publishing, 2022.

Reference Books

1. Cybersecurity Essentials, Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, John Wiley & Sons, Sybex A Wiley Brand, 2018
2. Network Security Assessment, Chris McNab, Third Edition, O'Reilly Media, Inc., 2016
3. Computer security: principles and practice, William Stallings, Lawrie Brown, Second Edition, Pearson Education, 2013

4. Network Security Essentials: Applications And Standards, William Stallings, Fourth Edition, Pearson Education, 2011.

Web Reference

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

22EGM01

INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES

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

Pre-Requisites
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 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.

Textbook:

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

Reference Books

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.

Web Reference

1 . http://www.nptel.ac.in/courses/103107084/Script.pdf

22CIC16

CYBER SECURITY LAB

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

Pre-Requisites

A basic knowledge of computer science concepts, understanding of operating systems and networks, programming experience in C, C++, Java, or Python, familiarity with databases and web applications, and a basic understanding of information technology (IT) concepts.

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	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	-	-	-	-	2	1	2	1
CO2	3	2	2	2	1	-	-	-	-	-	2	2	1	1
CO3	2	2	2	2	1	-	-	-	-	-	1	2	1	2
CO4	3	3	3	2	2	-	-	-	-	-	2	3	2	1
CO5	3	2	3	2	2	-	-	-	-	-	2	2	2	1

List of Experiments

1. Identify network devices and open ports using nmap and Wireshark; discuss security risks of exposed ports.
2. Configure firewall rules with UFW or iptables and test using nmap, or netcat, or Metasploit.
3. Create a web app and test for vulnerabilities with OWASP ZAP or Burp Suite; implement secure coding practices.
4. Test wireless network security using Aircrack-ng or Wireshark; understand WPA2/WPA3 encryption.
5. Run vulnerability scans with OpenVAS or Nessus; identify, prioritize, and mitigate vulnerabilities.
6. Establish a secure VPN with OpenVPN and analyze potential vulnerabilities using Wireshark.
7. Use OpenSSL for encryption/decryption and configure SSL/TLS on a web server.
8. Analyze malware in Cuckoo Sandbox, using IDA Pro or Ghidra for reverse engineering.
9. Secure a database (MySQL/PostgreSQL) and test for SQL injection with SQLMap.

Textbook:

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 Reference

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

22CIC17

TECHNICAL SEMINAR

Instruction	2 Hours per Week
Duration of End Examination	-
Semester End Examination	-
Continuous Internal Evaluation	50 Marks
Credits	1

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 maybe 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 powerpoint presentation shall include following aspects:

1. Introduction to the topic.
2. Literature survey.
3. Consolidation of available informatio ı.
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 30minutes, where the presentation should be for 20minutes in PowerPoint, 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.
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.

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

22CIC18

PROJECT PART- I

Instruction	4 Hours per Week
Duration of End Examination	-
Semester End Examination	-
Continuous Internal Evaluation	50 Marks
Credits	2

The objective of Project Phase – 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.

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

22CIE11

WRITING SECURE CODE

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

Pre-Requisites

Fundamental understanding of programming languages, software development processes, cybersecurity principles, data structures, algorithms, development tools, web development concepts, and cryptography principles.

Course Objectives

1. Understand the importance of secure systems in diverse digital environments.
2. Learn the proactive security development process and its phases.
3. Apply security principles effectively in software design and development.
4. Implement security coding techniques to mitigate common vulnerabilities.
5. Foster a security-conscious culture within organizations through education and awareness.

Course Outcomes

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

1. Evaluate the necessity of secure systems across various application domains.
2. Demonstrate proficiency in designing and developing software following a proactive security approach.
3. Apply security principles like secure by design and default to ensure robust software security.
4. Implement effective security coding techniques to prevent and mitigate vulnerabilities.
5. Advocate for and contribute to a security-aware environment within organizations.

CO-PO Articulation Matrix

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

Unit – I

The Need for Secure Systems - Applications on the Wild Wild Web, The Need for Trustworthy Computing, Getting Everyone's Head in the Game, Some Ideas for Instilling a Security Culture, The Attacker's Advantage, and the Defender's Dilemma.

Unit – II

The Proactive Security Development Process- Process Improvements, The role of education, Design phase, Development phase, Test Phase, Shipping and maintenance phase.

Unit – III

Security Principles to Live By- Secure by Design, by Default, and in Deployment, Security principles. Threat Modeling- Secure Design Through Threat Modeling, Security Techniques, Mitigating the Sample Payroll Application Threats, A Cornucopia of Threats and Solutions.

Unit – IV

Security Coding Techniques -I: Public Enemy #1: The Buffer Overrun, Determining Appropriate Access Control, Running with Least Privilege. Cryptographic Foibles.

Unit – V

Security Coding Techniques -II: Protecting secret data, All input is evil, Canonical Representation Issues, Database Input Issues, Web-Specific Input Issues, Internationalization Issues.

Textbook:

1. "Writing Secure Code" by Michael Howard and David LeBlanc, 2nd edition, 2003, Microsoft Press.

Reference Books

1. “Secure Coding in C and C++”, Robert C. Seacord, Addison-Wesley Professional, 2nd Edition, 2013, ISBN-10: 0321822753, ISBN-13: 978-0321822754
2. "The Tangled Web: A Guide to Securing Modern Web Applications" by Michal Zalewski, 1st edition, 2011, No Starch Press;
3. “Threat Modeling: Designing for Security”, Adam Shostack, Wiley, 1st Edition, 2014, ISBN-10: 1118809998, ISBN-13: 978-1118809990.

Web Reference

1. OWASP (Open Web Application Security Project): https://owasp.org/
2. SANS Institute: https://www.sans.org/

22CIE12

WRITING SECURE CODE LAB

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

Pre-Requisites

A foundational understanding of programming concepts and software development alongside familiarity with computer security fundamentals.

Course Objectives

1. Develop proficiency in identifying and exploiting web application vulnerabilities.
2. Foster effective teamwork skills through collaboration using version control and issue-tracking tools.
3. Understand and apply threat modelling techniques to assess security risks in software systems.
4. Gain practical experience in identifying and exploiting buffer overflow vulnerabilities in programs.
5. Acquire skills in configuring user accounts and managing file permissions on Linux systems for improved security.

Course Outcomes

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

1. Proficiency in identifying and exploiting web application vulnerabilities using industry-standard tools.
2. Effective collaboration skills in team environments by utilizing version control and issue-tracking tools.
3. Ability to assess security risks in software systems through the application of threat modelling techniques.
4. Practical knowledge of identifying and exploiting buffer overflow vulnerabilities in programs.
5. Skills in configuring user accounts and managing file permissions on Linux systems to enhance security measures.

CO-PO Articulation Matrix

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

Unit – I

1. Identify and exploit vulnerabilities in a web application using Burp Suite or OWASP ZAP.
2. Conduct threat modeling using the STRIDE framework and assess associated risks.
3. Exploit buffer overflow vulnerabilities in various programs using debugging tools like GDB or Immunity Debugger.
4. Configure user accounts and file permissions on a Linux system using command-line tools.
5. Implement basic cryptographic operations using Python cryptography library or OpenSSL.
6. Implement data protection measures in a database management system using SQL queries and encryption libraries like bcrypt.

7. Conduct interactive exercises and discussions to raise awareness about security best practices in a classroom setting.

Textbook:

1. "Writing Secure Code" by Michael Howard and David LeBlanc, 2nd edition, 2003, Microsoft Press.
2. “Secure Coding in C and C++”, Robert C. Seacord, Addison-Wesley Professional, 2nd Edition, 2013, ISBN-10: 0321822753, ISBN-13: 978-0321822754

Reference Books

1. "The Tangled Web: A Guide to Securing Modern Web Applications" by Michal Zalewski, 1st edition, 2011, No Starch Press;
2. “Threat Modeling: Designing for Security”, Adam Shostack, Wiley, 1st Edition, 2014, ISBN-10: 1118809998, ISBN-13: 978-1118809990.

Web Reference

1. OWASP (Open Web Application Security Project): https://owasp.org/
2. SANS Institute: https://www.sans.org/

22ADE32

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. A course on "Web Technologies";
2. A course on "Computer Networks";
3. A course on "Data Warehousing and Data Mining".

Course Objectives

This course aims to

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

Course Outcomes

Upon completion of this course, students will 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	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	2	2	1	-	-	1	1	2	1	1	3
CO 2	1	1	1	2	3	1	2	-	1	2	3	2	2	3
CO 3	2	2	1	3	-	2	-	-	-	-	-	1	1	2
CO 4	2	2	1	3	-	2	3	-	1	-	-	1	-	2
CO 5	-	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 Density and conflict. 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.

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.

Textbook:

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.

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 Sheiderman, Marc Smith, Analysing Social Media Networks with NodeXL: Insights from a Connected World, Morgan Kaufmann, 2011.

Web Reference

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

22ADE34

SOCIAL NETWORK ANALYTICS LAB

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

PREREQUISITE:

1. A course on "Web Technologies";
2. A course on "Computer Networks";
3. A course on "Data Warehousing and Data Mining".

COURSE OBJECTIVES:

This course aims to:

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

COURSE OUTCOMES:

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

1. Design the social network object in your familiar programming language like R/Python/java.
2. Analyze how to visualize a social network
3. Explore to calculate node and network-level summary statistics
4. Incorporate network connectivity in a spatial regression model
5. Create spatial network objects using the sfnetworks package.

Course 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	3	2	2	-	1	2	1	2	2	2	2
CO 2	3	3	3	2	2	1	-	1	2	2	2	2	2	2
CO 3	2	2	3	2	2	1	-	1	2	1	2	2	2	2
CO 4	2	2	3	2	2	1	-	1	2	1	2	2	2	2
CO 5	3	3	3	2	3	1	-	1	2	2	2	2	3	3

LIST OF LAB PROGRAMS:

1. Installing and loading required packages for social network analysis.
2. Analysis census tract data
3. Apply the following concepts on social network data analysis.
   A) Socio matrix B) Node and edge lists
4. Create the network object and explore it.
5. Visualizing your real time social network.
6. Analyze the Node characteristics such as centrality.
7. Explore the Network characteristics such Average degree, Centralization, Clustering, Diameter and Density.
8. Explore the Social and spatial network models
9. Analyze the sfnetworks model.
10. Develop one case study on real time social network and analyze it.

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 RESOURCES:

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

22ADE14

GENERATIVE AI

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. To learn the fundamental concepts of Generative AI
2. To acquire the knowledge of encoders, decoders and autoregressive models
3. To acquire the knowledge of various generative models for image generation, style transfer and text generation
4. To learn to apply transforms, prompt engineering and APIs for real world problems
5. To learn to implement develop application using chat GPTs and open API

Course Outcomes

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

1. Understand the fundamental concepts and significance of Generative AI and the unique challenges associated with generative models.
2. Learn the structure, function, and applications of autoencoders and autoregressive models in machine learning.
3. Understand the principles, architecture, and applications of Generative Adversarial Networks for image generation and style transfer.
4. Grasp the architecture and functionality of transformers, and apply prompt engineering techniques using Hugging Face pretrained transformers and APIs.
5. Explore the advancements, capabilities, and practical applications of GPT models, including developing a GPT-3 powered question-answering 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	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

Introduction: An Introduction to Generative AI, Applications of AI, The rules of Probability, Why use generative models, Unique challenges of generative models.

Unit – II

Auto Encoders and Autoregressive Models: Auto encoders, Regularized autoencoders, Stochastic Encoders and Decoders, Autoregressive Models, Fully Visible sigmoid Belief Network (FVSBN), Neural Autoregressive Density Estimation (NADE), Masked Autoencoder for Distribution Estimation (MADE)

Unit – III

Generative Adversarial Network: Generative Adversarial Networks, Vanilla GAN, Progressive GAN, Style transfer and Image transformation, Image Generation with GANs, Style Transfer with GANs

Unit – IV

Transformers and Prompt Engineering: Transformers, Large Language Models, MLM/NSP, Generative Pretrained Transformers (GPT), Task – Specific GPT Fine Tuning, Prompt Engineering, Hugging face pretrained Transformers, Hugging face APIs

Unit – V

Chat GPTs and OpenAI GPT 3, 3.5, 4, OpenAI APIS, working with the OpenAI Playground, Application and Use Cases: Content Filtering, Generating and Transforming Text, Classifying and Categorizing Text, building a GPT-3, Powered Question, Answering APP

Textbook:

1. Steve Tingiris Exploring GPT-3, Packt Publishing Ltd. Uk, 2021
2. Joseph Babcock Raghav Bali, Generative AI with Python and Tensor flow 2, Packt Publishing Ltd. UK, 2021

Reference Books

1. Sabit Ekin, Prompt Engineerign for Chat GPT: Aquick Guide to Techniques, Tips, and Best Practices, DOI: 10.36227/techrxiv.22683919.v2, 2023
2. Fregly Chris, Antje Barth, and Shelbee Eigenbrode. Generative AI on AWS: building context-aware multimodal reasoning applicaions, Orielly, 2023.
3. Auffarth, B. "Generative AI with Langchain: Build large language model (LLM) apps with python, chatgpt, and other llms." Packt Publishing, 2023.

Web Reference

1. https://huggingface.co/
2. https://www.udemy.com/course/generative-ai-for-beginners-b/
3. https://www.coursera.org/learn/generative-ai-with-llms?
4. https://ai.google/discover/generativeai/

22ADE15

GENERATIVE AI LAB

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

Course Objectives

1. Understand fundamental concepts of generative AI models including autoencoders, GANs, and transformers.
2. Gain proficiency in implementing generative AI models using TensorFlow or PyTorch.
3. Learn to evaluate and interpret the performance of generative AI models effectively.
4. Explore real-world applications of generative AI across various domains such as image generation and natural language processing.
5. Enhance problem-solving skills by experimenting with different model architectures and datasets in generative AI tasks.

Course Outcomes

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

1. Gain comprehensive understanding of generative AI concepts including autoencoders, autoregressive models, GANs, and transformer models.
2. Develop proficiency in implementing various generative AI models using TensorFlow or PyTorch.
3. Learn to evaluate model performance using appropriate metrics and analyze results effectively.
4. Enhance creative problem-solving abilities by experimenting with architectures, datasets, and hyperparameters.
5. Gain insights into real-world applications of generative AI models such as image generation, style transfer, and question answering.

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	3	3	3
CO 2	3	3	2	2	3	-	-	-	-	-	1	3	3	2
CO 3	2	2	2	3	3	3	1	-	-	-	-	3	3	3
CO 4	2	2	2	3	3	3	1	-	-	-	-	3	3	2
CO 5	2	2	2	3	3	3	1	-	-	-	-	3	3	3

LIST OF EXPERIMENTS:

1. Implement a basic autoencoder using TensorFlow or PyTorch and train it on a dataset like MNIST for image reconstruction.
2. Explore different regularization techniques such as L1/L2 regularization or dropout and compare their effects on the autoencoder's performance.
3. Implement a variational autoencoder (VAE) and train it on a dataset like FashionMNIST to generate new images.
4. Implement a basic autoregressive model like the Fully Visible Sigmoid Belief Network (FVSBN) using PyTorch or TensorFlow and train it on a sequential dataset like time series data.
5. Implement NADE and train it on a dataset like CIFAR-10 for image generation.
6. Implement MADE and train it on a dataset like CelebA for image generation.

7. Implement a Vanilla GAN using TensorFlow or PyTorch and train it on a dataset like CIFAR-10 for image generation.
8. Implement Progressive GAN and train it on a large dataset like LSUN for high-resolution image generation.
9. Implement a style transfer algorithm using GANs and apply it to images from the CIFAR-10 dataset.
10. Implement a basic transformer model using PyTorch or TensorFlow and train it on a text dataset like WikiText-2 for language modeling.
11. Fine-tune a pre-trained GPT model on a specific task such as sentiment analysis using a dataset like IMDB reviews.
12. Utilize the OpenAI API to build a question-answering application powered by GPT-3, allowing users to input questions and receive relevant answers.

Textbook:

1. Russell, Norvig, “Artificial Intelligence: A Modern Approach”, Pearson Education, 2nd Ed., 2015.
2. Giuseppe Bonaccorso, “Machine Learning Algorithms”, 2nd Edition, Packt, 2018.

Reference Books

1. Steve Tingiris Exploring GPT-3, Packt Publishing Ltd. Uk, 2021
2. Joseph Babcock Raghav Bali, Generative AI with Python and Tensor flow 2, Packt Publishing Ltd. UK, 2021
3. Sabit Ekin, Prompt Engineerign for Chat GPT: Aquick Guide To Techniques, Tips, and Best Practices, DOI: 10.36227/techrxiv.22683919.v2, 2023
4. Foster, D. "Generative Deep Learning. Teaching Machines to Paint, Write, Compose and Play (2019)." Beijing-Boston-Farnham-Sebastopol-Tokyo, OREILLY (2019): 330.
5. Hany, John, and Greg Walters. Hands-On Generative Adversarial Networks with PyTorch 1. x: Implement next-generation neural networks to build powerful GAN models using Python. Packt Publishing Ltd, 2019.

22CAE17

IMAGE PROCESSING

Instruction	3 L 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 this course, students will 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

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	3	1	1	1	1	1	3	2	3	3
CO 2	3	2	2	2	3	1	1	1	1	1	1	2	3	3
CO 3	3	2	2	2	3	1	1	1	1	1	1	2	3	3
CO 4	3	2	3	3	3	2	1	1	2	2	3	1	3	3
CO 5	3	2	2	2	3	1	1	1	1	1	1	3	3	3

Unit – I
Fundamentals of Image Processing: Introduction, examples, fundamental steps, components, elements of visual perception, light and electromagnetic spectrum, 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, elements of information theory, error free compression, lossy compression, image compression standards.

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.

Textbook:

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.

Reference Books

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

Web Reference

1. https://www.youtube.com/watch?v=DSGHkvQBMbsClist=PLuv3GM6-gsE08DuaC6pFUvFaDZ7EnWGX8
2. https://archive.nptel.ac.in/courses/117/105/117105135/

22CAE18

IMAGE PROCESSING LAB

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

Pre-Requisites

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

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	2	-	-	-	1	1	3	3	2	1
CO 2	3	3	2	2	3	-	-	1	1	1	3	1	2	3
CO 3	3	2	2	2	3	-	-	1	1	1	3	3	2	3
CO 4	3	2	2	2	3	-	-	1	1	1	3	3	1	3
CO 5	3	2	2	2	3	-	-	1	1	1	3	3	3	3

LIST OF EXPERIMENTS:

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.

Textbook:

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 Book:

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.

Web Reference

1. https://www.youtube.com/watch?v=DSGHkvQBMbsClist=PLuv3GM6-gsE08DuaC6pFUvFaDZ7EnWGX8
2. https://archive.nptel.ac.in/courses/117/105/117105135/

22ADE06

EXPLORATORY DATA ANALYSIS AND VISUALIZATION

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

Pre-Requisites
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	-	-	-	-	-	-	-	-	-	3	-	-	2
CO 2	3	2	-	1	1	-	-	-	-	-	3	-	-	2
CO 3	3	1	-	3	1	-	-	-	-	1	3	3	3	3
CO 4	3	2	1	3	1	-	-	-	-	3	3	3	3	3
CO 5	2	2	-	2	1	-	-	-	-	3	3	2	-	2

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, Working with Time Series, High-Performance functions - query() and eval()

Unit – IV

Inferential Statistics - Normal distribution, Poisson distribution, Bernoulli distribution, z-score, p-score, One-tailed and two-tailed, Type 1 and Type-2 errors, Confidence interval, Correlation, Z-test vs T-test, F-distribution, Chi-square distribution, the chi-square test of independence, ANOVA

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.

Textbook:

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

Reference Books

1. Wes McKinney, "Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter", 3rd Edition, 2022

Web Reference

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

22ADE07

EXPLORATORY DATA ANALYSIS AND VISUALIZATION LAB

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

Pre-Requisites
Python Programming

Course Objectives

1. Impart a strong foundational understanding of NumPy arrays and their role in efficient numerical computing within Python.
2. Familiarize students with the diverse array of mathematical functions to perform a wide range of data manipulations and analyses.
3. Guide students to proficiently clean, transform, and analyze real-world datasets using pandas.
4. Facilitate the exploration of advanced Pandas features, such as hierarchical indexing and data merging and joining,
5. Equip students with skills to create informative and engaging visualizations using Matplotlib and Seaborn.

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

1. Apply indexing, slicing, and reshaping techniques to extract, transform, and analyze numerical data within NumPy arrays.
2. Perform arithmetic operations, broadcasting, and other numpy functions to efficiently process and manipulate numerical data.
3. Apply Boolean masks and conditional statements to filter specific elements/from NumPy arrays
4. Implement various pandas functions to handle missing data, such as imputation, deletion, or interpolation, to ensure data quality and reliability.
5. Generate a wide range of 2D and 3D visualizations, including basic Matplotlib plots and specialized statistical graphs using Seaborn to draw useful insights about the 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	2	-	-	-	-	-	-	-	-	-	3	-	-	2
CO 2	3	2	-	1	1	-	-	-	-	-	3	-	-	2
CO 3	3	1	-	3	1	-	-	-	-	1	3	3	3	3
CO 4	3	2	1	3	1	-	-	-	-	3	3	3	3	3
CO 5	2	2	-	2	1	-	-	-	-	3	3	2	-	2

LIST OF EXPERIMENTS:

1. Implement indexing, slicing and reshaping on numpy arrays.
2. various operations on NumPy arrays, including arithmetic calculations, broadcasting
3. Apply Boolean operations on a numpy array to filter specific elements, sort the array, and manipulate it using Boolean masks.
4. Demonstrate identifying and handling missing data within Pandas DataFrames using various

techniques, such as filling missing values, dropping rows or columns with missing data.
5. Demonstrate interpolation techniques to estimate missing values.
6. Demonstrate hierarchical indexing and Multi-Criteria based data retrieval using pandas.
7. Combine and analyze datasets using Pandas operations including merge, join, concatenate, grouping and aggregation.
8. Plot different types of visualizations (e.g., line plot, scatter plot, histogram, bar plot) using matplotlib.
9. Demonstrate 3D visualizations using matplotlib.
10. Create various Seaborn visualizations such as pair plots, contour plots, violin plots, and box plots to represent different aspects of your data.
11. Case Study: Perform exploratory data analysis on any given dataset.

Textbook:

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

Reference Books

1. Wes McKinney, “Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter”, 3rd Edition, 2022

Web Reference

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

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	PO 11	PSO1	PSO2	PSO3
CO1	3	1	2	2	3	-	-	-	-	-	-	1	1	2
CO2	3	1	2	2	3	-	-	-	-	-	-	1	1	2
CO3	3	1	2	2	3	-	-	-	-	-	-	1	1	2
CO4	3	1	2	2	3	-	-	-	-	-	-	2	2	3
CO5	3	1	2	2	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 mering 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:

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 Reference

1.

22CIE18

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, Cyber Security.

Course Objectives
1. Understand social engineering, identify common attacks, and provide strategies for overcoming it.
2. Apply behavioral and technical controls in Social Engineering.
3. Identify how to communicate basic security awareness to others.

Course Outcomes
On Successful completion of the course, student will able to,
1. Apply up to date social engineering techniques and ethical consideration.
2. Extract Intelligence from publicly available sources to support intelligent needs and to discover vulnerabilities in IT Systems.
3. Explore different types of social engineering attack.
4. Identity the attacks and victims.
5. Acquire knowledge on tactics and strategies on how to protect network against attack.

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	-	1	-	2	1	2	-	3	3	2
CO 2	3	3	2	3	3	1	-	2	2	2	-	2	3	2
CO 3	3	3	2	3	3	1	-	2	2	2	-	2	3	2
CO 4	3	3	2	3	3	1	-	3	2	2	-	2	3	2
CO 5	2	2	2	3	1	1	-	2	1	2	-	2	3	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
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.

Unit – IV
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.

Textbook:

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.The Art of Deception: Controlling the Human Element of Security By: Kevin D. Mitnick, William L. Simon, 2007, ISBN: 9780764544682, Wiley Publishing.

Web Reference

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

22CAE19

NATURAL LANGUAGE PROCESSING

Instruction	3 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. Understand various Natural Language Processing Fundamentals.
2. Understand probabilistic NLP and classification of text using Python's NLTK Library
3. Understand various text representations and labelling techniques.
4. Understand various NLP models and named entities.
5. Learn RNN for NLP.
6. Understand usage of GRU and LSTM models for translation.
7. Understand various applications of NLP.

Course Outcomes

On Successful completion of this course, student will be able to

1. Understand the fundamentals of Natural Language Processing, manipulate and analyse language data.
2. Demonstrate key concepts from NLP, text representation and linguistics to describe and analyse language.
3. Demonstrate the word embedded techniques and classification of the text.
4. Make use of the Deep learning and Transformers for NLP.
5. Develop NLP applications using appropriate NLP tools and 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	2	2	2	2	2	2	2	3	1	2	2
CO 2	2	2	3	2	2	2	2	2	2	3	3	2	1	2
CO 3	2	2	3	2	2	2	2	2	2	3	3	1	1	2
CO 4	2	3	2	2	2	2	2	2	2	2	3	2	2	1
CO 5	2	2	3	2	2	2	2	2	2	3	3	3	1	2

Unit – I

Introduction to NLP: Definition, History, NLP in the real world, Approaches to NLP, NLP Pipeline.
Language Processing and Python: Computing with Language: Texts and Words, A Closer Look at Python: Texts as Lists of Words, Computing with Language: Simple Statistics.
Accessing Text Corpora and Lexical Resources: Accessing Text Corpora, Conditional Frequency.

Unit – II

Basic Vectorization approaches of Text Representation : One-Hot Encoding, Bag of Words, Bag of N-Gram, TF-IDF; Distributed universal text and handcrafted feature Representations, Neural language models, N-gram language model. Processing Raw Text: Accessing Text from the Web and from Disk, Text Processing with Unicode. Categorizing and Tagging Words: Using a Tagger, Tagged Corpora, Mapping Words to Properties Using Python Dictionaries, Automatic Tagging.

Unit – III

Word Embeddings: Count Vector, Frequency based Embedding, Prediction based Embedding,Word2Vec and Glove. Learning to Classify Text: Supervised Classification and Text classification with Machine learning algorithms.

Unit – IV

Deep learning for NLP: RNN for language model, Sequence Labelling and Sequence Classification, Encoder-Decoder with RNNs, GRUs and LSTMs for machine translation, Convolutional neural networks for sentence classification and Evolution metrics for NLP. Transformers for NLP: Attention , Transformers and BERT.

Unit – V

Case Study on NLP: Sentiment analysis, Machine translation, Automated speech recognition systems, Question-answering based systems, Topic modelling, Text Generation and Summarization.

Textbook:

1. Steven Bird, Ewan Klein, and Edward Lope, Natural Language Processing with Python. O‟Reily,2009.
2. Deep Learning for Natural Language Processing Develop Deep Learning Models for Natural Language in Python (Jason Brownlee), Machine Learning Mastery,2017.
3. Lewis Tunstall, Leandro von Werra, Thomas Wolf - Natural Language Processing with Transformers_ Building Language Applications with Hugging Face-O'Reilly Media (2022).
4. Akshay Kulkarni, Adarsha Shivananda, Natural Language Processing Recipes: Unlocking Text Data with Machine Learning and Deep Learning using Python. Apress, 2019.
5. Sudharsan Ravichandiran ,Getting Started with Google BERT Build and train state-of-the-art natural language processing models using BERT.

Web Reference

1. https://models.quantumstat.com/
2. https://www.coursera.org/learn/attention-models-in-nlp
3. https://github.com/keon/awesome-nlp

22CIE14

ROBOTIC PROCESS AND AUTOMATION

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

Pre-Requisites

Course Objectives

1. To provide insights on robotic process automation (RPA) technology and its value proposition
2. To introduce different platforms for RPA
3. To learn different types of variables, control flow and data manipulation techniques
4. To familiarize with Image, Text and data Tables Automation
5. To describe various types of Exceptions and strategies to handle them.

Course Outcomes

On Successful completion of the course, student will

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	1	2	2	2	-	-	-	-	-	-	1	2	1	1
CO 2	3	2	1	1	1	-	-	-	-	-	-	1	1	1
CO 3	3	2	1	2	1	-	-	-	-	-	-	2	1	1
CO 4	3	2	1	1	-	-	-	-	-	-	-	2	1	1
CO 5	2	2	1	2	1	-	-	-	-	-	-	2	1	1

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 example-CSV/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 control- Techniques 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 available- How 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.

Textbook:

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.

Reference Books

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

Web Reference

1 . https://www.uipath.com/rpa/robotic-process-automation
2. https://www.academy.uipath.com

22CSE14

SOFTWARE DEFINED NETWORKS

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

Pre-Requisites
Operating Systems, Computer Networks

Course Objective
This course aims to:
1. Develop knowledge in networking fundamentals
2. Gain conceptual understanding of software defined networks
3. Study industrial use-cases of SDN

Course Outcomes
Upon completion of this course, students will be able to:
1. Analyse the conventional network and SDN paradigm.
2. Describe the major requirements for the design of an SDN protocol.
3. Plan, configure and troubleshoot switches and controllers, and SDN networks.
4. Analyse the performance of SDN by using verification and troubleshooting techniques.
5. Evaluate the emerging SDN 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	PSO1	PSO2	PSO3
CO 1	2	2	1	1	-	-	-	-	-	-	-	2	1	1
CO 2	2	3	2	3	-	-	-	-	-	-	-	2	3	1
CO 3	2	-	1	-	3	-	1	-	-	-	-	2	1	1
CO 4	2	1	-	1	2	-	-	-	-	-	-	1	2	1
CO 5	2	1	-	-	-	-	-	-	-	-	-	2	3	1

Unit –I
Introduction to SDN: Introduction to Software Defined Networks, Elements of modern networking, Evolving Network Requirements and Technologies.

Unit –II
Network Operating System (NOS): SDN architecture, Planes- data, management and control; Interfaces- northbound and southbound.

Unit –III
Protocols: Languages and functions available for programming SDNs, northbound API, Mininet, software vs. hardware SDN switch implementations, Open vSwitch, WhiteBox, ONL; Controller implementations- POX, NOX, Beacon, Floodlight; Special purpose controllers-Flowvisor, Routevisor.

Unit –IV
Design and Development of SDNs: Network Programmability, Network function Virtualization, NetApp Development, Network Slicing, SDX; Northbound API, Current Languages and Tools, Composition of SDNs.

Unit –V
Programming and Use cases: Network Virtualization, Topology and Topological Information Abstraction,

Data Centric Traffic Management, Wide Area Traffic Management, Wireless networks, NFV use cases.

Text Books:

1. William Stallings, “Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud”, Pearson Education, 1st Edition, 2016
2. Paul Goransson, Chuck Black Timothy Culver, “Software Defined Networks: A Comprehensive Approach”, 2nd Edition, Morgan Kaufmann Press, 2016.

Suggested Reading:

1. Ken Gray, Thomas D. Nadeau, “Network Function Virtualization”, Morgan Kauffman, 2016.
2. Thomas D Nadeau, Ken Gray, “SDN: Software Defined Networks”, O’Reilly Media, 2013.
3. Fei Hu, “Network Innovation through OpenFlow and SDN: Principles and Design”, 1st Edition, CRC Press, 2014.
4. Oswald Coker, SiamakAzodolmolky, “Software-Defined Networking with OpenFlow”, 2nd Edition, O’Reilly Media, 2017.

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)

As per AICTE Model Curriculum 2022-23

Model Curriculum(R-22) 2025-26

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		Professional Elective-V	3	-	-	3	40	60	3
2		Open Elective-III	3	-	-	3	40	60	3
3	22CEM01	Environmental Science	2	-	-	2	-	50	No Credits
PRACTICAL									
4	22CIC20	Project Part – 2	0	0	8	-	100	100	4
		TOTAL	**8**	**-**	**8**	-	**180**	**270**	**10**

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)

As per AICTE Model Curriculum 2022-23

Professional Elective – V

S.NO	THEORY	
	Course Code	**Course**
1	22CIE15	Extended Reality
2	22CIE16	Emerging Threats and Defenses
3	22ADE29	Computer vision
4	22CSE13	Human Computer Interaction
5	22CSE08	User Interface and User Experience Design

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
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

22CEM01

ENVIRONMENTAL SCIENCE

Instruction	2 L Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	-
Credits	Non Credit

Course Outcomes:

This course aims 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	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	2	-	-	-	1	2	1	3
CO 2	3	1	-	-	-	1	1	-	-	-	1	3	1	2
CO 3	3	1	-	-	-	2	2	-	-	-	1	1	1	2
CO 4	3	1	-	-	-	2	2	2	-	-	1	2	1	2
CO 5	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

22CIC20

PROJECT PART- II

Instruction	8 Hours per Week
Duration of End Examination	-
Semester End Examination	100 Marks
Continuous Internal Evaluation	100 Marks
Credits	4

The objective of 'Project: Part Phase - 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, modelling, 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.

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

22CIE15

EXTENDED REALITY

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 understand immersive technology current state of development for designing and developing immersive experiences.
2. To understand the sensory, emotional and narrative immersion for best practice user interface and experience design.
3. To understand the intersection of AI and VR/XR, looking at how AI is being used to improve everything from graphics rendering to user interaction.
4. To understand the applications of VR/XR in healthcare, discussing the latest research, challenges and opportunities for healthcare professionals.
5. To understand the design principles that guide the creation of immersive experiences, from 3D modelling to user interface design.

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

1. Define and explain principles in immersive technology for designing and developing immersive experiences.
2. Explain the sensory, emotional and narrative immersion for best practice user interface and experience design.
3. Model and create intersection of AI and VR/XR to user interaction.
4. Design the applications of VR/XR in healthcare, discussing the latest research, challenges and opportunities for healthcare professionals.
5. Choose the creation of immersive experiences, from 3D modelling to user interface design.

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	2	1
CO2	3	3	3	3	2	-	-	-	-	-	3	2	1	1
CO3	3	3	3	3	3	-	-	-	-	-	3	1	2	1
CO4	3	3	3	3	3	-	-	-	-	-	3	3	2	1
CO5	3	3	3	3	3	-	-	-	-	-	3	1	1	1

Unit – I
Immersive Technology: Introduction Promise and Potential, Knowing immersive technologies - AR/VR/ExR, Overview of immersive technologies, AR/VR Milestones and breakthroughs, Current state, Statistical data, Potential and Limitations of immersive technologies. **The Psychology of Presence in Immersive Technologies**- Knowing presence, Theories of presence, Factors contributing to presence, Measuring, Advantages and limitations of measuring presence and Application of presence.

Unit – II
Designing Immersive Experience - Introduction, designing for sensory immersion, Designing for emotional immersion, Designing for narrative immersion, Best practices for user interface and experience design. **Evolution of VR Hardware -** Introduction to virtual reality hardware, The rise of consumer virtual reality, Virtual reality hardware design challenges, The future of virtual reality hardware, Role of haptic feedback on virtual reality hardware, Types of haptic feedback, Benefits and limitations of haptic technology, Case

Studies

Unit – III

AI in AR/VR/XR: -Introduction, AI and its usage in VR/AR, Graphic rendering, Natural language processing, User interaction, Predictive analytics. **Business Landscape of AR/VR/XR-** Introduction, Funding and investment, Funding and its challenges for VR/XR industry, Monetization strategies, User adoption and marketing, Technology challenges, Case studies.

Unit – IV

Applications of AR/VR/XR in Healthcare: -Introduction, Diagnosis and treatment, Rehabilitation and physical therapy Medical education and training, Use of immersive technology in patient education and engagement, Case studies, Design principles, Medical realities. **Applications of AR/VR/XR in Education:** Introduction, Immersive learning environment, Simulations and training, Personalized learning, Collaborative learning, Case studies.

Unit – V

Ethics in Immersive Technologies: Introduction to ethics in immersive technologies, Safety and physical health Psychological and emotional impact, Case studies. **3D Modeling and User Interface Design:** Introduction to 3D modelling, Modelling technique, Artistic and technical balance, Real-time 3D and game engines, User interface design principles, User interface design software and workflow, Implementing UIs in 3D environment, **Case Study:** Building VR Applications with Unity.

Textbook:

Immersive Realm of Extended Reality, Author Suman Dutta, First Edition 2024, Copyright © BPB Publications, India, ISBN: 978-93-55517-227

Reference Books

1. VIRTUAL REALITY, Steven M. LaValle, University of Oulu, Cambridge University Press.
2. Virtual and Augmented Reality- An Educational Handbook, By Zeynep Tacgin, Cambridge Scholars Publishing Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK
3. Virtual Reality Technology, Grigore C. Burdea, Philippe Coiffet, John Wiley & Sons, 30 Jun 2003 - Computers - 464 pages
4. 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://axisxr.gg/the-future-of-xr-trends-to-look-for-in-2024/
1. https://www.interaction-design.org/literature/topics/extended-reality-xr
2. https://www.accenture.com/us-en/services/technology/extended-reality
3. https://www.sngular.com/insights/235/extended-reality-will-it-be-more-widespread-in-2024

22CIE16

EMERGING THREATS AND DEFENSES

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

Pre-Requisites

A basic understanding of information technology and basic cybersecurity concepts. Familiarity with networking principles, common security practices, and risk management is recommended.

Course Objectives

1. Understand and evaluate the existing threats and challenges in the field of cybersecurity.
2. Learn strategies and tactics to improve organizational security and resilience against cyber threats.
3. Implement risk-based methodologies to prioritize and address security vulnerabilities effectively.
4. Develop skills to effectively respond to and recover from security incidents, including understanding forensic processes and technologies.
5. Anticipate and adapt to emerging trends and technologies in cybersecurity, focusing on proactive security measures.

Course Outcomes

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

1. Assess and articulate the current threat landscape and its impact on organizations.
2. Implement strategies to enhance their organization's security posture, including Red and Blue Team tactics.
3. Utilize a risk-based approach to manage and mitigate security risks within their organizations.
4. Demonstrate proficiency in responding to security incidents.
5. Equipped with knowledge and skills to implement adaptive and proactive security measures.

CO-PO Articulation Matrix

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

Unit – I

Security Posture, The current threat landscape, Cybersecurity challenges, Enhancing your security posture, The Red and Blue Team, Understanding The Problem, and The Changing Threat.

Unit – II

Understanding Organizational Security Compromise, Understanding the Processes of Organizational Compromise, Risk-based Approach to Security.

Unit – III

Emerging Trends, Protecting Your Data, Data Discovery Protected Enclaves, Everything Starts with Your Data, CIA, Data Classification, Encryption, Data at Rest, Data at Motion, Encryption—More Than You Bargained For, Network Segmentation and De-Scoping, Encryption Free Zone, Prevention is Ideal but

Detection is a Must, Inbound Prevention, Outbound Detection, Network vs. Host, Making Hard Decisions, Is AV/Host Protection Dead?

Unit – IV

Incident Response, Respond and Recover, The New Rule, Suicidal Mindset, Events/Audit Trails, Sample Incidents,6-Step Process, Forensic Overview, Technologies for Success, Integrated Approach to APT, How Bad is the Problem?, Trying to Hit a Moving Target, Finding the Needle in the Haystack, Understand What You Have, Identifying APT, Minimizing the Problem, End to End Solution for the APT.

Unit – V

The Future and How to Win, The Changing Landscape, Cloud and Mobilization, Proactive Security and Reputational Ranking, Focusing on the Right Security, Implementing Adaptive Security

Textbook:

1. Sun, Yuri Diogenes, and Dr. Erdal Ozkaya. *Cybersecurity - Attack and Defense Strategies: Infrastructure Security with Red Team and Blue Team Tactics*. 2nd ed., Packt Publishing, 2019.
2. Cole, Eric. *Advanced Persistent Threat: Understanding the Danger and How to Protect Your Organization*. Syngress, 2012.

Reference Books

1. "Hands-On Ethical Hacking and Network Defense" by Michael T. Goodrich, 1st edition, 2003, Cengage Learning
2. "Cryptography Engineering: Design Principles and Practical Applications" by Niels Ferguson, Bruce Schneier, and Tadayoshi Kohno, 1st edition, 2010, Wiley

Web Reference

1. SANS Institute Information Security Reading Room: https://www.sans.org/white-papers/454/
2. National Institute of Standards and Technology (NIST) Cybersecurity Framework: https://www.nist.gov/cyberframework
3. Cloud Security Alliance (CSA): https://cloudsecurityalliance.org/

22ADE29

COMPUTER VISION

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

Pre-Requisites
Knowledge on Matrices, Linear Algebra and Calculas

Course Objectives
This course aims to
1. To introduce the fundamentals of image formation
2. To provide understanding of segmentation and Augmentation techniques in Computer Vision
3. To Identify and interpret appropriate sources of information relating to computer vision.
4. To analyse, evaluate and examine existing practical computer vision
5. To Design and develop practical and innovative image processing and computer vision applications.

Course Outcomes
Upon completion of this course, students will be able to:
1. Understand the fundamental concepts in computer vision.
2. Apply segmentation and augmentation techniques and descriptors.
3. Identify and interpret appropriate sources of information relating to computer vision.
4. Analyse, evaluate and examine existing practical computer vision.
5. Design and develop practical and innovative image processing and computer vision 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	2	2	1	1	1	1	1	1	1	1	2	3	2
CO 2	3	3	2	2	1	1	1	1	2	2	1	2	3	2
CO 3	3	3	1	2	3	2	1	1	1	1	1	2	3	3
CO 4	3	2	1	2	3	1	1	2	2	1	2	3	3	3
CO 5	3	2	3	2	2	2	1	3	3	2	2	3	3	3

Unit – I
Introduction to Computer Vision and Basic Concepts of Image Formation: Introduction and Goals of Computer Vision and Image Processing, Image Formation Concepts, **Fundamental Concepts of Image Formation**: Radiometry, Geometric Transformations, Geometric Camera Models.

Unit – II
Fundamental Concepts of Image Formation: Camera Calibration, Image Formation in a Stereo Vision Setup, Image Reconstruction from a Series of Projections. **Image Processing Concepts**: Image Transforms, Image Transforms, Image Enhancement, Image Filtering, Color Image Processing, Image Segmentation.

Unit – III
Image Descriptors and Features: Texture Descriptors, Colour Features, Edges/Boundaries, Object Boundary and Shape Representations, Interest or Corner Point Detectors, Histogram of Oriented Gradients, Scale Invariant Feature Transform, Speeded up Robust Features, Saliency.

Unit – IV
Fundamentals of Machine Learning: Linear Regression, Basic Concepts of Decision Functions, Elementary Statistical Decision Theory, Parameter Estimation, Clustering for Knowledge Representation, Dimension Reduction, Linear Discriminant Analysis.

Unit – V

Applications of Computer Vision: Artificial Neural Network for Pattern Classification, Convolutional Neural Networks, Autoencoders, Gesture Recognition, Motion Estimation and Object Tracking, Programming Assignments.

Textbook:

1. Manas Kamal Bhuyan, "COMPUTER VISION AND IMAGE PROCESSING FUNDAMENTALS AND APPLICATIONS", Taylor & Francis, 2020

Reference Books

1. David A. Forsyth , "COMPUTER VISION A MODERN APPROACH, Pearson, 2012
2. Richard Szeliski, "Computer Vision Algorithms and Applications", Second edition, Springer, 2022.
3. E.R.Devis, "Computer and Machine Vision: Theory, Algorithms, Practicalities, Fourth edition, Appress, 2012

Web Reference

1. https://onlinecourses.nptel.ac.in/noc24_cs124/preview
2. https://onlinecourses.nptel.ac.in/noc24_cs89/preview
3. https://onlinecourses.nptel.ac.in/noc24_ee133/preview
4. https://onlinecourses.swayam2.ac.in/nou24_cs08/preview

22CSE13

HUMAN COMPUTER INTERACTION

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. Learn the foundations of Human Computer Interaction.
2. Familiarize with the design technologies for computer interaction.
3. Learn the design strategies, guidelines, models and theories for developing a user friendly interface.

Course Outcomes

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

1. Understand the structure of models and theories of human computer interaction.
2. Understand the vision of a computer user.
3. Understand the recognition and remembrance limitations of a computer user.
4. Understand the design rules and design process.
5. Apply the models and theories of human computer interaction to real-time 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	1	1	-	-	-	-	-	1	1	1	1	1
CO 2	3	1	2	1	1	-	-	-	-	1	1	1	2	3
CO 3	3	1	2	1	1	2	-	-	-	1	1	2	1	1
CO 4	3	1	1	1	1	2	1	-	1	1	1	1	1	2
CO 5	3	1	1	1	1	2	1	-	1	1	1	1	1	1

Unit –I

Foundations: The human, the computer, The Interaction, Paradigms. Introduction, Our perception is biased, our vision is optimized to see structure

Unit –II

We Seek and Use Visual Structure, Our Color Vision is Limited, Our Peripheral Vision is Poor, Reading is Unnatural, Our Attention is Limited; Our Memory is Imperfect, Limits on Attention Shape Our Thought and Action

Unit –III

Recognition is Easy; Recall is Hard, Problem Solving and Calculation are Hard, Many Factors Affect Learning, Human Decision Making is Rarely Rational

Unit –IV

Our Hand–Eye Coordination Follows Laws, We Have Time Requirements, Well-known User-Interface Design Rules, Design Process**:** Interaction design basics, HCI in the software process, Design rules

Unit –V

Models and Theories: Cognitive models, Socio-organizational issues and stakeholder requirements, Communication and collaboration models, Task analysis, Hypertext, multimedia and the World Wide Web.

Text Books:

1. Jeff Johnson, "Designing with the Mind in Mind – Simple Guide to Understanding", 2nd edition, Elsevier Inc., 2010.
2. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, "Human Computer Interaction", 3rd

edition, Pearson Education Limited, 2004.

Suggested Reading:

1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, "Designing the User Interface", 5th Edition, Pearson Education Limited, 2013.
2. John Haugeland, "Mind Design II", 2nd Edition, Revised and enlarged edition, The MIT Press, 1997.

22CSE08

USER INTERFACE AND USER EXPERIENCE DESIGN

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

Pre-Requisites

Fundamental Computer Skills, Knowledge of Web Technologies.

Course Objectives

This course aims to:

1. Familiarize students with the fundamental principles and concepts of user interface (UI) and user experience (UX) design.
2. Equip students with the practical skills and knowledge necessary to design effective UI/UX interfaces.
3. Understand the importance of applying user-centered design methods throughout the design process.

Course Outcomes

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

1. Apply user-centered design principles to create interfaces that meet the needs and preferences of target users.
2. Demonstrate proficiency in designing intuitive user interfaces that are easy to navigate and understand.
3. develop the skills to create wireframes, prototypes, and mockups using industry-standard design tools.
4. Gain an understanding of accessibility guidelines and principles, designing interfaces that are accessible to users with disabilities.
5. Identify emerging trends and technologies in UI/UX design.

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	3	3	3	3	3	3	3	1	1	2
CO 2	3	3	3	3	3	3	3	3	3	3	3	1	-	3
CO 3	2	3	3	3	3	2	-	3	3	3	3	1	1	-
CO 4	3	3	3	3	3	3	-	3	3	3	3	1	-	-
CO 5	3	3	1	2	2	1	-	3	3	1	-	1	-	-

Unit –I

Introduction to UI/UX Design: Understanding UI/UX Design: Definition and importance of UI/UX design, Difference between UI and UX, Roles and responsibilities of UI/UX designers, Overview of the design process. **User-Centered Design Principles**: Principles of user-centered design, User research methods (interviews, surveys, observations), Creating user personas and scenarios, Conducting user journey mapping exercises.

Unit –II

Design Fundamentals: Basic principles of visual design (layout, typography, color),Gestalt principles and their application in UI design, Applying visual hierarchy to improve user experience, Introduction to design tools (Sketch, Figma, Adobe XD). **Interaction Design**: Principles of interaction design, Designing effective navigation systems,Feedback mechanisms and user affordances Prototyping techniques for interaction design.

Unit –III

Usability and User Testing: Understanding usability principles, Nielsen's heuristics for user interface design, Conducting heuristic evaluations of UI designs, Usability testing methods (moderated vs. unmoderated, remote testing). **User Testing and Feedback:** Planning and conducting usability tests, Analyzing usability test results Incorporating user feedback into UI design iterations, Best practices for iterative design and testing cycles.

Unit –IV

Accessibility in UI/UX Design: Understanding accessibility guidelines (WCAG),Designing accessible interfaces for users with disabilities, Assistive technologies and their impact on UI/UX design. **Emotional Design and Engagement**: Principles of emotional design, Creating emotionally engaging user experiences, Strategies for enhancing user engagement and retention, Case studies of emotionally successful UI/UX designs.

Unit –V

Responsive and Mobile Design: Principles of responsive web design, Mobile-first design approach, Adapting layouts and content for different screen sizes, Testing and debugging responsive designs. **Designing for Mobile Platforms**: Mobile UI design patterns and conventions, Navigation and interaction patterns for mobile apps, Challenges and best practices for designing mobile interfaces, Introduction to mobile prototyping tools (InVision, Marvel).

Text Books:

1. Krug, S. (2006) Don’t Make Me Think, Rider publication.
2. Don Norman (2013) "The Design of Everyday Things", Published by Basic Books.

Suggested Reading:

1. Jim K. (2010) Design Basics Index, How books.
2. Lidwell, W., Holden, K. and Butler, J. (2010) Universal Principles of Design, Rockport Publishers.

Online Resources:

1. User Interface Design - Course (nptel.ac.in)
2. Introduction to User Experience Design Course (Georgia Tech) | Coursera.

22ECO02

REMOTE SENSING and GIS

Instruction	3L 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 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.

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	1	1	-	1	1	-	1	-	2	1	1	1
CO 2	3	1	1	1	-	1	1	-	1	-	2	1	1	1
CO 3	3	1	1	1	-	1	1	-	1	-	2	1	1	1
CO 4	2	1	1	1	-	1	1	-	1	-	2	1	1	1
CO 5	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.

22ECO03

FUNDAMENTALS OF WIRELESS COMMUNICATIONS

Instruction	3L 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 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

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	1	1	-	-	-	-	-	1	1	1	1
CO 2	2	1	1	2	1	-	-	-	-	-	1	1	1	1
CO 3	2	2	1	2	2	-	-	-	-	-	1	1	1	1
CO 4	2	1	1	1	1	1	-	-	2	-	2	1	1	1
CO 5	2	1	1	1	1	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.

22ECO05

PRINCIPLES OF EMBEDDED SYSTEMS

Instruction	3L 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: Fundamental knowledge about electronic device is required
This course aims to:

1. To learn the fundamentals of the embedded system design.
2. To learn architecture details of embedded processors
3. To 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

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	2	3	2	-	2	2	-	2	1	1	1
CO 2	3	3	3	2	2	2	-	2	2	-	2	1	1	1
CO 3	3	3	3	2	3	2	-	2	2	-	2	1	1	1
CO 4	3	3	3	2	2	2	-	2	2	-	2	1	1	1
CO 5	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.

22EGO01

TECHNICAL WRITING SKILLS

Instruction	3L 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.

Text Books:

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

22CEO01

INFRASTRUCTURE FOR SMART CITIES

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

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. Summarise 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	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	-	-	-	-	1	-	-	-	-	-	2	-	3
CO 2	2	-	-	-	-	1	-	-	-	-	-	2	-	3
CO 3	2	-	-	-	3	1	-	-	-	-	-	2	-	3
CO 4	2	3	-	-	3	1	-	-	-	-	-	2	-	3
CO 5	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.

E Resources:

1. https://onlinecourses.nptel.ac.in/noc23_ar12/preview
2. http://acl.digimat.in/nptel/courses/video/105105160/L01.html

22CEO02

DISASTER RISK REDUCTION AND MANAGEMENT

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

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
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 and Tsunami". 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 Press Pvt. Ltd

E Resources:

1. https://nptel.ac.in/courses/124107010
2. https://onlinecourses.swayam2.ac.in/cec19_hs20/preview

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)

22EEO06

WASTE MANAGEMENT

(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. Imbibe the concept of effective utilization of any scrap
2. Become familiar with the processes of all disciplines of engineering.
3. Learn 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

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO1	PSO2	PSO3
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

1 - Slightly; 2 - Moderately; 3 - Substantially

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.

22BTO05

COGNITIVE NEUROSCIENCE

(Open Elective)

Instruction	2 L-1T 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.

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	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.

22CHO02

FUNDAMENTALS OF NANO SCIENCE AND NANO TECHNOLOGY

Instruction	3(3L+0T) 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 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	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.

Text Books:

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 Reading:

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.

22CHO03

INDUSTRIAL POLLUTION CONTROL

(Open Elective)

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

22CHO04

ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT

Instruction	3(3L+0T) 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 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	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 Books:

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.

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	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 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

22MEO03

CORPORATE ORGANIZATIONAL BEHAVIOR

Instruction	3 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	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: 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.

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, **O**perationalizing 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/

22MEO06

PRINCIPLES OF ENTREPRENEURSHIP AND STARTUPS

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. 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.

22CIO01

FUNDAMENTALS OF INTERNET OF THINGS

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

Pre-Requisites
Programming Basics, Computer Architecture and Micro Processor.

Course Objectives
1. Impart necessary and practical knowledge of components in Internet of Things.
2. Understand working of IoT Systems.
3. Develop skills required to build IoT based systems.

Course Outcomes
By the end of this course, students should 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 the 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 – I
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 – II
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 Types, Actuator Characteristics.
Associated IoT technologies: Cloud Computing: Introduction, Virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Sensor-Cloud: Sensors-as-a-Service.

Unit – III
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 – IV
IoT Protocols: MQTT, CoAP, XMPP, AMQP, Bluetooth Low Energy (BLE), ZigBee, Z-Wave, RPL.

Unit – V

IoT Case Studies And Future Trends:

Vehicular IoT – Introduction, Healthcare IoT – Introduction, Case Studies, IoT Analytics – Introduction Smart City-Smart Lighting, Smart Parking Environment, Agricultural IoT – Introduction and Case Studies.

Textbook:

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.

Reference Books

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.

Web Reference

1. https://onlinecourses.nptel.ac.in/noc24_cs35/preview
2. https://www.nabto.com/guide-iot-protocols-standards/

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	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	2	2	3	1	3	3	3	2	2	2	2
CO 2	2	3	2	2	3	3	1	3	3	3	2	2	3	2
CO 3	1	2	2	2	1	3	1	3	2	3	3	1	2	2
CO 4	2	2	2	2	3	3	1	3	3	3	3	2	2	2
CO 5	2	2	2	2	2	3	1	3	3	3	3	2	2	2

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.

Textbook:

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 Reference

1. https://www.coursera.org/courses?query=cybersecurity&productDifficultyLevel=Beginner
2. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview

22CIO02

FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY

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

Pre-Requisites

Course Objectives

1. To provide an understanding of blockchain benefits and limitations
2. To familiarize with decentralisation and cryptography
3. To explore theoretical foundations of bitcoin
4. To equip with the knowledge of smart contracts
5. To analyse 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 decentralisation and cryptographic primitives.
3. 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	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3	1	-	-	-	-	-	3	3	3	3
CO 2	3	3	3	3	1	-	-	-	-	-	3	3	3	3
CO 3	3	3	3	3	2	-	-	-	-	-	3	3	3	3
CO 4	3	3	3	3	2	-	-	-	-	-	3	3	3	3
CO 5	3	3	3	3	3	-	-	-	-	-	3	3	3	3

Unit – I

Introduction to Blockchain Technology

Blockchain 101: Distributed systems, History of blockchain, Introduction to blockchain, Types of lockchain, CAP theorem and blockchain, Benefits and limitations of blockchain.

Unit – II

Decentralization and Cryptography:

Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations. Cryptography and Technical Foundations: Cryptographic primitives, Asymmetric cryptography, Public and private keys

Unit – III

Bitcoin and Alternative Coins:

Bitcoin, Transactions, Blockchain, Bitcoin payments Alternative Coins. Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash

Unit – IV

Smart Contracts and Ethereum 101:

Smart Contracts: Definition, Ricardian contracts. Ethereum 101: Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts.

Unit – V

Alternative Blockchains: Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media. **Case studies and real-world projects showcasing blockchain technology in various industries.**

Textbook:

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

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 Reference

1. https://nptel.ac.in/courses/106/104/106104220/
2. https://nptel.ac.in/courses/106/105/106105184/

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. Unity Learn
2. Coursera
3. Udemy
4. YouTube