B.S. Abdur Rahman ™
Crescent
Institute of Science & Technology
Deemed to be University u/s 3 of the UGC Act, 1956

Regulations 2021
Open Elective Courses and Syllabi

B.Tech. Programmes

REGULATIONS 2021

OPEN ELECTIVE COURSES & SYLLABI

FOR

B.TECH. PROGRAMMES

OPEN ELECTIVE COURSES FOR
B.TECH. PROGRAMMES R 2021 - VI SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	C	Offering Department
1.	GEDX 201	Application of Fluid Mechanics in Everyday Life	3	0	0	3	Aero
2.	GEDX 202	Basics of Management and Organizational Behaviour	3	0	0	3	CSB
3.	GEDX 205	Consumer Electronics	3	0	0	3	ECE
4.	GEDX 207	Cyber Forensics	3	0	0	3	CSE
5.	GEDX 208	Cyber Security	3	0	0	3	IT
6.	GEDX 209	Disaster Management	3	0	0	3	Civil
7.	GEDX 211	Enterprise Risk Management	3	0	0	3	CSB
8.	GEDX 212	Fundamentals of Project Management	3	0	0	3	CSB
9.	GEDX 213	Industrial Robotics	2	0	2	3	Mech.
10.	GEDX 214	Internet of Things and its Applications	3	0	0	3	ECE
11.	GEDX 216	IPR and Patent Laws	3	0	0	3	CSB
12.	GEDX 217	Logistics and Supply Chain Management	3	0	0	3	CSB
13.	GEDX 220	Optimization Techniques	3	0	0	3	EEE
14.	GEDX 221	Polymers for Different Transportation	3	0	0	3	Polymer
15.	GEDX 222	Programming Language Principles	3	0	0	3	CSE
16.	GEDX 224	Python Programming	2	0	2	3	IT
17.	GEDX 226	Smart Sensors for Healthcare Applications	3	0	0	3	EIE
18.	GEDX 227	Total Quality Management	3	0	0	3	Mech.
19.	GEDX 229	Waste Water Management	3	0	0	3	Civil
20.	GEDX 231	Electronics for Mechanical Systems	3	0	0	3	ECE

OPEN ELECTIVE COURSES FOR
B.TECH. PROGRAMMES R 2021 - VII SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	C	Offering Department
1.	GEDX 101	Advanced Entrepreneurship	3	0	0	3	CSB
2.	GEDX 102	Artificial Intelligence and Machine Learning Applications	3	0	0	3	CSE
3.	GEDX 103	Automotive Technology	3	0	0	3	Automobile
4.	GEDX 105	Building Repair Solutions	3	0	0	3	Civil
5.	GEDX 110	Deep Learning Essentials /	3	0	0	3	CSE
6.	GEDX 111	Drone Technologies	2	0	2	3	Aero
7.	GEDX 112	Electric Vehicle	3	0	0	3	EEE
8.	GEDX 113	Emerging Technologies in Mobile Networks	3	0	0	3	ECE
9.	GEDX 114	Fundamentals of Data Science and Machine Learning	3	0	0	3	IT
10.	GEDX 116	Green Design and Sustainability	3	0	0	3	Civil
11.	GEDX 117	Image Processing and its Applications	3	0	0	3	ECE
12.	GEDX 118	Industrial Automation and Control	3	0	0	3	EIE
13.	GEDX 119	Industrial Safety	3	0	0	3	Mech.
14.	GEDX 120	Industry 4.0	3	0	0	3	Mech.
15.	GEDX 121	Introduction to Artificial Intelligence	3	0	0	3	IT
16.	GEDX 122	Introduction to Artificial Intelligence and Evolutionary Computing	3	0	0	3	EEE
17.	GEDX 123	Motor Vehicle Act and Loss Assessment	3	0	0	3	Automobile
18.	GEDX 127	Soft Computing Techniques	3	0	0	3	CSE
19.	GEDX 128	Value Analysis and Engineering	3	0	0	3	Mech.
20.	GEDX 129	Vehicle Maintenance	3	0	0	3	Automobile

GEDX 201	APPLICATIONS OF FLUID MECHANICS IN EVERY DAY LIFE	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: To introduce the basic concepts of fluid mechanics and its measurement methods.

COB2: To make the student understand the various clouds formation and its effects.

COB3: To understand the application of fluid mechanics in automobile

COB4: To understand the application of fluid mechanics in biological system.

COB5: To understand the application of fluid mechanics in sport

MODULE I FUNDAMENTALS OF FLUID MECHANICS 9

Definition of fluids, Types of fluids, Classification of fluid flows, Units and dimensions, Various properties related to fluid. Approaches of fluid statics and dynamics condition. Digital pressure measurement systems.

MODULE II EFFECT OF FLUID IN ATMOSPHERE 9

Circulation of Water in the Atmosphere, Foggy Weather, Classification of Cloud, Cloud Identification, Cloud Development and Precipitation, Weather Forecasting methods, Tools for Forecasting the Weather, Overview of global climate.

MODULE III VEHICLE AERODYNAMICS 9

Introduction to automobile aerodynamics- Performance of cars and light vans, Aerodynamic drag of passenger cars, High-performance vehicles, heating, ventilation and air conditioning of motor vehicles

MODULE IV BIO-FLUIDICS 9

Introduction to Bio-fluid Mechanics - Fluidics in living systems and mechanobiology - Pressure driven flows - Analysis of Total Peripheral Flow - Circulatory Biofluid Mechanics - Blood Rheology - Blood Composition and Structure - Flow Properties of Blood - Blood Vessel Structure - Applications of Poiseuilli's Law for the study of Blood Flow

MODULE V SPORTS AERODYNAMICS 9

Factors influencing on running, Cycling Aerodynamics, Performance factors in bicycling: Human power, drag, and rolling resistance, Sports Ball Aerodynamics, Skin Suit Aerodynamics in Speed Skating

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Frank M. White, “Fluid mechanics”, Tata McGraw Hill, 2015.
2. Ahrens CD. Essentials of meteorology: an invitation to the atmosphere. Cengage Learning; 2014.
3. Lighthill, J. “Physiological Fluid Mechanics.” Springer-Verlag.
4. Fung, Y.C. (1996). “Biomechanics: Properties of Living Tissues.” Springer-Verlag

REFERENCES:

1. Helge Nørstrud, “Sport Aerodynamics”, Springer Vienna, 2010
2. Fung, Y.C. (1993). “First Course in Continuum Mechanics of Physical and Biological Engineers and Scientists.” 3rd Ed. Prentice-Hall.

COURSE OUTCOMES:

Students will be able to

CO1: Identify the different types of fluid and its related properties

CO2: Demonstrate the tools used for weather forecasting.

CO3: Know the fluid mechanics principle in vehicle design

CO4: Know the fluid mechanics in biological systems

CO5: Know the aerodynamics variables and parameter effecting the performance in sports

Board of Studies (BoS) :
17th BoS of aero held on 03.02.2023

Academic Council:
21st Academic Council held on 20.12.2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	H	H	H	L	L								H	H
CO2	H	H	H	L	L								H	M
CO3	M	H	L	L									M	M
CO4	L	M	M	M									L	L
CO5	M	M	M	L	L								L	L

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement : Holistic understanding of fluid mechanics in various filed of everyday life

GEDX 202	BASICS OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR	L	T	P	C
SDG: 8		3	0	0	3

COURSE OBJECTIVES:

COB1: Familiarize students with the evolution and fundamentals of management

COB2: : Introduce various functions of management

COB3: Impart knowledge on different elements of individual personality and behavior manifestation

COB4: Facilitate closer understanding of organization dimensions for maintaining a working relationship

COB5: Examine different styles and best approaches for better workforce management

MODULE I NATURE AND THEORIES OF MANAGEMENT 8

Evolution of management Thought-Classical, Behavioral and Management Science Approaches Management- meaning, levels, management as an art or science, Managerial functions and Roles, Evolution of Management Theory-Classical era- Contribution of F.W.Taylor, Henri Fayol, Neo-Classical - Mayo & Hawthorne Experiments. • Modern era – system & contingency approach Managerial Skills.

MODULE II PLANNING AND ORGANIZING 10

Planning - Steps in Planning Process - Scope and Limitations - Forecasting and types of Planning - Characteristics of a sound Plan - Management by OBJECTIVE (MBO) - Policies and Strategies - Scope and Formulation - Decision Making - Types, Techniques and Processes.

Organization Structure and Design - Authority and Responsibility Relationships - Delegation of Authority and Decentralization - Interdepartmental Coordination - Impact of Technology on Organizational design - Mechanistic vs Adoptive Structures - Formal and Informal Organization. Control: meaning, function, Process and types of Control.

MODULE III INDIVIDUAL BEHAVIOUR 10

Meaning of Organizational behavior, contributing disciplines, importance of organizational behavior, Perception and Learning - Personality and Individual Differences - Motivation theories and Job Performance - Values, Attitudes and

Beliefs - Communication Types-Process - Barriers - Making Communication Effective.

MODULE IV GROUP BEHAVIOUR 9

Groups and Teams: Definition, Difference between groups and teams, Stages of Group Development, Group Cohesiveness, Types of teams, Group Dynamics - Leadership - Styles - Approaches - Power and Politics - Organizational Structure - Organizational Climate and Culture, Conflict: concept, sources, Types, Stages of conflict, Management of conflict Organizational Change and Development.

MODULE V EMERGING ASPECTS OF ORGANIZATIONAL BEHAVIOUR 8

Comparative Management Styles and approaches - Japanese Management Practices Organisational Creativity and Innovation - Organizational behavior across cultures - Conditions affecting cross cultural organizational operations, Managing International Workforce, Productivity and cultural contingencies, Cross cultural communication, Management of Diversity.

L – 45 ; TOTAL HOURS – 45

TEXT BOOKS:

1. Koontz Harold & Weihrich Heinz “Essentials of Management”, Tata McGraw Hill, 10th Edition, 2015.
2. Stephen P. Robbins., Timothy A. Judge. and Neharika Vohra, “Organizational Behavior”, Pearson, 18th Edition, New Delhi, 2018.
3. Fred Luthans, Brett C. Luthans and Kyle W. Luthans, “Organizational Behavior, An Evidence Based Approach”, McGraw Hill Education, 13th Edition, New Delhi, 2013.

REFERENCES:

1. Udai Pareek. Understanding Organizational Behaviour, Oxford University Press, 4th Edition, New Delhi, 2016.
2. Prasad, L.M, “Principles and Practices of Management” Sultan Chand & Sons, 2019.
3. Tripathy P. C. and Reddy P. N., “Principles of Management”, 5th Edition, Tata McGraw Hill, 2015.

COURSE OUTCOMES:

After the completion of the course, the students will be able to

CO1: Describe and discuss the elements of effective management

CO2: Discuss and apply the planning, organizing and control processes

CO3: Describe various theories related to the development of leadership skills, motivation techniques, team work and effective communication

CO4: Have a better understanding of human behaviour in organization

CO5: Know the framework for managing individual and group performance

Board of Studies (BoS) :
15th BoS of CSB held on 15.09.2023

Academic Council:
21st Academic Council held on 20.12.2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1									H	M					
CO2									M	L		L			
CO3									H	H	M				
CO4									M	L		L			
CO5									M	M	L	M			

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9 : Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Statement: Understanding of the basics of functioning of management and people's behavior in organization help to improve the productive employment leading to sustainable economic growth.

GEDX 205	CONSUMER ELECTRONICS	L	T	P	C
SDG: 4,9		3	0	0	3

COURSE OBJECTIVES:

COB1: To discuss the fundamentals of audio systems.

COB2: To analyze the video systems and e communication systems

COB3: To adapt the fundamentals of electronics in consumer gadgets.

COB4: To compare the difference between CIoT and IoT

COB5: To choose the consumer electronics using IoT for an application

PREREQUISITE:

Fundamentals of electronic circuits, communication engineering, microprocessor and microcontrollers.

MODULE I AUDIO FUNDAMENTALS AND DEVICES **9**

Basic characteristics of sound signal, Microphone: working principle, sensitivity, nature of response, directional characteristics, Types: carbon, condenser, crystal, electrets, tie- clip, wireless, Loud speaker: working principle, characteristic impedance, Types: electrostatic, dynamic, permanent magnet etc., woofers and tweeters, Sound recording: Optical recording, stereophony and multichannel sound

MODULE II AUDIO SYSTEMS **9**

Audio system: CD player, home theatre sound system, Digital console: block diagram, working principle, Applications, FM tuner: concepts of digital tuning, ICs used in FM tuner TDA7021T, PA address system: speaker impedance matching, Characteristics, power amplifier, Specification.

MODULE III TELEVISION SYSTEMS **9**

Composite video signal: horizontal and vertical sync details, scanning sequence ,Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance ,Different types of TV camera, Transmission standards: PAL system, channel bandwidth

MODULE IV TELEVISION RECEIVERS AND VIDEO SYSTEMS 9

PAL-D colour TV receiver, block diagram, Precision IN Line color picture tube. Digital TVs: LCD, LED, PLASMA, HDTV, 3-D TV, projection TV, DTH receiver. Video interface: Composite, Component, Separate Video, Digital Video, SDI, HDMI Multimedia Interface, Digital Video Interface, CD and DVD player: working principles, interfaces.

MODULE V CIOT AND ITS CASE STUDIES 9

Introduction to Consumer Internet of Things (CIoT), difference between CIoT and IoT, Application of home appliances, Wearable devices and other case study of consumer electronic equipments.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. R R. GULATI, Modern Television Practice Transmission, Reception and Applications,New Academic Science, 2021
2. Bali S.P., Consumer Electronics, Pearson Education India, 2010, latest edition.

REFERENCES:

1. Bali R and Bali S.P, Audio video systems : principle practices & troubleshooting, Khanna Book Publishing Co. (P) Ltd., Delhi , India, 2010.
2. Gulati R.R., Modern Television practice, New Age International Publication (P) Ltd. New Delhi Year, 2011,
3. Gupta R.G.,Audio video systems, Tata Mc graw Hill, New Delhi, India,2nd edition, 2010.
4. Whitaker Jerry & Benson Blair, Mastering Digital Television: The Complete Guide to the DTV Conversion, McGraw-Hill Professional, 5th edition, 2006.
5. Whitaker Jerry & Benson Blair, Standard handbook of Audio engineering, McGraw-Hill Professional, 2nd edition, 2002.
6. Yashwant Kanetkar, “21 Internet of Things Experiments”, Kindle edition, BPB, January 2018
7. Mourade Azrour, Azeem Irshad, Rajasekhar Chaganti, “IoT and Smart Devices for Sustainable Environment”, Springer Cham, 2022

COURSE OUTCOMES:

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

CO1: Demonstrate the working of audio and television products.

CO2: Select suitable PA system for a specific scenario.

CO3: Apply the troubleshooting procedure of a typical TV receivers and video systems

CO4: Describe the troubleshooting procedure of audio devices

CO5: Illustrate the troubleshooting procedure of a typical TV camera

Board of Studies (BoS) : 23rd BoS of ECE held on 13.07.2022

Academic Council: 19th Academic Council held on 29.09. 2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	H	H	M	L	H	L	M	H	L	M	H	M	H	L	M
CO2	H	H	H	L	L	L	M	L	L	L	M	M	H	L	M
CO3	H	H	H	H	L	L	L	M	L	L	L	L	H	H	H
CO4	H	H	H	H	H	L	L	L	L	L	L	L	H	M	H
CO5	H	H	H	H	H	L	L	L	L	H	M	M	M	L	M

Note: L - Low Correlation M -Medium Correlation H -High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote Lifelong learning opportunities for all.

Statement: Provides quality education by understanding the fundamental concepts of home appliances and promotes research in the area of consumer electronic gadgets and electronic communication.

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Basic of consumer electronics perseveres on safety measurement of e-gadget used by us. It helps to build resilient Infrastructure; promote inclusive and sustainable industrialization through various electronics appliances used in day to day to life.

GEDX 207	CYBER FORENSICS	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: To inculcate the fundamentals of digital forensics from the viewpoint of courtroom legalities

COB2: To introduce the different types of cyber crimes.

COB3: To begin the policies and procedures to investigate cyber crime

COB4: To create forensics concepts and practices focusing on networks and internet

COB5: To gain the knowledge on digital investigations.

MODULE I FORENSICS FUNDAMENTALS 9

Introduction- Law Enforcement – Services- Benefits of Professional Forensics Methodology – Types of computer forensics technology.

MODULE II FORENSICS SYSTEM AND SERVICES 9

Internet Security Systems – Intrusion Detection System – Firewall Security System Storage area network security systems – Network disaster Recovery System – Satellite Encryption Systems – Fighting Cyber Crime with Risk Management Techniques- Computer Forensics Investigation Services – Forensics Process Improvement

MODULE III DATA RECOVERY 9

Live data collection – Forensics Duplication – Collecting Network based Evidence – Evidence Handling – Hiding and Recovering Hidden Data – Data backup and Recovery

MODULE IV EVIDENCE COLLECTION AND DATA SEIZURE 9

Collection Options – Types of Evidence – Rules of Evidence – Volatile Evidence – Collection& Archiving – Methods of Collection – Artifacts – Collection Steps – Reconstructing the Attack

MODULE V DATA ANALYSISAND DIGITAL FORENSICS 9

Computer System Storage Fundamentals – Data analysis techniques – Analyzing network traffic – Investigating hacker Tool –Investigating Routers – Writing - Types of cyber crime-Credit card and cyber crime-Web hacking Digital Detective Work-Cell Phone Forensics - Email and Webmail Forensics

L – 45; TOTAL HOURS –45

TEXT BOOKS:

1. John Sammons, “The Basics of Digital Forensics, The Primer for Getting Started in Digital Forensics”, Elsevier, 2nd Edition, ISBN: 9781597496612, 2014

REFERENCES:

1. Eoghan Casey, “Digital Evidence and Computer Crime: Forensic Science, Computers and the Internet“, Published by Elsevier, 3rd Edition, ISBN:9780123742681, 2011.
2. John Sammons, “The Basics of Digital Forensics, The Primer for
3. Getting ,Started in Digital Forensics”, Elsevier, 2nd Edition, ISBN: 9781597496612, 2014
4. Nina God bole, Sunlit Belapure, “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley, 2011.
5. Chuck East tom, “Computer Security Fundamentals”, 2nd Edition, Pearson Education, 2012.

COURSE OUTCOMES:

CO1: Describe the general security issues

CO2: Analyze various cybercrimes and offenses.

CO3: Outline the occurrence of Cybercrime in mobile and wireless environment.

CO4: Use relevant tools and methods in cybercrime

CO5: Apply security policies in cyber forensics

Board of Studies (BoS) :
19th BoS of CSE held on 28.12.2021

Academic Council:
18th Academic Council Meeting held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO1	PSO2
CO1					L									
CO2													M	
CO3		H						M						
CO4				L										H
CO5										H				

Note: - Low Correlation M - Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement : The comprehensive understanding of analysis, design and implementation of secure and efficient cyber security features that leads to reduction of offenses.

GEDX 208	CYBER SECURITY	L	T	P	C
SDG - 8		3	0	0	3

COURSE OBJECTIVES:

- To know the impact of various cybercrimes and cyber offenses.
- To understand cybercrimes in mobile devices.
- To know the tools and techniques used to secure from cybercrimes.
- To understand the basics of cyber security standards and policies.
- To learn about the basics of cyber forensics and cyber laws

MODULE I CYBERCRIME AND CYBEROFFENSES 9

Cybercrime and Information Security – Cybercriminals – Classifications of Cybercrimes – Email Spoofing – Spamming – Cyber defamation – Internet Time Theft – Forgery – Web jacking – Hacking – Online Frauds – Software Piracy – Mail Bombs – Password Sniffing – Cyberoffenses – Categories – Planning the attacks – Cyberstalking – Cybercafe and Cybercrimes.

MODULE II CYBERCRIME: MOBILE AND WIRELESS DEVICES 9

Proliferation of Mobile and Wireless Devices – Trends in Mobility – Credit card frauds in Mobile and Wireless Computing – Security Challenges – Authentication Service Security – Attacks on Mobile Phones – Android OS - iOS.

MODULE III INTRODUCTION TO CYBER CRIME LAW AND INVESTIGATION 9

Basics of Law, Understanding Cyber Space, Defining Cyber Laws, Scope and Jurisprudence, Concept of Cyber Jurisdiction, Overview of Indian Legal System, Introduction to IT Act 2000, Amendments in IT Act, Cyber Laws of EU – USA – Australia - Britain, other specific Cyber laws. Proxy Servers and Anonymizers – Phishing – Password Cracking – Keyloggers and Spywares – Virus and Worms – Trojan Horses and Backdoors – Steganography – DoS and DDoS Attacks – Introduction to Incident Response – Methodology – Steps - Activities in Initial Response Phase after detection of an incident.

MODULE IV SECURITY POLICIES 9

Introduction - Defining User Policies – Passwords – Internet Use – Email Usage – Installing/ Uninstalling Software – Instant Messaging – Defining System Administrative Policies – Defining Access Control – Developmental Policies – Standards, Guidelines and Procedures – Basics of Assessing a System - Firewalls.

MODULE V COMPUTER FORENSICS 9

History of Forensics – Computer Forensic Flaws and Risks – Rules of Computer Forensics – Legal issues – Digital Forensic Principles – Digital Environments – Digital Forensic Methodologies-Forensic Hardware and Software-Case study.

Total Hours : 45

TEXT BOOK:

1. Charles J. Brooks, Christopher Grow, “Cyber Security Essentials”, Sybex Jons Wiley and sons, 2018
2. William Stallings, “Computer Security Principles and Practice”, Third Edition, Pearson Education, 2015.
3. Andre Arnes, Digital Forensics, ISBN: 9781119262381 Wiley, 2017
4. Anthony Reyes, Jack Wiles, “Cybercrime and Digital Forenscis”, Elsevier Publications, 2007.
5. John Sammons, “The Basics of Digital Forensics”, Elsevier, 2012.
6. Linda Volonins, Reynalds Anzaldua, “Computer Forensics for dummies”, Wiley Publishing 2008.

COURSE OUTCOMES:

Upon completion of this course, students will be able to

- Know various cybercrimes and offenses.
- Identify cybercrime in mobile and wireless environment.
- Use relevant tools and methods in cybercrime.
- Apply security policies in cyber forensics.
- Outline the strategies adopted in computer forensics.

Board of Studies (BoS) : : 16th BoS of IT held on 18.8.2022

Academic Council: 19th AC held on 29.9.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	2		1		2			2				1	1
CO2	2	2	2				2						2	1	1
CO3	2	2	2		2	2		2		2				1	1
CO4	2		2											1	1
CO5	2	2	2		2		2			3				1	1

1.Low Correlation 2. Medium correlation 3. High Correlation

SDG 8 : Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Statement: It enable better management of infrastructure roll-out and maintenance, increase agricultural productivity, and provide additional business opportunities and market intelligence through online services.

GEDX 209	DISASTER MANAGEMENT	L	T	P	C
SDG: 3,11,13 & 15		3	0	0	3

COURSE OBJECTIVES:

COB1: To impart knowledge on the concept related to disaster, hazard and risk.

COB2: To provide an understanding about the types of natural disasters and man-made disasters

COB3: To gain knowledge related to the different impacts of disaster on health and environment

COB4: To provide an understanding about the concept of disaster risk reduction and management

COB5: To provide exposure related to various environmental policies & programs for disaster management

MODULE I BASIC CONCEPTS 7

Concepts and definitions: Disaster, Hazard and its types - Biological, Chemical, Ergonomic, Physical, Psychosocial- Vulnerability and its types –Risks and its types, Factors influencing degree of risk- Risk severity, Frequency and its capacity – Risk impact, prevention, mitigation.

MODULE II TYPES OF DISASTERS 10

Natural hazards and Disasters - Volcanic Eruption, Earthquakes, Tsunamis, Landslides, Cyclones, Floods, Droughts, Cold waves, Heat waves and Fire, Land Subsidence, Coastal Disaster, Cyclonic Disaster & Disaster in Hills with particular reference to India - Man-made Disasters - Industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, War etc.

MODULE III IMPACTS OF DISASTER 9

Disaster impacts - environmental, physical, social, ecological, economic, political, Health, psycho-social issues, demographic aspects - gender, age, special needs, hazard locations, global and national disaster trends, climate change and urban disasters.

MODULE IV NATURAL DISASTER REDUCTION & MANAGEMENT 10

Disaster management cycle –Disaster preparedness - Early warning systems - Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications) - Roles and responsibilities of government, community, Local institutions, NGOs and other stakeholders - Applications of Satellite Communications, GPS, GIS and Remote Sensing in disaster management.

MODULE V ENVIRONMENTAL POLICIES & PROGRAMMES IN INDIA **9**

Environmental Legislations in India - Environmental policies & programmes- National Disaster Management Authority and its functions - Role of Panchayats in Disaster mitigations - Sustainable rural and urban development- Awareness, Conservation Education & training related disaster management.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Gupta, H.K., "Disaster Management", University Press, India, 2003.
2. Gupta, M.C., "Manuals on Natural Disaster management in India", National Centre for Disaster Management, IIPA Publication, New Delhi, 2001.
3. Ghosh G.K., "Disaster Management", APH Publishing Corporation, 2006.
4. Satish Modh, "Introduction to Disaster Management", Macmillan Publishers India Limited, 2009.
5. Sulphey, M. M., "Disaster Management", Prentice Hall India Pvt., Limited, 2016.

REFERENCES:

1. Bhattacharya, T., "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012.
2. Dave, R.K., "Disaster Management in India: Challenges and Strategies", Prowess Publishing, 2018.
3. Kapur Anu, "Vulnerable India: A Geographical Study of Disasters", Sage Publishers, New Delhi, 2010.
4. Satender, "Disaster Management in Hills", Concept Publishing Co., New Delhi, 2003.

COURSE OUTCOMES:

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

CO1: Elaborate about the origin, changes and management of environmental hazards.

CO2: Define about the natural disasters and man-made disasters.

CO3: List down the different impacts of disaster.

CO4: Apply the concept of disaster management and relief measures in the real-time situation.

CO5: Suggest solutions based on the National Policy on Disaster Management.

Board of Studies (BoS) :
18th BoS of CE held on 05.04.2023

Academic Council:
20th Academic Council held on 13.04.2023

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	L	-	M	-	-	M	L	-	-	-	-	-	L	-	M
CO2	L	-	M	-	-	M	L	-	-	-	-	-	L	-	M
CO3	L	-	M	-	-	M	L	-	-	-	-	-	L	-	M
CO4	L	-	M	-	M	M	L	L	H	-	-	-	L	-	M
CO5	-	-	M	-	-	M	L	L	-	-	-	-	L	-	M

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 3: Ensure healthy lives and promote well-being for all at all ages

SDG 11. Make cities and human settlements inclusive, safe, resilient and sustainable

SDG 13 : Take urgent action to combat climate change and its impacts

SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Statement :

The knowledge on disaster management can strengthen resilience and adaptive capacity to natural disasters and make cities and human settlements inclusive, safe, resilient and sustainable.

GEDX 211	ENTERPRISE RISK MANAGEMENT	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: To understand the nature and scope of risk management.

COB2: To know the enterprise risk management's (ERM) benefits and regulatory standards.

COB3: To have a better understanding of ERM process's programming and analysis**.**

COB4: To know the ERM process's solution assessment.

COB5: To know the ERM process's decision and system administration.

MODULE I INTRODUCTION TO RISK MANAGEMENT 7

Nature of risk, terms and definitions - Organizing for Risk Management- Objectives of Risk Management - Scope of Risk Management - legal, financial and social benefits of managing risk.

MODULE II INTRODUCTION TO ENTERPRISE RISK MANAGEMENT (ERM) 7

Definition - Hallmarks of ERM - Goals, risk rulers and risk position - Influences and benefits of a risk management programme - Potential consequences of failing to manage risk. Risk management legislation, regulatory standards and compliance obligations - Risk management and the role of the Board and senior management.

MODULE III ERM PROCESS – RISK PROGRAMMING AND RISK ANALYSIS 10

Risk programming: vision, mission, values – Strategic planning and ERM – Role of Engineers in risk programming – Risk analysis: Identifying, measuring and analyzing risk – Identification methods - Risk description and expression methods - Role of engineers in risk analysis.

MODULE IV ERM PROCESS – SOLUTION ASSESSMENT 10

Risk response categories: prevention, mitigation, avoidance, resilience - Occupational health and safety: environmental risk and construction practices - physical and corporate security - Financial solutions: insurance

and contract management - Claims and incident management - Role of engineers in risk solution assessments.

MODULE V ERM PROCESS – DECISION PROCESS AND SYSTEM ADMINISTRATION **11**

Risk based decision making - Multi hierarchy attribute process - Role of engineer in risk decisions - Risk management structure - Board committees (audit, finance, HR), risk management function, internal audit and compliance function - Key risk indicators and risk position statements - Risk registers, dashboards, reports - Organizational Risk Management Maturity assessments - Risk monitoring and reporting obligations - Role of engineers in risk administration.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Krishnamurthy N., "Introduction to Enterprise Risk Management: A Guide to Risk Analysis and Control for Small and Medium Enterprises", Patridge Publishing, 1st edition, Singapore, 2019.

REFERENCES:

1. Alka Mittal, Gupta S.L. "Principles of Insurance and Risk Management", Sultan Chand and Sons, 2010.
2. James T.Gleason, "Risk; The New Management Imperative in Finance", JaicoPublishing House, 2004.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: understand the nature and scope of risk management.

CO2: know the enterprise risk management's (ERM) benefits and regulatory standards.

CO3: have a better understanding of ERM process's programming and analysis.

CO4: know the ERM process's solution assessment.

CO5: know the ERM process's decision and system administration.

Board of Studies (BoS) :
15th BoS of CSB held on 15.09.2023

Academic Council:
21st Academic Council held on 20.12.2023

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M	M	-	-	-	-	-	-	-	-	L	-	-	-	-
CO2	M	L	-	-	-	L	-	-	-	-	L	-	-	-	-
CO3	M	L	L	-	L	-	H	-	L	-	M	-	-	-	-
CO4	M	-	M	-	-	-	H	-	-	-	M	-	-	-	-
CO5	M	-	M	L	-	M	H	-	-	-	M	-	-	-	-

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement : The contents of the syllabus is intended to enable students to understand the enterprise risk management and it's process.

GEDX 212	FUNDAMENTALS OF PROJECT MANAGEMENT	L	T	P	C
SDG: 12		3	0	0	3

COURSE OBJECTIVES:

COB1: To gain insight into the basics of project management

COB2: To learn to manage project scope, time and cost

COB3: To establish measures to monitor and control project progress

COB4: To learn about the dynamics of project closure

COB5: To gain knowledge on recent trends in project management

MODULE I INTRODUCTION 8

Objectives of Project Management- Importance of Project Management- Types of Projects Project Management Life Cycle- Project Selection – Feasibility study: Types of feasibility Steps in feasibility study.

MODULE II PROJECT PLANNING AND IMPLEMENTATION 10

Defining Project Scope - Establishing Project Priorities - Creating Work Breakdown Structure (WBS) - Estimating Project Times and Costs - Developing a Project Schedule - Resource Leveling – Resource Allocation - Developing & Managing Project Teams - Project Risk Management - Risk Identification –- Risk Assessment – Risk Response Development

MODULE III PROJECT MONITORING AND CONTROL 10

Project Monitoring Information System – Project Control Process – Monitoring Time – Gantt Chart – Control Chart – Milestone Schedules – Indices to Monitor Progress – Technical Performance Measurement

MODULE IV PROJECT CLOSURE 8

Types of Project Closure - Project evaluation - Project Auditing –Project Audit Process - Project Closeout Checklist - Guidelines for closeout reports.

MODULE V RECENT TRENDS IN PROJECT MANAGEMENT 9

Managing International Projects – Environmental Factors – Project Site Selection – Cross Cultural Considerations – Selection and Training for International Projects - Agile Project Management - Traditional versus Agile methods

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Erik W. Larson, Clifford F. Gray, and Rohit Joshi, Project Management: The Managerial Process, 8th Edition, McGraw Hill, 2021

REFERENCES:

1. Schwalbe, K., "Information Technology Project Management", 9th Edition, Course Technology Inc., London, 2018.
2. Hughes, B. and Cotterrel, M., "Software Project Management", 1st Edition, Tata McGraw-Hill, New Delhi, 2009 (ISBN 13: 9780077122799)

COURSE OUTCOMES:

After the completion of the course, the students will be able to

CO1: Conduct feasibility studies to select projects

CO2: Manage project scope, time and cost

CO3: Monitor and control the progress of a project by identifying performance indices

CO4: Successfully close the project

CO5: Implement international projects and employ agile management

Board of Studies (BoS) : 15th BoS of CSB held on 15.09.2023

Academic Council: 21st Academic Council held on 20.12.2023

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	-	-	-	-	-	-	-	-	-	L	M	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	M	H	-	-	-	-
CO3	-	-	-	-	-	-	-	-	M	M	H	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	M	H	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	M	M	M	-	-	-

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 12 : Ensure sustainable consumption and production patterns

Statement : The understanding of the concepts of project management leads to the execution of a project within the time and cost deadline.

GEDX 213	INDUSTRIAL ROBOTICS	L	T	P	C
SDG: 9		2	0	2	3

COURSE OBJECTIVES:

COB1: To learn the fundamentals of robotic systems.

COB2: To study about various drives and control systems required for robot system.

COB3: To gain knowledge about the kinematics and dynamics of robots.

COB4: To familiarize with programming language and futuristic robot systems.

MODULE I FUNDAMENTALS OF ROBOTIC SYSTEMS L:6 P:6

History and Terminology of Robotics- Robot anatomy: Definition, law of robotics, Accuracy and repeatability of Robotics-Simple problems - Specifications of Robot- Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems.

MODULE II DRIVES AND CONTROL SYSTEMS FOR ROBOTS L:7 P:6

Objectives –Motivation -Open loop control - Closed loop control with velocity and position feedback - Types of drive systems - Components of drive system: Lead Screws, ball Screws, Chain and linkage drives, Belt drives, Gear drives, Precision gear boxes, Harmonic drives, Cyclo speed reducers - General aspects of robot control - Basic control techniques - Mathematical modelling of robot servos -Error responses and steady state errors in robot servos -Feed back and feed forward compensations - Hydraulic position servo - Selection of robot drive systems.

MODULE III KINEMATICS AND DYNAMICS OF ROBOTS L:8 P:9

Link coordinates -Denavit-Hartenberg(D-H) representation - The ARM equation - Direct kinematic analysis for Four axis, SCARA Robot and three, five and six axis Articulated Robots.

The inverse kinematics problem - General properties of solutions - Tool configuration - Inverse kinematics of four axis SCARA robot and three and five axis Articulated robot.

MODULE IV ROBOT PROGRAMMING AND FUTURISTIC ROBOT SYSTEMS **L:9 P:9**

Robot programming – Introduction-Types- Flex Pendant- Lead through programming - Coordinate systems of Robot - Robot controller- Major components –Functions-Wrist Mechanism-Interpolation-Interlock commands-Operating mode of robot - Jogging- Types - Robot specifications- Motion commands -End effectors and sensors commands. Robot intelligence - Tele robotics– Mechanical design Features: Mobility, locomotion and Navigation -Robots for Industrial applications.

PRACTICAL'S:

List of experiments:

Robot Anatomy

1. Robot Anatomy studies
2. Fundamentals of V-Rep and software control
3. Building Robot Environment in V-REP
4. Importing robot and virtual controller
5. Robot Jogging
6. Robot Programming
7. Motion Commands in RAPID
8. Path planning
9. Forward kinematics -1 DOF and 2 DOF
10. Inverse kinematics -1 DOF and 2 DOF

L – 30; TOTAL HOURS – 30

TEXT BOOKS:

1. Deb. S.R, "Robotics Technology and flexible automation", Tata McGraw-Hill Education, 2009.
2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, "Technology Programming and Applications", McGraw Hill, 2012.
3. Tsuneo Yohikwa, "Foundations of Robotics Analysis and Control", MIT Press., 2003.
4. John J. Craig, "Introduction to Robotics Mechanics and Control", Third Edition, Pearson, 2008.

REFERENCES:

1. Radhakrishnan. P, Srivatsavan. R, Mohan Ram. P.V and Radharamanan. R, CAD/CAM, "Robotics and factories of the

future, Proceeding of the 14th International Conference on CAR and FOF", 98 editors, Narosa Publishing house, 2003.

2. Richard D. Klafter, Thomas. A, ChriElewski, Michael Negin, "*Robotics Engineering an Integrated Approach"*, Phi Learning., 2009.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: Explain the fundamentals of robotics system**.**

CO2: Select the appropriate drive system required for particular robot system.

CO3: Describe the kinematics and dynamics of robots.

CO4: Elucidate the robot programming language and futuristic robot systems.

Board of Studies (BoS):

20th BOS held on 08.08.2022

Academic Council:

19th Academic Council held on 29.09. 2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	L			M				L			L		
CO2	L	L			M				L			L		
CO3	L	L	L		M				L			L		
CO4	L	L			M		H		L			L		

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

The understanding of robots promotes automation and helps to improve work environment, ultimately achieving improved productivity in labor-intensive industries through technology.

GEDX 214	**INTERNET OF THINGS AND ITS APPLICATIONS**	**L**	**T**	**P**	**C**
SDG: 4,9		**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

COB1: To discuss the basic concepts of IoT

COB2: To elaborate the vision of IoT from a global context

COB3: To choose different protocols for IoT design

COB4: To explain the security issues in IoT

COB5: To estimate the Market perspective of IoT.

PREREQUISITE:

Basics of embedded system and networking

MODULE I BASICS OF IOT **9**

IoT & Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues

MODULE II IOT ARCHITECTURE **9**

A Basic Perspective– Introduction, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, IoT reference Model, IoT Reference Architecture-Introduction, Functional View, Information View, Deployment and Operational View

MODULE III IOT PROTOCOLS **9**

Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus. IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivity and protocols

MODULE IV IoT SECURITY **9**

Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps

Towards a Secure Platform, Smartie Approach- Data Aggregation for the IoT in Smart Cities, Security

MODULE V APPLICATIONS OF IoT 9

IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

L – 45 ; TOTAL HOURS – 45

TEXT BOOKS:

1. S. Misra, A. Mukherjee, and A. Roy, " Introduction to IoT"Cambridge University Press, 2020
2. Hakima Chaouchi, "The Internet of Things Connecting Objects to the Web", Wiley Publications , 2010
3. Olivier Hersent, David Boswarthick, and Omar Elloumi, "The Internet of Things: Key Applications and Protocols", WileyPublications, 2012
4. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1 st Edition, 2014.

REFERENCES:

1. Daniel Minoli, — "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", Willy Publications, 2013
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.

COURSE OUTCOMES:

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

CO1: Explain the various concepts, terminologies and architecture of IoT systems.

CO2: Apply various protocols for design of IoT systems

CO3: Use of Devices, Gateways and Data Management in IoT

CO4: Design IoT applications in different domain

CO5: Analyze performance of IoT application

Board of Studies (BoS) :	**Academic Council:**
23rd BoS of ECE held on 13.07.2022	19th Academic Council held on 29.09.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H	H	H	H	M	H	L	L	M	L	M	M	H	H	H
CO2	H	H	H	H	M	H	L	L	M	L	M	M	H	H	H
CO3	H	H	H	H	M	H	L	L	M	L	M	M	H	H	H
CO4	H	H	H	H	M	H	L	L	M	L	M	M	H	H	H
CO5	H	H	H	H	M	H	L	L	M	L	M	M	H	H	H

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG No: 4 - Quality Education
Improving lives through the advancement of learning.

SDG No: 9 - Industry, Innovation and Infrastructure
To increase the performance by providing scalable computing and storage resources.

GEDX 216	IPR AND PATENT LAWS	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.

COB2: To disseminate knowledge on Copyrights and Design with their registration aspects

COB3: To learn the requirement of patentability, learn how to read and interpret patent specifications

COB4: To inculcate basic understanding on patent prosecution

COB5: To know about the enforcement agencies and rights

MODULE I OVERVIEW OF INTELLECTUAL PROPERTY 10

Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge – Trade Secret - IPR in India : Genesis and development – IPR in abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967,the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994

MODULE II COPY RIGHTS AND DESIGN 9

Nature of Copyright - Subject matter of copyright, Registration Procedure, Term of protection, Ownership of copyright, Assignment and licence of copyright - Infringement, Remedies & Penalties. Design: meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection

MODULE III INTRODUCTION TO THE INDIAN PATENT SYSTEM 9

Patent Laws as Concepts; Understanding the Patents Rules, 2003; Statutory Exceptions to Patentability; Novelty and Anticipation; Inventive Step; Capable of Industrial Application; How to Make a Patent Application, What to include in a Patent Application, Types of Patent Applications.

MODULE IV PATENT PROSECUTION 8

Publication and Examination; Powers of Controller—Examination Stage, Consideration of report by examiner, Refuse or Amend Applications, Division of Applications, Dating of Application, Anticipation, Potential Infringement

MODULE V PATENT LICENSING AND ENFORCEMENT 9

Compulsory Licensing—Working of Patents, Grounds for Grant of Compulsory License, Revocation; Patent Licensing; Patent Enforcement, International Arrangements and Other Miscellaneous Provisions Intellectual Property Appellate Board; Declaratory Suits, Infringement Suits

L – 45 ; TOTAL HOURS – 45

TEXT BOOKS:

1. Neeraj, P., & Khusdeep, D. (2014). Intellectual Property Rights. India, IN: PHI learning Private Limited.

REFERENCES:

1. Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis.
2. Basil, Lucas, Izumi and Nakanishi (2018), Patent law for scientist and engineers, LexisNexis.

COURSE OUTCOMES:

CO1: Enriched knowledge on types of IPRs

CO2: Better knowledge on copyrights and designs

CO3: Ability to classify the charateristics that are patenable and apply for patent

CO4: Know how to track a patent application and prosecute

CO5: Can apply for licensing and know the remedy in case of infringement

Board of Studies (BoS) :
15th BoS of CSB held on 15.09.2023

Academic Council:
21st Academic Council held on 20.12.2023

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1			M			M		L							
CO2						M									
CO3			M					L							
CO4						M									

CO5			M			M		L							

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement : It is established that intellectual property touches different aspects of a country's economic growth and social development, so an engineer or technocrat should know the implications of their innovations

GEDX 217	LOGISTICS AND SUPPLY CHAIN MANAGEMENT	L	T	P	C
SDG: 12		3	0	0	3

COURSE OBJECTIVES:

COB1: To identify of the role of logistics in adding value to the final product .

COB2: To gain knowledge on warehouse and transport operations in logistics.

COB3: To learn the fundamentals of supply chain management.

COB4: To learn to locate the facilities, design network in a supply chain.

COB5: To get exposed to the latest developments in the field of Logistics and Supply Chain Management.

MODULE I INTRODUCTION TO LOGISTICS MANAGEMENT **11**

Definition and scope of logistics management-Importance of logistics in supply chain management Evolution and trends in logistics management-Functions -In-bound and Out-bound logistics – Components of Logistics Management - Logistics Service Provides (LSP)-Role of 2 PL, 3 PL and 4 PL - Concepts and importance of reverse logistics

MODULE II WAREHOUSING & TRANSPORTATION **7**

Warehousing Functions - Types - Site Selection - Decision Model - Layout Design - Costing - Virtual Warehouse. Transportation System - Evolution - Infrastructure and Networks - Freight Management - Vehicle Routing – FTL and LTL.

MODULE III SUPPLY CHAIN MANAGEMENT **9**

Introduction to Supply chain management - Definition, objectives - functions of Supply chain and drivers – Drivers of supply chain performance –Material flow-financial flow- information flow-- Lack of supply chain coordination and the Bullwhip effect,VMI – CPFR.

MODULE IV SUPPLY CHAIN NETWORK **9**

Distribution network design – role - factors influencing options, design options – network design decisions – factors influencing options - models for facility location and capacity allocation - network optimization models.

MODULE V CURRENT TRENDS 9

Logistics Information Systems - Need - Characteristics and Design – E Logistics - Structure and Operation - Logistics Resource Management - e- LRM Role of information technology in a supply chain – e-business and supply chain management – Green supply chain management and environmental sustainability of supply chain.

L –45 ; TOTAL HOURS – 45

TEXT BOOKS:

1. Bowersox, D. and Closs, D., “Logistical Management: The Integrated Supply Chain Process”, Tata McGraw - Hill, New Delhi, 2010.
2. Chopra, S., Meindl, P. and Kalra, D.V., “Supply Chain Management: Strategy, Planning, and Operation”, 6th Edition, Pearson Education, New Delhi, 2016.

REFERENCES:

3. Vinod V. Sople., “Logistics Management”, 3rd Edition, Pearson Education, New Delhi, 2012.
4. Sharma S., “Supply Chain Management: Concept, Practices and Implementation”, Oxford University Press, New Delhi, 2010.
5. Martin Christopher, “Logistics & Supply Chain Management”, 9thEdition,2010.

COURSE OUTCOMES:

CO1: Appreciate the role of logistics in adding value to the final product

CO2: Bring about changes warehousing practices of an organization and Effectively manage transportation.

CO3: Recognize the processes in a supply chain and make suitable decisions.

CO4: Design supply chain network and locate various facilities in an optimal
Manner.

CO5: Execute logistics and supply chain management desires of a company from a global perspective.

Board of Studies (BoS) :	**Academic Council:**
15th BoS of CSB held on 15.09.2023	21st Academic Council held on 20.12.2023

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1			L		L		M		M		M	H		L	
CO 2			L		L		M		M		M	H		L	
CO 3			L		L		M		M		M	H		L	
CO 4			L		L		M		M		M	H		L	
CO 5			M		M		M		M		H	H		M	

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG No. 9 - Ensure sustainable consumption and production patterns

Statement : The understanding of the concepts of supply chain management leads to the production and distribution of goods and services for the mankind with a focus on improving the overall supply chain profitability.

GEDX 220	OPTIMIZATION TECHNIQUES	L	T	P	C
SDG: 4, ,9,11		3	0	0	3

COURSE OBJECTIVES:

COB1: To introduce the basic concepts of linear programming

COB2: To educate on the advancements in Linear programming techniques

COB3: To introduce non-linear programming techniques

COB4: To introduce the interior point methods of solving problems

COB5: To introduce the dynamic programming method

MODULE I LINEAR PROGRAMMING **9**

Introduction - formulation of linear programming model-Graphical solution–solving LPP using simplex algorithm – Revised Simplex Method.

MODULE II ADVANCES IN LPP **9**

Dual simplex method - Sensitivity analysis – Transportation problems– Assignment problems-Traveling sales man problem -Data Envelopment Analysis.

MODULE III NON LINEAR PROGRAMMING **9**

Classification of Non Linear programming – Lagrange multiplier method – Karush – Kuhn Tucker conditions–Reduced gradient algorithms– Quadratic programming method – Penalty and Barrier method.

MODULE IV INTERIOR POINT METHODS **9**

Karmarkar's algorithm–Projection Scaling method–Dual affine algorithm–Primal affine algorithm - Barrier algorithm.

MODULE V DYNAMIC PROGRAMMING **9**

Formulation of Multi stage decision problem–Characteristics–Concept of sub-optimization and the principle of optimality–Formulation of Dynamic programming–Backward and Forward recursion– Computational procedure–Conversion offinal value problem into Initial value problem.

TEXT BOOKS:

1. Hillier and Lieberman "Introduction to Operations Research", TMH, 2000.
2. R.Panneerselvam, "Operations Research", PHI, 2006

3. Hamdy ATaha, “Operations Research –An Introduction”, Prentice Hall India, 2003.

REFERENCES:

1. Philips, Ravindran and Solberg, “Operations Research”, John Wiley, 2002.
2. Ronald L.Rardin, “Optimization in Operation Research” Pearson Education Pvt. Ltd. New Delhi, 2005.

COURSE OUTCOMES:

At the end of the course, the student will

CO1 be proficient in formulating and solving linear programming problems by employing graphical techniques and the simplex algorithm.

CO2 solve intricate optimization problems through techniques like dual simplex method, sensitivity analysis, and solving transportation and assignment problems.

CO3 solve non-linear programming problems using methods such as Lagrange multiplier, Karush-Kuhn-Tucker conditions, and various optimization algorithms.

CO4 apply interior point methods, including Karmarkar's algorithm and Barrier algorithm, to solve optimization problems.

CO5 acquire the ability to model and solve multi-stage decision problems using dynamic programming principles, including sub-optimization and backward/forward recursion.

Board of Studies (BoS) :
19th BoS conducted on 29.08.2023

Academic Council:
21st Academic Council held on 20.12.2023

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	L	L	L	M	L	M	L	L	L	L	L	M	L	H
CO2	M	L	M	H	L	M	L	L	L	L	L	M	L	H
CO3	L	M	H	H	L	H	L	L	L	L	L	M	L	H
CO4	M	L	H	M	L	M	L	L	L	L	L	M	L	H
CO5	L	M	H	H	L	H	L	L	L	L	L	M	L	H

SDG 4:Quality education

Statement: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

The syllabus contributes to providing quality education by teaching optimization techniques and problem-solving methods.

SDG 9 : Industry, innovation and infrastructure

Statement:Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.

The syllabus covers advanced methods in optimization, which can contribute to innovative solutions in various industries and infrastructure development.

SDG 11: Sustainable Cities and Communities

Statement: Make cities and human settlements inclusive, safe, resilient, and sustainable.

Optimization techniques taught in the syllabus can be applied to urban planning and resource allocation, supporting the development of sustainable cities.

GEDX 221	POLYMERS FOR DIFFERENT	L	T	P	C
SDG: 8	TRANSPORTATION	3	0	0	3

COURSE OBJECTIVES:

COB1: To introduce the changing structure of automotive industries towards usage of plastics, rubbers, composites, sealants and adhesives.

COB2: To impart knowledge of polymers used in interior applications.

COB3: To develop knowledge of polymers used in exterior applications.

COB4: To provide knowledge of composite materials for automotive applications.

COB5: To illustrate the usage of automobile rubber components.

MODULE I INCLINATION OF AUTOMOTIVE COMPONENTS TOWARDS POLYMERS **9**

Quest for a lightweight vehicle - Need for plastics – advantages and limitations of plastics – designing with plastics –the decisive properties – materials selection – requirements for different application areas – light weight nanocomposites – uses of adhesives in automobile and aerospace – phenolics, epoxies, acrylics, anaerobics, cyanoacrylates.

MODULE II POLYMERS FOR AUTOMOBILE INTERIORS **9**

Interiors – dominance of plastic – fashion and function – plastics surfaces: texture and fogging – emissions and interior air quality - plastic structure and panel application: sandwich concept, instrumental panel, other sensitive panels – structural and mechanical components: seating, door and window furniture, steering wheel, airbags, seat belts, pedals, instrumental and others.

MODULE III POLYMERS FOR AUTOMOBILE EXTERIORS **9**

Exteriors: Body panels and structure – Painting problems – Bumpers – Other exteriors: Grills, Spoilers, Mirrors, Door handles, Wheel trim, Road wheels, Sunroof components, Windscreen wiper assemblies.

MODULE IV COMPOSITE MATERIALS FOR ELECTRIC VEHIVLES **9**

Low-cost carbon fibers – lightweight automotive materials - Barriers to Carbon Fibre Adoption in the Automotive Industry - Low-Cost Carbon Fibre - Precursor Materials - PAN-Based - Lignin-Based - Polyolefin-Based - Advanced Processing Techniques - Advanced Surface Treatment and

Sizing - Application of Composite Materials in the Automotive Industry - Composite Driveshaft and Spring - Recent Developments in Automotive thermoplastic composites

MODULE V RUBBER COMPONENTS IN AUTOMOBILES 9

Rubber mounts – Spring design – Comparison with metallic springs –Seals for static and dynamic applications –tyres and tubes – timing belt – rubber – metal bonding

L – 45 ; TOTAL HOURS –45

TEXTBOOKS:

1. James Maxwell, “Plastics in the Automotive Industry”, SAE internationals, woodhead Publication, England, 1994.
2. Omar Faruk, Jimi Tjong, Mohini Sain, “Lightweight and Sustainable Materials for Automotive Applications”, CRC Press, 2017.
3. Ahmed Elmarakbi, “Advanced Composite Materials for Automotive Applications”, Wiley, 2014.

REFERENCES:

1. Kalyan Sehanobish, “Engineering Plastics and Plastic composites in Automotive Applications”, SAE internationals, Warrendale, 2009.
2. Automotive Plastics and Composites, Reinforced Plastic Magazine, Elsevier Advanced Technology, 1999.

COURSE OUTCOMES:

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

CO1: demonstrate the the changing structure of automotive industries towards usage of plastics

CO2: explain the plastics used in automotive interior applications

CO3: appreciate the plastics usage in automotive exterior applications

CO4: suggest composite materials for automotive parts

CO5: appreciate the usage of rubbers for various automotive applications

Board of Studies (BoS):
BoS of PE held on 07.02.2023

Academic Council:
20th Academic Council held on 13.04.2023

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	L				L							L		M	H	
CO2	L				L							L			H	

CO3	L						M				L			H	
CO4	L				M						L			H	
CO5	L										L			H	

Note: L– Low Correlation M –Medium Correlation H –High Correlation

SDG 8: Work opportunities for automobile and mechanical engineers in polymer and automotive part manufacturing industries

Effective learning of this course will lead the other department students to appreciate the usage of polymer materials in automobile applications which in turn leads to work opportunities

GEDX 222	PROGRAMMING LANGUAGE PRINCIPLES	L	T	P	C
SDG: 8		3	0	0	3

COURSE OBJECTIVES:

COB1:To learn syntax and semantics of programming languages

COB2: To comprehend data, data types, and basic statements

COB3: To explore call-return architecture and ways of implementing them

COB4: To gain knowledge about object-orientation, concurrency and even handling in programming languages

COB5: To write programs in non-procedural programming paradigms

MODULE I SYNTAX AND SEMANTICS 09

Evolution of programming languages – describing syntax – context-free grammars– attribute grammars – describing semantics – lexical analysis – parsing – recursive-decent – bottom-up parsing.

MODULE II DATA, DATA TYPES AND BASIC STATEMENTS 09

Names – variables – binding – type checking – scope – scope rules – lifetime and garbage collection – primitive data types – strings – array types– record types –union types – pointers and references – Arithmetic expressions – overloaded operators –type conversions – relational and Boolean expressions – assignment statements – control structures – selection – iterations – branching – guarded statements.

MODULE III SUBPROGRAMS AND IMPLEMENTATIONS 09

Subprograms – design issues – local referencing – parameter passing – overloaded methods – generic methods – design issues for functions – semantics of call and return–implementing simple subprograms – stack and dynamic local variables – nested subprograms – blocks – dynamic scoping.

MODULE IV OBJECT-ORIENTATION, CONCURRENCY, AND EVENT ANDLING 09

Object-orientation – design issues for OOP languages – implementation of object-oriented constructs – concurrency – semaphores – monitors – message passing – threads –statement level concurrency – exception handling – even handling.

MODULE V FUNCTIONAL AND LOGIC PROGRAMMING LANGUAGES 09

Introduction to lambda calculus – fundamentals of functional programming languages –Programming with Scheme – Programming with ML – Introduction to logic and logic programming – Programming with Prolog – multi-paradigm languages.

L – 45; TOTAL HOURS –45

TEXT BOOKS:

1. Robert W. Sebesta, “Concepts of Programming Languages”, Tenth Edition, Addison Wesley, ISBN:9789332518872, 9332518874, 2014.
2. Michael L. Scott, “Programming Language Pragmatics”, Third Edition, Morgan Kaufmann,ISBN:9780124104778, 0124104770, 2015.

REFERENCES:

1. R. Kent Dybvig, “The Scheme programming language”, Fourth Edition, MIT Press,ISBN:9780262512985, 026251298, 2009.
2. Jeffrey D. Ullman, “Elements of ML programming”, Second Edition, Prentice Hall, ISBN:9780137903870, 0137903871, 1998.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: Identify syntax and semantics of programming languages

CO2: Define data, data types, and basic statements of programming languages

CO3: Design and implement subprogram constructs

CO4: Apply object-oriented, concurrency, and event handling programming constructs

CO5: Develop programs in Scheme, ML, and Prolog

Board of Studies (BoS) :
19th BoS of CSE held on 28.12.2021

Academic Council:
18th Academic Council Meeting held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1				H										
CO2	H													
CO3	H			L										
CO4	H	H		H		H	M						H	
CO5	H	H		H	H	H	H						H	H

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement::By learning the Programming Language Principles, the student will be able to create robust real time applications.

GEDX 224	PYTHON PROGRAMMING	L	T	P	C
SDG - 8		2	0	2	3

COURSE OBJECTIVES:

The students will

COB1: understand basics of Python programming.

COB2: gain the knowledge in control structures, loops, functions and modules.

COB3: represent the data using lists, tuples and dictionaries.

COB4: acquire knowledge about the fundamental principles of Object-Oriented Programming.

COB5: discover the use of file and exception handling techniques

MODULE I INTRODUCTION TO PYTHON 10+10

Basic introduction to Python-Python Interpreter- variables and simple data types-strings-string formatting-Numbers-comments-Operators- Operator Precedence-Control flow-Conditional statements-Nested conditionals-Loops-Loop control statements.

MODULE II DATA COLLECTION AND FUNCTIONS 10+10

Data collection- Processing data with List, Tuples, Dictionaries -Function Definitions –Function Call and Returning Values – Parameter Passing – Local and Global Scope – Recursive Functions –Passing a List- Storing your functions in module.

MODULE III CLASSES, FILE HANDLING AND EXCEPTION HANDLING 10+10

Classes and objects – Inheritance - Multiple level of Inheritance– Encapsulation and Information Hiding- Python Standard Libraries–Packages-File handling- File Open-Read, Write, Delete-Exceptions - Exception handling

L – 30; P – 30 ;TOTAL HOURS - 60

LIST OF EXPERIMENTS

Students should develop and practice simple Python programs using the following concepts.

1. Data Types and variables
2. String formatting
3. Operators
4. Conditional branching

5. Loops
6. Collection and processing with Lists
7. Collection and processing with Tuples
8. Collection and processing with Dictionaries
9. Functions
10. Recursion
11. Modules
12. Classes & Objects
13. Inheritance
14. File handling
15. Exception handling
16. Mini Python project such as
    - Simple Quiz using python
    - Random Number guessing Game
    - Rock paper scissor
    - Countdown timer

TEXT BOOK:

1. Eric Matthes," Python Crash Course: A Hands-On, Project-Based Introduction to Programming" ,3rdedition, No starch Press, 2023.

REFERENCES:

1. Allen B. Downey, Think Python: How to Think Like a Computer Scientist', 2nd edition, Updated for Python 3, Shroff /O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)
2. Python Cookbook,Third edition by David Beazley, Brian K. Jones
3. Paul J. Deitel and Harvey Deitel, Python for Programmers, First edition, Pearson Education, ISBN-10 : 9353947987, 2020.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: Write simple Python programs using data types, variables, operators and string.

CO2 : Interpret the use of conditional statements, loops and function calls to navigate program control flow effectively.

CO3: Implement data structures in Python.

CO4: Apply fundamental OOP principles for creation of Python programs through effective class creation, object utilization, and inheritance.

CO5: Discover the functionality of the file system in Python and handle exceptions effectively.

Board of Studies (BoS) : 16th BoS of IT held on 18.08.2022

Academic Council: 19th AC held on 29.09.2022

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

Note 1- Low Correlation 2- Medium Correlation 3-High Correlation

SDG 8 : Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Students can be equipped with valuable Python programming skills crucial for successful employment. Also students will be empowered to make significant contributions across various sectors.

GEDX 226	SMART SENSORS IN HEALTHCARE APPLICATIONS	L	T	P	C
SDG: 4,9		3	0	0	3

COURSE OBJECTIVES:

COB1: To understand the basics of biosensors and its instrumentation

COB2: Provide knowledge on the various enzyme sensors in healthcare applications

COB3: To provide information to the students on application of bio sensors.

MODULE I INTRODUCTION TO BIO SENSORS 8

Introduction to Bio sensors, Classification of Biosensors- Based on Type of Transduction, Based on Biological Element, Instrumentation, Future Directions in Biosensors (Micro and Nano Technologies), Designing a Simple Biosensor

MODULE II ENZYME SENSORS 10

Enzyme Sensors: Principles of Operation, Theoretical Aspects, Transient response, Stability, Sensor Calibration. Potentiometric Enzyme Electrodes: Potentiometric Glucose Electrodes, Potentiometric Amino Acid Electrodes, Comparison of Potentiometric Enzyme Electrodes.

MODULE III SEMICONDUCTOR ENZYME SENSORS 10

Semiconductor Enzyme Sensor: MOSFET Sensors, ISFET Sensors, ENFET Sensors

MODULE IV OPTICAL AND THERMAL SENSORS 7

Optical Enzyme Sensors: Principles of Operation, Optical Sensors Based on Absorption- based on Fluorescence- Bio/Chemi-luminescence, Optical Fibers, Thermal Enzyme Sensors: Determination of Glucose, Determination of Urea, Piezoelectric Enzyme Sensors.

MODULE V SMART SENSOR APPLICATIONS 10

Electronic Tongue- Applications and Challenges, Electronic Nose- Applications and Challenges. Biosensors for Neurological Disease.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Hamida Hallil, HadiHeidari,Smart Sensors for Environmental and Medical Applications, ISBN: 978-1-119-58734-7 May 2020 Wiley-IEEE Press
2. Tran Minh Canh , Biosensors , , Chapman & Hall Publication 1993 edition, 2013

REFERENCES:

1. Bansi d. Malhotra and Anthony r. F. Turner, “Advances in Biosensors”edited , , JAI Press INC (Imprint of Elsevier Science)
2. Robert S. Marks, Christopher R. Lowe, David C. Cullen, Howard H. Weetall,Handbook of Biosensors and Biochips (2 Volume set), Wiley (2007)

COURSE OUTCOMES:

CO1: Able to find design simple bio sensors

CO2: Able to identify sensors for bio medical applicationsanalyze the stability of nonlinear systems

CO3: Apply the principles of semi conducting properties in bio sensors

CO4: Identify the optical and thermal sensors used for various biomedical applications

CO5: Able to apply the smart sensor technology in electronic bio sensors

Board of Studies (BoS) :
18th Board of Studies of EIE held on 12.07.2022

Academic Council:
19th Academic Council Meeting held on 29.09.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO 3
CO1	H	H	M	L		L				L	L	L	L	L	H
CO2	H	H	M	L		L				L	L	L	L	L	H
CO3	H	H	M	L	H	L				L	L	L	L	L	H
CO4	H	H	M	L		L				L	L	L	L	L	H
CO5	H	H	M	L		L				L	L	L	L	L	H

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4,9: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all and help in developing technological capabilities

Students will be able to apply the recent advancements in technology in the field of biomedical applications

GEDX 227	TOTAL QUALITY MANAGEMENT	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: To learn the basics of TQM.

COB2: To acquire knowledge on the principles of TQM

COB3: To familiarize with the various TQM tools and techniques

COB4: To gain knowledge about Lean six sigma

COB5: To be conversant with Quality management system.

MODULE I INTRODUCTION L:9

Definition of quality- Evolution of quality- TQM framework- Basic concepts of TQM- Dimensions of manufacturing and service quality- Principles of TQM- Contributions of Deming, Juran and Crosby- Barriers to TQM Implementation.

MODULE II TQM PRINCIPLES L:8

Customer focus – Customer satisfaction - Customer retention – Costs of quality - Leadership – Strategic quality planning - Quality Councils - Quality circles - Recognition and Reward - Performance appraisal – Supplier partnership – Partnering -Supplier selection - Supplier Rating.

MODULE III TQM TOOLS AND TECHNIQUES L:9

The seven traditional tools of quality– New management tools – Benchmarking - Continuous process improvement: PDCA cycle, 5S, Kaizen, Benchmarking Process, Quality Function Deployment (QFD) - Process – Benefits- Taguchi Quality Loss Function - Total Productive Maintenance (TPM) – Concept- Improvement Needs- FMEA – Stages of FMEA.

MODULE IV LEAN SIX SIGMA L:11

Concept of Six Sigma - Definition - Identifying project of importance from service and manufacturing sector- Developing project charter - Measure - Finalizing critical to quality (CTQ) characteristics – MSA - Analyse - Identification and confirmation of potential critical factors - Improve - Generation and evaluation of solutions to critical root causes - selection and optimization of best solution - Pilot implementation and validation of solution- Control - control plan.

MODULE V QUALITY MANAGEMENT SYSTEMS L:8

Need for ISO 9000 and Other Quality Systems - ISO 9000:2000 Quality System– Elements - Implementation of Quality System – Documentation -Quality Auditing - TS 16949. ISO 14000 – Concept, Requirements and Benefits - ISO 22301:2019- Business continuity management systems.

L – 45; TOTAL HOURS – 45

TEXTBOOKS:

1. Total Quality Management(TQM) 5th Ed byPearson Education– October 2018. ByBesterfield Dale H. & BesterfieldCarol.
2. Total Quality Control 4th edition Subsequent Edition 2004 - Armand V. Feigenbaum.

REFERENCES:

1. “The Management and Control of Quality”, James R.Evans& William M.Lidsay, 5th Edition, South-Western (Thomson Learning), 2002.
2. “Total Quality Management”, Oakland.J.S., Butterworth HcinemannLtd.,Oxford, 2002.
3. Total Quality Management: Key Concepts and Case Studies, D.R. Kiran, October 2016.
4. “Total Quality Management (TQM): Principles, Methods, and Applications”, AshishAgarwal, Dixit Garg, Sachin K. Mangla, Sunil Luthra, 2020.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1. Explain fundamentals of Total Quality Management

CO2: Describe the principles of TQM.

CO3: Select the proper TQM tools for continuous quality improvement process

CO4: Illuminate the lean six sigma concepts

CO5: Explainthe Quality management system.

Board of Studies (BoS):	**Academic Council:**
20th BOS of mechanical dept held on 08.08.2022	19th Academic Council held on 29.09. 2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	L							M	M	M	L		
CO2	M	L		M					M	M	M	L		
CO3	M	L							M	M	H	L		
CO4	M	L		L		H	M		M	M	L	L		
CO5	M	L						M	M	H	M	L		

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

The comprehensive understanding of TQM principles and tools promote quality in process and products.

GEDX 229	WASTEWATER MANAGEMENT	L	T	P	C
SDG: 6		3	0	0	3

COURSE OBJECTIVES:

COB1: To impart knowledge on the generation , type and characteristics of domestic wastewater

COB2: To give an insight on the principle of domestic wastewater treatment

COB3: To familiarize the characteristics of industrial wastewater and its treatment methods

COB4: To provide exposure about the cycle of sanitation and stages of septage management

COB5: To impart knowledge on the advanced techniques in sewage treatment

MODULE I WASTEWATER GENERATION 9

Wastewater generation - Types of domestic wastewater - Types of sewerage system - Storm water management - Flow estimation - Sewage characteristics –Impact of untreated effluents on land and water - Pollution Control Rules and Environmental legislation.

MODULE II DOMESTIC WASTEWATER TREATMENT 9

Onsite and offsite challenges in wastewater treatment – Stages of wastewater treatment – Principles and Functions of treatment process - Working of Septic tanks - Onsite grey water treatment - wetland treatment - Capturing nutrients - Stages in Sludge management

MODULE III INDUSTRIAL WASTEWATER TREATMENT 9

Sources and characteristics of industrial wastewater - Effects of Industrial wastes on sewerage system - Sewage treatment plants and receiving water bodies -Standards related to industrial wastewater - Pre-treatment - Waste volume reduction, waste strength reduction, neutralization, equalization and proportioning, Removal of Organic and inorganic dissolved solids

MODULE IV SEPTAGE TREATMENT 9

Full cycle of sanitation - Sustainable practices in capture and containment - Septage treatment using Drying beds, Planted drying bed,

Anaerobic digestion - Disposal and resource recovery - Challenges in operation and maintenance of receiving and treatment facilities

MODULE V ADVANCED TREATMENT METHODS AND REUSE 9

Advances in sewage treatment – Microalgae based wastewater treatment technologies – Advances in membrane technology - Thermal hydrolysis technology for sludge treatment – Biogas generation - Wastewater Reuse and Recycle - Regulations Standards - Types of Reuse – Agriculture - Groundwater Recharge.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Mackenzie L. Davis,. “Water and Wastewater Engineering: Design Principles and Practice”, Second Edition (McGraw-Hill Education: New York, 2020.
2. Metcalf and Eddy, “Wastewater Engineering Treatment, Disposal and Reuse”, Tata McGraw Hill, 2007.
3. Narayana Rao M and Amal K. Datta “Wastewater Treatment, Rational methods of Design and Industrial practices”, Oxford and IBH Publications, Third Edition, New Delhi, Reprint 2009
4. Strande, L., Ronteltap, M., and Brdjanovic, D., Fecal Sludge Management: Systems Approach for Implementation and Operation, IWA Publishing, 2014.

REFERENCES:

1. Athar Hussain, Sirajuddin Ahmed. “Advanced Treatment Techniques for Industrial Wastewater”, IGI Global, USA, 2018.
2. Arceivala, S.J., “Wastewater Treatment for Pollution Control & Reuse”, McGraw-Hill, New Delhi, 3rd Edition, 2006.
3. NG Wun Jern. “Industrial Wastewater Treatment”. World Scientific, Imperial College Press, Singapore, 2020.
4. Patwardhan, A. D, “Industrial Wastewater Treatment”, PHI Learning (P) Ltd., New Delhi, 2017.
5. Operative Guidelines for Septage Management for Local Bodies in Tamil Nadu, Municipal Administration and Water Supply Department Government of Tamil Nadu, 2020.

COURSE OUTCOMES:

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

CO1:describe the types of wastewater, its generation and characteristics

CO2: explain the treatment of domestic wastewater.

CO3:identify and suggest the treatment methods relevant to the industrial wastewater

CO4:illustrate the current practices for septage management

CO5: describe the advanced treatment methods and recommend options for reuse

Board of Studies (BoS) :
18th BoS of CE held on 05.04.2023

Academic Council:
20th Academic Council held on 13.04.2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1			L			M	H					M			H
CO2			L			M	H					M			H
CO3			L			M	H					M			H
CO4			L			M	H					M			H
CO5			L			M	H					M			H

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG No.6 :Ensure availability and sustainable management of water and sanitation for all

The knowledge on the Domestic and industrial wastewater management along with the sanitation would cater the development of infrastructure aiming to reduce pollution and safeguard the environment.

GEDX 231	ELECTRONICS FOR MECHANICAL	L	T	P	C
SDG 4 ,9	SYSTEMS	3	0	0	3

COURSEOBJECTIVES:

COB 1 : To study the characteristics of semiconductor devices such as diodes, transistors and their applications.

COB 2 : To study fundamentals of digital logic circuits.

COB 3 : To study 8085 microprocessors and its interfacing with other peripheral devices.

COB 4 : Classify sensors based on their operating principles.

COB 5 : Recognize the significance of electronic sensors in modern technology.

PREREQUISITE:

MODULE I SEMICONDUCTORS AND RECTIFIERS 9

Classification of solids based on energy band theory-Intrinsic semiconductors Extrinsic semiconductors-P type and N type-PN junction and its application – HWR-FWR-BR-Zener diode. Bipolar junction transistor- Field effect transistor: Configuration and characteristic-SCR, DIAC, TRIAC, UJT.

MODULE II DIGITAL ELECTRONICS 9

Number systems- Binary Arithmetic Operations-Boolean Algebra-Logic gates Karnaugh map: SOP, POS.

MODULE III COMBINATIONAL AND SEQUENTIAL CIRCUITS 9

Combinational Circuits: Half and full adders- Magnitude Comparator- Multiplexer/ Demultiplexer- encoder / decoder Sequential circuits: Flip Flops: SR, JK, D and T FF- Truth tables and circuits-Shift Registers-Ripple Counters.

MODULE IV 8085 MICROPROCESSOR AND APPLICATIONS OF MICROPROCESSOR 8

Architecture of 8085-Pin configuration - Instruction set-Addressing modes- Simple programs using arithmetic and logical operations. Applications – printed boards Arduino / Raspberry Pi.

MODULE V SENSORS FOR ENGINEERING APPLICATIONS **10**

Overview of electronic sensors and their applications - Classification of sensors- Sensing principles- Sensor characteristics- Interfacing analog and digital sensors with Arduino / Raspberry Pi board- applications.

L- 45;TOTAL HOURS- 45

TEXT BOOKS:

1. Ramesh Goankar, "Microprocessor Architecture", Programming and Applications with 8085, Wiley Eastern, 1998.
2. Mehta V.K, "Principles of Electronics", S. Chand and Company Ltd, 1994

REFERENCES:

1. Malvino and Leach, "Digital Principles and Applications", Tata McGraw-Hill,1996.
2. Mehta V.K, "Principles of Electronics", S. Chand and Company Ltd, 1994
3. DouglesV.Hall, "Microprocessor and Interfacing", Programming and Hardware, Tata McGraw-Hill, 1999.
4. Salivahanan S, Suresh Kumar N, Vallavaraj A, "Electronic Devices and Circuits" First Edition, Tata McGraw-Hill, 1999.

COURSE OUTCOMES:

Students who complete this course will be able to

CO1 : Working principles and characteristics of various semiconductor devices.
CO2 : Different digital logic circuits: Combinational and sequential circuits. Architecture of 8085, its features and programming for specific application
CO3 : Architecture of 8085, its features and programming for specific application
CO4 : Evaluate and compare sensor selection .in engineering applications
CO5 : Identify various applications where electronic sensors are used.

Board of Studies (BoS):
25th BOS of ECE held on 20.09.2023

Academic Council:
21st Academic Council held on 20.12.2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO 3
CO1	H	H	M	M	L	-	-	L	M	L	M	L	H	L	H
CO2	H	H	H	M	L	-	-	L	M	L	M	L	H	L	H
CO3	H	H	H	M	L	-	-	L	M	L	M	L	H	L	H
CO4	H	H	L	L	L	-	-	L	M	H	H	L	M	L	M
CO5	H	H	M	L	L	-	-	L	M	H	H	L	H	L	H

Note: L - Low Correlation M-Medium Correlation H-High Correlation

SDG 4: Quality Education

Statement: A fundamental concept of electronics properties and its characteristic provides a global impact on quality education.

SDG 9: Industry, Innovation and Infrastructure

Statement: This course plays a major role in electronic sensing and analyzing for IoT technology which modernize industry operations.

GEDX 101	ADVANCED ENTREPRENEURSHIP	L	T	P	C
SDG: 8		3	0	0	3

COURSE OBJECTIVES:

COB1: Realize the skills required to be an entrepreneur

COB2: Acquaint the students with challenges of starting new ventures

COB3: Enable them to investigate, comprehend and internalize the process of setting up a business by identifying the business opportunity

COB4: Identify the right sources of fund for starting a new business

COB5: Locate a business which contributes to the society at large

MODULE I INTRODUCTION TO ENTREPRENEURSHIP 10

Entrepreneurship: knowledge and skills requirement - characteristic of successful entrepreneurs - entrepreneurship process, factors impacting emergence of entrepreneurship - managerial vs. Entrepreneurial approach - National Policy on Skill Development and Entrepreneurship 2015 - Digital India and Make in India flagship programme of Government of India.

MODULE II STARTING THE VENTURE 10

Generating business idea – sources of new ideas, methods of generating ideas - creative problem solving, opportunity recognition - environmental scanning – competitor and industry analysis - Forms of ownership - procedure for registration in small industry - Overview of Government of India start up India Scheme – Journey of Sachin Bansal : From Flipkart to Navi's IPO

MODULE III FUNDAMENTALS OF MANAGEMENT 10

Overview of Marketing - Human resources, finance and Operation requirement for new venture - sources of funds – overview of venture capital and angel investment. Overview of project management. The role and Functions of Business Incubators and Accelerators in entrepreneurship Development – The secret sause of Nykaa : Story of FalguniNayar

MODULE IV BUSINESS PLAN REPORT PREPARATION 7

Understanding the value of a business plan - Developing an investor presentation - Preliminary Project Report - students' business plan presentation

MODULE V IMPACT OF SOCIAL ENTREPRENEURSHIP ON SOCIETY 8

Social Entrepreneurship: Definition, Types, and Issues, Static Impact of social Entrepreneurship, Impact of For- Profit companies Vs social entrepreneurship - case studies on social entrepreneurs.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Hisrich, Robert D., Michael Peters and Dean Shepherded, Entrepreneurship, Tata McGraw Hill,2014.
2. Rashmibansal, Arise awake: the inspiring stories of young entrepreneur who graduated from college into A Business of their own, westland books private Ltd,2015.

REFERENCES:

1. Barringer, Brace R., and R., Duane Ireland, Entrepreneurship, Pearson Prentice Hall, New Jersy (USA), 2012.
2. Kishore Biyani&DipayanBaishya, It happened in India: The story of pantaloons, Big Bazaar, Central and the great Indian consumer, Rupa& co, 2011
3. Donald F Kuratko, T.V Rao. Entrepreneurship: A South Asian perspective. Cengage Learning. 2012
4. Rashmi Bansal: Take me Home: The Inspiring story of 20 Entrepreneurs from small town India with Big Time Dream, Westland, 2014
5. Moloy K. Bannerjee, SiddharthBannerjee, P. RanganathSastry Start-up City: Ten Tales of Exceptional Entrepreneurship from Bangalore's Software Miracle, Collins Business, 2014
6. The Portfolio Book of Great Indian Business Stories: Riveting Tales of Business Leaders and Their Times, portfolio, 2015

COURSE OUTCOMES:

CO1: Turn out to be an expert to recognize a business opportunity that fits the individual

CO2: Demonstrate the ability to provide a self-analysis in the context of an entrepreneurial career

CO3: Construct an appropriate business model

CO4: Develop a well-presented business plan

CO5: Start socially relevant new ventures

Board of Studies (BoS) :
15th BoS of CSB held on
15.09.2023

Academic Council:
21st Academic Council held on
20.12.2023

GEDX 102	ARTIFICIAL INTELLIGENCE AND	L	T	P	C
SDG: 8	MACHINE LEARNING APPLICATIONS	3	0	0	3

COURSE OBJECTIVES:

COB1:To learn the problem solving methods and learning design of intelligent systems.

COB2: To comprehend the concepts of machine learning

COB3: To explore supervised and unsupervised learning and their applications

COB4: To build systems that learns and adapts using real-world applications.

COB5: To implement learning algorithms that can be applied to real-world.

MODULE I INTRODUCTION TO ARTIFICIAL INTELLIGENCE 06

Computerized reasoning - Artificial Intelligence (AI) - characteristics of an AI problem - Problem representation in AI - State space representation - problem reduction-Concept of small talk programming

MODULE II SEARCH PROCESS 10

AI and search process - Brute force search techniques, Depth first, Breadth first search techniques, Hill climbing, Best first search, AND/OR graphs, A* algorithm - Constraint satisfaction - Knowledge Representation: Logic - Rules of inference - Resolution - Unification algorithm - Production rules - Semantic networks - Frames – Scripts - Conceptual dependency

MODULE III SUPERVISED LEARNING 10

Basic concepts and types of Machine Learning - Supervised Learning**:** Linear Models for Classification: Discriminant Functions - Probabilistic Generative Models - Probabilistic Discriminative Models - Bayesian Logistic Regression. Neural Networks: Feed forward Network Functions - Error Backpropagation – Regularization in Neural Networks - Mixture Density Networks - Bayesian Neural Networks - Kernel Methods - Ensemble learning: Boosting - Bagging.

MODULE IV UNSUPERVISED LEARNING 10

Clustering - K-means - Mixtures of Gaussians - The EM Algorithm in General – Model Selection for Latent Variable Models - High-Dimensional Spaces. Dimensionality Reduction: Factor analysis - Principal Component Analysis - Probabilistic PCA - Independent components analysis.

MODULE V APPLICATION 09

Linear Models for Regression - Linear Basis Function Models - The Bias-Variance Decomposition - Bayesian Linear Regression - Bayesian Model Comparison – Applications: Radar for target detection, Deep Learning Automated ECG Noise Detection and Classification, ML in Network for routing, traffic prediction and classification, ML in Cognitive Radio Network (CRN).

L – 45; TOTAL HOURS –45

TEXT BOOKS:

1. Stuart Russel and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Prentice Hall,ISBN:9781292153964, 1292153962, 2016.
2. Elaine Rich, Kevin Knight and Shivashankar B Nair, “Artificial Intelligence”, Tata McGraw Hill, ISBN:9780070087705, 0070087709, 2019.

REFERENCES:

1. Patrick Henry Winston, “Artificial Intelligence”, Addison Wesley, ISBN:9780201533774, 0201533774, 2000.
2. Luger George F and Stubblefield William A, “Artificial Intelligence: Structures and Strategies for Complex Problem Solving”, Pearson Education, ISBN:9780201648669, 0201648660, 2002.
3. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, ISBN:9780387310732, 0387310738, 2007.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: Use appropriate search algorithms for any AI problem

CO2: Represent a problem using first order and predicate logic

CO3: Identify the apt agent strategy to solve a given problem

CO4: Design software agents to solve a problem

CO5: Implement applications for NLP that use Artificial Intelligence

Board of Studies (BoS) :
19th BoS of CSE held on 28.12.2021

Academic Council:
18th Academic Council Meeting held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	H	L				H								
CO2	H	L											H	
CO3	H	M												

CO4	H	M	H	L		H							H	
CO5	M	L	H	H		H								H

Note:L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: The implementation of technologies such as deep learning in the industry contributes to improving productivity, manufacturing efficiency and allows faster, more flexible and more efficient processes.

GEDX 103	AUTOMOTIVE	L	T	P	C
SDG: 9	TECHNOLOGY	3	0	0	3

COURSE OBJECTIVES:

COB1: To understand the engineering principles that underpins the technology of an automotive vehicle.

COB2: Recognize the future direction of the sensors used within the automotive vehicle.

COB3: To gather knowledge about the role and use of advanced systems in automobile.

COB4: To learn in a vehicle accident reconstruction and deformation behavior of a vehicle.

COB5: To gain knowledge of the vehicle case study and in E-Mobility business.

MODULE I VEHICLE TECHNOLOGY 9

Introduction - Electric and Hybrid Vehicle technology- LEV, TLEV, ULV & ZEV, Basic components of Electric vehicles, types - series and parallel hybrid, layouts, comparison, Power systems and control systems, Different modes of operation for best usage. Electric/hybrid vehicle features and system requirements, Battery Electric vehicle (BEV), Hybrid electric vehicle (HEV), Plug-in hybrid vehicle (PHEV), Fuel cell electric vehicle (FCEV),Comparison of Electric vehicles with different energy sources

MODULE II SENSOR TECHNOLOGY 9

Connectivity Fundamentals- Navigation and Other Applications, Vehicle-to-Vehicle Technology and Applications, Vehicle-to-Roadside and Vehicle-to-Infrastructure Applications, Wireless Security Overview. Basics of Radar Technology and Systems -Ultrasonic Sonar Systems - LIDAR Sensor Technology and Systems -Camera Technology-Night Vision Technology, Use of Sensor Data Fusion, Integration of Sensor Data to On-Board Control Systems.

MODULE III ADVANCED SYSTEMS 9

ADAS- Introduction to ADAS- Concept of Advanced Driver Assistance Electronic Systems, NHTSA-consideration, next generation of mobile-connected devices accuracy. Modem electronic and micro control systems in automobiles: Electronically controlled concealed headlight systems, Electro chromic mirrors, automatic review mirrors, Day time

running lamps (DRL), Head up display, Travel information systems, On board navigation system, Electronic climate control, Electronic cruise control, Antilock braking system, Electronically controlled sunroof, Anti-theft systems, Automatic door locks (ADL).

MODULE IV VEHICLE RECONSTRCTION TECHNIQUES 9

Safety and accident reconstruction- crash test techniques, offset frontal collision test and lateral collision test, Bharat NCAP, Euro NCAP, US NCAP,NCAP rating, vehicle crash Reconstruction - Principles and Technology- Reconstruction and Analysis of Motorcycle and passenger car Crashes- Reconstruction and Analysis of Rollover Crashes of Light Vehicles.

MODULE V E-MOBILITY 9

E-mobility business, electrification challenges, Connected Mobility and Autonomous Mobility- case study E-mobility Indian Roadmap Perspective. Policy: EVs in infrastructure system, integration of EVs in smart grid, social dimensions of EVs, case studies- Emerging Technologies for Electric Vehicle Drives, Case Studies of Two Wheeler, Three-Wheeler, and Four-Wheeler Electric Vehicles.

L-45; TOTAL HOURS – 45

TEXT BOOKS:

1. John Wiley, Advanced Driver Assistance Systems (ADAS) Professional Engineering Publishing, 2020.
2. Robert Bosch GmbH Safety, Comfort and Convenience Systems, 2016.
3. Donald J Van Kirk, Vehicular Accident Investigation and Reconstruction 1st Edition, 2021.

REFERENCES:

1. The Center for Auto Safety, “Newly Developed Roof Crush Test Proves Existence of Safer Vehicles that can Withstand Rollover Crashes". Archived from the original on 2007.
2. SAE, Electric and Hybrid Electric Vehicles and Fuel Cell Technology, 2020.

COURSE OUTCOMES:

On completion of the course the students should be able to

CO1: Describe the characteristics and importance of energy sources in automotive design technology.

CO2: Identify relevant automotive sensor technology for the specified vehicles.

CO3: Design a vehicle advanced system based on automotive design standards.

CO4: Analyze the various crash techniques and reconstruction systems in an automobile.

CO5: Analyze vehicle E-mobility challenges and techniques for futuristic requirements.

Board of Studies (BoS) :
14th Board of Studies held on 22.08.2022

Academic Council:
19th Academic Council held on 29.09. 2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	H	H	L	L	L	L	L	L	M	M	M	H	H	H
CO2	H	H	L	L	L	L	L	L	M	M	M	H	H	H
CO3	H	H	L	L	L	L	L	L	M	M	M	H	H	H
CO4	H	H	L	L	L	L	L	L	M	M	M	H	H	H
CO5	H	H	L	L	L	L	L	L	M	M	M	H	H	H

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9: The subject will cover the fundamental understanding of how automobile technology has evolved.

Statement: Effective comprehension of cutting-edge systems, vehicle reconstruction, and e-mobility issues.

GEDX 105	BUILDING REPAIR SOLUTIONS	L	T	P	C
SDG: 11		3	0	0	3

COURSE OBJECTIVES:

The objective of the course is to impart adequate knowledge on

COB1: materials commonly used in building construction including type of buildings

COB2: cement mortar and cement concrete manufacturing methods including quality control aspects

COB3: physical and chemical deterioration mechanisms acting on buildings in the real time conditions

COB4: materials used for building repair works

COB5: techniques for rehabilitating common distress in buildings

MODULE I MATERIALS FOR CONSTRUCTION AND TYPES OF BUILDINGS 9

Introduction – types of cement, sand and stone chips (coarse aggregate) – basic properties – water for construction – types of steel reinforcement rods & its basic properties – bricks – formation of wall with bricks and solid blocks – types of buildings – classification.

MODULE II MANUFACTURE OF CEMENT MORTAR AND CEMENT CONCRETE 9

Cement mortar – ingredients - mix ratio – manufacturing – application areas, cement concrete – ingredients – design of concrete mix – manufacturing methods – applications areas - quality control procedures, cement mortar and concrete – microstructure – influencing parameters.

MODULE III MAJOR CAUSES FOR BUILDING DISTRESS 9

Durable buildings - definition and significance in the current context, causes for building repairs - physical mechanisms - shrinkage, creep, thermal incompatibility, frost action, erosion, abrasion and fire exposure, chemical mechanisms - carbonation, chloride attack, sulphate attack, acid attack - mechanism of corrosion of steel reinforcement rods in concrete.

MODULE IV BUILDING REPAIR MATERIALS 9

Repair materials - factors influencing selection of repair materials – various stages of concrete repair - importance of surface preparation - bond coat - rust convertors - rust removers - protective coating to steel rebars -

superplasticizers - corrosion inhibitor admixed concrete - micro concrete - polymer modified mortar / concrete - crack sealing compounds - concrete coatings.

MODULE V BUILDING REPAIR TECHNIQUES 9

Overview of repair techniques - techniques for arresting cracks – grouting – guniting and shotcrete – concrete / steel jacketing technique, procedure for arresting leakage and dampness in terrace, washroom and wall areas – case study.

L – 45 ; TOTAL HOURS – 45

TEXT BOOKS:

1. Duggal, S. K., "Building Materials", 4th Edition, New Age International, 2012
2. Gambhir, M.L., "Concrete Technology", 5th Edition, Tata McGraw Hill Education, 2013

REFERENCES:

1. Santha Kumar, A.R., "Concrete Technology", Oxford University Press, New Delhi, 2007.
2. Shetty, M.S., and A.K., Jain "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd., 2010.
3. Brooks, J.J. and Neville, A.M., "Concrete Technology", Pearson, 2019.
4. Kumar Mehta. P. and Paulo J.M. Monteiro., "Concrete: Microstructure, Properties, and Materials" 4th Edition, McGraw Hill Education (India) Pvt. Ltd., 2014.
5. Gambhir, M. L., and Neha Jamwal, Building Materials: Products, Properties and Systems, Tata McGgraw Hill, 2017.
6. Raj, P. Purushothama, Building construction materials and techniques, Pearson Education India, 2017.
7. Gahlot, P. S. and Sanjay Sharma, Building repair and maintenance management, CBS Publishers and Distributors, 2019.

COURSE OUTCOMES:

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

CO1: understand the various materials used for building construction, its properties and significance.

CO2: understand and visualize the manufacture of cement mortar and concrete used in building construction, and relevant quality control aspects.
CO3: recognize the physical and chemical deteriorating mechanisms detrimental to the buildings.
CO4: suggest materials for different repair works in a building.
CO5: identify the suitable repair techniques for rehabilitation of common distress buildings.

Board of Studies (BoS):
18th BoS of CSE held on 05.04.2023

Academic Council:
20th Academic Council held on 13.04.2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1						L	H								
CO2						L	H								
CO3						L	H								
CO4						L	H	M			M				
CO5					H	L	H	M			M				

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 11 : Make cities and human settlements inclusive, safe, resilient and sustainable

GEDX 110	DEEP LEARNING ESSENTIALS	L	T	P	C
SDG: 8		3	0	0	3

COURSE OBJECTIVES:

COB1:To learn the machine learning basics

COB2: To estimate the deep learning networks

COB3: To describe the deep networks.

COB4: To expose the students to sequence modeling

COB5: To summarize the practical methodology and applications of deep learning.

MODULE I MACHINE LEARNING BASICS FOR DEEP LEARNING **09**

Learning Algorithms - Capacity, Overfitting and Underfitting -Hyper parameters and Validation Sets - Estimators, Bias and Variance - Maximum Likelihood Estimation - Bayesian Statistics - Stochastic Gradient Descent - Building a Machine Learning Algorithm - Challenges Motivating Deep Learning.

MODULE II DEEP LEARNING NETWORKS **09**

Introduction – Historical context of Deep Learning – Classes of Deep Learning Network – Deep Networks for Unsupervised learning – Deep Networks for Supervised learning – Hybrid Deep Networks.

MODULE III DEEP NETWORKS: MODERN PRACTICES **09**

Deep Feedforward Networks - Architecture Design - Back-Propagation and Other Differentiation Algorithms - Regularization for Deep Learning - Regularization and Under- Constrained Problems - Optimization for Training Deep Models - Optimization Strategies and Meta-Algorithms – Convolutional Network.

MODULE IV SEQUENCE MODELING: RECURRENT AND RECURSIVE NETS **09**

Unfolding Computational Graphs - Recurrent Neural Networks - Deep Recurrent Networks - The Challenge of Long-Term Dependencies - Echo State Networks - The Long Short-Term Memory and Other Gated RNNs - Optimization for Long-Term Dependencies.

MODULE V PRACTICAL METHODOLOGY AND APPLICATION 09

Performance Metrics - Default Baseline Models - Selecting Hyperparameters - Debugging Strategies - Example: Multi-Digit Number Recognition – Applications - Computer Vision, Speech Recognition and Natural Language Processing – Other Applications.

L – 45; TOTAL HOURS –45

TEXT BOOKS:

1. Li Deng and Dong Yu, “Deep Learning Methods and Applications”, NowPublisher, 1st Edition, ISBN: 1932-8346, 2014.
2. Josh Patterson, Adam Gibson, “Deep Learning”, O'Reilly Media, 1stEdition, ISBN: 978-1491914250, 2017

REFERENCES:

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, “Deep Learning (Adaptive Computation and Machine Learning Series)”, MIT Press, 1st Edition,ISBN: 978-0262035613, 2017.
2. Tom M. Mitchell, Machine Learning, McGraw Hill Education, 1stEdition,ISBN: 978-1259096952, 2013.
3. LaureneFausett, “Fundamentals of Neural Networks: Architectures, Algorithms and Applications”, Pearson, 1st Edition, ISBN- 978-8131700532, 2004.

COURSE OUTCOMES

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

CO1: Illustrate the machine language applications in deep learning

CO2: Identify the various deep learning algorithms and its application

CO3:Evaluate the role of sequence modeling

CO4: Compare the various deep learning network algorithms

CO5: Apply the deep learning algorithms to solve real time problems.

Board of Studies (BoS) :
19th BoS of CSE held on 28.12.2021

Academic Council:
18th Academic Council Meeting held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2
CO1		L											L	
CO2		M											L	
CO3								M						M

CO4		M	H						M	L		L		M
CO5	M		H	H	M				H	H		L		H

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: The implementation of technologies such as deep learning in the industry contributes to improving productivity, manufacturing efficiency and allows faster, more flexible and more efficient processes.

1. Development of sustainable infrastructure by understanding the physical and chemical deteriorating mechanisms during its life time.
2. Make the human settlements safe and resilient by implementing proactive measures for enhancing durability in new construction, and adopting suitable repair materials and techniques for rehabilitation of existing buildings.

GEDX 111	DRONE TECHNOLOGY	L	T	P	C
SDG: 9		2	0	2	3

COURSE OBJECTIVES:

COB1: To give basic knowledge about the design and analysis of the controlled flights

COB2: To provide knowledge on the assembly of a designed controlled flight.

MODULE I INTRODUCTION TO UAV/MAV 10

History of UAV –classification –basic terminology- models and prototypes – applications.

MODULE II BASICS OF AIRFRAME 10

Airframe –dynamics –modeling- structures –wing design- engines types-equipment maintenance and management-control surfaces-specifications. Autopilot – AGL pressure sensors-servos –accelerometer – gyros – actuators - power supply processor, integration, installation, configuration, and testing.

MODULE III COMMUNICATION PAYLOADS AND PATH PLANNING 10

Payloads-Telemetry-tracking-Aerial photography-controls-PID feedback-radio control frequency range – Waypoints navigation-ground control software-Recent trends in UAV-Case Studies.

PRACTICALS 30

1. Introduction to various types of RPV/RC- Controlled flights
2. Introduction to various multi-copter configurations.
3. Wing Analysis using XFLR analysis
4. Weight estimation and components selection for drones.
5. Assembling of drone and inspection of various components.
6. Calibration of ESC and motors.
7. Binding of Receiver and Transmitter.
8. Introduction to various Flight controllers
9. Basic connection of flight controller and its calibration
10. Mission planner Introduction and calibration procedures
11. Machine-in-loop autonomous flight mission planning
12. Simulator training for drone flying
13. Test Flight and Ground flight.

L- 30; P- 30; TOTAL HOURS: 60

TEXT BOOKS:

5. Robert C. Nelson, Flight Stability and Automatic Control, McGraw-Hill, Inc, 1998.
6. Skafidas, “Microcontroller Systems for a UAV”, KTH, TRITA-FYS 2002:51 ISSN 0280-31634, 2002.

REFERENCES:

3. Jane’s Unmanned Aerial Vehicles and Targets, Jane’s Information Group; ASIN: 0710612575, 1999.
4. R. Said and H. Chayeb, “Power supply system for UAV”, KTH, 2002.

COURSE OUTCOMES:

Students will be able to

CO1: To design and do the analysis for a controlled flight.

CO2: construct a drone and have a basic experience of flying the controlled flight.

Board of Studies (BoS):
18th BoS held on 24.11.2023

Academic Council:
21th AC held on 20th December 2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	H	H	L	L								H	H
CO2	H	H	H	L	L								H	M

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement : Holistic understanding of fluid mechanics in various filed of everyday life

GEDX 112	ELECTRIC VEHICLE	L	T	P	C
SDG: 8,9		3	0	0	3

COURSE OBJECTIVES:

COB 1: To study the concept of electric vehicles (EV)

COB2: To get familiarized with electric vehicle energy storage systems

COB3: To learn the basics of charging in EV's

COB4: To study about electric vehicle modelling

COB5: To understand about electric vehicle's ancillary system and its design

MODULE I INTRODUCTION TO ELECTRIC VEHICLE (EV) 9

A Brief History -Technology, benefits and challenges in comparison with IC engine –EV's and hybrid electric vehicle (HEV) – costs and emissions – autonomous cars – general and hybrid electric vehicle layout – working principle of an HEV drive train – concept of electric, hybrid electric and plug-in HEV – HEV drive train topologies – plug-in HEV drive train topologies – Case studies on recent EV's.

MODULE II ENERGY STORAGE SYSTEMS FOR EV 9

Battery parameters - Types of Battery : Lithium – Nickel – Sodium – Zinc – Lead Acid - Coin cell - Rechargeable – Battery sealing – Ideal model, Linear model, Thevenin model – Battery Cell Voltage Equalization – Onboard power electronics battery management – Equalizer chaining method. Electrical Modeling of Ultra capacitors, Flywheel Energy Storage Systems and Renewable Fuel Cell Power Sources.

MODULE III EV CHARGING SYSTEMS 10

Introduction to charging systems – Charging time – cost – Standardization – Methods – Modes of operation – Types of charging plugs – Vehicle to grid technology – wireless power transfer – Case studies.

MODULE IV ELECTRIC VEHICLE MODELLING AND DESIGN CONSIDERATIONS 10

Tractive Effort - Modeling Vehicle Acceleration - Modelling Electric Vehicle Range - Aerodynamic Considerations - Transmission Efficiency - Electric Vehicle Chassis and Body Design - General Issues in Design.

MODULE V DESIGN OF ANCILLARY SYSTEMS 7

Heating and Cooling Systems - Design of the Controls - Power Steering - Choice of Tyres - Wing Mirrors, Aerials and Luggage Racks - Electric Vehicle Recharging and Refueling Systems.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Tom Denton, “Electric and Hybrid Vehicles” Routledge Publishers, 1st edition, March 2020.
2. James Larminie and John Lowry, “Electric Vehicle Technology Explained”,John Wiley &Sons Ltd, 2nd edition, 2015.
3. M. Ehsani, Y. Gao, Stefano Lango, K.M.Ebrahimi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design”, CRC Press, 3rd Edition,2018.

REFERENCES:

1. Tariq Muneer and Irene IllescasGarcía, “The automobile, In Electric Vehicles: Prospects and Challenges”, Elsevier, 2017.
2. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, 2nd edition, CRC Press, 2016.

COURSE OUTCOMES:

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

CO1:realize the importance of electric transportation systems.

CO2: model battery system for any EV

CO3: design and choose a suitable charging system for EV

CO4: develop a model of EV considering design constraints

CO5: identify the opportunities and challenges in ancillary system design

Board of Studies (BoS) :
19thBoS of EEE conducted on 29.08.2023

Academic Council:
21st Academic Council held on 20.12.2023

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		H			M			H		M	M		H	
CO2	H						H							H
CO3		H	M		M				M		M		M	M
CO4	M		H				M		H			H		
CO5					H						H			M

SDG 8: Decent work and economic growth

Statement: The learners of this course can get descent work and earn financial benefits and they can work in interdisciplinary areas to promote economic growth.

SDG No. 9 Industry, innovation and infrastructure

Statement: The development of zero emission electric vehicles will meet out the desired needs such as new innovative systems for industry and establishing advanced infrastructure.

GEDX 113	EMERGING TECHNOLOGIES IN MOBILE NETWORKS	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: To list the various technologies involved in mobile networks.

COB2: To describe the importance and research aspects of SDN

COB3: To apply the D2D, M2M, IoT and Vehicular networks in mobile networks

COB4: To differentiate LTE networks and Advanced LTE

COB5: To explain the concept of 5G technology in mobile networks

MODULE I INTRODUCTION TO MOBILE NETWORKS 9

Mobile Network Architecture, Basics of IP Networks, IPv6 Address, Format and types of Addresses and IPv6 Messages, Stateless Auto configuration, DNS, IPv6 Packet Headers , Base IPv6 Header ,Extension Headers, Migration to IPv6

MODULE II SOFTWARE-DEFINED NETWORKING 9

Need of Software Defined Networking, Conventional Routing, Computational Workload of Routers , Decoupling Control and Data Planes ,Architectural , SDN in Research, Programmable Networks , Global Environment for Networking Investigation , OpenFlow Protocol, OpenFlow Network Architecture, OpenFlow Operation.

MODULE III OPPORTUNISTIC NETWORKING 9

Opportunity in Networking, Opportunistic Channel Access, Cognitive Radio Networks , Channel Sharing: D2D, M2M and IoT, Mobile Relay, Vehicular Relays, Opportunistic Vehicular Communication, 802.11-Based Vehicular Networks, Challenges in Opportunistic Vehicular Networks .

MODULE IV LTE NETWORKS 9

LTE Network Architecture, Protocol Stack, Resource Grid, Frame, LTE Configurations, LTE-Advanced Networks, Coordinated Multipoint (CoMP), Carrier Aggregation.

MODULE V 5G COMMUNICATION TECHNOLOGY 9

5G Expectations and Limitations, UE , Device-to-Device , Modes of Operation, Other D2D Technologies: Wi-Fi Direct, D2D Communication Underlying LTE-A ,Transmit Power Control, Resource Allocation.

L – 45 ; TOTAL HOURS – 45

TEXT BOOKS:

1. Hasan, Syed Faraz. Emerging trends in communication networks. Springer International Publishing, 2014.
2. Hu, Wen-Chen, ed. Emergent trends in personal, mobile, and handheld computing Technologies. IGI Global, 2012.

REFERENCES:

1. Rodriguez, Jonathan. *Fundamentals of 5G mobile networks*. John Wiley & Sons, 2015.
2. Jan, Mian Ahmad, Fazlullah Khan, and Muhammad Alam, eds. Recent trends and advances in wireless and IoT-enabled networks. Berlin/Heidelberg, Germany: Springer, 2019.

COURSE OUTCOMES:

students will be able to,

CO1: Discuss various technologies of mobile networks

CO2: Summarize the necessity of IPv6, cognitive radio, IoT, LTe and 5G in mobile networks

CO3: Compare the various trends in mobile networks

CO4: Adapt the various network architectures.

CO5: Differentiate the networks based on the applications

Board of Studies (BoS) :
23rd BoS of ECE held on 13.07.2022

Academic Council:
19th Academic Council held on 29.09. 2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	H	M	H	M	–	–	–	–	–	–	–	–	H	H	M
CO2	H	H	M	H	H	–	–	–	–	–	–	–	H	M	M
CO3	M	M	M	H	H	–	–	–	–	–	–	–	H	H	M
CO4	H	H	H	M	H	–	–	–	–	–	–	–	H	H	M
CO5	H	H	H	M	H	M	–	–	–	–	–	-	M	H	M

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Able to apply the theoretical concepts for the various application of image processing

GEDX 114	FUNDAMENTALS OF DATA SCIENCE AND MACHINE LEARNING	L	T	P	C
SDG:		3	0	0	3

COURSE OBJECTIVES:

COB1: To understand fundamentals of statistical concepts

COB2: To learn unsupervised learning algorithms

COB3: To acquire knowledge in regression models

COB4: To explain various classification algorithms

COB5: To understand deep learning concepts

MODULE I FUNDAMENTALS OF DATA **9**

Importing – Summarizing - Visualizing Data - Statistical Learning - Monte Carlo Sampling - Monte Carlo Estimation - Monte Carlo for Optimization.

MODULE II UNSUPERVISED LEARNING **9**

Introduction - Risk and Loss in Unsupervised Learning - Expectation–Maximization (EM) Algorithm - Empirical Distribution and Density Estimation - Clustering via Mixture Models - Mixture Models - EM Algorithm for Mixture Models - Clustering via Vector Quantization - K-Means - Clustering via Continuous Multiextremal Optimization - Hierarchical Clustering - Principal Component Analysis (PCA) - Motivation: Principal Axes of an Ellipsoid - PCA and Singular Value Decomposition.

MODULE III REGRESSION **9**

Linear Regression - Analysis via Linear Models - Inference for Normal Linear Models - Nonlinear Regression Models - Linear Models in Python - Regularization and Kernel Methods.

MODULE IV CLASSIFICATION **9**

Introduction - Classification Metrics - Classification via Bayes' Rule - Linear and Quadratic Discriminant Analysis - Logistic Regression and Softmax Classification - K-nearest Neighbors Classification - Support Vector Machine - Classification with Scikit-Learn - Decision Trees and Ensemble Methods.

MODULE V DEEP LEARNING **9**

Introduction to ANN – ANN with 1 Input and 1 Output – Working with Any Number of Input – Working with Hidden Layer.

L – 45; TOTAL HOURS –45

TEXT BOOKS:

1. Dirk P. Kroese, Zdravko Botev, Thomas Taimre, Radislav Vaisman, "Data Science and Machine Learning Mathematical and Statistical Methods", CRC Press, 2020.
2. Ahmed Fawzy Gad, Fatima Ezzahra Jarmouni, "Introduction to Deep Learning and Neural Networks with Python: A Practical Guide", Academic Press, 2021.

REFERENCES:

1. Taweh Beysolow II, "Introduction to Deep Learning Using R", Academic Press, 2017.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning, MIT Press, 2016.
3. Sandro Skansi, "Introduction to Deep Learning", Springer International Publishing, 2018.

COURSE OUTCOMES:

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

CO1: recognize the fundamentals of statistical concepts

CO2: explain unsupervised learning algorithms

CO3: apply regression models to solve data science problems

CO4: apply the classification algorithms for the given problem

CO5: explain deep learning concepts

CO6: analyze complex data using machine learning algorithms

Board of Studies (BoS) :
16th BoS of IT held on 18.08.2022

Academic Council:
19th Academic Council Meeting held on 29.09.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	M												M	
CO2	M												M	
CO3			M	M									M	
CO4				M									M	
CO5				M									M	
CO6				M									M	

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 8 : Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Statement: It provides deep knowledge on unsupervised learning, regression analysis, classification and deep learning concepts, which can add to productive employment.

GEDX 116	GREEN DESIGN AND SUSTAINABILITY	L	T	P	C
SDG 11		3	0	0	3

COURSE OBJECTIVES:

The objectives of the course are

- To impart knowledge on the concepts of sustainable development and fundamentals of socio economic systems.
- To understand the basics of green building and frame work for the attainment of sustainability.
- To enhance the student's interest in the design of green building and energy efficient measures in a buildings.
-

MODULE I CONCEPTS OF SUSTAINABLE DEVELOPMENT 9

Objectives of Sustainable Development - Need for sustainable development - Environment and development linkages - Globalization and environment - Population, poverty and pollution- global, regional and local environment issues-Greenhouse gases and climate change.

MODULE II SUSTAINABLE DEVELOPMENT OF SOCIO ECONOMIC SYSTEMS 9

Demographic dynamics of sustainability- Policies for socio economic development- Sustainable Development through trade- Economic growth-Action Plan for implementing sustainable development- Sustainable Energy and Agriculture.

MODULE III FRAME WORK FOR ACHIEVING SUSTAINBAILITY 9

Sustainability indicators- Hurdles to sustainability- Business and Industry – Science and Technology for Sustainable Development- Performance indicators of sustainability and assessment mechanism- Constraints and barriers of Sustainable Development.

MODULE IV GREEN BUILDINGS 9

Introduction to Green Building- Energy- Water- Materials and Resources - Sustainable Sites and Land Use - Indoor Environmental Quality- Life Cycle Assessment- Energy, water and materials efficiency - Elements of Green Buildings Design- Foundation, Electrical, Plumbing, flooring, Decking, roofing, insulation, wall coverings, windows, siding, doors and finishing, LEED certification for Green Buildings, Green Buildings for sustainability.

MODULE V ENERGY CONSERVATION AND EFFICIENCY 9

Energy savings- Energy Audit- Requirements- Benefits of Energy conservation-Energy conservation measures for buildings- Energy wastage- impact to the environment.

Total Hours –45

TEXT BOOKS:

1. Charles Kibert, J., “Sustainable Construction: Green Building Design and Delivery”, 5th Edition, John Wiley and sons, 2022.
2. Peter P Rogers, Kazi F Jalal and John A Boyd “An Introduction to Sustainable Development” Earthscan, 2017
3. Kirby, J., Okeefe, P., and Timber lake, “Sustainable Development”, Earthscan Publication, London, 2007.
4. Moncef Krarti, “Energy Audit of Building Systems: an Engineering approach” CRC Press, LLC, Florida 2020.

REFERENCES:

1. Handbook of Green Building Design and Construction: LEED, BREEAM,
2. Green Building Handbook: Volume 2: A Guide to Building Products and their Impact on the Environment Paperback 2000

COURSE OUTCOMES:

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

- Explain the objective, need for the sustainability and the link between the globalization and environment.
- Address the economic, environmental, and social concerns in the sustainable development.
- Acquire knowledge on the performance indicators, constraints and barrier for sustainability.
- Explain the relationship between sustainability and emergence of green building practices.
- Conduct the energy audit on green building design and suggest ideas for attainting sustainability in building.

Board of Studies (BoS) :
18th BoS of CE held on 05.04.2023

Academic Council:
20th Academic Council held on 13.04.2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	H	H				H	H				M	M	H	L	M
CO2	M	H	H	M	H	H	H		M	H		M	H	L	M
CO3	H	H	M	L		H	H		L	M	H		H	L	M
CO4	L	H			H	H	H		H		H	M	H	L	M
CO5	H	H	H	M	H	H	H	H	H	H	H	M	H	L	M

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 11 : Make cities and human settlements inclusive, safe, resilient and sustainable

Statement : Green building and design with sustainable indicator will enhance the sustainable development.

GEDX 117	IMAGE PROCESSING AND ITS APPLICATIONS	L	T	P	C
SDG: 4,9		3	0	0	3

COURSE OBJECTIVES:

- **COB1 :** To apply the fundamentals of digital image processing
- **COB2 :** To analyze the performance parameters of image processing.
- **COB3 :** To discuss the image enhancement techniques for remote sensing
- **COB4 :** To adapt the image processing techniques in medical applications
- **COB5 :** To adapt the image processing techniques for industrial applications.

PREREQUISITES:

Fundamental concepts of transforms.

MODULE I DIGITAL IMAGE FUNDAMENTALS 9

Elements of Image Processing System, Fundamental steps in Digital Image Processing, Image Sampling & Quantization, Spatial and Gray level resolution. Fundamentals of Color Image Processing, Color models-RGB,CMY,HIS

MODULE II IMAGE ENHANCEMENT AND TRANSFORMS 9

Image Enhancement-Basic Gray level transformations, Histogram Processing, Spatial filtering, Image transforms- 2D DFT , DCT, Hadamard and Haar transform.

MODULE III IMAGE SEGMENTATION AND RESTORATION 9

Segmentation: Point, Line and Edge detection methods, Image segmentation and its types, Restoration: Noise model, Inverse filter and Wiener filter. Unconstrained and constrained restoration.

MODULE IV MEDICAL IMAGE APPLICATIONS 9

Multimodal medical image processing applications -Ultrasound image processing application, Dental X-ray image analysis- Content-based image retrieval-Detection of parasites using image processing

MODULE V REMOTE SENSING AND INDUSTRIAL APPLICATIONS 9

Satellite image classification, Satellite image restoration- Industrial applications– Fault detection in automotive systems, Cereal grain inspection.

L – 45 ; TOTAL HOURS – 45

TEXT BOOKS:

1. Gonzalez and Woods, "Digital Image Processing", 4th E dition, Pearson Education, 2018.
2. Robert Shcowebgerdt, Remote sensing models & methods for image processing, 2nd edition, 2012
3. Geoff Dougherty, "Digital Image Processing for Medical Applications", 1st Edition, Cambridge University Press, 2009.

REFERENCES:

1. E.R.Davies ,“Image Processing for the Food Industry”,World Scientific Publishing Co Pvt Ltd, 2000
2. John R. Jensen, Introductory Digital Image Processing: A Remote Sensing Perspective, 4th Edition, 2015.

COURSE OUTCOMES:

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

CO1 : Explain the fundamental concepts of digital image processing

CO2 : Summarize the image enhancement techniques and transforms

CO3 : Apply suitable image segmentation and restoration techniques

CO4 : Select appropriate image processing techniques for medical applications

Board of Studies (BoS) :
23rd BoS of ECE held on 13.07.2022

Academic Council:
19th Academic Council held on 29.09. 2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	L	L	L	L	L	L	L	L	L	L	L	H	M	H	M
CO2	L	H	L	L	L	L	L	L	L	L	L	H	M	H	M
CO3	L	H	M	H	H	L	L	L	L	L	L	H	H	H	M
CO4	H	M	H	H	H	H	H	H	L	L	L	L	M	H	H
CO5	H	M	H	H	H	H	H	L	L	L	L	M	H	H	H

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement: This course enables the student to understand basic image processing techniques and helps for lifelong learning.

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Able to apply the theoretical concepts for the various application of image processing

GEDX 118	INDUSTRIAL AUTOMATION AND	L	T	P	C
SDG: 9	CONTROL	3	0	0	3

COURSE OBJECTIVES

COB1: Learn and familiarize with the technologies which typically exist in an industrial facility.

COB2: Study of components used in data acquisition systems interface techniques.

COB3: To educate on the components used in PLC, DCS and SCADA.

COB4: To introduce the communication buses used in automation industries.

MODULE I PROGRAMMABLE LOGIC CONTROLLERS 9

Evolution of PLCs - Hard Relay Logic - Programmable logic controllers - Organisation - Hardware details - I/O - Power supply - CPU - Programming of PLC — relay logic — Ladder logic — Functional blocks programming – Programming Timers, Counters.

MODULE II PLC INTERMEDIATE FUNCTIONS & COMMUNICATION IN PLCS 9

Program control instructions-Data manipulation Instructions-Arithmetic instructions - Sequencer instructions- Design of interlocks and alarms using PLC - Requirement of communication networks for PLC — connecting PLC to computer — Use of Embedded PC as PLC - PLC applications in Industrial Automation

MODULE III LARGE SCALE CONTROL SYSTEM - SCADA 9

SCADA: Introduction - SCADA Architecture - Different Communication Protocols - Common System Components - Supervision and Control - HMI - RTU and Supervisory Stations - Trends in SCADA - Security Issues

MODULE IV DISTRIBUTED CONTROL SYSTEM 10

Introduction to DCS-Evolution, Architectures-Hybrid, centralized computer control, Generalized DCS. Architectures-Comparison, Local control unit, LCU-Configurations, Comparison, Process interfacing issues, Communication facilities-

Low level and High level operator interfaces, Operator displays, Low level and High level engineering interfaces, Factors to be considered in selecting DCS

MODULE V INDUSTRIAL COMMUNICATION NETWORKS 8

Introduction - Evolution of signal standard - HART communication protocol and communication modes - HART and OSI model - Modbus - Profibus - Foundation field bus - Introduction to AS-Interface (As-i) - Device net and Industrial Ethernet

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Petrezeulla, “Programmable Controllers”, tenth edition , Mc-Graw Hill, 2010.
2. Michael P.Lucas, “Distributed Control System”, Van Nastrand Reinhold Company, New York,1986.
3. Romilly Bowden, “HART application Guide”, HART Communication Foundation, 1999.

REFERENCES:

1. W. Bolton,” Programmable Logic Controllers “,(Fifth Edition), Newnes, 2009.
2. G.K.Mc-Millan, “Process/Industrial Instrument and controls and handbook”, Mc Graw Hill, New York, 1999.
3. Hughes T, “Programmable Logic Controllers”, ISA Press, 1989.

COURSE OUTCOMES:

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

CO1: Evaluate the hardware components of PLC and develop basic wiring diagrams.

CO2: Develop industrial automation system, identify the requirements of communications networks in PLC and analyze issues related to PLC applications in installation and trouble shooting.

CO3: Design a SCADA, HMI system for any industrial application.

CO4: Compare the different architectures of DCS and analyze the configurations of local control unit.

CO5: Distinguish between low level and high level operator interfaces in DCS and select DCS for specific applications.

CO6: Able to select and use most appropriate networking technologies and standards for a given application

Board of Studies (BoS) :	**Academic Council:**
18th BoS of EIE held on 12.07.2022	19th Academic Council Meeting held on 29.09.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	H	H	H	M	M	M		L		L	M	L		H
CO2	H	H	H	H	M	M	M		L		L	M	L		H
CO3	H	H	H	H	M	M	M		L		L	M	L		H
CO4	H	H	H	H	M	M	M		L		L	M	L		H
CO5	H	H	H	H	M	M	M		L		L	M	L		H

SDG 9: These technologies connect citizens around the world, monitor and track environmental impact, and optimize industrial inefficiencies

The technologies in Industrial Automation connect citizens around the world, monitor and track environmental impact, and optimize industrial inefficiencies

GEDX 119	INDUSTRIAL SAFETY	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: To learn the modern safety concepts

COB2: Tofamiliarize with the safety in manufacturing industries

COB3: To acquire knowledge in construction and electrical safety systems

COB4: Tobe conversant with safety performance monitoring

COB5: To gain knowledge in safety education and training

MODULE I INTRODUCTION TO SAFETY L:7

Evolution of modern safety concept- Safety policy - Safety Organization - Line and staff functions for safety- Safety Committee- budgeting for safety - Safety education and training.

MODULE II SAFETY IN MANUFACTURING L:10

Safety in metal Working-Machine guarding -Safety in welding and gas cutting - Safety in cold forming and hot working of metals -Safety in finishing, inspection and testing – Regulations - Safety consideration in material handling devices: Ropes, Chains, Sling, Hoops, Clamps, Arresting gears – Prime movers.

MODULE III CONSTRUCTIONAL AND ELECTRICAL SAFETY L:10

General safety consideration in Excavation, foundation and utilities – Cordoning – Demolition – Dismantling –Clearing debris – Types of foundations – Open footings.

Electrical Hazards – Energy leakage – Clearance and insulation – Excess energy – Current surges – Electrical causes of fire and explosion – National electrical Safety code.

MODULE IV SAFETY PERFORMANCE MONITORING L:9

Permanent, partial and temporary disabilities - Calculation of accident indices: frequency rate, severity rate, frequency severity incidence, incident rate, accident rate, safety “t” score, safety activity rate – Problems.

MODULE V SAFETY EDUCATION AND TRAINING L:9

Importance of training - Identification of training needs - Training methods: programme, seminars, conferences, competitions - Method of promoting safe practice - Motivation – Communication - Role of government agencies and private consulting agencies in safety training: Creating awareness, awards, celebrations, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic safety and training.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Nasser Elahi, “Industrial Safety Management”, Kalpaz Publications, 2006.
2. Jain.R.K., Sunil S.Rao. “Industrial Safety, Health and Environment Management Systems” Khanna Publishers, 2000.
3. Accident Prevention Manual, NSC, Chicago, 14th Edition, 2015.

REFERENCES:

1. Fulman, J.B., Construction Safety, Security, and Loss Prevention, John Wiley and Sons, 1979.
2. John Ridley, “Safety at Work”, Butterworth & Co., London, 1983.
3. Alexandrov, M.P., Material Handling Equipment, Mir Publishers, Moscow, 1981.
4. Fordham Cooper W., Electrical Safety Engineering, Butterworths, London, 1986.
5. Heinrich H.W. “Industrial Accident Prevention” McGraw-Hill Company, New York,1980.
6. Blake R.B., “Industrial Safety” Prentice Hall, Inc., New Jersey, 1973.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: Describe the modern safety concepts

CO2: Discuss the safety in manufacturing industries

CO3: Elucidate the electrical and construction safety systems

CO4: Illuminate safety performance monitoring

CO5: Explain the safety education and training

Board of Studies (BoS):	**Academic Council:**
20th BOS held on 08.08.2022	19th Academic Council held on 29.09. 2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	L	M			M	L	L				L	L	L
CO2	M	L	M			M	L	L				L	L	L
CO3	M	L	M			M	L	L				L	L	L
CO4	L	L	M			M	L	L		L		L	L	L
CO5	L	L	M			M	L	L	H	L		L	L	L

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Holistic understanding of Industrial safety fundamental norms enhances the safety of men and machines in industries.

GEDX 120	INDUSTRY 4.0	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: To gain knowledge about the need of industry 4.0

COB2: To familiarize with various technologies involved in Industry 4.0

COB3: To be conversant with the systems supporting Industry 4.0

COB4: To acquire knowledge in data and information handling in Industry 4.0

COB5: To learn about the maturity and readiness levels for Industry 4.0

MODULE I INTRODUCTION TO INDUSTRY 4.0 L:9

Various Industrial revolutions- Developments in USA, Europe, China and other countries- Digitalisation and the Networked Economy- Drivers, Enablers, Compelling Forces for Industry 4.0- Comparison of Industry 4.0 factory and conventional factory- Benefits.

MODULE II TECHNOLOGIES OF INDUSTRY 4.0 L:9

Internet of Things (IoT) - Industrial Internet of Things (IIoT) - Internet of Services- Smart Manufacturing- Smart Devices and Products- Smart Logistics - Smart Cities - Predictive Analytics.

MODULE III SYSTEMS SUPPORTING INDUSTRY 4.0 L:9

Cyber physical systems- Robotic automation and collaborative robots- Mobile computing - Cyber security.

MODULE IV DATA AND INFORMATION HANDLING IN INDUSTRY 4.0 L:9

Resource-based view of a firm- Data as a new resource for organizations- Harnessing and sharing knowledge in organizations- Cloud computing basics- Cloud computing and Industry 4.0

MODULE V MATURITY AND READINESS FOR INDUSTRY 4.0 L:9

Challenges – Gaps- Maturity levels- Readiness assessment – Opportunities- Future Trends - Case studies.

L – 45; TOTAL HOURS – 45

REFERENCES:

1. Christoph Jan Bartodziej, “The Concept Industry 4.0 An Empirical Analysis of Technologies and Applications in Production Logistics”, Springer Gabler, 2017.
2. Alp Ustundag and EmreCevikcan, “Industry 4.0: Managing the Digital Transformation”, Springer International Publishing, 2018.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: Explain the need of Industry 4.0

CO2: Elucidate the various technologies involved in Industry 4.0

CO3: Discuss the systems supporting Industry 4.0

CO4: Describe the data and information handling in Industry 4.0

CO5: Assess the readiness level of particular industry towards Industry 4.0

Board of Studies (BoS):
20th BOS 0f Mechanical dept held on 08.08.2022

Academic Council:
19th Academic Council held on 29.09. 2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	L					M		L			L	L	L
CO2	M	L			M				L			L	L	L
CO3	M	L			M				L			L	L	L
CO4	M	L	M	M	M				L			L	L	L
CO5	M	L	H				M		L			L	L	L

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

The knowledge of various technologies and systems of Industry 4.0 will help in the development innovative industry setups.

GEDX 121	INTRODUCTION TO ARTIFICIAL	L	T	P	C
SDG: 1	INTELLIGENCE	3	0	0	3

COURSE OBJECTIVES:

COB1: Familiarize students with Artificial Intelligence principles and techniques.

COB2: Identify appropriate AI methods to solve a complex problem.

COB3: Formalize a given problem in the language/framework of different AI methods

COB4: To assess the applicability, strengths, and weaknesses of the basic knowledge representation, problem solving, and learning methods in solving engineering problems

COB5: Implement appropriate searching strategies for few real world environments

MODULE I INTRODUCTION 9

Importance of AI, Evolution of AI - Applications of AI, Classification of AI systems with respect to environment, , Intelligent Agents, Different types of agents, Problem-Solving Process – Formulating Problems-Problem Types and Characteristics- Problem Analysis and Representation, Performance Measuring-Problem Space and Search-Toy Problems- Real-world problems-Problem Reduction Methods.

MODULE II PROBLEM SOLVING 9

General Search algorithm – Uniformed Search Methods – BFS, Uniform Cost Search, Depth First search , Depth Limited search (DLS), Iterative Deepening, Informed Search-Introduction- Generate and Test, BFS, A* Search, Memory Bounded Heuristic Search, Local Search Algorithms and Optimization Problems – Hill climbing and Simulated Annealing.

MODULE III KNOWLEDGE AND REASONING 9

Knowledge Representation-Knowledge based Agents-The Wumpus World, Logic-Propositional Logic-Predicate Logic-Unification and Lifting, Representing Knowledge using Rules-Semantic Networks Frame Systems, Definition of uncertainty, Bayes Rule – Inference, Belief Network.

MODULE IV PLANNING 9

Planning Problem – Simple Planning agent –Blocks world, Goal Stack Planning-Means Ends Analysis- Planning as a Statespace Search, Partial Order Planning-Planning Graphs-Hierarchical Planning Non- linear Planning -Conditional Planning-Reactive Planning, Knowledge based Planning-Using Temporal Logic – Execution Monitoring and Re-planning-Continuous Planning-Multi-agent Planning-Job shop Scheduling Problem. NLP-Introduction-Levels of NLP-Syntactic and Semantic analysis Discourse and Pragmatic Processing-Information Retrieval Information Extraction-Machine Translation-NLP and its Application.

MODULE V GAME PLAYING 9

Introduction-Important Concepts of Game Theory, Game Playing and Knowledge Structure-Game as a Search Problem, Alpha-beta Pruning-Game Theory Problems Game Theory, Expert System-Architecture-Knowledge acquisition-Rule based Expert System-Frame based and Fuzzy based expert system- Case study in AI Applications.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Russell, S. and Norvig, P. 2015. Artificial Intelligence - A Modern Approach, 3rd edition, Prentice Hall.

REFERENCES:

1. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill, 2003.
2. Parag Kulkarni, Prachi Joshi, “Artificial Intelligence –Building Intelligent Systems ”PHI learning private Ltd, 2015
3. Akshar Bharati, Vineet Chaitanya, Rajeev Sangal, “Natural Language Processing: A Paninian Perspective”, Prentice Hall India Ltd.,New Delhi, 1996

COURSE OUTCOMES:

CO1: Evaluate Artificial Intelligence (AI) methods and describe their foundations.

CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation and learning.

CO3: Demonstrate knowledge of reasoning and knowledge representation for solving real world problems.

CO4: Analyze and illustrate how search algorithms play vital role in problem solving

CO5: Ability to apply knowledge representation, reasoning, to real-world problems.

CO6: Discuss current scope and limitations of AI and societal implications.

Board of Studies (BoS) :
16th BoS of IT held on 18.08.2022

Academic Council:
19th Academic Council held on 29.09.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	H	H	M	M	L				L	H	H	H	M	
CO2	L	L	H	M	M	H				M	M	H	M	M	
CO3	H	H	L	L	L	H				M	L	H	L	L	
CO4	M	M	L	M	L	M				M	M	H	M		
CO5	L	L	H	M	M	H				M	M	H	M	M	

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 1 : End poverty in all its forms everywhere.

Statement : AI Sector will produce new employment to peoples, thus providing them with salary and ending poverty.

		L	T	P	C
GEDX 122	**INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND EVOLUTIONARY COMPUTING**				
SDG: 4,8 &9		**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

COB1: To introduce students to the fundamental concepts, principles, and techniques in Artificial Intelligence (AI) and Evolutionary Computing.

COB2: To familiarize students with various AI algorithms, including evolutionary computing, machine learning, and natural language processing.

COB3: To provide students with a comprehensive understanding of problem-solving techniques and search algorithms in AI.

COB4: To explore the applications of AI and Evolutionary Computing in various domains such as robotics, computer vision, healthcare, and finance.

COB5: To foster an awareness of ethical considerations and societal impact associated with AI and Evolutionary Computing.

MODULE I INTRODUCTION TO ARTIFICIAL INTELLIGENCE 9

Introduction to the course and its objectives- History and evolution of artificial intelligence - Fundamental concepts in AI - Problem-solving techniques and search algorithms.

MODULE II EVOLUTIONARY COMPUTING 10

Introduction to evolutionary computing - Genetic algorithms - Genetic programming - Evolutionary strategies - Swarm intelligence.

MODULE III MACHINE LEARNING 10

Introduction to machine learning - Supervised learning algorithms (e.g., perceptron, feed forward neural networks) - Unsupervised learning algorithms (e.g., clustering, self-organizing maps) - Deep learning and neural networks - Reinforcement learning- Machine learning case studies using python.

MODULE IV NATURAL LANGUAGE PROCESSING 9

Introduction to natural language processing - Syntax and semantic analysis - Language models and text classification - Named entity recognition and sentiment analysis - Machine translation and language generation.

MODULE V ADVANCED TOPICS IN ARTIFICIAL INTELLIGENCE **7**

Computer vision and image recognition - Robotics and autonomous systems - Ethical considerations in AI - AI in healthcare and finance - Future trends in AI-Generative AI and Prompt Engineering.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig.Pearson, 4th edition (2020)
2. "Artificial Intelligence: Foundations of Computational Agents" by David L. Poole and Alan K. Mackworth, Cambridge University Press, 2nd edition (2017)

REFERENCES:

1. "Introduction to Evolutionary Computing" by Agoston E. Eiben and J. E. Smith, Springer, 3rd edition (2015)
2. "Evolutionary Algorithms: The Role of Mutation and Recombination" by David E. Goldberg, Springer, 1st edition (1989)
3. "Pattern Recognition and Machine Learning" by Christopher M. Bishop, Springer, 1st edition (2006)
4. "Deep Learning" by Ian Goodfellow, YoshuaBengio, and Aaron Courville, The MIT Press, 1st edition (2016)
5. "Speech and Language Processing" by Daniel Jurafsky and James H. Martin, Pearson, 3rd edition (2019)
6. "Foundations of Statistical Natural Language Processing" by Christopher D. Manning and HinrichSchütze, The MIT Press, 1st edition (1999)
7. "Computer Vision: Algorithms and Applications" by Richard Szeliski, Springer, 1st edition (2010)
8. "Robotics, Vision and Control: Fundamental Algorithms in MATLAB" by Peter Corke, Springer, 1st edition (2011).
9. "Ethics of Artificial Intelligence and Robotics" edited by Vincent C. Müller, Routledge, 1st edition (2020).

COURSE OUTCOMES:

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

CO1:apply the key concepts of Artificial Intelligence and Evolutionary Computing.

CO2:apply problem-solving techniques and search algorithms to solve AI-related problems.

CO3: implement and analyze different machine learning algorithms for classification, clustering, and regression tasks.
CO4: utilize evolutionary computing techniques, such as genetic algorithms, genetic programming, and evolutionary strategies, to optimization and design problems.
CO5: analyze the ethical implications of implementing AI technologies in various domains

Board of Studies (BoS) :
19thBoS of EEE conducted on 29.08.2023

Academic Council:
21st Academic Council held on 20.12.2023

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	M											M		
CO2				M	M	M				M			M		
CO3		H		H	M	M				M	M			M	
CO4				M	M									M	
CO5						H		H	H		H		H		

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 4: Quality Education
The course contributes to quality education by providing knowledge and understanding of artificial intelligence and evolutionary computing, enabling students to acquire the skills and competencies needed in the field.

SDG 8: Decent Work and Economic Growth
The course prepares students for the growing field of artificial intelligence and evolutionary computing, which has the potential to drive economic growth and create new job opportunities.

SDG 9: Industry, Innovation, and Infrastructure
The course focuses on innovative technologies and computational techniques that are essential for advancing industries and improving infrastructure.

GEDX 123	MOTOR VEHICLE ACTS AND LOSS ASSESSMENT	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: To understand the structures and function of transport authorities

COB2: To gain knowledge in penalty for offenses

COB3: To gain knowledge in vehicle insurance and policy

COB4: To understand the vehicle impact

COB5: To study the surveying procedure for insurance

MODULE I INTRODUCTION TO TRANSPORTATION AND TRANSPORT AUTHORITIES **9**

Functions of Transport Authorities - Key terms used in Motor Vehicle Act- Classification and anatomy of different classes of vehicle - Importance of Permit - Provisions regarding permit - Special Provisions for State Transport Undertakings (STUs)

MODULE II CONSTRUCTION, MAINTENANCE OFFENCES AND PENALTY FOR MOTOR VEHICLES **9**

Provisions regarding construction and maintenance of motor vehicles - Preparing rules for various mandatory components to be fitted in a vehicle. Manipulate the maximum limit for speed and weight - Reconstructing provisions for vehicles with left-handed driving vehicles - Planning the rules for driving motor vehicle keeping safety of passengers and occupants a public places - Outlining the punishments for law-breakings.

MODULE III VEHICLE INSURANCE **9**

Purpose and need of Insurance- Role in economic development of the country - Insurance legislation and IRDA act - Market Structure - GIC Reinsurance company/ Tariff Advisory Committee - Principle of general insurance - Types of motor vehicle insurance - Types of motor vehicle policies - Zero Depreciation Policy -Terms and Conditions for motor vehicle insurance.

MODULE IV ANALYZING VEHICLE IMPACT **9**

Reasons of occurring of accidents - Effect on vehicle during impact from: Any One Side, Head on Collision, Vehicle Topple – underwriting an insurance form – risk assessment in given circumstances.

MODULE V SURVEYING AND INVESTIGATING MOTOR VEHICLE CLAIM 9

Surveyor - Licensing authority and controller of insurance - Role of surveyor and loss adjustor - Empanelment of surveyor- Intimation - Site visit - Garage visit – Photography - Estimate and claim form - Passing of estimate - Cost of parts - Cost of repairing – Labour - Checking of documents (Paper pertaining to vehicle) - Important aspects of survey - Various types of loss assessment - Preparation of survey reports and submission - Fraud claims - Connected to Packet Policy- MACT

L 45 ; TOTAL HOURS – 45

TEXT BOOKS:

1. R H Prajapati, Motor Vehicle Acts and Loss Assessment", Atul Prakashan Publications, 1st edition, 2016.

REFERENCES:

1. Hucho.W.H, "The Motor Vehicles Act, 1988 ", Universal/LexisNexis publications, 2021 edition.
2. G.S.Karkaras, "Assessment of Compensation in Accidents under Motor Vehicles Act", Delhi Law House publications, 2nd edition, 2013. (ISBN-13 :978-8186976708)
3. "The motor vehicles act, 1988", Asia law house Publishing, 17th edition, 2020. (ISBN-13 : 978-8186976708)
4. Janak Raj jai., "Motor accident claims law and procedure", Universal law publishing, 6th Edition, India, 2016.(ISBN-13 : 978-8186976708)
5. Kannan, Vijayaragavan, "Motor vehicle laws", 16th edition, 2019. (ISBN:0768082536)

COURSE OUTCOMES:

Students should able to

CO1: Paraphrase Motor Vehicle Acts.

CO2: Examine of Motor Vehicles for Safety and Pollution Control Engineering.

CO 3: Analyze the Penalties related with the Offences and their Procedures.

CO 4: Recognize the types of Motor Vehicle Insurance.

CO 5: Extrapolate the Duties and Responsibilities of Surveyor and Loss Assessor.

Board of Studies (BoS) :
14th Board of Studies of auto held on 22.08.2022

Academic Council:
19th Academic Council held on 29.09. 2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	H	L	L	L	L						L	H	H	H
CO2	H	L	L	L	L						L	H	H	H
CO3	H	L	L	L	L						L	H	H	H
CO4	H	L	L	L	L						L	H	H	H
CO5	H	L	L	L	L						L	H	H	H

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG No: 9

The motor vehicle act and the insurance policies are the topics that everyone must be aware of.

Statement : Better understanding of the insurance claim process is made accessible by having a thorough understanding of motor vehicle act and claim procedure.

GEDX 127	SOFT COMPUTING TECHNIQUES	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: To learn the basic concepts of Soft Computing

COB2: To become familiar with various techniques like neural networks, genetic algorithms and fuzzy systems

COB3: To apply soft computing techniques to solve problems.

COB4: To learn the basic concepts of genetic algorithms

COB5: To integrate soft computing techniques for complex problems.

MODULE I INTRODUCTION TO SOFT COMPUTING 9

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.

MODULE II ARTIFICIAL NEURAL NETWORKS 9

Back propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization -Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.

MODULE III FUZZY SYSTEMS 9

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations -Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.

MODULE IV GENETIC ALGORITHMS 9

Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction - Inheritance Operators - Cross Over - Inversion and Deletion Mutation Operator - Bit-wise Operators -Convergence of Genetic Algorithm.

MODULE V HYBRID SYSTEMS 9

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy ArtMap:

A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015.
2. S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt.Ltd., 2nd Edition, 2011.
3. S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt.Ltd., 2017.

REFERENCES:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani," Neuro-Fuzzy and Soft Computing", Prentice-Hall of India,ISBN-978-0132610667 2021.
2. Kwang H.Lee,-First course on Fuzzy Theory and Applications, Springer,
ISBN-3-540-22988-42020,2021.
3. Sujatha Dash," Advanced Soft Computing Techniques in Data Science,
IoT and Cloud Computing",Springer Nature- ISBN 3030756572,2021
4. Deepti Moyi Sahoo, Nisha Rani Mahato, and Snehashish Chakraverty "Concepts of Soft Computing: Fuzzy and ANN with Programming- Springer; ISBN-B07R6Z66LT,2020.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: Apply suitable soft computing techniques for various applications.

CO2: Integrate various soft computing techniques for complex problems.

CO3: Analyze various genetic and hybrid systems.

CO4: Compare different Fuzzy and Neural algorithms

CO5: To design various Neuron model systems.

Board of Studies (BoS) :
19th BoS of CSE held on 28.12.2021

Academic Council:
18th Academic Council Meeting held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1					L									H
CO2		H											L	
CO3								M						
CO4			L											
CO5		H								H				L

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement : By learning “Soft Computing” the students are able to develop methods to collaborate with fuzzy and Neural systems for various real time applications which leads to sustainable economic growth in turn providing productive employment.

GEDX 128	VALUE ANALYSIS AND ENGINEERING	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: To learn the basics of value engineering

COB2: To gain knowledge in value engineering job plan and process

COB3: To be conversant with orientation and information phases

COB4: To familiarize with the function analysis and creative phases

COB5: To acquire knowledge on evaluation and investigation

MODULE I VALUE ENGINEERING BASICS L: 12

Origin of value engineering - Definition of value engineering and value analysis - Benefits of value engineering– Problem recognition –Level of value engineering in organization –Value engineering activity - Difference between value engineering and value analysis - Types of value function - Basic and secondary functions - Creativity aspects in value engineering and analysis.

MODULE II VALUE ENGINEERING JOB PLAN AND PROCESS L: 7

Seven phases of job plan - FAST diagram - Behavioural and organizational aspects of value engineering - Principles of value analysis - Requirement of value engineering - Role of value analysis in engineering applications.

MODULE III ORIENTATION AND INFORMATION PHASES L:8

Launch of value engineering project works – Selection and evaluation of value engineering projects - Objectives and targets – Value engineering project work- Time-bound programme – Projects scheduling and teams - Time schedule - Technical data - Marketing related information - Competition profile - Cost data - Materials Management related information - Quality and reliability related information - Manufacturing data.

MODULE IV FUNCTION ANALYSIS AND CREATIVE PHASES L:11

Objectives - Function definition –Anatomy of the function – Approach and evaluation of function - Classification of functions - Higher level functions –Value gap - Value index - Cost Modelling -Progress in creativity - Promotion of creativity skills in firm- Obstacles in creativity - Mental road blocks - Creativity killer phrases - Positive thinking - Ideas stimulators - Creativity techniques - Brainstorming.

MODULE V EVALUATION AND INVESTIGATION L:7

Paired comparison and evaluation matrix techniques - Unique and quantitative evaluation of ideas - Criteria for comparison - Function analysis system technique - Criteria for selection of value engineering solutions - Design – Materials – Quality – Marketing – Manufacturing - Preview sessions.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Mudge, Arthu E, Value engineering – A systematic approach, Mc Graw Hill, 2000.
2. Kumar S, Singh R K and Jha J K (Ed), Value Engineering, Narosa publishing, 2005.

REFERENCES:

1. Park R J, Value Engineering: A plan for invention, St. Lucie press, 1999.
2. Heller D E, Value management, value engineering and cost reduction, Addison Wesley, 1988.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: Describe the basics of value engineering

CO2: Elucidate value engineering job plan and process

CO3: Explain the orientation and information phases

CO4: Illuminate function analysis and creative phases

CO5: Discuss the investigation and evaluation reports

Board of Studies (BoS):
20th BOS of Mech held on 08.08.2022

Academic Council:
19th Academic Council held on 29.09. 2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	L							L			L	L	L
CO2	M	L	H						L			L	L	L
CO3	M	L							L			L	L	L
CO4	M	L			H				L			L	L	L
CO5	M	L				M			L	H		L	L	L

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Holistic understanding of value engineering helps to identify and eliminate unwanted costs and improve function and quality.

GEDX 129	VEHICLE MAINTENANCE	L	T	P	C
SDG: 9		3	0	0	3

COURSE OBJECTIVES:

COB1: To know about the various methods of maintaining procedure, vehicle insurance and basic problems in a vehicle.

COB2: The student able to impart knowledge in maintaining of engine components and subsystems.

COB3: The student able to impart knowledge in maintaining of transmission, driveline, steering, suspension, braking and wheels.

COB4: The student able to impart knowledge in maintaining of steering, suspension, braking and wheels.

COB5: The student able to impart carefully maintaining their vehicle wiring and air conditioning systems.

MODULE I MAINTENANCE, WORKSHOP PRACTICES, SAFETY AND TOOLS **8**

Maintenance – Need, importance, primary and secondary functions, policies - classification of maintenance work - vehicle insurance - basic problem diagnosis. Automotive service procedures – workshop operations – workshop manual – vehicle identification. Safety – Personnel, machines and equipment, vehicles, fire safety - First aid. Basic tools – special service tools – measuring instruments – condition checking of seals, gaskets and sealants. Scheduled maintenance services – service intervals - Towing and recovering.

MODULE II ENGINE AND ENGINE SUBSYSTEM MAINTENANCE **8**

General Engine service- Dismantling of Engine components- Engine repair-working on the underside, front, top, ancillaries- Service of basic engine parts, cooling and lubricating system, fuel system, Intake and Exhaust system, electrical system - Electronic fuel injection and engine management service - fault diagnosis- servicing emission controls.

MODULE III TRANSMISSION AND DRIVELINE MAINTENANCE **8**

Clutch- general checks, adjustment and service- Dismantling, identifying, checking and reassembling transmission, transaxle- road testing- Removing and replacing propeller shaft, servicing of cross and yoke joint and constant velocity joints- Rear axle service points- removing axle shaft and bearings-servicing differential assemblies- fault diagnosis.

MODULE IV STEERING, SUSPENSION, BRAKE AND WHEEL MAINTENANCE **12**

Maintenance and Service of Mc person strut, coil spring, leaf spring, shock absorbers. Dismantling and assembly procedures. Inspection, Maintenance and Service of steering linkage, steering column, Rack and pinion steering, Recirculating ball steering service- Worm type steering, and power steering system.

Inspection, Maintenance and Service of Hydraulic brake, Drum brake, Disc brake, parking brake. Bleeding of brakes. Wheel alignment and balance, removing and fitting of tyres, tyre wear and tyre rotation.

MODULE V AUTO ELECTRICAL AND AIR CONDITIONING MAINTENANCE **9**

Maintenance of batteries, starting system, charging system and body electrical -Fault diagnosis using Scan tools. Maintenance of air conditioning parts like compressor, condenser, expansion valve, evaporator - Replacement of hoses- Leak detection- AC Charging- Fault diagnosis Vehicle body repair like panel beating, tinkering, soldering, polishing, painting.

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Panchal, Dhruv U., et al. Vehicle Maintenance and Garage Practice. India, PHI Learning, 2014.
2. Denton, Tom. Advanced Automotive Fault Diagnosis. N.p., Taylor & Francis, 2006.

REFERENCES:

1. Bonnick, Allan, and Newbold, Derek. A Practical Approach to Motor Vehicle Engineering and Maintenance. United States, CRC Press, 2011.
2. VanGelder, Kirk T. Automotive Engine Repair. United States, Jones & Bartlett Learning, 2017.

COURSE OUTCOMES:

students can able to

CO1: Prepare maintenance schedules and procedures with appropriate tools.

CO2: Demonstrate the procedure and methods to repair and calibrate the engine.

CO3: Analyse the causes and remedies for fault in transmission and drive line

systems.

CO4: Analyse the causes and remedies of steering, suspension systems, brake and wheel.

CO5: Demonstrate the procedure for maintenance in wiring and air conditioning systems.

Board of Studies (BoS) :
14th BOS of Auto held on 22.08.2022

Academic Council:
19th Academic Council held on 29.09. 2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO 12	PSO 1	PS O2
CO1	H	H	H							H		H	H	H
CO2 H	H	H	H							H		H	H	H
CO3	H	H	H							H		H	H	H
CO4	H	H	H							H		H	H	H
CO5	H	H	H							H		H	H	H

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG No. 9 : Sustainable development in the transport

Statement: Improve the durability and maintenance of vehicles.