



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*  
*(Updated as per 24<sup>th</sup> Academic Council*  
*- August 2025)*

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**B.Tech. Programmes**



## **REGULATIONS 2021**

### **OPEN ELECTIVE COURSES & SYLLABI**

**FOR**

**B.TECH. PROGRAMMES**

**(updated as per 24<sup>th</sup> Academic Council – August 2025)**

**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 203	Big Data Analytics	3	0	0	3	CA
4.	GEDX 204	Biology for Engineers	3	0	0	3	SLS
5.	GEDX 205	Consumer Electronics	3	0	0	3	ECE
6.	GEDX 206	Creative Writing	2	1	0	3	English
7.	GEDX 207	Cyber Forensics	3	0	0	3	CSE
8.	GEDX 208	Cyber Security	3	0	0	3	IT
9.	GEDX 209	Disaster Management	3	0	0	3	Civil
10.	GEDX 210	English for Competitive Examination	2	1	0	3	English
11.	GEDX 211	Enterprise Risk Management	3	0	0	3	CSB
12.	GEDX 212	Fundamentals of Project Management	3	0	0	3	CSB
13.	GEDX 213	Industrial Robotics	2	0	2	3	Mech.
14.	GEDX 214	Internet of Things and its Applications	3	0	0	3	ECE
15.	GEDX 215	Introduction to Health Care Analytics	3	0	0	3	CA
16.	GEDX 216	IPR and Patent Laws	3	0	0	3	CSB
17.	GEDX 217	Logistics and Supply Chain Management	3	0	0	3	CSB
18.	GEDX 218	Nano Materials and Technology	2	0	2	3	Physics
19.	GEDX 220	Optimization Techniques	3	0	0	3	Maths
20.	GEDX 221	Polymers for Different Transportation	3	0	0	3	Polymer
21.	GEDX 222	Programming Language Principles	3	0	0	3	CSE
22.	GEDX 223	Public Speaking and Rhetoric	2	1	0	3	English
23.	GEDX 224	Python Programming	2	0	2	3	IT
24.	GEDX 226	Smart Sensors for Healthcare Applications	3	0	0	3	EIE

25.	GEDX 227	Total Quality Management	3	0	0	3	Mech.
26.	GEDX 228	Value Education	3	0	0	3	Commerce
27.	GEDX 229	Waste Water Management	3	0	0	3	Civil
28.	GEDX 231	Electronics for Mechanical Systems	3	0	0	3	ECE
29.	GEDX 232	Renewable Energy Engineering					EEE
30.	GEDX 233	Nuclear Hazard and Disarmament	3	0	0	3	Physics
31.	GEDX 235	Remote Sensing Essentials	3	0	0	3	Civil
32.	GEDX 236	Water and Waste Water Treatment	3	0	0	3	Civil
33.	GEDX 237	Cryptography and Network Security	3	0	0	3	IT
34.	GEDX 238	Matalb Programming	3	0	0	3	EIE
35.	GEDX 239	Introduction to Ancient Indian Technology	3	0	0	3	Auto
36.	GEDX 240	Advertising and Promotion Management	3	0	0	3	CBS

**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 106	Cloud Services and Management	3	0	0	3	CA
6.	GEDX 108	Cyber Law and Ethics	3	0	0	3	CSL
7.	GEDX 110	Deep Learning Essentials /	3	0	0	3	CSE
8.	GEDX 111	Drone Technologies	2	0	2	3	Aero
9.	GEDX 112	Electric Vehicle	3	0	0	3	EEE
10.	GEDX 113	Emerging Technologies in Mobile Networks	3	0	0	3	ECE
11.	GEDX 114	Fundamentals of Data Science and Machine Learning	3	0	0	3	IT

12.	GEDX 115	Genetic Engineering	3	0	0	3	SLS
13.	GEDX 116	Green Design and Sustainability	3	0	0	3	Civil
14.	GEDX 117	Image Processing and its Applications	3	0	0	3	ECE
15.	GEDX 118	Industrial Automation and Control	3	0	0	3	EIE
16.	GEDX 119	Industrial Safety	3	0	0	3	Mech.
17.	GEDX 120	Industry 4.0	3	0	0	3	Mech.
18.	GEDX 121	Introduction to Artificial Intelligence	3	0	0	3	IT
19.	GEDX 122	Introduction to Artificial Intelligence and Evolutionary Computing	3	0	0	3	CSE
20.	GEDX 123	Motor Vehicle Act and Loss Assessment	3	0	0	3	Automobile
21.	GEDX 126	Personal Finance and Investment	3	0	0	3	Commerce
22.	GEDX 127	Soft Computing Techniques	3	0	0	3	CSE
23.	GEDX 128	Value Analysis and Engineering	3	0	0	3	Mech.
24.	GEDX 129	Vehicle Maintenance	3	0	0	3	Automobile
25.	GEDX 130	Graphical Programming Based System Design	3	0	0	3	ECE
26.	GEDX 131	Business to Business Marketing	3	0	0	3	CSB
27.	GEDX 132	Introduction to Marketing Essentials	3	0	0	3	CSB
28.	GEDX 133	E – Business	3	0	0	3	CSB
29.	GEDX 135	Municipal Solid Waste Management	3	0	0	3	Civil
30.	GEDX 136	Automation in Production Systems and Management	3	0	0	3	Automobile

31.	GEDX 137	Dairy and food process and products	3	0	0	3	SLS
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**GEDX 201 APPLICATIONS OF FLUID MECHANICS L T P C**  
**SDG: 9 IN EVERY DAY LIFE 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) :**

17<sup>th</sup> BoS of aero held on  
03.02.2023

**Academic Council:**

21<sup>st</sup> Academic Council held on  
20.12.2023

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

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

### **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) :**

15<sup>th</sup> BoS of CSB held on  
15.09.2023

#### **Academic Council:**

21<sup>st</sup> 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
<b>CO1</b>									H	M					
<b>CO2</b>									M	L		L			
<b>CO3</b>									H	H	M				
<b>CO4</b>									M	L		L			
<b>CO5</b>									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.

## **COURSE OBJECTIVES:**

## **COB1: Provide the overview of Big Data technology.**

**COB2:** Understand the big data framework, components of Hadoop and configuration requirements.

## COB3: Familiarize to map reduce analytics in Hadoop and working principle of YARN.

**COB4:** Provide training to configure Google Colab for Machine learning algorithm implementation.

**COB5:** Implement skills to solve complex real-world problems in for decision support.

## MODULE I      INTRODUCTION

9

Big Data: Evolution - Characteristics- Need – Significance- Sources-Types of data -  
Big Data analytics-Traditional Approach Vs Big Data Technology –Data model-  
Data discovery-Analytical components and its types - Big data applications.

MODULE II HADOOP ARCHITECTURE AND ECOSYSTEM

9

Apache Hadoop and Ecosystem – History and Milestone–Core Components, Design of Hadoop distributed file system - Data Flow - Fault Tolerance – Java API – Daemons in Hadoop cluster: Name Node –Secondary Name Node - JobTracker –Task Tracker and Data Node–Configuration.

## MODULE III MAPREDUCE AND YARN

9

MapReduce workflows – unit tests with MR Unit test data and local tests –anatomy of MapReduce -Job run – Classic MapReduce- Job scheduling –shuffle and sort – Task execution – MapReduce types input formats –Output form-YARN – Failures in classic MapReduce and YARN.

MODULE IV IMPLEMENTATION USING COLAB

9

Introduction to Google Colab - Setting Up Google Colab Environment - Working with Notebooks - First ColabNotebook - Collaborative Features–Saving Your Work - Using Python Libraries and Packages - Data Handling and Visualization – Installing ML Libraries-Integration with Google Services - Accessing data from Google Drive - Using Google Cloud Platform services within Colab –Install and

configure Hadoop, set working directory and various processes - Import dataset in GoogleColab.

**MODULE V USE CASES ,VISUALIZATION AND CASE STUDIES 9**

Big Data visualization tools: D3, Kibana, Grafana, Scala, Python for Data Visualization, Open source on Microsoft Azure: Spark, Hive, Hbase - Big Data Analytics in E-Governance & Society, Applications in Science, Engineering, Healthcare, Visualization, Business etc. Case studies.

**L – 45 ; TOTAL HOURS – 45**

**TEXT BOOKS:**

1. Big Data and Analytics: The key concepts and practical applications of big data analytics by Jugnesh Kumar, Anubhav Kumar, Rinku Kumar, BPB Publication,2024.
2. Seema Acharya, Subhashini Chellappan, Big Data and Analytics Wiley Publication, 2019.
3. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services, 2015.
4. Big Data, Black Book: Covers Hadoop 2, Map Reduce, Hive,YARN, Pig, Rand Data Visualization, DT Editorial Services,2016.

**REFERENCES:**

1. Big Data Analytics: Introduction to Hadoop, Spark, and Machine-Learning by [Raj Kamal , PreetiSaxena](#), 2019.
2. Big Data Analytics, 2<sup>nd</sup> edition by [Radha Shankarmani , M. Vijayalakshmi](#), Wiley Publication, 2016.

**COURSE OUTCOMES:** After completing this course, students will be able to

**CO1:** Summarize the concepts and principles underlying big data analytics.

**CO2:** Analyze exclusive Hadoop framework for the undertaken project.

**CO3:** Implement the map-reduce analytics using Hadoop.

**CO4:**Configure and Implement Machine Learning in Google Colab

**CO5:**Build Data visualization models and Analytics in Big data environment.

**Board of Studies (BoS) :**

20<sup>th</sup>BoS of CA held on 17.05.2024

**Academic Council:**

22<sup>nd</sup> Academic Council held on  
04.09.2024

	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	H												
CO2			H											
CO3					M									
CO4					H								H	
CO5														H

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

**Statement:** The learner would be able to design and provide predictive analytical solutions with much more accuracy level after incorporating big data analytics and apply in the socially relevant environment related weather condition prediction problems, health care predictive analytical solutions for the society and energy analytics for building SMART cities.

<b>GEDX 204</b>	<b>BIOLOGY FOR ENGINEERS</b>	<b>L T P C</b>
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<b>SDG: 3, 15</b>	<b>3 0 0 3</b>
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**COURSE OBJECTIVES:**

**COB1:** To provide an overview of cell structure and function.

**COB2:** To give basic idea on biochemistry related to biological aspects.

**COB3:** To introduce genes, their structure, inheritance and about living organisms.

**COB4:** To learn the basics of Microbiology and its classification.

**COB5:** To inform students of engineering about the interface of biology and engineering.

**MODULE I      BASICS OF CELL STRUCTURE AND FUNCTION      7**

Cells as unit of life – basic chemistry of cell – physical and chemical principles involved in maintenance of life processes, cell structure and functions Prokaryotic and Eukaryotic cells, cell wall, plasma membrane, endoplasmic reticulum, nucleus, chromosomes- cell division – mitosis, meiosis – molecules controlling cell cycle.

**MODULE II      BIOCHEMISTRY      10**

Biomolecules – introduction – basic principles of organic chemistry, types of functional groups, chemical nature, pH and biological buffers – carbohydratesmono, di, oligo and polysaccharides, lipids- phospholipids, glycolipids, sphingolipids, cholesterol, steroids, prostaglandins – aminoacids, peptides, proteins – structures- primary, secondary, tertiary and quaternary, glycoproteins, lipoproteins – Nucleic acids – purines, pyrimidines, nucleoside, nucleotide, RNA, DNA.

**MODULE III      GENETICS      9**

Genes – structure and functions – behavior, dominance and epigenetics, evolution – inheritance – reproduction and gene distribution – genome of living organisms – plants – bacteria and viruses – animals – humans, genetic engineering.

**MODULE IV      MICROBIOLOGY      10**

Microbiology – basis of microbial existence – microbial diversity – classification and nomenclature of micro-organisms- impact of microorganisms on industry,

agriculture and health, industrial microbiology – primary and secondary screening of micro-organisms, fermentation processes, bioreactors, microbial ecology – microbial bio-remediation – epidemiology and public health. .

**MODULE V     BIOLOGY AND ENGINEERS**
**9**

Application of biology in engineering– living things as the solutions (bionics) living things as models (biometrics) – bio-technology – biomedical engineering– effect of human action on living things – right balance – bioinformatics bionanotechnology – sensors, biosensors, biochips-ethics in biology.

**L – 45; TOTAL HOURS –45**
**TEXT BOOKS:**

1. Johnson, Arthur T., Biology for Engineers, CRC Press, FL, 2011.
2. Campbell and Recee, Biology, Pearson, Benjamin Cummins Pub. 8th edition, 2008.
3. Scott Freeman, Biological Sciences, Printice Hall, 2002.

**COURSE OUTCOMES:**

**CO1:** Able to understand the engineering of life processes.

**CO2:** Apply the cell structures and its genetics in engineering aspects.

**CO3:** Able to apply the knowledge of biology for engineering applications.

**CO4:** Evaluate the knowledge of microbiology in real life

**CO5:** Analyse the interface of biology and engineering

**Board of Studies (BoS) :**

8<sup>th</sup>BoS of SLS held on 5.07.2021

**Academic Council:**

18<sup>th</sup> AC 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	PSO 3
<b>CO1</b>	H	L	-	L	-	-	L	L	-	L	-	L	H	H	H
<b>CO2</b>	H	L	-	L	-	-	L	L	-	L	-	L	H	H	H
<b>CO3</b>	H	L	-	L	-	-	L	L	-	L	-	L	H	H	H
<b>CO4</b>	H	L	-	M	-	-	M	L	-	M	-	L	H	H	H
<b>CO5</b>	H	L	-	H	-	-	H	L	-	H	-	L	H	H	H

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

**SDG 3. Good Health and Well Being Statement:** Understanding of the fundamentals of rDNA technology we can modify the live organisms that can help in maintains systems to promote good health and well being.

<b>GEDX 205</b>	<b>CONSUMER ELECTRONICS</b>	<b>L T P C</b>
<b>SDG: 4,9</b>		<b>3 0 0 3</b>

### **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 Clot 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, 2<sup>nd</sup> edition, 2010.
4. Whitaker Jerry & Benson Blair, Mastering Digital Television: The Complete Guide to the DTV Conversion, McGraw-Hill Professional, 5<sup>th</sup> edition, 2006.
5. Whitaker Jerry & Benson Blair, Standard handbook of Audio engineering, McGraw-Hill Professional, 2<sup>nd</sup> 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) :**

23<sup>rd</sup> BoS of ECE held on  
13.07.2022

**Academic Council:**

19<sup>th</sup> Academic Council held on  
29.09. 2022

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

## **COURSE OBJECTIVES:**

**COB1:** Explore the creative process through writing about varied techniques of fiction, non-fiction & poetry

**COB2:** Learn how to critique (and be critiqued) constructively.

MODULE I INTRODUCTION CREATIVE FORMS OF WRITING 6+3

## Genre Writing (Mystery, Science Fiction, Fantasy, Romance) - Qualities of Great Writing - Aspects of Drama - Short Fiction

## MODULE II EXPLORING THE CREATIVE PROCESS THROUGH POETRY 6+3

## There Is No Word" - Tony Hoagland

## “Adolescence II” - Rita Dove

## “Wild Geese” - Mary Oliver

## "The Deep-Sea Cables" - Rudyard Kipling

"Next to of course God" - E.E Cummings

## "Mother to Son" - Langston Hughes

## MODULE III EXPLORING THE CREATIVE PROCESS THROUGH FICTION 6+3

## “Kindred” - Octavia Butler

## “Beloved” - Toni Morrison

## “One for the Road” - Harold Pinter

## “The Hanging Garden” - Patrick White

MODULE IV REVIEWING CREATIVE WRITING 6+3

## Autobiographical Writing: Virginia Woolf excerpt from “Moments of Being”

## Critic Writing: Critiquing pieces by professional writers - Critiquing pieces by fellow writers

## Travel Writing: Writing for journals/articles - Reviewing books and movies

MODULE V CREATIVE WRITING FOR DIGITAL MEDIA 6+3

## Digital Storytelling: Graphic Novels “Brazen: Rebel Ladies Who Rocked the World” by Penelope Bagieu and Fred Fordham

Writing for Media (Radio, Television), Writing for social media - Memes development  
- Creation of memes - Spread and virality of memes –Internet Phenomena  
Blogs: The Art of Blogging: Learning How to Write and Think in the Age of Self-Publishing

**L-30, T-15;Total Hours - 45**

**TEXTBOOKS:**

1. Creative Writing: How to Develop Successful Writing Skills for Fiction and Non-Fiction Publication
2. Writing for Media Wendy Bowler - La Trobe University, Media & Cinema Studies Program, 2000.

**REFERENCES:**

1. Creative Writing, Judy McGraw – Macmillan
2. The World of Memes e-text (2017) by Leroy Jenkins
3. Johnson, Burges, and Syracuse University. "Creative Writing",
4. Creative Writing - UEA". www.uea.ac.uk. Archived from the original on 2014-05-22. Retrieved 2014-05-14.Creative Writing Guide - The University of Vermont
5. Writing in the disciplines: Creative Writing - Kelsey Shields, Writing Center, University of Richmond

**COURSE OUTCOMES:**

At the end of the semester the students will be able to

**CO1:** understand the depth of thought necessary for effective writing

**CO2:** employ the concepts of literature to analyze the mentor texts of selected authors to craft original stories, poems, and plays

**CO3:** examine how texts function across a range of genres, contexts, and cultures.

**CO4:** use strategies such as free-writing, clustering, and collaborative dialogue to develop original works in poetic and prose forms.

**CO5:** write creatively on any genre for publication in print or digital media.

**Board of Studies (BoS) :**

14<sup>th</sup> BoS of the Department of English  
held on 07.12.2021

**Academic Council:**

18<sup>th</sup> AC held on 24.02.2022

**SDG 4:** To ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

**Statement:** The course equips students to appreciate the beauty of great literature and learn what it has to teach. It also teaches to use literature to critique society from a certain political standpoint.



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 Getting Started in Digital Forensics", Elsevier, 2nd Edition, ISBN: 9781597496612, 2014
3. Nina Godbole, Sunlit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley, 2011.
4. Chuck Easttom, "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 Forensics", 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) :**

: 16<sup>th</sup> BoS of IT held on 18.8.2022

**Academic Council:**

19<sup>th</sup> 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.

<b>GEDX 209</b>	<b>DISASTER MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 3,11,13 &amp; 15</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **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.

<b>MODULE IV</b>	<b>NATURAL DISASTER REDUCTION &amp; MANAGEMENT</b>	<b>10</b>
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.		

  

<b>MODULE V</b>	<b>ENVIRONMENTAL POLICIES &amp; PROGRAMMES IN INDIA</b>	<b>9</b>
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) :**

18<sup>th</sup> BoS of CE held on

05.04.2023

**Academic Council:**

20<sup>th</sup> 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
<b>CO1</b>	L	-	M	-	-	M	L	-	-	-	-	-	L	-	M
<b>CO2</b>	L	-	M	-	-	M	L	-	-	-	-	-	L	-	M
<b>CO3</b>	L	-	M	-	-	M	L	-	-	-	-	-	L	-	M
<b>CO4</b>	L	-	M	-	M	M	L	L	H	-	-	-	L	-	M
<b>CO5</b>	-	-	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.

<b>GEDX 210</b>	<b>ENGLISH FOR COMPETITIVE EXAMINATION</b>	<b>L T P C</b>
<b>SDG: 4</b>		<b>2 1 0 3</b>

**COURSE OBJECTIVES:**

**COB1:** To demonstrate the range of vocabulary and communicate effectively using grammatically correct language.

**COB2:** To exhibit the effective use of the four skills of communication

**COB3:** To help students learn how to write business letter, SWOT, & resume

**COB4:** To practice and develop critical thinking, discussion, speak publically, Interview Skills and analysis skills through application of course concepts to a diversity of rhetorical artifacts

**COB5:** To expose students to general knowledge & current affairs

**MODULE I DETECTING USAGE ERRORS 5+2**

Articles and Preposition  
Linking words  
Phrases and Clauses  
Subject-Verb agreement  
Tag Questions  
Tense  
Reported Speech  
Active and Passive  
Sentence Completion

**MODULE II READING 6+2**

Comprehension  
Transcoding a given chart, Table or Statistics into a report  
Business Letter  
Email writing  
Dialogue Writing (Situational)

**MODULE III WRITING 6+3**

Expansion of Proverbs  
Idiomatic Expressions  
Essay Writing  
SWOT & Resume

**MODULE IV SPEAKING 7+4**

## Pronunciation, Stress & Intonation

## Fluency

## Etiquette

## Group Discussion Skills

## Public Speaking Skills

## Interview Skills

MODULE V GENERAL KNOWLEDGE & CURRENT AFFAIRS 6+4

General Knowledge: UNO, Countries and Capitals, Currencies, Current Affairs; National Issues, International Developments, Social Issues, and Systems of Government

**L - 30, T-15; TOTAL HOURS – 45**

## TEXT BOOKS:

1. Crystal, David. *Language and the Internet*. University of Wales, Bangor, 2006.
2. Gangal, J.K. *Competitive English for Professional Courses*, S. Chand Publications. 2008.
3. Hashem, Abdul. '*Interview Manual – Interview Techniques and Model Interviews*'. Ramesh Publishing House, 12- H, New Daryaganj Road, New Delhi – 110 002.
4. Kishore, B.R. '*Group Discussion*'. Vee Kumar Publications Pvt. Ltd., 507, Vikram Towers, Rajendra Place, New Delhi – 110 008.
5. Sijwal, B.S and Indu Sijwal '*The art and Techniques of Interviews*'. Arihant Publications, Kalindi Transport Nagar, Meerut -2 (U.P) – 250 003.
6. Thompson, Walter. '*Better speeches made easy*'. W.R Goyal Publishers and Distributors, 86, UB Jawahar Nagar, Delhi–110 007.

## **COURSE OUTCOMES:**

## CO1: Use vocabulary and grammatical expressions effectively

## CO2: Use the four skills of the language

### CO3: Write business letter, SWOT & resume effectively

**CO4:** Think critically, take part in discussion, speak publically in an effective manner, use interview skills and analysis skills,

## **CO5: Use general knowledge & the knowledge of current affairs**

## **Board of Studies (BoS) :**

## 14<sup>th</sup> BoS of the Department of English held on 07.12.2021

## Academic Council:

18<sup>th</sup> AC held on 24.02.2022

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

**Statement:** This course offers knowledge of the usage of vocabulary, grammatical expressions, four skills of the language and enable the learners to think critically.

<b>GEDX 211</b>	<b>ENTERPRISE RISK MANAGEMENT</b>	<b>L    T    P    C</b>
<b>SDG: 9</b>		<b>3    0    0    3</b>

### **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 7 MANAGEMENT (ERM)**

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 10 ANALYSIS**

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 11**

### **ADMINISTRATION**

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, 1<sup>st</sup> edition, Singapore, 2019.

#### **REFERENCES:**

3. Alka Mittal, Gupta S.L. "Principles of Insurance and Risk Management", Sultan Chand and Sons, 2010.
4. James T.Gleason, "Risk; The New Management Imperative in Finance", Jaico Publishing 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) :**

15<sup>th</sup> BoS of CSB held on  
15.09.2023

#### **Academic Council:**

21<sup>st</sup> 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.

<b>GEDX 212</b>	<b>FUNDAMENTALS OF PROJECT MANAGEMENT</b>	<b>L T P C</b>
<b>SDG: 12</b>		<b>3 0 0 3</b>

**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, 8<sup>th</sup> Edition, McGraw Hill, 2021

**REFERENCES:**

1. Schwalbe, K., "Information Technology Project Management", 9<sup>th</sup> Edition, Course Technology Inc., London, 2018.
2. Hughes, B. and Cotterrel, M., "Software Project Management", 1<sup>st</sup> 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) :**

15<sup>th</sup> BoS of CSB held on  
15.09.2023

**Academic Council:**

21<sup>st</sup> Academic Council held on  
20.12.2023

	PO1	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.

<b>GEDX 213</b>	<b>INDUSTRIAL ROBOTICS</b>	<b>L T P C</b>
<b>SDG: 9</b>		<b>2 0 2 3</b>

**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 14<sup>th</sup> 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):**

20<sup>th</sup> BOS held on 08.08.2022

**Academic Council:**

19<sup>th</sup> 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.

<b>GEDX 214</b>	<b>INTERNET OF THINGS AND ITS APPLICATIONS</b>	<b>L T P C</b>
<b>SDG: 4,9</b>		<b>3 0 0 3</b>

### **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) :**

23<sup>rd</sup> BoS of ECE held on  
13.07.2022

**Academic Council:**

19<sup>th</sup> 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.

<b>GEDX 215</b>	<b>INTRODUCTION TO HEALTHCARE ANALYTICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES:**

- COB1:** Understand fundamentals of the healthcare analytics
- COB2:** Learn about the norms and policies governing healthcare.
- COB3:** Explore how analytics are used in healthcare.
- COB4:** Acquire forecasting skills inside the healthcare system.
- COB5:** Apply analytics in healthcare applications

### **MODULE I INTRODUCTION** **9**

History- Need - Role of healthcare analytics – Electronic Health Record (EHR/EMR): coding system, Key drivers for healthcare transformation- data analysis process in healthcare- healthcare quality and value- benefits and challenges.

### **MODULE II HEALTHCARE STANDARDS** **9**

Healthcare delivery and finance policy -industry basics -- protection of patient privacy and patient rights - adoption of electronic medical records - promoting value-based care - advanced analytics in healthcare - patient data – Journey from patient to computer.

### **MODULE III TYPES OF HEALTHCARE ANALYTICS** **9**

Introduction – types of analytics - descriptive analytics - diagnostic analytics -predictive analytics – prescriptive analytics – analytics in healthcare applications.

### **MODULE IV HEALTHCARE ANALYTICS USING MACHINE LEARNING TECHNIQUES** **9**

Model frameworks for health care support system - Reasoning: probabilistic reasoning and Bayes theorem - Machine learning algorithm: logistic regression – simple linear regression- multiple linear regression - random forest –decision trees - Naive Bayes Classifier -support vector machine -K-Nearest Neighbors.

### **MODULE V CASE STUDIES IN HEALTHCARE ANALYTICS** **9**

Emerging Technologies - Healthcare and deep learning - obstacles - ethical issues and limitations - Case Study: smart ambulance system using IOT - Hospital Acquired

Conditions - ECG Data Analysis – fraud detection in healthcare claims – remote patient monitoring and telemedicine.

**L – 45 ; TOTAL HOURS – 45**

**TEXT BOOK:**

1. Chandan K. Reddy, Charu C. Aggarwal., “Healthcare Data Analytics”, CRCPress, ISBN : 036757568X , 2020.

**REFERENCES:**

1. Pantea, “Big Data Analytics for Healthcare”, Elsevier Science, ISBN: 9780323985161, 2022.
2. Kulkarni, Siarry, Singh, Abraham, Zhang, Zomaya, Baki, “Big Data Analytics in HealthCare”, Springer, 2020..

**COURSE OUTCOMES:**

**CO1:** Evaluate the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications.

**CO2:** Understand the healthcare standards and policies

**CO3:** Classify various types of analytics used in healthcare system.

**CO4:** Apply analytics in healthcare systems for effective predictions.

**CO5:** Design emergency care system using health data analysis.

**Board of Studies (BoS) :**

20<sup>th</sup>BoS of CA held on 17.05.2024

**Academic Council:**

22<sup>nd</sup> Academic Council held on 04.09.2024

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO1 1	PO 12	PSO1	PSO 2
CO1		M											M	
CO2				L										
CO3					H									H
CO4					H							H	M	
CO5				H										M

**SDG 9**

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

By learning this course, the student may be able to learn about the challenges and opportunities in healthcare data analysis and identify solutions to clinical problems.

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 characteristics that are patentable 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) :**

15<sup>th</sup> BoS of CSB held on  
15.09.2023

**Academic Council:**

21<sup>st</sup> 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

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

### **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      11 MANAGEMENT**

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:**

5. Vinod V. Sopole., "Logistics Management", 3rd Edition, Pearson Education, New Delhi, 2012.
6. Sharma S., "Supply Chain Management: Concept, Practices and Implementation", Oxford University Press, New Delhi, 2010.
7. Martin Christopher, "Logistics & Supply Chain Management", 9th Edition, 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) :**

15<sup>th</sup> BoS of CSB held on  
15.09.2023

**Academic Council:**

21<sup>st</sup> 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.

<b>GEDX 218</b>	<b>NANO MATERIALS AND TECHNOLOGY</b>	<b>L T P C</b>
		<b>2 0 2 3</b>

**COURSE OBJECTIVES:**

**COB1:** To acquire basic knowledge about the nanomaterials and applications.

**COB2:** To learn about the imaging techniques of nanomaterials.

**COB3:** To gain the basic concepts of fabrication techniques.

**COB4:** To enable the students to correlate theoretical principles with practical applications.

**MODULE I NANOMATERIALS AND APPLICATIONS 10**

Properties of nanomaterials optical and magnetic properties size effect on thermal, electrical, electronic, mechanical, quantum confinement classification of nanomaterials. quantum well, quantum wire, quantum dot- nanoporous materials- zeolite, mesoporous materials, carbon nanotubes, graphene-nanocomposites applications (qualitative): Molecular electronics- nanoelectronics - nanophotonics single electron transistor-drug delivery.

**MODULE II SYNTHESIS AND IMAGING TECHNIQUES 12**

Top-down and bottom up approaches mechanical alloying and mechanical ball milling-sol- gel approach-hydrothermal method-precipitation method-spray pyrolysis-spin coating-self assembled monolayer (SAM)-Chemical vapour deposition method Physical vapour deposition method: laser ablation method, sputtering method, Molecular beam epitaxy - Optical microscopy - Phase contrast and interference microscopy confocal microscopy- XRD - High resolution Scanning electron microscope (HRSEM)- High resolution Transmission electron microscope (HRTEM) - Atomic force microscope - Scanning Tunnelling microscope (STM) – Dynamic light scattering – UV-Vis Spectroscopy.

**MODULE III NANOFABRICATION 8**

Photolithography - electron beam lithography - X-ray and Ion beam lithography- nanoimprint lithography - soft lithography - nanoelectromechanical systems (NEMS) – Applications of NEMS - nanoindentation principles.

**NANOMATERIALS LABORATORY**

1. Synthesis of nanomaterials by sol-gel method.
2. Synthesis of nanomaterials by chemical reduction method.
3. Synthesis of nano thin films by spray pyrolysis method
4. Synthesis of thin films by spin coating.
5. Determination of dielectric constant of the given materials.
6. Calculation of Bandgap from UV spectrum.
6. Phase confirmation by XRD.

**L-30, P-30, Total Hours - 60**

**REFERENCES:**

1. W.Gaddand, D.Brenner, S.Lysherski and G.J.Infrate(Eds.), Handbook of NanoScience, Engineering and Technology, CRC Press, 2002.
2. G. Cao, Nanostructures & Nanomaterials: Synthesis, Properties & Applications, Imperial College Press, 2004.
3. S. Yang and P.Shen, Physics and Chemistry of Nanostructured Materials, Taylor & Francis, 2000.
4. R.D. Piner, Dip-Pen Nanolithography, Science 283, 661, 1999.
5. Chris Mack, Fundamental Principles of Optical Lithography: The Science of Microfabrication, Wiley, 2008.

**COURSE OUTCOMES:**

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

**CO1:** understand the importance and basic concepts of the nanomaterials.

**CO2:** comprehend the imaging techniques for nanomaterials.

**CO3:** illustrate the various nanofabrication techniques.

**CO4:** complement the knowledge acquired in the theory class and correlate the results for applications.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	L	L	M	L	M	M	M	L	L	L	M	-	-	-
CO2	M	L	M	H	L	M	H	M	L	L	L	M	-	-	-
CO3	L	M	H	H	L	H	M	M	L	H	L	M	-	-	-
CO4	M	L	H	M	L	M	M	H	L	M	L	M	-	-	-

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

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

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

## **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

<b>MODULE I</b>	<b>LINEAR PROGRAMMING</b>	<b>9</b>
Introduction - formulation of linear programming model-Graphical solution– solving LPP using simplex algorithm – Revised Simplex Method.		
<b>MODULE II</b>	<b>ADVANCES IN LPP</b>	<b>9</b>
Dual simplex method - Sensitivity analysis – Transportation problems– Assignment problems-Travelling sales man problem -Data Envelopment Analysis.		
<b>MODULE III</b>	<b>NON LINEAR PROGRAMMING</b>	<b>9</b>
Classification of Non Linear programming – Lagrange multiplier method – Karush – Kuhn Tucker conditions–Reduced gradient algorithms–Quadratic programming method – Penalty and Barrier method.		
<b>MODULE IV</b>	<b>INTERIOR POINT METHODS</b>	<b>9</b>
Karmarkar's algorithm–Projection Scaling method–Dual affine algorithm–Primal affine algorithm - Barrier algorithm.		
<b>MODULE V</b>	<b>DYNAMIC PROGRAMMING</b>	<b>9</b>
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.Panneer selvam, "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) :

19<sup>th</sup>BoS conducted on  
29.08.2023

#### Academic Council:

21<sup>st</sup> 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
<b>CO1</b>	L	L	L	M	L	M	L	L	L	L	L	M	L	H
<b>CO2</b>	M	L	M	H	L	M	L	L	L	L	L	M	L	H
<b>CO3</b>	L	M	H	H	L	H	L	L	L	L	L	M	L	H
<b>CO4</b>	M	L	H	M	L	M	L	L	L	L	L	M	L	H
<b>CO5</b>	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  
SDG: 9 TRANSPORTATION L T P C**

## **COURSE OBJECTIVES:**

**COB1:** To know the necessity of polymers in transportation.

**COB2:** To provide fundamental knowledge on the polymeric materials.

**COB3:** To provide a basis for understanding properties and applications of polymeric materials.

**COB4:** To get insight into the polymeric products used for transportation and and case studies.

## **COB5: To provide knowledge on environmental regulations**

MODULE I      ROLE OF POLYMERS IN TRANSPORTATION

Light Weight - ease of manufacturing - custom design - 3D Printing - Electric vehicle – Comfort – Safety – Fuel efficiency.

MODULE II POLYMERS IN TRANSPORTATION 12

Transportation industries – Application of polymers in automotive, aerospace, marine and rail, Thermoplastics - PE, PP, PA, ABS, PC, POM, ASA, SMA, Thermosets – Epoxy, Phenolics, PU, Elastomers – NR, IIR, SBR, NBR, CR, EPDM, Silicone, FKM, Composites – SMC, BMC.

MODULE III PROPERTIES AND PROCESSING TECHNIQUES 12

Properties of polymers for transport applications - thermal, electrical, chemical, mechanical, weathering resistance, corrosion resistance, sound insulation, durability, fire retardancy, resilience, creep, hysteresis, damping, stress relaxation, dynamic properties - Selection criteria – Advanced processing techniques for polymeric materials in transportation.

MODULE IV APPLICATION OF POLYMERS IN TRANSPORTATION 9

Functional – non-functional – interior – exterior – metro coaches - case studies on the use of polymers in automobiles, aerospace, marine, and rail applications.

**MODULE V REGULATORY TRENDS****6**

Registration, evaluation, authorization, and restriction of chemicals (REACH), EMISSION Norms, ELV Norms, Smoke emission, and toxicity.

**L – 45; TOTAL HOURS – 45**

**TEXT BOOKS:**

1. Joseph P. Greene, "Automotive Plastics and Composites Materials and Processing", William Andrew, 1st Edition - June 23, 2021
2. Rubber Technology Maurice Morton Van Nostrand Company Inc. 3rd, 1987.
3. Dick Mann M.Inst.M, "Automotive Plastics and Composites- worldwide markets and trends to 2007", Elsevier Advanced Technology, Second edition December 1999
4. Mr P. Vignesh, Dr. A.R. Pradeep Kumar, Dr. N. Shankar Ganesh, "Indian Emission norms and practices", bohrpub, 2021
5. Reachin brief, Environment Directorate General, European Commission, October 2007.

**REFERENCES:**

1. Blow.C.M. and Hepburn C., "Rubber Technology and Manufacture", Butterworth Heinemann, 1982.
2. Brydson.J.A., Plastics Materials, 7th edition Elsevier Publication, 1999

**COURSE OUTCOMES:**

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

**CO1:** Identify the importance of polymers in transportation.

**CO2:** Identify and differentiate various types of polymers used for transportation.

**CO3:** Evaluate the essential properties of polymers required for transportation and apply the selection criteria for choosing appropriate polymers for transportation.

**CO4:** demonstrate various polymeric products used for transportation and gains problem solving skills on polymeric application in automobiles.

**CO5:** Apply knowledge on environmental regulations and correlates with the polymers.

**Board of Studies (BoS):**

**Academic Council:**

17<sup>th</sup> BoS of Polymer Engineering held on 22<sup>nd</sup> ACM held on 04.09.2024  
17.05.2024

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3	PSO4
CO1	M												L			
CO2	M	M	H		H								H	H		
CO3	M		M										M	H		M
CO4	L		H		H					H				H	H	H
CO5	L		L						H	H	M					

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

**SDG 9:** Development of innovative polymeric materials for various transportation applications by understanding the industrial requirements.

**Statement:** Understanding the properties of polymeric materials and manufacturing products for transportation based on industrial regulations.

<b>GEDX 222</b>	<b>PROGRAMMING LANGUAGE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 8</b>	<b>PRINCIPLES</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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-descent – 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 HANDLING 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    09  
LANGUAGES**

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	PO10	PO11	PO12	PSO1	PSO2
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.

<b>GEDX 223</b>	<b>PUBLIC SPEAKING AND RHETORIC</b>	<b>L T P C</b>
<b>SDG 4</b>		<b>2 1 0 3</b>

**COURSE OBJECTIVES:**

**COB1:** To develop the diverse array of skills needed to Speak effectively and persuasively

**COB2:** To practice and develop critical thinking, discussion, and analysis using rhetorical models of discourse

**MODULE I INTRODUCTION 6+1**

What is rhetoric? - Rhetorical situations - Difference between speaking and writing - How do we talk? - The art of rhetoric - Aristotle's Rhetoric Triangle

**MODULE II RHETORICAL DEVICES 6+4**

Rhetorical devices in speaking - Story telling strategies - Audience Analysis - Preparing your speech - Managing Anxiety - Structuring a presentation

**MODULE III DISCOURSE ANALYSIS 6+4**

Analyzing informative and persuasive speeches - Understanding presentation rubrics

**MODULE IV DELIVERY TECHNIQUES 6+2**

Methods of Delivery - Vocal dynamics - Body language in Delivery

**MODULE V DESIGNING PRESENTATIONS 6+4**

Use of PowerPoint - Strategies for designing slides - Use of visuals and infographics

**L –30, T - 15; TOTAL HOURS – 45**

**SUGGESTED TOPICS FOR BACKGROUND READING**

Public Speaking

Developing a dramatic narrative

Body language for public speaking

Prosody

**SUGGESTED READINGS**

1. O'Hair, D., Rubenstein, H., & Stewart, R. A. (2007). *A pocket guide to public speaking* (p. 336). Bedford/St. Martin's.
2. Gregory, H. (2010). *Public speaking for college and career* (p. 476). McGraw-Hill Higher Education.

**REFERENCES:**

1. American Rhetoric Speech Bank (available at [www.americanrhetoric.com](http://www.americanrhetoric.com))
2. Carnegie, Dale & Mitch Horowitz (2018). *Public Speaking to Win*. Gildan Media LLC.
3. O'Hair, Dan, Rob Stewart, and Hannah Rubenstein (2007). *Speaker's Guidebook: Text and Reference*. 3<sup>rd</sup> edition. New York: Bedford/St. Martin's.
4. Kennerly, Michele. *The Stoic Nature of Early Dramatistic Theory*. Advances in the History of Rhetoric 14, no. 1 (2011): 33-48.
5. Lucas, Stephen E. (2012). *The Art of Public Speaking*. 11<sup>th</sup> edition. McGraw Hill.
6. The International Society for the History of Rhetoric-Online Resources (available at <http://ishr.cua.edu/resources.cfm>)

**COURSE OUTCOMES:**

**CO1:** Plan and prepare speeches that inform, persuade, or fulfill the needs of a special occasion.

**CO2:** Use presentation aids to enhance speeches

**CO3:** Outline your speeches in a logical and thorough fashion.

**CO4:** Analyze the audience and design speeches to reflect the analysis.

**CO5:** Deliver effective speeches depending on the occasion and need.

**Board of Studies (BoS) :**

14<sup>th</sup> BoS of the Department of English

held on 07.12.2021

**Academic Council:**

18<sup>th</sup> AC held on 24.02.2022

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

**Statement:** The course on rhetoric and public speaking will educate the students about the art of public speaking and apply it in real life and workplace situations.



**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" ,3<sup>rd</sup> edition, 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) :**

16<sup>th</sup> BoS of IT held on 18.08.2022

**Academic Council:**

19<sup>th</sup> 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.

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

**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) :**

18<sup>th</sup> Board of Studies of EIE held on  
12.07.2022

**Academic Council:**

19<sup>th</sup> 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

<b>GEDX 227</b>	<b>TOTAL QUALITY MANAGEMENT</b>	<b>L T P C</b>
<b>SDG: 9</b>		<b>3 0 0 3</b>

**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) 5<sup>th</sup> Ed by Pearson Education – October 2018. By Besterfield Dale H. & Besterfield Carol.
2. Total Quality Control 4<sup>th</sup> edition Subsequent Edition 2004 - Armand V. Feigenbaum.

## REFERENCES:

1. “The Management and Control of Quality”, James R.Evans& William M.Lidsay, 5<sup>th</sup> 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: Explain the Quality management system.

**Board of Studies (BoS):**

20<sup>th</sup> BOS of mechanical dept  
held on 08.08.2022

**Academic Council:**

19<sup>th</sup> 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.

<b>GEDX 228</b>	<b>VALUE EDUCATION</b>	<b>L    T    P    C</b>
		<b>3    0    0    3</b>

**SDG: 4**

**COURSE OBJECTIVES:**

**COB1:** To make the students comprehend the concept, nature, and purpose of value education.

**COB2:** To make the students appreciate human and social choices and expressing them in relation to themselves, others, the community and the world at large.

**COB3:** To help in examining professional values.

**COB4:** To help students build a positive character and promote harmony between the individual and others

**COB5:** To highlight mutually fulfilling human behavior and mutually enriching interaction with nature.

**MODULE I                    INTRODUCTION -VALUE EDUCATION                    9**

Introduction: Definition, concept and nature, learning sources of values, relevance of value education in the present day-types of values-right understanding, relationship and physical facility(Holistic development and the role of education)

**MODULE II                    HUMAN VALUES AND SOCIAL VALUES                    9**

Definition of human values, self confidence, self discipline, self assessment, self restraint, self motivation; Determination, ambition, contentment, humility and simplicity, sympathy and compassion; Gratitude, forgiveness, honesty, courtesy; Definition of social values, faith, service, and secularism, social sense and commitment, social awareness, brotherhood, responsibility, co-operation, freedom.

**MODULE III                    PROFESSIONAL VALUES                            9**

Definition, competence, confidence, devotion to duty, efficiency, accountability; Respect for Learning, willingness to learn-open and balanced mind, team spirit, professional ethic; Willingness for Discussion, aims, effort, avoidance of procrastination and slothfulness-alertness.

**MODULE IV                    MORAL VALUES AND SPIRITUAL VALUES                    9**

Good manners at home and outside, equality; Purity of thought, speech, and action, understanding the role of religion, faith; Understanding the commonness of religions, mutual respect of different cultures; Unity in Diversity, tolerance, non-violence, unified efforts towards peace, patriotism.

**MODULE V HARMONY IN NATURE/EXISTENCE 9**

Understanding harmony in the nature, interconnectedness, self-regulation and mutual benefit among the four orders of the nature; The binding of man and nature, environment conservation and enrichment.

**PRACTICALS / ASSIGNMENTS**

1. Presentation on various issues & concerns of value education.
2. Take up introspection exercises in the class with the students.
3. Reciting moral lessons and performing various activities to transmit values among students.
4. Exploring the feeling of trust, respect and systems to fulfill human goal.
5. Exploring the four orders of nature and co-existence in existence.

**L – 45; TOTAL HOURS –45****TEXT BOOK:**

1. R R Gaur, R Apthana, G P Bagaria ,Human Values and Professional Ethics, Excel Books, 2nd Revised Edition, New Delhi,2019. I S BN 978-93 -87 034-s3 -2

**REFERENCES:**

1. Dr. Kiruba Charles. & V.Arul SelviValue Education, Neel Kamal Publications PVT. LTD. Educational Publishers, New Delhi, 2012.
2. A.P.J. Abdul Kalam , My journey –Transforming Dreams into Actions, Rupa Publications India, 2013.
3. Neil Postman, The End of Education: Redefining the Value of School Vintage 1996.
4. Bagchi, S. (2009). The Professional. India: Penguin Portfolio.

**COURSE OUTCOMES:**

After the completion of the course, the learners will be able to:

**CO1:** To determine and reflect on different values.

**CO2:** To analyze the essentials of human values and skills, self exploration, happiness and prosperity.

**CO3:** To develop appropriate technologies and management patterns to create harmony in professional and personal lives

**CO4:** To describe their own personal, social, moral and spiritual values and be aware of practical methods for developing and deepening.

**CO5:** To associate the holistic perception of harmony at all levels of existence.

**Board of Studies (BoS):**

20<sup>th</sup>BoS of Department of Commerce held on  
22.04.2024

**Academic Council:**

22<sup>nd</sup> Academic Council held on  
04.09.2024

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1					H	H	M							M	M	
CO2					H	H	M							M	M	
CO3					H	H	M							M	M	
CO4					H	H	M							M	M	
CO5					H	H	M							M	M	

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

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

This course enables the learners to have more knowledge on human values, that helps in better understanding of self as well as others and to ensure a transformative education required for life-long learning.

<b>GEDX 229</b>	<b>WASTEWATER MANAGEMENT</b>	<b>L T P C</b>
<b>SDG: 6</b>		<b>3 0 0 3</b>

### **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, 3<sup>rd</sup> 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 septicage management

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

**Board of Studies (BoS) :**

18<sup>th</sup> BoS of CE held on

05.04.2023

**Academic Council:**

20<sup>th</sup> Academic Council held on

13.04.2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	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.

<b>GEDX 230</b>	<b>WEB APPLICATION DEVELOPMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

**COB1:** Introduce the basic concepts of internet .

**COB2:** Learn the static website design using HTML and CSS.

**COB3:**Provide database connectivity using PHP.

**COB4:** Train to develop the website using wordpress framework.

**COB5:** Apply API and Ecommerce plugins connection to the various vendors.

**MODULE I** **INTRODUCTION** **9**

Introduction to Internet- Computer Networks –Client server architecture-Web Protocols –WebBrowsers and Web Servers – SSL Security and Vulnerability- GET and POST method-Web System Architecture-DNS– URL- Domain Name: Search – Registration -Extension- Hosting- different types of hosting – Client-side and server-side scripting.

**MODULE II** **HTML AND CSS** **9**

HTML-Document Structure-Various Tags: Image Tag, Table Tag, LineBreaks, Frames, and Forms. HTML5 Tags –New Elements- Google Map embed, GEO Location - HTML Canvas Tag -Audio, Video. CSS– Property: Background - Font - Text - Padding.

**MODULE III** **SERVER SIDE SCRIPTING** **9**

Introduction to PHP– Operators – Conditions- Looping – Functions : Date and TimeFunctions – String functions - Arrays - File Handling - File Uploading – Email Basics – Emails with attachments.PHP& MySQL database integration.

**MODULE IV** **WEB TOOLS** **9**

Domain Registration through service providers - NS Configuration – AAA Records– Cpanel- Wordpress – Installation – Updation – Themes – Divi – Astra –Plugins: Security plugins- Embedding plugins- Backup plugins- Mysqldata base backup.

**MODULE V** **CASE STUDY** **9**

Create E-Commerce website: B2B, B2C, C2C platforms – Google Map Integration- Payment gateway integration – PHP email sender- API integration – Embedding Pixel, Google Analytics.

**L –45 ; TOTAL HOURS –45**

**TEXT BOOKS:**

1. Paul Deitel, Harvey Deitel, Abbey Deitel, *Internet & World Wide Web – Howto Program*, 5th edition, Pearson Education, 2018.

2. PHP, MySQL & JavaScript All-in-One for Dummies, Richard Blum, 2018.

**REFERENCES:**

1. Kogent Learning Solutions Inc, Web Technologies Black Book, Dream Tech press, 2013.
2. WordPress Complete, Sixth Edition: A comprehensive guide to WordPress development from scratch, Sixth Edition, Karol krol, 2017.
3. <https://wordpress.com/go/category/web-design/>
4. <https://wordpress.org/plugins/>
5. <https://wordpress.org/themes/>
6. <https://razorpay.com/payment-gateway/>
7. <https://ratzpackmedia.com/wp-content/uploads/2016/06/Guide-to-the-Facebook-Pixel.pdf>
8. Patrick Almeida, Mastering the Meta Pixel Helper: : A Comprehensive Guide To Help You Take Advantage Of Facebook Ads Conversion Tracking. Kindle edition.
9. For free hosting and Cpanel visit : <https://in.000webhost.com/>

**COURSE OUTCOMES:**

**CO1:** Create and Register appropriate domain name for web applications.

**CO2:** Select the appropriate HTML and CSS tags for website design.

**CO3:** Integrate frontend and backend with database connectivity.

**CO4:** Apply appropriate web tools to enhance the quality of website.

**CO5:** Build a holistic e-commerce system.

Board of Studies (BoS) :  
20<sup>th</sup>BoS of CA held on 17.05.2024

Academic Council:  
22<sup>nd</sup> Academic Council held on  
04.09.2024

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

### SDG 9

Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation To analyze, design and develop Advance Web development skills taught in this course for the learners with respect to the course outcomes are measurable and implementable. Learners will Design the responsive websites, Web apps and to become a Web-App Developer through innovative approach.

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

### **COURSE OBJECTIVES:**

**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 8 OF MICROPROCESSOR**

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.

## **COURSE OBJECTIVES:**

COB1: To analyze the fundamental principles and applications of various renewable energy sources, including solar, biomass, and wind energy.

COB2: To evaluate the technical aspects of solar energy conversion, including both non-concentrating and concentrating collector systems.

COB3: To examine the processes and technologies involved in biomass conversion for energy production.

COB4: To understand the principle of wind turbine operation and power generation.

COB5: To assess the role of energy storage in optimizing renewable energy systems.

MODULE I      **Basics of Solar Energy**      9

Basic concepts of Energy - Types of Energy-Renewable and Non renewable Energies- Energy alternatives and current energy scenario - Sun-Earth Relationship - Formation of the Atmosphere - Solar Radiation at Earth's surface – Air Mass- Instruments for the measurement of Solar radiation and Sunshine.

MODULE II SOLAR COLLECTORS 9

Solar thermal collectors - Flat plate collectors - theory of flat plate collectors- Thermal Analysis- Absorber coatings - Solar Air heaters and Evacuated tube collectors - Solar cooker - Solar stills- Solar cooling and Refrigeration - Concentrating collectors - Thermal and Performance Analysis.

MODULE III      STORAGE SYSTEMS      9

Thermal Energy storage - Thermo chemical storage- Mechanical storage – Solar pond - types of solar ponds – Advantages - Applications.

MODULE IV WIND ENERGY CONVERSION SYSTEMS 9

History and Basics of wind energy – Important terms - Turbine types – Betz limit – characteristics and power generation from wind energy – Generators and Power electronics for wind systems.

MODULE V BIOMASS 9

Types and characterization – classification of energy sources – analysis of composition – characteristics and properties of bio mass - structural components of biomass - Biomass residues and energy conversion process - classification of bio gas plants.

**L – 45; TOTAL HOURS – 45**

**TEXT BOOKS:**

1. Solar Energy- Principles of thermal collection and storage by S.P Sukhatme, Tata McGraw-Hill, New Delhi, 2006.
2. S. N. Bhadra, D.Kastha, S.Banerjee, — Wind Electrical Systems II, Oxford University Press, 2005.
3. Khan B. H., Non-Conventional Energy Resources, 2<sup>nd</sup> Edition, Tata McGraw-Hill Education Pvt. Ltd. 2009.

**COURSE OUTCOMES:**

At the end of the course, the student will

CO1: have a comprehensive understanding of energy fundamentals, including different energy types, renewable and non-renewable energies, current energy alternatives, the Sun-Earth relationship, atmospheric formation, solar radiation measurement, and instrumentation techniques.

CO2: be able to analyse and design solar thermal systems, including flat plate collectors, evacuated tube collectors, concentrating collectors, and solar cookers, for applications such as water heating, space heating, and desalination.

CO3: be able to apply different thermal energy storage methods, including thermo-chemical, mechanical, and solar pond technologies, to optimize energy use in residential, commercial, and industrial applications.

CO4: gain a thorough understanding of wind energy conversion principles, and the function of generators and power electronics in wind energy systems.

CO5: be able to comprehensively analyse and characterize various biomass resources and conversion processes for bioenergy generation, with a focus on the classification of biogas plants.

**Board of Studies (BoS):**

20th BOS of EEE held on  
17.05.2024

**Academic Council:**

22<sup>nd</sup> Academic Council  
held on 04.09.2024

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

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

**SDG 7:** Affordable and Clean Energy.

Ensure access to affordable, reliable, sustainable and modern energy for all.

**Statement:** Understanding the technical details of these renewable energy sources empowers students to contribute to their development, implementation, and optimization. This aligns with the overall goal of SDG 7 to promote the use of clean energy technologies. The course includes a section on energy storage, a crucial element in integrating renewable energy sources with the existing grid infrastructure. This aligns with SDG 7's emphasis on reliable and modern energy services.

**GEDX 233 NUCLEAR HAZARD AND DISARMAMENT L T P C**  
**3 0 0 3**

**COURSE OBJECTIVES:**

**COB1:** To help the students comprehend the basics of nuclear hazard.

**COB2:** To describe the principles of radiological protection, hazard evaluation and control.

**COB3:** To acquire the knowledge of various types and characteristics of nuclear weapons

**COB4:** To understand the importance of nuclear disarmament.

**COB5:** To get the insights into the various aspects of nuclear waste management and disposals.

**MODULE I NUCLEAR HAZARDS 9**

Interaction of charged particles and Radiation with matter - Photon interactions with matter- biological effects of radiation, Radiation damage - Molecular level & Cellular level, Deterministic effects, Stochastic effects-nuclear emergencies, nuclear explosions, radiation exposure effects, power plant accidents, transportation accidents involving radiation, radiation hazards in health care, nuclear winter.

**MODULE II RADIOLOGICAL PROTECTION,  
EVALUATION & CONTROL 9**

Radiation Quantities and Units - Dose, equivalent dose and effective dose – ALI & DAC Radiological protection – Optimization of protection – Dose limits for radiation workers – internal exposure, Occupational exposure and members of public - Occupational exposure levels - Radiation hazards evaluation - Specific Gamma constant - Principles to control external hazards - Radiation shield.

**MODULE III TYPES OF NUCLEAR WEAPON 9**  
Fission and fusion theory, thermonuclear reactions, fusion power, fissionable material, Types of fission and thermonuclear bombs, conventional nuclear bomb, radiation enhanced neutron bomb, yield of a nuclear weapon, strategic and tactical weapon system, nuclear thermal output, radiation output

**MODULE IV NUCLEAR WEAPON DISARMAMENT****9**

Disarmament- Purpose & Objectives, disarmament of weapons: Nuclear weapons, Other Weapons of Mass destruction, Outer space disarmament aspects, conventional weapons, International and regional efforts on security, UN-system of disarmament machinery, UN security council on disarmament, IAEA-efforts, Organization for prohibition of chemical weapons(OPCW), Treaty on Prohibition of Nuclear weapons(TPNW), Comprehensive Test Ban Treaty(CTBT) commission, Non Proliferation Treaty(NPT) and International Campaign to Abolish Nuclear weapons(ICAN).

**MODULE V NUCLEAR WASTE MANAGEMENT AND SAFETY 9**

Types of Nuclear Waste: Spent nuclear fuel, high-level radioactive waste, low-level radioactive waste, Waste Treatment and Conditioning: Techniques for volume reduction and preparation for storage or disposal with safety as a priority. Long-Term Storage Strategies: Dry cask storage and geological repositories Transportation Safety: Regulations and protocols for safe transportation of nuclear waste. The Future of Nuclear Power: Ethical considerations and policy debates on balancing energy needs with safety and environmental concerns.

**L – 45 Hrs, Total Hours : 45****COURSE OUTCOMES:**

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

**CO1:** explain the effects and implications of nuclear hazards to human beings and to the environment.

**CO2:** describe the fundamental principles underlying the radiological hazard evaluation and the means to control it

**CO3:** deliver the knowledge about the types of nuclear weapons and materials needed for the nuclear weapons.

**CO4:** describe the key instruments in the area of nuclear non-proliferation, disarmament and the efforts of the United Nations in enhancing disarmament initiatives

**CO5:** describe the key instruments in the area of nuclear non-proliferation, disarmament and the efforts of the United Nations in enhancing disarmament initiatives

### TEXT BOOKS:

1. Nuclear Materials Science (2nd Ed.), Karl Whittle, Published in 2020, IOP Publishing Ltd 2020.
2. Nuclear Materials, Pavel V. Tsvetkov, Published in 2021, Intech Open Limited (Open access DOI: 10.5772/intechopen.83315).
3. Physics and Technology of Nuclear Materials, IOAN URSU, Published in 1985, Elsevier Ltd.
4. Glenn F. Knoll 'Radiation Detection and Measurement', John Wiley & Sons Inc.2010 Edition.

### REFERENCES:

1. Physicist guide to nuclear weapons, IOP Publishing Ltd 2016 Online ISBN: 978-0-7503-1308-7 • Print ISBN: 978-0-7503-1309-4.
2. James Saling and Audeen W. Fentiman, "Radioactive Waste Management", CRC Press (2018).
3. Samuel Glasstone and Alexander Sesonske, "Nuclear Reactor Engineering", Springer (1994).
4. John R. Lamarsh and Anthony J. Baratta, "Introduction to Nuclear Engineering", Pearson (2018).

#### Board of Studies (BoS):

14th meeting of BOS held on  
07/06/2024

#### Academic Council:

22<sup>nd</sup> Academic Council  
held on 04.09.2024

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	H	H	M	H	L	M	L	L	L	M	M	L	H	M	M
<b>CO2</b>	H	H	M	H	L	M	L	L	L	M	M	L	H	H	M
<b>CO3</b>	H	H	M	H	L	M	L	L	L	M	M	L	H	M	M

<b>CO4</b>	H	H	M	H	L	M	L	L	L	M	M	L	H	H	M
<b>CO5</b>	H	H	M	H	L	M	L	L	L	H	H	M	H	M	H

SDG3: Ensure healthy lives and promote wellbeing for all at all ages

SDG4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Statement: The holistic understanding of the course will bring global impact on quality education.

SDG9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Understanding the safety precautions required for mitigating the nuclear hazards, waste management and nuclear disarmament.

SDG16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

<b>GEDX 235</b>	<b>REMOTE SENSING ESSENTIALS</b>	<b>L T P C</b>
<b>SDG: 9</b>		<b>3 0 0 3</b>

**COURSE OBJECTIVES:**

The objectives of the course are

- COB1:** To impart knowledge on the principles of remote sensing data acquisition and analysis of satellite data.
- COB2:** To explore the spectral signatures of various earth features and electromagnetic interactions.
- COB3:** To apply image enhancement techniques to improve the interpretability of satellite images.
- COB4:** To identify the characteristic features of microwave remote sensing.
- COB5:** To explore the usage of remote sensing for different applications.

**MODULE I INTRODUCTION TO REMOTE SENSING 8**

Remote sensing: Introduction – components of remote sensing - advantages - Historical Perspective of development of remote sensing technology - – Active and Passive remote sensing – platforms – EM spectrum – visible, infrared (IR) near IR, middle IR, thermal IR and microwave – solar reflection and thermal emission – Laws of Radiation and their relevance in Remote Sensing.

**MODULE II INTERACTION MECHANISM WITH 9  
ATMOSPHERE AND EARTH FEATURES**

Atmospheric characteristics – the scattering of EMR – Rayleigh, Mie, Non-selective and Raman scattering – EMR interaction with water vapour and ozone – atmospheric windows – Interaction mechanisms of EM radiation with ground, spectral signature - spectral response curves for water, soil and vegetation.

**MODULE III DIGITAL IMAGE PROCESSING 10**

Importance of digital image processing – Digital Image Processing Software – Basic image enhancement techniques – Colour representations and transforms – Image Histograms and statistics – Atmospheric errors and corrections – Georeferencing – Spatial Filtering Techniques – Supervised &Unsupervised image classification

**MODULE IV MICROWAVE REMOTE SENSING 9**

Active Microwave Remote Sensing– Passive Microwave Remote Sensing– Radar Images interpretation and applications –working principle of RADAR – components of RADAR imaging –SAR Interferometry (InSAR) –Advantages of Microwave Remote Sensing –Applications of Microwave Remote Sensing.

## MODULE V

## APPLICATIONS OF REMOTE SENSING

9

Image interpretation of different geological landforms, rock types and structures, Remote Sensing of Moon and Mars, Google Earth and its Applications, Integrated applications of RS in electrical networks, Earthquake Studies, Landslides, Forest mapping.

**L – 45; TOTAL HOURS – 45**

## TEXTBOOKS:

1. Anji Reddy, "Remote sensing and Geographical systems", 4<sup>th</sup> Edition, B.S Publications, Hyderabad, 2014.
2. Basudeb Bhatta, "Remote Sensing and GIS", 3<sup>rd</sup> Edition, Oxford Higher Education / Oxford University Press, 2020.
3. Lillesand.T.M. and Kiefer.R.W., "Remote sensing and image interpretation", 7<sup>th</sup> Edition, John Wiley and sons, 2015.

## REFERENCES:

1. De Merse and Michael, N., "Fundamentals of Geographic Information System", 4<sup>th</sup> Edition, John Wiley and Sons, New York, 2012.
2. Srinivas M.G., "Remote sensing applications", 2<sup>nd</sup> Edition, Narosa Publishing House, New Delhi, 2011.
3. <https://www.gislounge.com/gis-essentials>
4. <https://www.geospatialworld.net/article/technology-trends-in-remote-sensing-and-data-analysis>

## **COURSE OUTCOMES:**

After completion of the course, the students will be able

**CO1:** To describe the basic principles of remote sensing data, types of remote sensing and laws related to remote sensing.

**CO2:** To explore the interactions of EMR with earth features based on their spectral signatures.

**CO3:** To evaluate the processing techniques for interpretation of the satellite images.

**CO4:** To analyze the characteristic features of microwave remote sensing.

**CO5:** To explore the use of remote sensing for different applications.

## **Board of Studies (BoS):** 20<sup>th</sup> BoS of Civil held on 08.07.2025

**Academic Council:**

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

The integrated understanding of remote sensing helps one to build sustainable industrialization through optimization of resource utilization in an innovative way

<b>GEDX 236</b>	<b>WATER AND WASTE WATER TREATMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 6</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

The objectives of the course are to impart knowledge on

**COB1:** The water sources, water quality and its preliminary treatment technologies

**COB2:** The primary and advanced water treatment methods

**COB3:** The sewerage systems, estimation of wastewater flows & storm runoff, wastewater characterization and its primary treatment

**COB4:** The secondary treatment of wastewater

**COB5:** The methods for wastewater disposal & sludge handling.

**MODULE I INTRODUCTION TO WATER TREATMENT 9**

Introduction - Overview of water systems - Urban water system - Design Period - Types of water demand -Sources of water - Characteristics of water - Quality and Quantity of water - Material flows - Material balances - Treatment plans - Water treatment -- Treatment objectives - Types of plants - Standards for drinking water - Principle, function and design of water treatment units - Screens – Grit chamber

**MODULE II PRIMARY AND ADVANCED WATER TREATMENT 9**

Design process - Sedimentation, coagulation & flocculation, Filtration – theory & principle of disinfection methods. Water softening – Iron, Manganese and Phosphorus removal, Defluoridation– Desalination - Membrane filtration

**MODULE III INTRODUCTION TO WASTEWATER TREATMENT 9**

Sewerage systems - Sewage flow estimation - Storm runoff estimation - Sewer materials - Sewer appurtenances – Characteristics of sewage - Unit operations and processes - Primary treatment – Principles, functions and design of sewage treatment units

**MODULE IV SECONDARY TREATMENT OF WASTEWATER 9**

Introduction to Aerobic and Anaerobic treatment process – Attached and Suspended Growth Systems - Functions and design of Activated sludge process and trickling filter – Principles and functions of Rotating Biological Contactor, Sequential batch reactor, Waste stabilisation pond, UASB reactor

**MODULE V WASTEWATER DISPOSAL & SLUDGE TREATMENT 9**

Standards for disposal into water bodies – Self-purification of river - Oxygen sag curve – Sewage farming and methods - Sludge thickening & Digestion – Biogas recovery – Sludge conditioning and Dewatering – Sludge drying bed

**L – 45; TOTAL HOURS – 45**

**TEXT BOOKS:**

1. Garg SK, "Water Supply Engineering", Khanna Publications, 27<sup>th</sup> Edition, 2015
2. Mackenzie L. Davis, Ph.D., P.E., BCEE. Water and Wastewater Engineering: Design Principles and Practice, Second Edition (McGraw-Hill Education: New York, 2020.
3. Metcalf and Eddy, "Wastewater Engineering Treatment, Disposal and Reuse", Tata McGraw Hill, 2007.
4. Modi.P.N., "Sewage Treatment and Disposal and Wastewater Engineering", Standard Book House, New Delhi, 2008
5. Davis, Mackenzie L., Water and Wastewater Engineering: Design Principles and Practice, 2nd Edition, McGraw-Hill, New York, 2010.
6. Metcalf and Eddy, Wastewater Engineering: Treatment and Resource Recovery, Fifth Edition, Metcalf & Eddy, Inc., McGraw-Hill Publishers, New York, 2013.

**REFERENCES:**

1. APHA., "Standard methods for the examination of Water and Waste Water", American Public Health Association, United States, 2013.
2. Bureau of Indian Standards, "Indian Standard Drinking water — Specification- IS10500 : 2012, New Delhi.
3. Water and Wastewater analysis – Manual, Central Pollution Control Board, New Delhi, 2011.
4. Tchobanoglous, G., et al., Wastewater Engineering: Treatment, Disposal, and Reuse, Fifth Edition, Metcalf & Eddy, Inc., McGraw-Hill Publishers, New York, 2013.
5. Crittenden, J.C., et al., Water Treatment Principles and Design, 2nd Ed., Montgomery, Inc., John Wiley and Sons, New York, 2005.
6. Reynolds, T.D., Richards, P.A., Unit Operations and Processes in Environmental Engineering, PWS Publishing Company, Boston, 1996.

**COURSE OUTCOMES:**

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

**CO1:** Estimate quantity of water demand, characterize water quality and design treatment units

**CO2:** Describe and design of various primary and advanced treatments for water

**CO3:** Explain the sewerage systems, estimate wastewater flows & storm runoff, characterize quality of wastewater and design the primary wastewater treatment units

**CO4:** Describe the secondary treatment of wastewater

**CO5:** Describe the methods for wastewater disposal & sludge handling.

**Board of Studies (BoS):**  
20<sup>th</sup> BoS of Civil held on 08.07.2025

**Academic Council:**  
24<sup>th</sup> Academic Council on 26.08.2025

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	-	M	M	-	L	H	L	M	M	-	M	L	M	H
CO2	M	-	L	M	-	-	H	L	M	M	-	M	L	M	H
CO3	M	-	M	M	-	L	H	L	M	M	-	M	L	M	H
CO4	M	-	M	M	-	-	H	L	M	M	-	M	L	M	H
CO5	M	-	L	M	-	M	H	L	M	M	-	M	L	M	H

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

#### SDG No.6 : Clean Water and Sanitation

The understanding of water and wastewater treatment leads to the development of sustainable technologies for treatment and management of water and wastewater.

<b>GEDX 237</b>	<b>CRYPTOGRAPHY AND NETWORK SECURITY</b>	<b>L T P C</b>
SDG – 9		<b>3 0 0 3</b>

**OBJECTIVES:**

- To understand the fundamental principles of computer and network security attacks.
- To explore symmetric and asymmetric encryption algorithms and how they enable secure communication.
- To learn the fundamentals of web and communication security and purpose of X.509 certificates in digital authentication.
- To Gain a foundational understanding of IP Security (IPSec) and its role in protecting data at the network layer.
- To analyze the concept of intruders and their behavior patterns in compromising systems.

**MODULE I INTRODUCTION 9**

Computer Security Concepts - The OSI Security Architecture - Security Attacks - Security Services - Security Mechanisms - A Model for Network Security - Standards – Classical Encryption Techniques.

**MODULE II ENCRYPTION CRYPTOGRAPHY 9**

Symmetric Encryption Principles – Symmetric Block Encryption Algorithms – Random and Pseudorandom Numbers – Stream Ciphers and RC4 – Cipher Block Modes of Operation –Approaches to Message Authentication – Secure Hash Functions – Message Authentication Codes – Introduction – Public Key Cryptography – Public-Key Cryptography Algorithms – Digital Signatures – Attacks on Public Key Systems.

**MODULE III MESSAGE AUTHENTICATION AND INTEGRITY 9**

Introduction – X.509 Certificates – Public-Key Infrastructure – Federated Identity Management – Web Security Considerations – Secure Socket Layer and Transport Layer Security –Transport Layer Security.

**MODULE IV ELECTRONIC MAIL SECURITY AND IP SECURITY 9**

Wireless Transport Layer Security – WAP End-to-End Security – Pretty Good Privacy – S/MIME – Domain Keys Identified Mail – IP Security Overview – IP Security Policy – Encapsulating Security Payload – Combining Security Associations – Internet Key Exchange – Cryptographic Suites.

**MODULE V      SYSTEM SECURITY****9**

Intruders – Intrusion Detection – Password Management – Types of Malicious Software – Viruses Countermeasures – Worms – Distributed Denial of Service Attacks –The Need for Firewalls – Firewall Characteristics – Types of Firewalls – Firewall Basing – Firewall Location and Configurations.

**Total Hours : 45****TEXT BOOK:**

1. William Stallings, Cryptography and Network Security: Principles and Practice, Pearson, 8th Edition, 2023.
2. Christof Paar and Jan Pelzl, Understanding Cryptography: A Textbook for Students and Practitioners, Springer, 2020.
3. Douglas R. Stinson and Maura B. Paterson, Cryptography: Theory and Practice, CRC Press, 4th Edition, 2019.

**OUTCOMES:**

Upon completion of this course, students will be able to

1. Apply the OSI Security Architecture to real-world security scenarios.
2. Implement encryption algorithms like AES or DES to secure data.
3. Demonstrate understanding of SSL and TLS protocols, including the handshake process, encryption techniques, and authentication mechanisms.
4. Configure and apply IPSec policies to define secure communication rules.
5. Design and configure firewall systems, including location and rule-setting for optimal protection.

Board of Studies (BoS):

20th BoS of IT held on 12.06.2025

Academic Council:

24th Academic Council on 26.08.2025

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	3	3	2	2	2	2			2				
CO2	3	3	3	2	2		2							
CO3	3	3	3	2	2	2		2		2				
CO4	3	3	3	2	2									
CO5	3	3	3	2	2	2	2			2				

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

**Statement:** Cryptography and Network security is critical for building secure and resilient digital infrastructure, which is a foundation for innovation and industrial development.

<b>GEDX 238</b>	<b>MATLAB FOR ENGINEERS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **Course Objectives**

This course is designed to:

1. Introduce the fundamentals of MATLAB programming for engineering applications.
2. Enable students to use MATLAB for solving mathematical and scientific problems.
3. Equip learners with practical tools to implement numerical methods in MATLAB.
4. Provide hands-on exposure to solve equations, perform data analysis, and simulate systems.
5. Prepare students to solve real-world engineering problems using differential equations, regression, and optimization.

#### **Module I: Introduction to MATLAB Programming**

**9**

MATLAB environment, variables, arrays, and data types, Scripts and functions, Control flow: loops, conditionals, File operations, plotting, and data visualization, Debugging and best coding practices, Case studies from engineering (e.g., resistor networks, basic kinematics)

#### **Module II: Fundamentals of Numerical Methods**

**9**

Approximations and errors: truncation and round-off, Taylor/Maclaurin series-based error estimation, Solving systems of linear equations: Gaussian elimination, LU decomposition, MATLAB solvers: linsolve, matrix operations, Applications in circuit analysis, structural problems

#### **Module III: Nonlinear Equations and Calculus Applications**

**9**

Root-finding techniques: Bisection, Newton-Raphson, MATLAB functions: fzero, fsolve, Numerical differentiation and integration, Trapezoidal and Simpson's rules, Error propagation, Engineering examples: fluid flow, heat transfer rates

**Module IV: Differential Equations in Engineering** **9**

ODEs – single and multiple variable IVPs, Stiff systems and step-size control, Solving with ode45, ode15s, ode23, Boundary value problems (BVPs) using bvp4c, Differential-Algebraic Equations (DAEs), Applications: control systems, mechanical vibrations

**Module V: Interpolation, Regression and PDEs** **9**

Linear and polynomial interpolation, splines, Linear and nonlinear regression techniques, MATLAB tools: interp1, polyfit, lsqcurvefit, PDEs: classification and simple solutions, MATLAB solvers for heat/diffusion/conduction problems, Introduction to optimization with MATLAB: fminsearch, fmincon, Capstone examples integrating multiple topics.

**L:45 ; TOTAL HOURS- 45**

**Textbook**

- Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, 4th Edition, McGraw-Hill Education, 2018.
- Brian Hahn and Daniel T. Valentine, Essential MATLAB for Engineers and Scientists, Elsevier, 2021.

**Reference Books**

1. Rudra Pratap, Getting Started with MATLAB, Oxford University Press, 2016.
2. Amos Gilat, MATLAB: An Introduction with Applications, Wiley, 6th Edition, 2016.
3. John H. Mathews and Kurtis D. Fink, Numerical Methods using MATLAB, Pearson, 2004.

**Course Outcomes (COs)**

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

**CO1:** Develop MATLAB scripts and functions using structured programming concepts.

**CO2:** Apply MATLAB to solve linear and nonlinear algebraic equations.

**CO3:** Implement techniques for numerical differentiation, integration,

regression, and interpolation.

**CO4:** Solve ordinary and partial differential equations (ODEs and PDEs) in engineering contexts using MATLAB.

**CO5:** Integrate optimization and numerical tools to solve multi-domain engineering problems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PS O1	PS O2	PS O3
<b>CO1</b>	M	M	M	H	M	L	L		L		L	M			M
<b>CO2</b>	M	M	M	H	M	L	L		L		L	M			M
<b>CO3</b>	M	M	M	H	M	L	L		L		L	M			M
<b>CO4</b>	M	M	M	H	M	L	L		L		L	M			M
<b>CO5</b>	M	M	M	H	M	L	L		L		L	M			M

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

### **SDG 9 – Industry, Innovation and Infrastructure**

This course strengthens **engineering computation and problem-solving skills** that are fundamental for innovation and industrial development. It encourages **innovation** through **simulation, optimization, and automation**, forming the backbone of **modern industrial research and digital infrastructure**.

<b>GEDX 239</b>	<b>INTRODUCTION TO ANCIENT INDIAN TECHNOLOGY</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**COURSE OBJECTIVES:**

**COB1:** To impart knowledge about the Ancient Indian Civilization

**COB2:** To educate Indian Agriculture and its systems

**COB3:** To elucidate various Temple Water tanks and Dams

**COB4:** To introduce the significance of Ancient Rural Indian Housing

**COB5:** To develop knowledge on the World of Materials

**Module I: Ancient Indian Civilization 9**

Basic Concepts of Ancient Indian Civilization, Ancient Indian Civilization's Gift to the World – Glimpses of Ancient Indian Science and Technology – Brief Review of Ancient Indian Scriptures – Basic Principles of carrying out science and technology – Arrays of Physics, Chemistry and Indoor games – Marvels of Ancient Indian Technology.

**Module II: Indian Agriculture 9**

Introduction to Indian Agriculture – Problems arising due to modern agricultural practices – Pesticides and soil degradation – Agriculture – A Primary Productive Activity – An Agricultural Tools – A Plough – Soil and seeds – Sowing Methods – Indigenous cattle and manuring – Availability of Water and Freshwater – Ancient Indian Wells.

**Module III: Temple Water tanks and Dams 9**

Introduction to Concept and Temple Water tanks and Dams – Tank Irrigation system and Rainwater Harvesting – Waterbodies – Lakes and Canals – Sluices and Embankments – Handlooms and Charkha – Different types of Handlooms.

**Module IV: Ancient Rural Indian Housing 9**

Introduction to Concept and Ancient Rural Indian Housing – Thatched Roof House – Rural Walls and Roof materials – Indus Valley and Harappan Civilization – First and Second of Indian Civilization – Town topologies and Brick

and tile making process – Cooling and Ventilation System in Building – Temple Architecture in ancient India.

**Module V: World of Materials****9**

Types of Metals – Gold, Silver, Lead, Iron and copper – Iron and Steel crafts in ancient India – Extraction and smelting of Zinc in Ancient India – Wootz Steel Technology – Metal Casting in Ancient India – Glass Technology in Ancient India – Environmental Consciousness in Ancient India – Environmental Policy in Ancient India.

**TEXT BOOK:**

Ancient Indian Science, Technologies & Culture | Decoding the Vedas from Engineering to Consciousness – 22 August 2023 by Dr. Arjak Bhattacharjee, Sukanta Majumdar, Debasish Ghorui, Arpita Routray , Garuda Prakashan Pvt. Ltd.

**REFERENCES:**

1. History of Science, Philosophy and Culture in Indian Civilization: pt. 1. Science, technology, Chattpadhyaya, D. P. (Ed.). (1999), . Pearson Education India
2. The Archaeology of Ancient Indian Cities. Chakrabarti, D. K. (1992), Oxford University Press.

**COURSE OBJECTIVES:**

**COB1:** Understand the concept of Ancient Indian Civilization

**COB2:** understand the basic function of Indian Agriculture

**COB3:** Evaluate the Temple Water tanks and Dams technology in appropriate system

**COB4:** Select and apply the concept of Ancient Rural Indian Housing

**COB5:** Apply World of Materials to solve operational problems

<b>GEDX 240</b>	<b>ADVERTISING AND PROMOTION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>	<b>MANAGEMENT</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>

**COURSE OBJECTIVES: To enable students**

**COB1:** To acquire foundational knowledge about advertising.

**COB2:** To familiarize with various advertising models.

**COB3:** To explain budgeting techniques, media planning, and creative strategy.

**COB4:** To evaluate advertising effectiveness through research methods and understand industry structure.

**COB5:** To analyze the ethical, legal, and PR aspects of advertising in contemporary media environments.

**MODULE I Foundations of Advertising 6 0 0**

Introduction to Advertising: Definition, Scope, and Evolution-Role of Advertising in Integrated Marketing Communications (IMC)-Advertising and Positioning Decisions-Classification and Types of Advertising.

**MODULE II Advertising Model 6 0 0**

Overview of Advertising Models: AIDA, DAGMAR, Hierarchy of Effects-In-depth Discussion on Popular Advertising Models-Setting Advertising Objectives – SMART Framework-Role of Objectives in Campaign Strategy.

**MODULE III Media Decision 6 0 0**

Advertising Budgeting: Methods and Approaches-Media Planning: Types of Media, Media Selection, and Scheduling-Copy Decisions: Elements of an Effective Ad Copy-Copy Testing: Pre-testing and Post-testing Techniques.

**MODULE IV Campaign Evaluation 6 0 0**

Evaluating Advertising Effectiveness-Advertising Research Techniques-Structure and Functions of Advertising Agencies-Agency–Client Relationship and Compensation Methods

**MODULE V      Public Relations and Advertising Ethics      6      0      0**

Public Relations (PR) in the Marketing Mix-Tools and Techniques of PR-Social and Economic Impact of Advertising-Ethical and Regulatory Issues in Advertising-Codes of Conduct and Legal Aspects.

**L – 30; T – 0; P – 0; Total Hours:30**

**TEXT BOOKS:**

1. Advertising and Promotion Management John R. Rossiter, Larry Percy McGraw-Hill.

**REFERENCES:**

1. Advertising Promotion and Other Aspects of Integrated Marketing Communications by Terence A. Shimp and J. Craig Andrews, Publisher: Cengage Learning.
2. "Advertising Management with Integrated Brand Promotion" by Thomas O'Guinn, Chris Allen, and Richard Semenik, Publisher: Cengage Learning
3. Positioning: The Battle for Your Mind By Al Ries and Jack Trout Publisher: McGraw-Hill Education.

**COURSE OUTCOMES:**

**CO1:** Understand the evolution, types, and role of advertising in integrated marketing communications.

**CO2:** Apply advertising models and objective-setting frameworks in campaign planning.

**CO3:** Develop appropriate budgeting methods and media strategies for effective copy decisions and testing.

**CO4:** Evaluate advertising campaigns using research techniques.

**CO5:** Analyse advertising's ethical implications and the role of public relations.

	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
<b>CO1</b>	H	M	L				L			M	M	L	M	L
<b>CO2</b>	H	M	M			H	L	L		M	M	L	M	M
<b>CO3</b>	M	H	H	M	M	M	L	L	L	M	M	M	H	H
<b>CO4</b>	M	M	H	H	M	H		L	M	H	M	M	H	M
<b>CO5</b>	M	L	M	L	L	H	H	H	L	M	M	L	M	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:**

By equipping learners with skills in strategic advertising planning, media innovation, campaign evaluation, and ethical promotion practices, this course supports SDG 9 by fostering innovation in marketing communication, strengthening advertising infrastructure, and promoting sustainable industrial practices in the advertising and media sectors.

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

<b>GEDX 101</b>	<b>ADVANCED ENTREPRENEURSHIP</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 8</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 sauce 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 Shepherd, 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) :**

15<sup>th</sup>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.

<b>MODULE V</b>	<b>APPLICATION</b>	<b>09</b>
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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.

<b>GEDX 103</b>	<b>AUTOMOTIVE TECHNOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **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.

<b>MODULE I</b>	<b>VEHICLE TECHNOLOGY</b>	<b>9</b>
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		
<b>MODULE II</b>		
<b>SENSOR TECHNOLOGY</b>		
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.		
<b>MODULE III</b>		
<b>ADVANCED SYSTEMS</b>		
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 RECONSTRUCTION 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) :**

14<sup>th</sup> Board of Studies held  
on 22.08.2022

**Academic Council:**

19<sup>th</sup> Academic Council held on 29.09.  
2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
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.

<b>GEDX 105</b>	<b>BUILDING REPAIR SOLUTIONS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 11</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **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 converters - 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", 4<sup>th</sup> Edition, New Age International, 2012
2. Gambhir, M.L., "Concrete Technology", 5<sup>th</sup> 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" 4<sup>th</sup> Edition, McGraw Hill Education (India) Pvt. Ltd., 2014.
5. Gambhir, M. L., and Neha Jamwal, Building Materials: Products, Properties and Systems, Tata McGraw 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):**

18<sup>th</sup> 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
<b>CO1</b>						L	H								
<b>CO2</b>						L	H								
<b>CO3</b>						L	H								
<b>CO4</b>						L	H	M			M				
<b>CO5</b>					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

<b>GEDX 106</b>	<b>CLOUD SERVICES AND MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

**COB1:** Introduce the basic concepts and principles of cloud services.

**COB2:** Impart the knowledge of cloud services management.

**COB3:** Study the various cloud service providers.

**COB4:** Train the necessary functionalities of cloud tools.

**COB5:** Deploy the real-life applications of cloud.

**MODULE I INTRODUCTION** **9**

Overview of Cloud–Types of Deployment Models - Public, Private, Hybrid and Multi-Clouds - Multi Cloud Strategy - Services of Cloud – Adoption of Cloud Services – VMware Cloud Services- Features and Benefits of Cloud Services.

**MODULE II MANAGING CLOUDSERVICES** **9**

Understanding Workloads - Workload Use Cases - Analytics workload and Batch workloads - Principles of Workload Management - Workload Management in a Hybrid Cloud - Connecting Workloads in the Cloud -Importance of API, Standard workload layer and Portability - Managing and Monitoring Workloads - Tracking workloads - Introduction to Terraform - Using Terraform to define and manage workloads.

**MODULE III CLOUD SERVICE PROVIDERS** **9**

Overview of Cloud Providers - Microsoft Azure: Fundamental Concepts - Architectural Components – Database - Analytics – Amazon Web Services: Fundamentals - Architecture and Frameworks – Load Balancer - Google Cloud Platform: Fundamentals - Core Infrastructure.

**MODULE IV CLOUD SERVICE STORAGE&SECURITY** **9**

Overview of Cloud Storage - Object Storage Basics- Amazon S3 - Manage Amazon S3 buckets using Terraform - Managing Azure Blob Storage with Terraform - Azure Blob Storage - Google Cloud Storage - Introduction to Cloud Security - Shared Responsibility Model - Identity and Access Management Basics - Role-Based Access Control - Multi-Factor Authentication.

**MODULE V APPLICATIONS AND CASE STUDIES****9**

IaaS: Amazon EC2, Amazon S3, Amazon Cloud Front, Drop box - PaaS: AWS Lambda, AWS SNS - SaaS: Microsoft Office 365 – Case Study: Video Streaming Platforms – File hosting services – Secure storage of personal data – Backup Solutions for systems, sites and software –Automating AWS Lambda and SNS deployment using Terraform- Chatbot.

**TOTAL HOURS – 45****TEXT BOOKS:**

1. S.M. Ibrahim, RabiaFarheen, S.M. Salman. FUNDAMENTALS OF AWS GCP Azure Cloud Technology, Amazon digital services publications, 2022.
2. Hiran, Kamal Kant, RuchiDoshi, TemitayoFagbola, and MehulMahrishi. Cloud computing: master the concepts, architecture and applications with real-world examples and case studies. Bpb Publications, 2019.
3. Patterson, Scott. Learn AWS Serverless Computing: A Beginner's Guide to Using AWS Lambda, Amazon API Gateway, and Services from Amazon Web Services. Packt Publishing Ltd, 2019.

**REFERENCES:**

1. Hurwitz, Judith, Marcia Kaufman, and Fern Halper. "Cloud services for dummies." USA: IBM Limited Edition (2012).

**COURSE OUTCOMES:**

CO1: Define the cloud storage requirements for cloud services.

CO2: Learn and manage the various cloud services.

CO3: Compare and select the appropriate cloud service providers.

CO4: Apply the appropriate cloud tools in different applications scenario.

CO5: Solve the cloud based real life problems.

**Board of Studies (BoS) :**

20<sup>th</sup>BoS of CA held on 17.05.2024

**Academic Council:**

22<sup>nd</sup> Academic Council held on  
04.09.2024

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

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

**SDG 9:** Industry, Innovation and Infrastructure – Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

**Statement:** Introduction to Cloud Technology helps the learners to prepare a plan for utilize various cloud services and they can analysis of case studies and applications when deciding to adopt cloud computing architecture. Furthermore, knows the solutions for management of cloud services and demonstrate cloud-based application

<b>GEDX 108</b>	<b>CYBER LAW AND ETHICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG : 16</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

**COB-1** : To introduce students to the foundational principles of cyber law, including the legal framework governing cyber activities and cybercrimes.

**COB-2** : To provide an understanding of data protection, privacy rights, and intellectual property in the digital environment.

**COB-3** : To examine the ethical issues involved in the use of technology and digital platforms, including social and professional responsibilities.

**COB-4** : To analyse the legal implications of cybercrimes and develop practical knowledge of cyber law enforcement.

**COB-5** : To equip students with the skills necessary to identify and handle ethical dilemmas in cyberspace effectively.

### **MODULE - I** **INTRODUCTION TO CYBER LAW AND DIGITAL ETHICS** **9**

Overview: Introduction to cyber law; Evolution of cyber law and the Information Technology (IT) Act, 2000; Amendments and key provisions - Ethical Foundations: Importance of ethics in cyberspace; Professional and societal ethics; Ethical theories and decision-making in the digital context - International Context: Cyber law in different jurisdictions; International agreements on cyber regulations.

### **MODULE - II** **DATA PROTECTION AND PRIVACY LAWS** **9**

Data Protection: Concepts of data protection and privacy; Principles of data protection laws; Overview of data protection laws in India and the GDPR - Privacy Rights: Understanding privacy in the digital age; The right to privacy and landmark cases; Mechanisms for data protection and user rights - Digital Surveillance and Ethics: Ethical issues in surveillance, data mining, and tracking; Government and corporate responsibility.

### **MODULE - III** **CYBERCRIMES AND LEGAL REGULATIONS** **9**

Cybercrime Meaning & Categories: Types of cybercrimes—hacking, phishing, identity theft, financial fraud, cyberstalking, and cyberbullying. - Legal Framework for Cybercrimes: Provisions under the IT Act; Sections related to cyber offenses in the Bharatiya Nyaya Sanhita (BNS); Judicial precedents and case studies; - Cybercrime

Investigation: Digital evidence, forensic investigation, and procedural challenges in cybercrime cases; Role of CERT-IN.

**MODULE - IV**                   **INTELLECTUAL PROPERTY RIGHTS IN CYBERSPACE**

**9**

IP Laws and Digital Media: Copyrights, trademarks, and patents in digital media; Infringement and remedies - Cyber Squatting and Domain Disputes: Legal challenges in domain names and trademarks; ICANN policies and dispute resolution mechanisms - Digital Piracy and Content Sharing: Issues with streaming, sharing, and distribution of digital content; Legal and ethical considerations.

**MODULE - V**                   **ETHICAL ISSUES IN CYBERSPACE**

**9**

Online Freedom of Speech: Rights and restrictions on online speech; Hate speech, censorship, and digital defamation; - Social Media Ethics: Ethical challenges in social media use, misinformation, privacy violations, and ethical conduct - Future of Cyber Ethics: Emerging ethical issues in AI, machine learning, big data, and virtual reality; Cyber ethics in the age of technological advancement.

**L: 45 Hrs; Total Hours 45**

**TEXT BOOKS**

1. Dudley, Alfreda, et al. *Investigating Cyber Law and Cyber Ethics: Issues, Impacts and Practices*. Ukraine, Information Science Reference, 2012.
2. Priyadarshini, Ishaani, and Cotton, Chase. *Cybersecurity: Ethics, Legal, Risks, and Policies*. United Kingdom, Apple Academic Press, 2022.
3. *Information Security & Cyber Laws*. India, Khanna Book Publishing Company (P) Limited, 2019
4. Fatima, Talat. *Information Technology Law in India*. Netherlands, Wolters Kluwer, 2023.
5. *Information Technology Laws and Cyber Crimes*. N.p., Shashwat Publication, 2023.

**REFERENCES**

1. Grabowski, Mark, and Robinson, Eric P.. *Cyber Law and Ethics: Regulation of the Connected World*. United Kingdom, Taylor & Francis, 2021.
2. Lloyd, Ian J.. *Information Technology Law*. United Kingdom, Oxford University Press, 2020.
3. *Cyber Law, Privacy, and Security: Concepts, Methodologies, Tools, and Applications*. United States, IGI Global, 2019.
4. *The Ethics of Cybersecurity*. Germany, Springer International Publishing, 2020.

**COURSE OUTCOMES**

**CO-1** : Explain the framework of cyber law and its significance in the protection of digital information.

**CO-2** : Demonstrate knowledge of data protection laws and the legal principles associated with digital privacy.

**CO-3** : Analyse cybercrimes and apply relevant laws to understand the prevention and penalties associated with them.

**CO-4** : Evaluate ethical issues arising in the digital landscape and suggest appropriate resolutions.

**CO-5** : Identify practical solutions to cyber-ethical issues and cyber law cases within professional contexts.

**Board of Studies (BoS) :**

09th BoS of CSL held on  
25.03.2023

**Academic Council:**

20th Academic Council Meeting held  
on 13.04.2023

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
CO-1	H	M	L	L	M	L	H	L	L
CO-2	M	H	M	L	L	L	M	L	L
CO-3	H	M	L	H	M	L	H	M	L
CO-4	M	L	H	L	M	L	M	H	L
CO-5	H	M	L	H	L	H	L	M	H
NOTE:	L - LOW CORRELATION			M- MEDIUM CORRELATION			H- HIGH CORRELATION		

**SDG :16** SDG 16 focuses on promoting peaceful and inclusive societies, providing access to justice for all, and building effective, accountable, and inclusive institutions at all levels. Cyber law and ethics play a crucial role in achieving these goals by ensuring legal frameworks and ethical standards to protect individuals, prevent cybercrimes, safeguard data privacy, and promote responsible use of technology, which collectively support justice and robust digital governance.

<b>GEDX 110</b>	<b>DEEP LEARNING ESSENTIALS</b>	<b>L    T    P    C</b>
<b>SDG: 8</b>		<b>3    0    0    3</b>

**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 09 LEARNING**

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 09 RECURSIVE NETS**

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    09  
                          APPLICATION**

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, 1<sup>st</sup> Edition, 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, 1st Edition, 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.

<b>GEDX 111</b>	<b>DRONE TECHNOLOGY</b>	<b>L T P C</b>
<b>SDG: 9</b>		<b>2 0 2 3</b>

**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):**

18<sup>th</sup> BoS held on 24.11.2023

**Academic Council:**

21<sup>th</sup> AC held on 20<sup>th</sup> 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

<b>GEDX 112</b>	<b>ELECTRIC VEHICLE</b>	<b>L T P C</b>
<b>SDG: 8,9</b>		<b>3 0 0 3</b>

### **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 10 CONSIDERATIONS**

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, 1<sup>st</sup> edition, March 2020.
2. James Larminie and John Lowry, "Electric Vehicle Technology Explained", John Wiley & Sons Ltd, 2<sup>nd</sup> 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, 3<sup>rd</sup> Edition, 2018.

**REFERENCES:**

1. Tariq Muneer and Irene Illescas García, "The automobile, In Electric Vehicles: Prospects and Challenges", Elsevier, 2017.
2. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, 2<sup>nd</sup> 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) :**

19<sup>th</sup> BoS 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 decent 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.

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

**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) :**

23<sup>rd</sup> BoS of ECE held on  
13.07.2022

**Academic Council:**

19<sup>th</sup> 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
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**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

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

### **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
<b>CO1</b>	M												M	
<b>CO2</b>	M												M	
<b>CO3</b>			M	M									M	
<b>CO4</b>				M									M	
<b>CO5</b>				M									M	
<b>CO6</b>				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.

<b>GEDX 115</b>	<b>GENETIC ENGINEERING</b>	<b>L T P C</b>
<b>SDG: 3, 15</b>		<b>3 0 0 3</b>

**COURSE OBJECTIVES:**

**COB1:** To learn basics of DNA structure and rehybridization techniques

**COB2:** To get knowledge on tools required for gene transfer

**COB3:** To get knowledge on cloning vectors

**COB4:** To acquire knowledge on PCR and its applications

**COB5:** To get knowledge of modifying gene and its applications

**MODULE I BASICS CONCEPTS** 7

DNA Structure and properties; Restriction Enzymes; DNA ligase, Klenow enzyme, T4 DNA polymerase, Polynucleotide kinase, Alkaline phosphatase; Cohesive and blunt end ligation; Linkers; Adaptors; Homopolymeric tailing; Labeling of DNA: Nick translation, Random priming, Radioactive and non-radioactive probes, Hybridization techniques: types (Over view)

**MODULE II TOOLS OF GENETIC ENGINEERING** 9

Cloning vehicles, Restriction enzymes, modifying enzymes, DNA ligase, Polymerase etc, Transformation, transduction, Particle gun, Electroporation, liposome mediated, microinjection, Agrobacterium mediated gene transfer, Preparation and application of molecular probes: DNA probes, RNA probes, Radioactive labeling, nonradioactive labeling, use of molecular probes, DNA fingerprinting

**MODULE III CLONING VECTORS** 9

Plasmids; Bacteriophages; M13 mp vectors; PUC19 and Bluescript vectors, Phagemids; Lambda vectors; Insertion and Replacement vectors; Cosmids; Artificial chromosome vectors (YACs; BACs); Animal Virus derived vectors-SV-40; vaccinia/baculo& retroviral vectors; Expression vectors; pMal; GST; pET-can be omitted vectors; Protein purification; His-tag; GST-tag; MBP-tag etc.

**MODULE IV PCR AND ITS APPLICATIONS** 9

Primer design; Fidelity of thermostable enzymes; DNA polymerases; Types of PCR – multiplex, nested, reverse transcriptase, real time PCR, touchdown PCR, hot start PCR, colony PCR, cloning of PCR products; Sequencing methods; Enzymatic DNA

sequencing; Chemical sequencing of DNA; Automated DNA sequencing; RNA sequencing; Chemical Synthesis of oligonucleotides.

**MODULE V APPLICATION OF GENETIC ENGINEERING 9**

Gene silencing techniques; Introduction to siRNA; siRNA technology; Micro RNA; Construction of siRNA vectors; Principle and application of gene silencing; Gene knockouts and Gene Therapy; Creation of knock out mice; Disease model; Somatic and germ-line therapy- in vivo and ex-vivo; Suicide gene therapy; Gene replacement; Gene targeting; Transgenics; cDNA and intragenic arrays; Differential gene expression and protein array. Ethics in genetic engineering and global policy.

**L – 45; TOTAL HOURS –45**

**TEXT BOOKS:**

1. S.B. Primrose, R.M. Twyman and R.W.Old; Principles of Gene Manipulation. 6th Edition, S.B.University Press, 2001.
2. J. Sambrook and D.W. Russel; Molecular Cloning: A Laboratory Manual, Vols 13, CSHL, 2001.
3. Brown TA, Genomes, 3rd ed. Garland Science 2006
4. Selected papers from scientific journals.
5. Desmond S. T. Nicholl. An Introduction to Genetic Engineering Cambridge University Press 2008
6. Technical Literature from Stratagene, Promega, Novagen, New England Biolab etc.

**COURSE OUTCOMES:**

**CO1:** Define recombinant DNA technology and explain how it is used to clone genes

**CO2:** Assess the tools that are required for gene transfer

**CO3:** Compare and contrast different types of vectors and describe practical features of vectors and their applications in molecular biology.

**CO4:** Apply the knowledge of PCR in experiments

**CO5:** Analyse the applications of gene transfer

**Board of Studies (BoS) :**

8thBoS of SLS held on 5.07.2021

**Academic Council:**

18th AC 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	PSO 3
CO1	H	L	-	L	-	-	L	L	-	L	-	L	H	H	H
CO2	H	L	-	L	-	-	L	L	-	L	-	L	H	H	H
CO3	H	L	-	L	-	-	L	L	-	L	-	L	H	H	H
CO4	H	L	-	M	-	-	M	L	-	M	-	L	H	H	H
CO5	H	L	-	H	-	-	H	L	-	H	-	L	H	H	H

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

SDG 3. Good Health and Well Being Statement: Understanding of the fundamentals of rDNA technology we can modify the live organisms that can help in maintains systems to promote good health and wellbeing.

<b>GEDX 116</b>	<b>GREEN DESIGN AND SUSTAINABILITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG 11</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 SUSTAINABILITY 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 attaining sustainability in building.

**Board of Studies (BoS) :**

18<sup>th</sup> BoS of CE held on 05.04.2023

**Academic Council:**

20<sup>th</sup> Academic Council held on 13.04.2023

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	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.

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

### **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", 4<sup>th</sup> Edition, Pearson Education, 2018.
2. Robert Shcowergerdt, Remote sensing models & methods for image processing, 2<sup>nd</sup> edition, 2012
3. Geoff Dougherty, "Digital Image Processing for Medical Applications", 1<sup>st</sup> 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, 4<sup>th</sup> 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) :**

23<sup>rd</sup> BoS of ECE held on  
13.07.2022

**Academic Council:**

19<sup>th</sup> 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

<b>GEDX 118</b>	<b>INDUSTRIAL AUTOMATION AND</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>	<b>CONTROL</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **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) :**

18th BoS of EIE held on  
12.07.2022

**Academic Council:**

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

<b>GEDX 119</b>	<b>INDUSTRIAL SAFETY</b>	<b>L T P C</b>
<b>SDG: 9</b>		<b>3 0 0 3</b>

**COURSE OBJECTIVES:**

**COB1:** To learn the modern safety concepts

**COB2:** To familiarize with the safety in manufacturing industries

**COB3:** To acquire knowledge in construction and electrical safety systems

**COB4:** To be 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 – Cordon – 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, 14<sup>th</sup> 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):**20<sup>th</sup> BOS held on 08.08.2022**Academic Council:**19<sup>th</sup> 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
CO2	M	L	M			M	L	L					L	L
CO3	M	L	M			M	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

**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.

<b>GEDX 120</b>	<b>INDUSTRY 4.0</b>	<b>L T P C</b>
<b>SDG: 9</b>		<b>3 0 0 3</b>

**COURSE OBJECTIVES:**

**COB1:** To impart knowledge about the need of industry 4.0

**COB2:** To elucidate various technologies involved in Industry 4.0

**COB3:** To educate the supporting systems of Industry 4.0

**COB4:** To introduce the significance and systems of data handling in Industry 4.0

**COB5:** To illustrate the challenges 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-Social Innovations-Types.

**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-Prototyping techniques.

**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-Entrepreneurship & IPR.

**MODULE V MATURITY AND READINESS FOR INDUSTRY 4.0** L:9

Challenges – Gaps - Maturity levels - Readiness assessment – Opportunities - Future Trends - Case Studies-Medical, Agricultural devices- Societal impacts

**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 Emre Cevikcan, "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:** Identify the abilities of various technologies suitable for the particular requirement

**CO3:** Select and apply the supporting systems of Industry 4.0 as per the needs

**CO4:** Describe the concept of data analysis in the industry requirement

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

**Board of Studies (BoS) :**

24<sup>th</sup> BoS of Mechanical on  
24.01.2025

**Academic Council:**

23<sup>rd</sup> Academic Council on 28.02.2025

	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.

<b>GEDX 121</b>	<b>INTRODUCTION TO ARTIFICIAL</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 1</b>	<b>INTELLIGENCE</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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.

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.

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) :**

16<sup>th</sup> BoS of IT held on

18.08.2022

**Academic Council:**

19<sup>th</sup> 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.

<b>GEDX 122</b>	<b>INTRODUCTION TO ARTIFICIAL</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 4,8 &amp;9</b>	<b>INTELLIGENCE AND</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**EVOLUTIONARY COMPUTING**

**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, Yoshua Bengio, 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 Hinrich Schütze, 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) :**

19<sup>th</sup>BoS 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.

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

### **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 9 TRANSPORT AUTHORITIES**

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 9 PENALTY FOR MOTOR VEHICLES**

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 9 VEHICLE CLAIM**

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, 1<sup>st</sup> 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, 2<sup>nd</sup> edition, 2013. (ISBN-13 :978-8186976708)
3. "The motor vehicles act, 1988", Asia law house Publishing, 17<sup>th</sup> 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", 16<sup>th</sup> 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) :**

14<sup>th</sup> Board of Studies of auto  
held on 22.08.2022

**Academic Council:**

19<sup>th</sup> 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.

<b>GEDX 126</b>	<b>PERSONAL FINANCE AND INVESTMENT</b>	<b>L T P C</b>
<b>SDG: 1 &amp; 4</b>		<b>3 0 0 3</b>

### **COURSE OBJECTIVES:**

**COB1:** To equip learners with a comprehensive understanding of financial planning concepts and tools.

**COB2:** Highlighting the significance of emergency funds and formulate practical strategies for insurance.

**COB3:** To equip with the knowledge and skills to make strategic investment decisions, considering various investment options, understanding return & risk concepts

**COB4:** To provide learners with a comprehensive understanding of the retirement planning process, enabling them to estimate their retirement corpus, & navigate retirement products

**COB5:** Effective strategies for minimizing taxes and ensuring a financially stable retirement.

### **MODULE I                    BASIC OF FINANCIAL PLANNING                    8**

Meaning of Financial Planning, Need and Objective; Financial Planning Process; Cash flow statement, Net Worth statement, Budgeting; Time Value of Money (Present and Future Value of Single Cash Flows & Multiple Cash Flows; Rule of 72.

### **MODULE II                    INSURANCE AND SAVINGS PLANNING                    9**

Emergency fund; Need for medical insurance, Role of insurance in personal finance, Steps in insurance planning, Life and general insurance products.

### **MODULE III                    INVESTMENT PLANNING                    12**

Debt, Equity, Gold, real estate, Mutual funds, SIP's, & other securities in the stock market; Understanding Return and its concept, Compounding concept, Real vs Nominal Rate of Return, Tax Adjusted Return, Risk-Adjusted Return; Holding period and cost.

**MODULE IV            RETIREMENT PLANNING            8**

Introduction to the retirement planning process, estimating retirement corpus, Determining the retirement corpus, Retirement Products.

**MODULE V            TAX PLANNING            8**

Income Tax: Income tax principles: Heads of Incomes, Exemptions and Deductions, Types of Assesses, Rates of Taxation, Obligations for Filing and Reporting, Tax aspects of Investment Products.

**PRACTICALS / ASSIGNMENTS :**

1. Prepare the cash flow statement, net worth and budgeting for yourself
2. Set any 5 years and 10 years financial goal discuss the key point that you will be focusing for asset allocation
3. Make a plan for your family to use the proceeds of insurance policies and assets

**L – 45 ; TOTAL HOURS – 45**

**TEXT BOOKS:**

1. 5 W's of Financial Planning: Master the Art of Personal Finance Strategy. (2021),, Notion Press.
2. Basic Financial Management,(2018),3rd Edition, M Y Khan, P K Jain, McGraw Hill India.
3. Bogle, J. C. (2017). The Little Book of Common Sense Investing: The Only Way to Guarantee Your Fair Share of Stock Market Returns. Germany: Wiley.

**REFERENCES:**

1. Personal Finance Simplified: The Step-By-Step Guide for Smart Money Management. (2014).
2. Hora, R. M., Vij, D. (2015). Money Smart: The Indian Woman's Guide to Managing Wealth. India: Hachette India.
3. Halan, M. (2018). Let's Talk Money: You've Worked Hard for It, Now Make It Work for You. India: HarperBusiness.

**COURSE OUTCOMES:**

On successful completion of this course students will be able to

**CO1:** Evaluate the role of monitoring and adjusting financial plans as circumstances change.

**CO2:** Develop strategies for establishing and managing an effective emergency fund to mitigate unforeseen financial challenges.

**CO3:** Differentiate between various investments vehicles, including debt, equity, gold, real estate, mutual funds, SIPs, and other securities in the stock market.

**CO4:** Analyze the features, benefits, and risks associated with each retirement product to make informed decisions.

**CO5:** Explain the principles of income tax, including the classification of income into various heads, identification of exemptions and deductions available.

**Board of Studies (BoS) :**

20<sup>th</sup>BoS of Department of Commerce  
held on 22.04.2024

**Academic Council:**

22<sup>nd</sup> Academic Council held  
on 04.09.2024

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	PSO4
CO1				H	H	M							H	M	M	
CO2				H	H	M							H	M	M	
CO3				H	H	M							H	M	M	
CO4				H	H	M							H	M	M	
CO5				H	H	M							H	M	M	

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

SGD 1: No Poverty &

SDG 4: Quality Education

By managing personal finances effectively, individuals can lift themselves out of poverty and create financial stability. Investing in education for oneself or family members enhances skills and knowledge, leading to better opportunities and socioeconomic development.

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-3-540-22988-4 2020,2021.
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.

<b>GEDX 128</b>	<b>VALUE ANALYSIS AND ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 9</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **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):**

20<sup>th</sup> BOS of Mech held on

08.08.2022

**Academic Council:**

19<sup>th</sup> 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
CO2	M	L	H						L				L	L
CO3	M	L							L				L	L
CO4	M	L			H				L				L	L
CO5	M	L				M			L	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.

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

<b>GEDX 129</b>	<b>VEHICLE MAINTENANCE</b>	<b>L T P C</b>
<b>SDG: 9</b>		<b>3 0 0 3</b>

### **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 8 AND TOOLS**

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 repairing- 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 12 MAINTENANCE**

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 9 MAINTENANCE**

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:**

19<sup>th</sup> 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	PSO 2
CO1	H	H	H							H			H	H
CO2	H	H	H							H			H	H
CO3	H	H	H							H			H	H
CO4	H	H	H							H			H	H
CO5	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.

<b>GEDX 130</b>	<b>GRAPHICAL PROGRAMMING BASED SYSTEM DESIGN</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 3,9</b>		<b>2</b>	<b>0</b>	<b>1</b>	<b>3</b>

**COURSE OBJECTIVES:**

- **COB1:** To describe the LabVIEW environment, dataflow programming and LabVIEW development techniques .
- **COB2:** To develop the applications in LabVIEW graphical programming environment.
- **COB3:** To discuss graphs, charts and file I/Os in LabView environment
- **COB4:** To utilize the debugging tools in LabView.
- **COB5:** To create applications using a state machine design pattern.

**PREREQUISITE:** Experience in writing algorithms in the form of flowcharts or block diagrams

**MODULE I      Introduction To LabVIEW      6**

Introduction to Virtual Instrumentation , The LabVIEW Environment - Front Panels, Block Diagrams, LabVIEW Projects, SubVIs, the Icon, and the Connector, Alignment Grid, Pull-Down Menus, Floating Palettes, The Toolbar ,Pop-Up Menus, Help, Express Vis, Data types.

**MODULE II      Programming Execution With Structures      7**

**Controlling Program Execution with Structures:** Two Loops, Shift Registers, The Case Structure, Dialogs, The Sequence Structure, Flat or Stacked, Timing, The Timed Structures, The Formula Node, The Expression Node.

**Arrays and Clusters:** Creating Array Controls and Indicators, Functions for Manipulating Arrays, Polymorphism, Compound Arithmetic, Clusters, Error Clusters and Error-Handling Functions.

**MODULE III      LabVIEW's Visual Displays and File Management      7**

**LabVIEW's Exciting Visual Displays:** Waveform Charts, Graphs, XY Graphs, Chart and Graph Components, Intensity Charts and Graphs Colour as a Third Dimension, Time Stamps, Waveforms, and Dynamic Data, Mixed Signal Graphs, Exporting Images of Charts and Graphs.

**Exploring Strings and File I/O:** Overview, More About Strings, Using String Functions, Parsing Functions, File Input/output.

**MODULE IV Advanced LabVIEW Structures and Functions 5**

Local, Global, and Shared Variables, Property Nodes, Invoke Nodes, Event-Driven Programming : The Event Structure ,Type Definitions, The State Machine and Queued Message Handler, Messaging and Synchronization..

**MODULE V Data Acquisition – Interfacing with real world signals 5**

Interfacing with real time systems with DAQ unit , Case study based on Embedded systems

**L – 30 ,P –30 ; TOTAL HOURS –60**

**TEXT BOOKS:**

1. Jeffrey Travis, Jim Kring, **LabVIEW for Everyone: Graphical Programming Made Easy and Fun** (3rd Edition) (National Instruments Virtual Instrumentation Series) (Hardcover), August 2006.
2. Gary W. Johnson , Richard Jennings, **LabVIEW Graphical Programming**, 4th Edition,McGraw-Hill Professional ©2007 ,ISBN:0071370013

**REFERENCES:**

1. Ronald W. Larsen, **LabVIEW for Engineers 1st Edition**, Published by Prentice Hall (2011)

**COURSE OUTCOMES:**

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

**CO1:** Create Virtual Instruments (VI) and sub VI

**CO2:** Edit and Debug Virtual Instruments.

**CO3:** Build Arrays, Loops, Formulas and Sequence Structures using LabVIEW

**CO4:** Create applications using state machine pattern

**CO5:** Interface the real time signals with relevant hardware.

**Board of Studies (BoS) :**

26th BOS of ECE held on 13.05.2024

**Academic Council:**22<sup>nd</sup> AC held on 04.09.2024

PO CO	P O1	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	M	L									L	M	H
CO2	M	H	H	M	L									M	H
CO3	M	H	H	M	L								L	M	H
CO4		M	H	H	M									M	H
CO5				M	H								L	M	H

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

SDG 3 : Good Health and Well-Being Statement : Graphical Programming system design plays a major role in real time applications. A sound knowledge in these could lead to a substantial research and development in health and well-being.

SDG 9 : Industry, Innovation & Infrastructure Statement : Programming knowledge helps to innovate new applications and solve complex real world problems.

<b>GEDX 131</b>	<b>BUSINESS-TO-BUSINESS MARKETING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 12</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES:**

COB1: Get an overview of the various dimensions of business-to-business marketing

COB2: Learn the buying behaviour of industrial organizations

COB3: Gain conceptual insight into segmentation, targeting and positioning from industrial perspective

COB4: Learn to formulate product and distribution strategies

COB5: Gain knowledge on designing the pricing and marketing communications

### **MODULE I DIMENSIONS OF BUSINESS-TO-BUSINESS MARKETING 9**

Introduction to B2B Marketing: Business marketing, Classification of business market products, Types of business market customers, Environment and Characteristics of Business Markets, Organizational and business markets - Government as a customer - Commercial enterprises - Commercial and institutional customers, B2B vs B2C Marketing – Strategic decision making in industrial markets – at Corporate and SBU levels

### **MODULE II ORGANISATIONAL BUYING AND BUYER BEHAVIOUR 9**

Organizational Buying Behaviour: Organizational buyers' decision process - A Stepwise Model and A Process Flow Model - Buy grid model: Buying situations, Buy Phases, Marketing strategies in various buying situations and phases – Buying centres: Buying centre roles – Models of business buying behaviour – Webster and Wind Model, Sheth Model - Managing Business Market channels The Growth-Share Matrix, Multifactor Portfolio Matrix, The Balanced Scorecard - Buyer seller relationship, types of relationships, transactional and collaborative relationships – role of service in industrial markets.

### **MODULE III INDUSTRIAL MARKETING RESEARCH & S-T-P STRATEGIES 9**

Demand forecasting - qualitative and quantitative forecasting methods - B2B marketing research, the role of qualitative research techniques in B2B research, developing a marketing information system - Marketing STP: Market Segmentation, bases for segmenting business markets, basic framework of segmentation, choosing target segments and positioning

**MODULE IV INDUSTRIAL PRODUCT AND CHANNELDECISIONS 9**

Product management: new product development, industrial product life cycle, product evaluation matrix, techniques for identifying new products, QFD, perceptual mapping, reverse engineering, fishbone diagram, role of service and maintenance in industrial markets, customer experience life cycle, service quality - Business marketing channels and participants - Channel design and management decisions -B2B logistics management, types of industrial middlemen and intermediaries, marketing logistics and physical distribution

**MODULE V INDUSTRIAL MARKETING COMMUNICATION AND PRICING 9  
STRATEGIES**

Business Marketing Communications- B2B Advertising, Digital Marketing,- Trade shows, exhibitions, business meets - Managing the sales force -Deployment analysis, Direct marketing - Pricing: Pricing strategies; The pricing policy; Price on the Internet; competitive bidding, commercial terms and conditions, role of leasing.

**L – 45; TOTAL HOURS – 45**

**TEXT BOOKS:**

1. Krishna K. Havaldar and ShailendraDasari, "B2B Marketing, Text and Cases", McGrawhill Publications, 2021, 5<sup>th</sup> edition.

**REFERENCES:**

1. Robert R. Reeder, Edward G. Brittle and Pretty H. Reedier, "Industrial Marketing - Analysis Planning and Control," Prentice Hall of India Limited, New Delhi, 2017.
2. James C. Anderson, Das Narayandas, James A. Narus and D.V.R. Seshadri, "Business Market Management Understanding, Creating and Delivering Value", Pearson, 2010, 3rd edition.

**COURSE OUTCOMES:**

CO1: Recognize the characteristics of industrial consumers

CO2: Apply various models to understand organizational buying behaviour

CO3: Formulate strategies for segmenting, targeting and positioning industrial products

CO4: Choose the appropriate channel for distributing industrial products

CO5: Formulate appropriate pricing and promotional strategies for industrial Products

**Board of Studies (BoS) :**17<sup>th</sup>BoS of CBS on 07.02.2025**Academic Council:**23<sup>rd</sup> Academic Council on  
28.02.2025

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M		L	M	M	M	
CO2	M		L	M	M	M	
CO3	M		L	M	M	M	
CO4	M		L	M	M	M	
CO5	M		L	M	M	M	

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

SDG 12 : Ensure sustainable consumption and production patterns

The understanding of the concepts of retail marketing leads to developing retail strategies that adds value to the final product in terms of place utility as well as increases product consumption.

<b>GEDX 132</b>	<b>INTRODUCTION TO MARKETING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 12</b>	<b>ESSENTIALS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

**COB1:** Understand key marketing principles and concepts.

**COB2:** Analyze consumer behavior and market segmentation strategies.

**COB3:** Develop marketing strategies by integrating the marketing mix elements.

**COB4:** Understand the role of digital marketing and technological advancements in marketing.

**COB5:** Demonstrate critical thinking and problem-solving skills in marketing scenarios.

**MODULE I INTRODUCTION TO MARKETING****9**

Definition of Marketing: Creating Value for Customers - The Marketing Process: From Needs to Customer Satisfaction - The Evolution of Marketing: From Product-Oriented to Customer-Oriented - The Marketing Environment: Macro and Micro Factors - The Role of Marketing in Organizational Success

**MODULE II CONSUMER BEHAVIOUR AND MARKET****9****SEGMENTATION**

Psychological Factors Influencing Consumer Behavior - The Consumer Decision-Making Process - Cultural, Social, and Personal Influences on Buying Behavior - Business-to-Business (B2B) vs. Business-to-Consumer (B2C) Marketing - Market Segmentation: Bases of Segmentation (Demographic, Psychographic, Geographic, Behavioral) - Market Targeting: Evaluating Segment Attractiveness - Positioning: Creating a Competitive Advantage and Brand Image

**MODULE III MARKETING MIX (4Ps) – PRODUCT AND PRICE****9**

Product Life Cycle (PLC) - Product Differentiation and Innovation - Branding, Packaging, and Labeling - New Product Development (NPD) Process - Pricing Objectives and Strategies - Value-Based Pricing vs. Cost-Based Pricing - Price Elasticity and Demand - Pricing in Competitive Markets

**MODULE IV MARKETING MIX (4Ps) – PROMOTION AND PLACE****9**

Integrated Marketing Communications (IMC) - Advertising, Sales Promotion, Public Relations, and Personal Selling - Digital Promotion: Social Media, Content Marketing, SEO, and Email Campaigns - Measuring Promotion Effectiveness - Types of Distribution

Channels: Direct and Indirect - Retailing and Wholesaling Strategies - Supply Chain Management and Logistics - Channel Management and Conflict Resolution

**MODULE V     DIGITAL MARKETING AND SUSTAINABLE MARKETING****9**

The Role of Digital Marketing in the Modern Marketplace - Tools and Techniques: SEO, SEM, Email, and Social Media Marketing - Mobile Marketing and E-commerce - Emerging Trends: Artificial Intelligence (AI) and Big Data in Marketing - Ethical Issues in Marketing: Consumer Privacy, Misleading Advertising - Corporate Social Responsibility (CSR) in Marketing - Green Marketing and Sustainable Business Practices

**L – 45; TOTAL HOURS – 45****TEXT BOOKS:**

1. **Principles of Marketing** (19th Edition, 2023) by Philip Kotler, Gary Armstrong, Sridhar Balasubramanian, and Prafulla Y. Agnihotri. Published by Pearson Education, ISBN-13: 978-9357055215.

**REFERENCES:**

2. **Marketing Management** (16th Edition, 2022) by Philip Kotler, Kevin Lane Keller, G. Shainesh, Alexander Chernev, and Jagdish N. Sheth. Published by Pearson Education, ISBN-13: 978-9356061125.

**COURSE OUTCOMES:**

**CO1:** Understand and explain fundamental marketing concepts and terminologies.

**CO2:** Analyze market conditions and consumer behavior using segmentation, targeting, and positioning (STP).

**CO3:** Design a comprehensive marketing mix strategy (product, price, place, promotion).

**CO4:** Evaluate the role of digital marketing and the impact of technological advancements on marketing strategies.

**CO5:** Develop problem-solving skills by applying marketing strategies to case studies and practical business scenarios.

**Board of Studies (BoS) :**

17<sup>th</sup>BoS of CBS on 07.02.2025

**Academic Council:**

23<sup>rd</sup> Academic Council on 28.02.2025

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M		L	M	M	M	
CO2	M		L	M	M	M	
CO3	M		L	M	M	M	
CO4	M		L	M	M	M	
CO5	M		L	M	M	M	

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

#### SDG 12: Ensure sustainable consumption and production patterns

The understanding of the concepts of retail marketing leads to developing retail strategies that adds value to the final product in terms of place utility as well as increases product consumption.

<b>GEDX 133</b>	<b>E-BUSINESS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 8</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

COB1: Understand the digital economy and its impact on different businesses models.

COB2: Recognize the e-business models and infrastructure

COB3: Understand the role of the internet and digital technologies in business.

COB4: Learn how to formulate and implement effective e-business strategies.

COB5: Understand the ethical issues and challenges in e-business.

**MODULE I FOUNDATIONS OF E-BUSINESS SYSTEMS 9**

Introduction to E Business-Components of E Business-Business Models- Digital Economy and Transformation-Global e-business practices, trends, and innovations.

**MODULE II IINFORMATION SYSTEMS &WEB TECHNOLOGIES 9**

Information system of foundations - Decision support for the management-ERP- Internet and Web Technologies- Benefits of cloud services in e-business - E-Business Platforms.

**MODULE III E-BUSINESS INFRASTRUCTURE 9**

Business Model Innovation in e-business- Web Analytics Tools-e-business value chain functional as are as enabled: e-procurement-e-marketing, e-selling, e-SCM

**MODULE IV E BUSINESS SECURITY AND DATA CAPTURING 9**

Security System - Protocols for Security-Cyber Threats-Digital Signature- Digital Payment System - In interoperability of information system-EDI- fundamentals of web services- Automatic data C capture using RFID-GPS and GIS in supply Chain-Sensors and IoT-Business analytics.

**MODULE V RECOMMENDER SYSTEMS& DECISION SUPPORT SYSTEMS 9**

Recommender Systems, Types of Recommender Systems. User behavior modelling from web log, E-Planning Capacity Planning, Capacity Management Tools. Decision support concepts- understanding the web log-Webpage mining- Decision Support in E-Business.

**L – 30; T – 10; TOTAL HOURS – 40**

**TEXT BOOKS:**

1. Colin Combe, Introduction to E-Business-Routledge, London, Published 2006, eBook ISBN- 9780080492780, 2000.
2. Michael Papazoglou, Pieter M. A. Ribberes, E-Business :Organisational Technical Foundation, 2006.

**REFERENCES:**

1. Danny Samson, E-Business Value creation for Management, 2000.
2. Trites, G. and Boritz, J., E-Business: A Canadian Perspective for a Networked World, Pearson, Toronto Canada, 4<sup>th</sup> Edition, 2013.
3. Harvey M Deitel, Paul J Deitel,Kate Steinbuhler, E-Business & E-Commerce for Managers, ,1<sup>st</sup> edition,Pearson, 2001.

**COURSE OUTCOMES:** Through knowledge and understanding, students will be able to

**CO1:** Acquire knowledge about some innovative e-Business systems.

**CO2:** Analyzing E Business models, applications and strategies.

**CO3:** Understanding E business infrastructure, E marketing strategies.

**CO4:** Understand the role of digital technologies in streamlining supply chain management, procurement, marketing, CRM.

**CO5:** Evaluate the legal, ethical, and security challenges in e-business.

**Board of Studies (BoS) :**

17<sup>th</sup>BoS of CBS on 07.02.2025

**Academic Council:**

23<sup>rd</sup> Academic Council on 28.02.2025

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	M			M			L
CO2				M		M	H
CO3	L			L		M	L
CO4	M	L		M			L
CO5	M	L	L	M			M

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

SDG 8: Decent work and economic growth

E-business is directly tied to economic growth by enabling new digital business models, improving market access for small and medium-sized enterprises (SMEs), and fostering innovation.

It creates opportunities for decent work by supporting entrepreneurship, online businesses, remote work, and freelancing in the digital economy.

**GEDX 135****SDG: 3****MUNICIPAL SOLID WASTE  
MANAGEMENT****L T P C**  
**3 0 0 3****COURSE OBJECTIVES:**

The objectives of the course are to impart knowledge on

**COB1:** sources, types, characteristics, and effects of improper disposal of municipal solid waste.

**COB2:** on-site waste segregation and storage methods

**COB3:** different methods employed for waste collection and transfer

**COB4:** various types of waste processing techniques and resource recovery

**COB5:** solid waste disposal methods and ISWM approach.

**MODULE I                    INTRODUCTION TO SOLID WASTE MANAGEMENT            9**

Evolution, Sources, Types and Generation of Solid Waste– Quantity – Factors affecting generation of solid wastes - Characteristics – Methods of sampling and characterization - Effects of improper disposal of solid wastes - Principle of solid waste management - Public awareness - Role of NGOs.

**MODULE II                    ON-SITE STORAGE & HANDLING            9**

Storage of household waste - Selection of storage containers: Types, materials, and capacity- Storage area design: Location, Accessibility, and Safety considerations- Labeling and color coding for waste containers- Principles of safe waste handling- Tools and equipment for waste handling.

**MODULE III                    COLLECTION AND TRANSFER            9**

Methods of collection – Primary and secondary collection - Types of vehicles – Light commercial vehicles- Four wheeled mini trucks- Skip truck - Manpower requirement – Collection routes - Transfer stations – Selection of location- Operation & maintenance.

## MODULE IV      OFF-SITE PROCESSING

9

Processing techniques – Mechanical volume reduction, Thermal volume reduction and Chemical volume reduction – Chemical processes- Incineration-Solidification-Neutralization and chemical precipitation- Biological Processes- Composting- anaerobic digestion and vermicomposting.

## **MODULE V                    DISPOSAL OF SOLID WASTE**

9

Dumping of solid waste – effects in land and water environment- Impacts of improper disposal of plastic waste and e-waste-Training and use of personal Protective Equipment (PPE) Sanitary landfills – site selection, design and operation of sanitary landfills – Leachate collection & treatment – Integrated Solid Waste Management (ISWM) and legislation.

**L – 45; TOTAL HOURS – 45**

## TEXT BOOKS:

1. George Tchobanoglous, Hilary Theisen, Vigil, S. A. Integrated Solid Waste Management, Engineering Principles and Management Issues, McGraw-Hill Education (India) Private Limited, 2014.
2. Ramesha Chandrappa, Diganta Bhushan Das, Solid Waste Management, Principles and Practice, Springer Berlin Heidelberg, London, 2012
3. Ramachandra, T. V. Management of Municipal Solid Waste, TERI Press, New Delhi, 2011.
4. Sasikumar, K., Sanoop Gopi Krishna, Solid Waste Management, PHI Learning, New Delhi, 2009.

## REFERENCES:

1. CPHEEO, "Manual on Municipal Solid Waste Management", Central Public Health and Environmental Engineering Organisation, New Delhi, 2016.
2. Gomes, Maria Isabel, Martinho, G., Pires, A., Rodrigues, S., "Sustainable Solid Waste Collection and Management", Springer International Publishing, Germany, 2018.
3. MSW Management Rules 2016, Govt. of India <https://cpcb.nic.in/rules-2/>

**COURSE OUTCOMES:**

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

**CO1:** describe the different sources, types and the effects of improper disposal of municipal solid waste

**CO2:** explain the storage, segregation and handling of solid waste

**CO3:** Illustrate the methods for the collection of solid waste

**CO4:** identify the appropriate offsite processing techniques and resource recovery from solid waste

**CO5:** explain the solid waste disposal techniques and ISWM approach.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
CO1	-	-	L	-	-	L	L		-	-	-	-	-	-	L
CO2	-	-	L	-	-	L	L		-	-	-	-	-	-	L
CO3	-	-	L	-	-	L	L		-	-	-	-	-	-	L
CO4	-	-	L	-	-	L	L		-	-	-	-	-	-	L
CO5			L			L	L								L

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

**Board of Studies (BoS):**

20<sup>th</sup> BoS of Civil held on 08.07.2025

**Academic Council:**

24<sup>th</sup> Academic Council on 26.08.2025

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

The knowledge about the management of solid waste and implementing techniques helps to minimize their adverse impacts on human health. It will also aid in developing a sustainable environment.

**GEDX 136 AUTOMATION IN PRODUCTION SYSTEMS  
AND MANAGEMENT**L T P C  
3 0 0 3**COURSE OBJECTIVES:****COB1:** To impart knowledge about the need of industry automation**COB2:** To educate the geometric modelling and its systems**COB3:** To elucidate various computer aided manufacturing technology**COB4:** To introduce the significance of group technology and cellular manufacturing**COB5:** To develop knowledge on the Flexibility in Manufacturing Systems**MODULE I: INTRODUCTION TO AUTOMATION IN MANUFACTURING 9**

Basic Concepts of Manufacturing Systems, Evolution of Manufacturing Systems – Types of Manufacturing Systems and Role of Automation – Product-Process-Flexibility Matrices, Four-Plan Concept of Manufacturing – Product Design and Manufacturing Systems – Definitions and Design Criteria for Production Systems, Industry 4.0, Smart Manufacturing, Robotic automation.

**MODULE II: GEOMETRIC MODELING 9**

Geometric modeling: Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modelling facilities desired. Additive manufacturing – Mass production automation, Drafting and Modeling systems: Basic geometric commands, layers, display control commands, editing, dimensioning, and solid modeling, constraint based modeling.

**MODULE III: COMPUTER AIDED MANUFACTURING 9**

Introduction to Concept and Application of Numerical Control (NC) Technology – Basic Concepts of an NC System – NC Coordinate System, NC Motion Control System – Features of CNC, Configuration of CNC Machine Control System – Numerical Examples.

Distributed Numerical Control (DNC) and its Configuration – NC Part Programming – Interpolation and Part Programming.

#### **MODULE IV: GROUP TECHNOLOGY AND CELLULAR MANUFACTURING 9**

Group Technology (GT): Concept and Definition – Methods and Implementation of GT for Automation – Part Family Formation: Tools and Techniques – Numerical Examples on Part Family Formation – Application of GT for Designing Flexible and Programmable Automation. Concept and Definition of Cellular Manufacturing System (CMS) – Cell Formation Approaches – Evaluation of Cell Design – Production Planning and Control in CMS, Assessment of Solution by Heuristics/Algorithms for Cell Formation.

#### **MODULE V: FLEXIBILITY IN MANUFACTURING SYSTEMS 9**

Types and Definitions of Flexibility in Manufacturing Systems – Basic Features of FMS: Physical Subsystems – Basic Features of FMS: Control Subsystems and Manufacturing Control Activities. Operational Problems in FMS: Tools and Techniques – Tool Allocation Policies in FMS – Fixture and Pallet Selection Problems – Types of FMS Layout.

#### **TEXT BOOK:**

1. CAD / CAM Principles and Applications – 2nd edition, P.N. Rao, Tata Mc. Graw Hill.

#### **REFERENCES:**

1. CAD / CAM Theory and Practice / Ibrahim Zeid / TMH
2. CAD / CAM / CIM / Radhakrishnan and Subramanian / New Age
3. Principles of Computer Aided Design and Manufacturing / Farid Amrouche/ Pearson
4. Computer Numerical Control Concepts and programming / Warren S Seames/ Thomson.

#### **COURSE OBJECTIVES:**

**COB1:** Understand the concept of manufacturing systems and role of automation

**COB2:** understand the basic function of geometric modelling

**COB3:** Evaluate the computer aided manufacturing technology in appropriate system

**COB4:** select and apply the concept of group technology and cellular manufacturing

**COB5:** Apply FMS to solve operational problems

**Board of Studies (BoS) :**

17<sup>th</sup>BoS of Automobile on 07.02.2025

**Academic Council:**

23<sup>rd</sup> Academic Council on 28.02.2025

<b>GEDX 137</b>	<b>DAIRY AND FOOD PROCESS AND</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG: 8</b>	<b>PRODUCTS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES:**

COB1: provide students with appropriate academic studies and industrial experience to enable them to contribute to food biotechnology.

COB2: To update students' knowledge of new developments in the biology of the food industry

COB3: To give students a broad understanding and experience of technological processes involved in the food industry, especially dairy products.

COB4: To give students a broad understanding of food quality and control

COB5: To give students a broad understanding of food preservation

### **MODULE I      INTRODUCTION TO FOOD PROCESS AND PRESERVATION      9**

Basic food processing and preservation principles and methods. Emerging Technologies in Food Processing. Food additives and preservatives. Food laws and standards. Effect of processing on acceptability and nutritive value of food. Radappertization, Radicidation, and Radurization of Foods.

### **MODULE II      DAIRY PRODUCTS PROCESS, PRODUCTS AND REGULATORY STANDARDS      9**

Physico-chemical properties and structure of milk and milk constituents. Chemical and microbial spoilage of milk and milk products; Fluid milk Processing, packaging, and distribution. Common dairy processes – cream separation (standardization), pasteurization, sterilization, and homogenization. Process technology for the manufacture of evaporated milk, condensed milk, dried milk, malted milk, infant and baby foods, ice cream, cheese, butter, fermented milk, and indigenous dairy products. Methods and procedures for sampling and testing of milk and milk products. Laws and standards for milk and milk products. Technological processes for industrially manufactured foods of commercial importance, from plant and animal origin

**MODULE III      VEGETABLES AND OTHER FOODS      9**

Cereals, vegetables, fruits, meats, poultry, and egg products; Bakery, pasta, and confectionary products, ready to eat foods, fermented foods, alcoholic and non-alcoholic. Beverages, tea, coffee and cocoa, fabricated foods.

**MODULE IV      FOOD PACKING      9**

Packaging materials; Characteristics, properties, and their design. Packaging requirement for Different processed and unprocessed foods.

**MODULE V      FOOD PACKING AND REGULATORY REQUIREMENTS      9**

Working Principles of various types of fillers: form-fill-seal machine. Gas packaging and modified atmosphere Package design. Shelf life prediction of foods in packages. Quality control in food packaging. Product safety and packaging regulations. Microbial safety of food products, Chemical safety of food products, heavy metal, fungal toxins, pesticide and herbicide contamination.

**L – 30; T – 10; TOTAL HOURS – 40**

**TEXT BOOKS:**

1. Colin Combe, Introduction to E-Business-Routledge, London, Published 2006, eBook ISBN- 9780080492780, 2000.
2. Michael Papazoglou, Pieter M. A. Ribberes, E-Business :Organisational Technical Foundation, 2006.

**REFERENCES:**

1. Danny Samson, E-Business Value creation for Management, 2000.
2. Trites, G. and Boritz, J., E-Business: A Canadian Perspective for a Networked World, Pearson, Toronto Canada, 4<sup>th</sup> Edition, 2013.
3. Harvey M Deitel, Paul J Deitel, Kate Steinbuhler, E-Business & E-Commerce for Managers, ,1<sup>st</sup> edition, Pearson, 2001.

**COURSE OUTCOMES:**

CO1: The students will be able to search, collect, and analyze the information, with the use of the necessary technology.

CO2: Understand the common techniques used in food processes, especially dairy, poultry, and ready-to-eat foods.

CO3 : Understand the food preservatives and their importance.

CO4: The importance of various processing techniques in packing and packing standards.

CO5: Students can understand the food commodities.