COURSE TITLE: DNA COMPUTING									
Course Code:				**CSE-243013EAC**		**Examination Scheme**			
Total number of Lecture Hours: 56						**External**	**80**		
						Internal	**20**		
Lecture (L):	**4**	**Practicals(P):**	**-**	**Tutorial (T):**	**-**	**Total Credits**	**4**		

Course Objectives

- Understand the fundamentals of DNA structure and its role in molecular computing.
- Apply mathematical theories and language systems to model DNA computing processes.
- Analyze the parallelism of DNA strands and computational models like Watson-Crick automata and insertion-deletion systems.
- Explore distributed H systems and evaluate the recent trends and practical applications of DNA computing in computer networks.

Course Content	TEACHING HOURS
UNIT 1: Introduction to DNA Structure and Molecular Computing	**14 Hrs**
Introduction: DNA Structure, Sequence and Processing of DNA Introduction to molecular computing	
UNIT 2: Mathematical Foundations of DNA Computing	**14 Hrs**
Mathematical Theory: Mathematical Theory of DNA Computing; Introduction to language theory, Sticker systems	
UNIT 3: Parallelism and Computational Models in DNA Computing	**14 Hrs**
Parallelism of DNA strands; Watson Crick Automata; Insertion-Deletion Systems; Splicing circular strings.	
UNIT 4: Distributed H Systems and Applications of DNA Computing	**14 Hrs**
Distributed H Systems, Splicing, Recent trends and applications of DNA Computing in computer networks.	

Textbooks

2. Rozenberg, G., Bäck, T., & Kok, J. N. (2012). *Handbook of natural computing* (1st ed.). Springer Berlin Heidelberg.

Reference Books

2. DNA Computing by Paun, Gheorghe, Rozenberg, Grzegorz, Salomaa, Arto; Springer publication

COURSE OUTCOMES (CO):

CO1: Explain the basic structure of DNA and how it can be leveraged for molecular computing processes.

CO2: Demonstrate the ability to model DNA computing using mathematical theories, including language theory and sticker systems.

CO3: Design computational solutions using parallel DNA strand processing, insertion-deletion systems, and Watson-Crick automata.

CO4: Assess and implement distributed H systems and evaluate the impact of DNA computing applications in computer networks.

LEVEL OF CO-PO MAPPING TABLE

	POs											
COs	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	2	1	3	-	1	-	2	2	-	2
2	3	3	2	2	3	-	-	-	1	2	-	2
3	3	3	3	3	3	1	2	1	3	2	2	3
4	3	3	3	3	3	3	3	2	3	3	3	3

Open Electives

To be effective from year-2024

COURSE TITLE: Business Analytics

Course Code:			**CSE-243021OE**			**Examination Scheme**	
Total number of Lecture Hours: 56						**External**	**80**
						Internal	**20**
Lecture(L):	**4**	**Practicals(P):**	**0**	**Tutorial(T):**	**0**	**Total Credits**	**4**

Course Objectives

- Provide a solid foundation in business analytics, including data-driven decision-making processes, and key techniques used in business environments.
- Introduce students to descriptive analytics (summarizing and interpreting data), predictive analytics (forecasting future trends), and prescriptive analytics (recommending actions).
- Equip students with the knowledge to use popular tools like Microsoft Excel, R, Python, and business intelligence (BI) tools for data analysis and visualization.
- Teach statistical techniques and machine learning methods for business decision-making, including regression, classification, clustering, and optimization.
- Teach students how to interpret complex data analysis and communicate findings to stakeholders effectively.

Course Content	TEACHING HOURS
UNIT 1:	**- Hrs**
Overview of Business Analysis, Importance of data and analytics in modern business, types of analytics (descriptive, predictive, prescriptive). Data collection, data cleaning, analysis, and interpretation. Analytics in Different Business Functions: Marketing, finance, supply chain, HR, operations, etc.	**14**
UNIT 2:	**- Hrs**
Descriptive Statistics: Measures of central tendency (mean, median, mode), dispersion (variance, standard deviation), and shape of data (skewness, kurtosis). Data Exploration: Visualizations (histograms, box plots, scatter plots), summarizing data (pivot tables, summary statistics). Handling missing data, outliers, data normalization, and transformation. Using Exploratory Data Analysis (EDA) techniques to understand the underlying structure of business data.	**14**
UNIT 3:	**- Hrs**
Simple linear regression, multiple regression models. Logistic regression, decision trees, k-Nearest Neighbors (k-NN), and their applications in customer segmentation and risk assessment. Linear programming, integer programming, optimization models for resource allocation. Evaluation metrics (accuracy, precision, recall, F1 score, ROC curve) and cross-validation.	**14**
UNIT 4:	**- Hrs**
Best practices for creating clear, impactful visualizations for business decision-making. Using Excel, Tableau, Power BI, or R for creating dashboards and reports. Key performance indicators (KPIs), real-time dashboards, and interactive visualizations for business managers. Applying business analytics concepts to real-world business cases across various industries (e.g., retail, healthcare, finance).	**14**

Textbooks

1. Albright, S. Christian, and Wayne L. Winston. Business Analytics: Data Analysis & Decision Making. 6th ed., Cengage Learning, 2020.
2. Srivastava, Ashok N., and Nitin R. Patel. Analytics: Data Science and Predictive Analytics. Pearson, 2019.

Reference Books

1. Olson, David L., and Dursun Delen. Case Studies in Business Analytics: Real Business Applications of Data Science. Springer, 2017.
2. Provost, Foster, and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking. O'Reilly Media, 2013.
3. Shmueli, Galit, Nitin R. Patel, and Peter C. Bruce. Data Mining for Business Analytics: Concepts, Techniques, and Applications in R. Wiley, 2017.

COURSE OUTCOMES(CO):

CO1: Demonstrate an understanding of business analytics frameworks and processes for data-driven decision-making.

CO2: Summarize and interpret data using techniques such as measures of central tendency, dispersion, and data visualization tools.

CO3: Apply optimization and simulation techniques to recommend decisions based on business data.

CO4: Use software tools like Excel, R, Python, and BI tools to analyze data, build models, and present results.

CO5: Effectively communicate data insights and business recommendations to stakeholders, using appropriate visualizations and reports.

LEVEL OF CO-PO MAPPING TABLE

	POs											
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	3	2	2	2	2	1	1	2	2	1	2
2	3	3	2	3	3	2	1	1	2	2	2	3
3	3	3	3	3	3	2	1	1	2	3	2	3
4	2	2	2	2	3	1	1	1	3	3	2	2
5	3	3	3	3	2	3	2	2	3	3	2	3

COURSE TITLE: Industrial Safety

Course Code:				**CSE-243022OE**		**Examination Scheme**		
Total number of Lecture Hours: 56						**External**	**80**	
						Internal	**20**	
Lecture (L):	**4**	**Practicals(P):**	**-**	**Tutorial (T):**	**-**	**Total Credits**	**4**	

Course Objectives

- **Understanding Industrial Safety**: Gain knowledge of accident causes, preventive measures, and safety regulations, including the Factories Act 1948, fire prevention techniques, and safety color codes.
- **Learning Maintenance Engineering Fundamentals**: Understand the principles, functions, responsibilities, and economic aspects of maintenance engineering, as well as the tools and techniques involved.
- **Analyzing Wear and Corrosion**: Explore the causes, types, and prevention methods of wear and corrosion, including the role of lubrication and corrosion prevention techniques.
- **Mastering Fault Tracing**: Develop the ability to identify and resolve faults in various mechanical, hydraulic, pneumatic, automotive, thermal, and electrical systems using decision trees and structured fault-finding methods.

Course Content	TEACHING HOURS
UNIT 1: Industrial safety	**-Hrs**
Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.	14
UNIT 2: Fundamentals of maintenance engineering	**- Hrs**
Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.	14
UNIT 3: Wear and Corrosion and their prevention	**-Hrs**
Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	14
UNIT 4: Fault tracing	**-Hrs**
Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.	14

Textbooks

6. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
7. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
8. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

Reference Books

3. Maintenance Engineering, H. P. Garg, S. Chand and Company.

COURSE OUTCOMES (CO):

CO1: Demonstrate knowledge of industrial safety practices and regulations, and apply preventive measures to reduce accidents and hazards in industrial environments.
CO2: Explain the functions of maintenance engineering, select appropriate maintenance strategies, and evaluate maintenance costs concerning equipment replacement and service life.
CO3: Identify the causes and effects of wear and corrosion in industrial equipment and propose suitable prevention and lubrication techniques for various applications.
CO4: Diagnose and troubleshoot faults in machine tools, pumps, compressors, engines, boilers, and electrical motors by applying systematic fault-finding techniques and decision-tree methods.

LEVEL OF CO-PO MAPPING TABLE

	POs											
COs	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	3	2	2	3	3	2	-	2	-	2
2	3	3	2	3	2	2	3	2	-	2	3	3
3	3	3	2	2	2	2	2	3	1	-	1	3
4	3	3	3	3	3	3	2	2	2	3	2	3

COURSE TITLE: Operations Research								
Course Code:				**CSE-243023OE**		**Examination Scheme**		
Total number of Lecture Hours: 56						**External**	**80**	
						Internal	**20**	
Lecture (L):	**4**	**Practicals(P):**		**Tutorial (T):**	**-**	**Total Credits**	**4**	

Course Objectives

- To introduce linear programming and optimization techniques, covering both graphical and simplex methods for solving linear problems.
- To explore unconstrained one-dimensional optimization techniques, including search methods and interpolation techniques for finding optimal solutions.
- To study unconstrained multi-dimensional optimization methods, such as random search, pattern search, and descent algorithms like steepest descent and quasi-Newton methods.
- To understand constrained optimization techniques, including conditions for optimality, Kuhn-Tucker conditions, and methods like gradient projection, cutting plane, and penalty function.

Course Content	TEACHING HOURS
Unit 1: Fundamentals of Optimization Techniques	**14 Hrs**
Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models	
Unit 2: Advanced Linear Programming and Parametric Analysis	**14 Hrs**
Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming	
Unit 3: Nonlinear Programming and Network Optimization	**14 Hrs**
Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT	
Unit 4: Scheduling, Sequencing, and Inventory Models	**14 Hrs**
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.	

Textbooks

- H.A. Taha, Operations Research, An Introduction, PHI, 2008
- H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
- J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008

Reference Books

- Hitler Libermann Operations Research: McGraw Hill Pub. 2009
- Pannerselvam, Operations Research: Prentice Hall of India 2010 6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

COURSE OUTCOMES (CO):

CO1: Demonstrate a comprehensive understanding of operating system principles and advanced system types.

CO2: Analyze and apply process management and system architecture concepts in modern computing systems.

CO3: Develop solutions for scheduling, synchronization, and deadlock issues in various computing environments.

CO4: Evaluate and implement strategies for memory, I/O, and security management in operating systems.

LEVEL OF CO-PO MAPPING TABLE

	POs											
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	3	2	2	2	2	1	1	2	2	1	2
2	3	3	2	3	3	2	1	1	2	2	2	3
3	3	3	3	3	3	2	1	1	2	3	2	3
4	2	2	2	2	3	1	1	1	3	3	2	2

COURSE TITLE: Cost Management of Engineering Projects									
Course Code:				**CSE-243024OE**			**Examination**	**T**	**P**
Total number of Lecture Hours:56 **Total number of Practical Hours:-**							**External** **Internal**	**80** **20**	
Lecture (L):	**4**	**Practicals(P):**	**-**	**Tutorial (T):**	**-**	**Total Credits**		**4**	

Course Objectives:

- To understand the principles of cost behavior and profit planning, including key costing methods like marginal costing and absorption costing.
- To apply various budgeting techniques, including flexible, performance, and zero-based budgets, for effective financial control and decision-making.
- To explore quantitative techniques such as linear programming, PERT/CPM, and simulation for cost management and optimization.
- To analyze and implement advanced cost management methods such as activity-based cost management, target costing, and total quality management.

Course Content	**TEACHING HOURS**
UNIT 1: Strategic Cost Management and Decision-Making in Business Operations	**-14 Hrs**
Introduction and Overview of the Strategic Cost Management Process Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.	
UNIT 2: Project Management: Stages, Execution, and Cost Control	**- 14 Hrs**
Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process.	
UNIT 3: Cost Behavior, Profit Planning, and Advanced Cost Management Techniques	**-14 Hrs**
Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis.	

UNIT 4: Budgetary Control and Quantitative Techniques for Cost Management	**-14 Hrs**
Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing., Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.	

Textbooks

5. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi

References

1. Charles T. Horngren and George Foster, Advanced Management Accounting
2. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
3. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
4. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

COURSE OUTCOMES (CO):

CO1: Understand and apply key cost concepts like marginal costing, break-even analysis, and cost-volume-profit analysis in decision-making.

CO2: Develop and implement budgets using different techniques, including flexible budgets, performance budgets, and zero-based b udgeting.

CO3: Use quantitative techniques like linear programming, PERT/CPM, and simulation to solve cost-related problems and optimize resource allocation.

CO4: Analyze and apply advanced cost management strategies such as activity-based costing, life cycle costing, and total quality management to improve organizational profitability

LEVEL OF CO-PO MAPPING TABLE

	POs											
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3	3	2	2	3	1	2	2	2	2	3	3
2	3	3	2	2	3	2	2	2	2	3	3	2
3	3	3	3	3	3	2	2	3	3	2	3	3
4	3	3	3	3	3	2	3	2	3	3	2	3

Textbooks

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007. i

References

1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

COURSE OUTCOMES (CO):

CO1: Define and classify composite materials and explain their advantages and applications in various industries.

CO2: Describe the role of reinforcements and matrices in composites and analyze the effect of reinforcement parameters on overall composite performance.

CO3: Explain the mechanical behavior of composites using the rule of mixtures and different stress conditions.

CO4: Demonstrate an understanding of different manufacturing techniques for metal matrix, ceramic matrix, and carbon-carbon composites.

LEVEL OF CO-PO MAPPING TABLE

	POs											
COs	1	2	3	4	5	6	7	8	9	10	11	12
1	3	3	2	2	3	1	2	2	2	2	3	3
2	3	3	2	2	3	2	2	2	2	3	3	2
3	3	3	3	3	3	2	2	3	3	2	3	3
4	3	3	3	3	3	2	3	2	3	3	2	3

COURSE TITLE: Composite Materials									
Course Code:				CSE-243025OE			Examination	T	P
Total number of Lecture Hours:56 Total number of Practical Hours:-							External	80	
							Internal	20	
Lecture (L):	4	Practicals(P):	-	Tutorial (T):	-		Total Credits	4	

Course Objectives:

- To introduce students to the fundamental concepts of composite materials, their classification and characteristics.
- To understand the functional requirements and role of reinforcement and matrix in composites.
- To explore different types of reinforcements and their effects on mechanical properties of composites.
- To gain knowledge of various manufacturing techniques for metal matrix, ceramic matrix, and carbon-carbon composites.
- To study the different methods of polymer matrix composite manufacturing and their applications in engineering fields.

Course Content	TEACHING HOURS
UNIT 1: Introduction	**-14 Hrs**
Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.	
UNIT 2: Reinforcements	**- 14 Hrs**
Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.	
UNIT 3: Manufacturing of Metal Matrix Composites	**-14 Hrs**
Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.	
UNIT 4: Manufacturing of Polymer Matrix Composites	**-14 Hrs**
Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.	

COURSE TITLE: Waste To Energy

Course Code:	CSE-243026OE	Examination	T	P
Total number of Lecture Hours:56 Total number of Practical Hours:-		External	80	
		Internal	20	

Lecture (L):	4	Practicals(P):	-	Tutorial (T):	-	Total Credits	4

Course Objectives:

- To provide an understanding of various waste materials and their classification as fuel sources.
- To explore different waste-to-energy conversion technologies, including incineration, gasification, pyrolysis, and digestion.
- To study biomass pyrolysis, its types, and the production of pyrolytic oils and gases.
- To analyze different biomass gasification systems, their design, and applications in power generation and heating.
- To understand biomass combustion technologies and the design, construction, and operation of biomass combustors.
- To examine biogas production, its properties, technologies, and applications in energy system

Course Content	TEACHING HOURS
UNIT 1:	**-14 Hrs**
Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors. Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.	
UNIT 2:	**- 14 Hrs**
Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.	
UNIT 3:	**-14 Hrs**
Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.	
UNIT 4:	**-14 Hrs**

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications.	

Textbooks

1. "Biomass Conversion and Technology" – C. Y. Wereko-Brobby and E. B. Hagan, John Wiley & Sons.
2. "Biogas Technology - A Practical Handbook" – Khandelwal K. C. & Mahdi S. S., Tata McGraw-Hill.
3. "Biomass Renegerable Energy" – D. Pimentel, Springer.
4. "Waste to Energy: Opportunities and Challenges for Developing and Transition Economies" – Charles W. Reith & Nathan P. C. Snyder, Elsevier.
5. "Renewable Energy Sources and Emerging Technologies" – D. P. Kothari, K. C. Singal, Rakesh Ranjan, PHI Learning Pvt. Ltd.

References

1. Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

COURSE OUTCOMES (CO):

CO1: Classify different types of waste materials and explain their potential as energy sources.

CO2: Describe various waste-to-energy conversion technologies such as incineration, gasification, and digestion.

CO3: Explain the process of biomass pyrolysis, its methods, and the production of useful by products like pyrolytic oils and gases.

CO4: Evaluate different biomass combustion technologies, including stoves, fixed bed combustors, and fluidized bed combustors.

CO5: Understand the principles of biogas production, the design of biogas plants, and their applications in renewable energy systems.

LEVEL OF CO-PO MAPPING TABLE

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	3	2	2	3	1	2	2	2	2	3	3
2	3	3	2	2	3	2	2	2	2	3	3	2
3	3	3	3	3	3	2	2	3	3	2	3	3
4	3	3	3	3	3	2	3	2	3	3	2	3
5	3	3	2	2	3	1	2	2	2	3	2	3