CEOE308 Draught & Flood

Pre-requisite: None

L	T	P/D	Credits	Total contact hours
3	0	0	3	3

Brief description of the course: The subject deals with basic concepts and principles of drought and flood. It helps to estimate and analyze the drought & flood, and explainspreventive measures to prevent the drought & flood. Also, it provides student knowledge of shortage and excess of precipitation and its impact on human life.

Course Content:

Unit-I (8 hrs)

Drought (6 hrs)

Definition, causes, types, effects of drought, indices, management, water harvesting.

Flood Problems (2 hrs)Causes, alleviation

Unit-II (12 hrs)

Estimation of design floods (6 hrs)Methods of computations

Flood routing through reservoirs and channels (6 hrs)Puls method, Muskingum method

Unit-III (9 hrs)

Spillway designs (5 hrs) Functions, types and design

Flood mitigation (4 hrs)

Various types of storages, Reservoir operation, river improvement works

Unit-IV (7 hrs)

Flood forecasting, warning and fighting (3 hrs)

Forecasting techniques, engineering measures for flood fighting

Design of subsurface drainage systems (4 hrs)Necessity, design of underdrains

Note: The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possiblesustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Text Books/Reference:

1 Engineering Hydrology by K.Subramanya.
2 Hydrology for Engineers by Linsely, Kohler, Paulhus.
3 Flood Control and Drainage Engineering by S.N. Ghosh
4 Water Resources Engineering by Larry W. Mays
5 Land drainage Principles, methods and applications by A K Bhattacharya and A MMicael

Course outcomes: Upon successful completion of the course, the students will be able to

1. Understand the basic principles of drought and flood.
2. Measure the flow of water through the channel and watershed area.
3. Understand preventive measures to prevent the drought and flood.
4. Understand methods of design structures required for the mitigation of flood.

CEOE310 Sustainable Infrastructure

L	T	P/D	Credits	Total contact hours
3	0	0	3	3

Brief Description about the course:

This course develops engineering skills with the focus on planning, design, and construction of sustainable infrastructure with the key purpose to support and connect our communities. It is not simply the short-term provision of infrastructure that is of prime importance butplanning and designing infrastructure which takes full account of its own impact and its operational needs and use. Sustainable infrastructure design is not just about new infrastructure, it is about rehabilitation, reuse, or optimization of existing infrastructure. Infrastructures should set an aim to set a responsible standard of sustainable design in boththe short- and the long-term. Infrastructure must be sustainable if it is to benefit coming generations and make a positive contribution to the future. Students will learn how to usetheir knowledge of these processes by designing sustainably and quantitatively assess alternative design options. Design-based problems and case studies are used to build on theory and challenge students to use their skills in applied settings.

Course content:

Unit I - 12 hrs.

Examine systems theory as a tool throughout the conception, analysis, and design of technological systems operating in modern societies and embedded within the natural environment for buildings, structures, plants and networks for communication and transport, water and wastewater treatment, production, and distribution of energy; relations between infrastructure and sustainable development

Unit II - 8 hrs.

Regulations and standards; indicators of sustainability; consequences of climate change;vulnerability and safety of infrastructure;

Unit III - 8 hrs.

Materials and technology for construction and management; Applications for sustainablecommunities; service life and life cycle assessments

Unit IV - 8 hrs.

Case studies from around the world.

Note: The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possiblesustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Text Books/Reference:

1. Sarte S. B., 'Sustainable Infrastructure: The Guide to Green Engineering and Design,Wiley; 1st edition, 2010.
2. Horne R. E., Grant T., Verghese K., 'Life Cycle Assessment: Principles, Practice andProspects', CSIRO, 2009.
3. Karli Verghese, Helen Lewis, Leanne Fitzpatrick, 'Packaging for Sustainability', Springer,2012.

Course Outcomes:

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

1. understand the values and societal importance of the built environment.
2. understand the influence on a sustainable development.
3. gain knowledge on how to use environmental impact assessments as a tool for design.
4. understand construction and management of a sustainable built environment.

Course Code	**:**	**CSOE 302**
Course Title	**:**	**Design and Analysis of Algorithms**
Number of Credits and L/T/P	**:**	**3 & 3/0/0**
Prerequisites (Course code)	**:**	
Course Category	**:**	**OE**

Course Learning Objectives:

1. Able to design, implement and analysis of standard searching and sorting algorithms.
2. Implement standard divide and conquer, Dynamic programming, Greedy and backtracking algorithms.
3. Able to implement between different data structures i.e., trees, heaps etc. also, able to pick an appropriate data structure for any given design situation.
4. Able to implement the major graph algorithms and their analysis.

Course Content:

Unit 1: Introduction

Concept of Time and space complexity, analysis of algorithms, asymptotic notation, recurrence relations, design and analysis of D & C problems like quick sort etc, heap sort, priority queues, sorting in linear time, hashing, binary search trees.

Unit 2: Graph Algorithms

Graph representation & traversal (search), topological sort, strongly connected components, minimum spanning trees – Kruskal and Prim's, Single source shortest paths, relaxation, Dijkstra's algorithm, Bellman- Ford algorithm, single source shortest paths for directed acyclic graphs, all-pairs shortest path.

Unit 3: B-Trees and Dynamic programming

B-Trees: representation and operations; Elements of Dynamic Programming, structure and steps, Matrix-chain multiplication, longest common subsequence.

Unit 4: Greedy & Backtracking Approaches:

Greedy algorithms – Elements, activity-selection problem, Huffman codes, task scheduling problem, Knapsack Problem, Backtracking – Elements, 8 – Queens, Graph Coloring, Hamiltonian Cycles.

Text Books:

1. Cormen, Leiserson and Rivest: Introduction to Algorithms, 3/e, PHI.
2. Horowitz, Sahni, and Rajasekaran: Fundamentals of Computer Algorithms, Second Edition, Universities Press, Hyderabad.
3. Aho, Hopcroft, and Ullman: The Design and Analysis of Computer Algorithms, Addison Wesley.

Course Outcomes

1. Able to design, implement and analysis of standard searching and sorting algorithms.
2. Implement standard divide and conquer, Dynamic programming, Greedy and backtracking algorithms.
3. Able to implement between different data structures i.e., trees, heaps etc. also, able to pick an appropriate data structure for any given design situation.
4. Able to implement the major graph algorithms and their analysis.

Course Code	**:**	**ITOE 302**
Course Title	**:**	**Design and Analysis of Algorithms**
Number of Credits and L/T/P scheme	**:**	**3 & 3/0/0**
Prerequisites (Course code)	**:**	
Course Category	**:**	**OE**

Course Learning Objectives:

1. Able to design, implement and analysis of standard searching and sorting algorithms.
2. Implement standard divide and conquer, Dynamic programming, Greedy and backtracking algorithms.
3. Able to implement between different data structures i.e., trees, heaps etc. also, able to pick an appropriatedata structure for any given design situation.
4. Able to implement the major graph algorithms and their analysis.

Course Content:

Unit 1: Introduction

Concept of Time and space complexity, analysis of algorithms, asymptotic notation, recurrence relations, design and analysis of D & C problems like quick sort etc, heap sort, priority queues, sorting in linear time, hashing, binary search trees.

Unit 2: Graph Algorithms

Graph representation & traversal (search), topological sort, strongly connected components, minimum spanning trees – Kruskal and Prim's, Single source shortest paths, relaxation, Dijkstra's algorithm, Bellman-Ford algorithm, single source shortest paths for directed acyclic graphs, all-pairs shortest path.

Unit 3: B-Trees and Dynamic programming

B-Trees: representation and operations; Elements of Dynamic Programming, structure and steps, Matrix-chain multiplication, longest common subsequence.

Unit 4: Greedy & Backtracking Approaches:

Greedy algorithms – Elements, activity-selection problem, Huffman codes, task scheduling problem, Knapsack Problem, Backtracking – Elements, 8 – Queens, Graph Coloring, Hamiltonian Cycles.

Text Books:

1. Cormen, Leiserson and Rivest: Introduction to Algorithms, 3/e, PHI.
2. Horowitz, Sahni, and Rajasekaran: Fundamentals of Computer Algorithms, Second Edition, UniversitiesPress, Hyderabad.
3. Aho, Hopcroft, and Ullman: The Design and Analysis of Computer Algorithms, Addison Wesley.

Course Outcomes

1. Able to design, implement and analysis of standard searching and sorting algorithms.
2. Implement standard divide and conquer, Dynamic programming, Greedy and backtracking algorithms.
3. Able to implement between different data structures i.e., trees, heaps etc. also, able to pick an appropriatedata structure for any given design situation.
4. Able to implement the major graph algorithms and their analysis.

Open Electives (Semester VI)

ELECTRICAL ENGINEERING DEPARTMENT

EEOE305 POWER ELECTRONIC SYSTEMS

Pre-requisite: EEPC101, EEPC202

L	T	P	Credits	Total contact hours
3	0	0	3	42

Brief Description about the course:

Unit I **(10)**

Modern Power Electronics Devices:

Principle of operation of SCR, dynamic characteristic of SCR during turn ON and turn OFF, Two transistor analogy, Protection of SCR, Snubber circuit, Commutation circuits, SCR ratings, Triggering Methods, Series and Parallel operation of SCR. Principle of operation of, IGBT, GTO, DAIC, TRAIC, their operating characteristics

Unit II **(12)**

A.C. to D.C. Converter:

Single-phase Converter: Half-wave converter, 2-pulse midpoint converter, half-controlled and fully-controlled bridge converters, input current and output voltage waveforms, effect of load and source impedance, expressions for input power factor, displacement factor, harmonic factor and output voltage, effect of free-wheeling diode, triggering circuits, Dual converter.

Three-phase Converter: Half wave, full wave, half controlled and fully controlled bridge converters, effect of load and source impedance, expressions for input power factor, displacement factor, harmonic factor and output voltage

Unit III **(10)**

D.C. to D.C. Converter: Classification of choppers. Principle of operation, steady state analysis of class A chopper, step up chopper, switching mode regulators: Buck, Boost, Buck-Boost.

A.C. to A.C. Converter: Principle of operation of single-phase ac regulator, effect of load inductance, firing pulse requirement. Principle of operation of cyclo-converter, waveforms, control technique

Unit IV **(10)**

Applications of Power Converters to Renewable Energy Systems

Introduction toMulti-level converters, topologies and control techniques, PWM techniques. DC-DC converter, Interleaved buck/boost converter, advanced modulation techniques. Multi-channel interleaved boost converters, voltage source converters, control of grid-tied converters.

References/Textbooks:

1. M. Ramamoorthy. Thyristor and their applications, East West Publication, 1991.
2. PS Bhimbra.Power Electronics, Khanna Publishers, 2015.
3. MD Singh and KB Khanchandani, Power Electronics, TMH Edition, 2007.
4. G.K. Dubey, S. R. Doradla, A. Joshi, and R. M. K. Sinha, "Thyristorised Power Controllers", New Age International Private Ltd.
5. Mohan N., Undeland T. M. and Robbins W. P., "Power Electronics Converters, Applications and Design", 3rd ED, Wiley India.
6. V. Yaramasu and B.Wu, "Model Predictive Control of Wind Energy Conversion Systems," Wiley- IEEE Press, 2016.

Course Outcomes:

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

CO1 Understand fundamental concepts in power electronics.

CO2 To analyze power converter circuits and power electronics-based design and application

CO3 To troubleshoot power electronics circuits, adaptability to analyze power converter-based renewable energy systems

CO4 To troubleshoot gird compatibility issues with power electronics circuits

ELECTRICAL ENGINEERING DEPARTMENT

EEOE306 ELEMENTS OF POWER SYSTEMS ENGINEERING

Pre-requisite:

L	T	P	Credits	Total contact hours
3	0	0	3	42

Brief Description

To understand the basic concepts of power generation, economics of generation, the concept of transmission and distribution systems, layouts of substation and lines, insulators, and basics' of technologies related to distributed energy resources

Course Content

Unit - I Introduction **(10)**

Typical Layout of an Electrical Power System Present Power Scenario in India. Generation of Electric Power (Qualitative): Conventional Sources: Hydro station, Steam Power Plant, Nuclear Power Plant and Gas Turbine Plant. Renewable energy Sources: Wind Energy, Fuel Cells, and Solar Energy, Tidal.

Unit – II Economics of Generation **(10)**

Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load duration curve, number and size of generator units. Base load and peak load plants. Cost of electrical energy-fixed cost, running cost, Tariff structure to customer.

Unit – III AC Transmission and Distribution **(12)**

Introduction, single line diagram of a typical power system, AC distribution, Single phase, 3-phase, 3 phase 4 wire system, bus bar arrangement, Selection of site and layout of substation, Overhead Line Insulators: Introduction, types of insulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential, testing of insulators. Insulated Cables: Introduction, insulation, insulating materials, high voltage cables, grading of cables, insulation resistance of a cable, Capacitance of a single core and three core cables, Overhead lines versus underground cables, types of cables.

Unit – IV Renewable Energy Systems **(10)**

Sustainability of renewable energy sources in Power System: environmental sustainability, economic sustainability, social sustainability, technology Drivers (Qualitative): basics of

Technologies associated with Distributed energy Resources (e.g. Fuel cells, Microturbines, Solar PV)

References/Textbooks:

1. C.L. Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New-Age International, Second Edition, 2009.
2. C.L. Wadhwa, Electrical Power Systems, New-Age International, Fifth Edition, 2009.
3. W.D. Stevenson, Elements of Power System Analysis, McGraw Hill, Fourth Edition, 1984
4. B. R. Gupta, Generation of Electrical Energy, 7th Edition, S. Chand Publishing, 2017.
5. B. R. Gupta, Power System Analysis And Design, A H Wheeler Publishing Company Limited, 1998.
6. Sustainable Power Systems, Nava Raj Karki, Rajesh Karki, Ajit Kumar Verma, Jaeseok Choi, Springer Singapore, 2017.
7. Modeling and Control of Sustainable Power Systems, Lingfeng Wang, Springer-Verlag Berlin Heidelberg, 2012.
8. Elements of Electrical Power Station Design, M.V.Deshpande, Wheeler Pub., Third Edition, 1998.
9. https://www.coursera.org/learn/electric-power-systems
10. https://onlinecourses.nptel.ac.in/noc19_ee62/preview

Course Outcomes

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

CO 1: Understand the operation of conventional generating stations and renewable sources of electrical power.

CO 2 Analyze the power economics and power tariff methods.

CO 3 Analyze the AC transmission and distribution systems, insulators and cables

CO 4 Understand renewable energy sustainability and technology drivers.

ELECTRICAL ENGINEERING DEPARTMENT

EEOE307 RENEWABLE POWER GENERATION SYSTEMS

Pre-requisite:

L	T	P	Credits	Total contact hours
3	0	0	3	42

Brief Description

The course introduces to various sources of power generation from renewable energy sources.

Unit – I Solar and Wind Power Generation **(10)**

Introduction to Photovoltaic effect, characteristics of photovoltaic cells, conversion efficiency, and applications.

Introduction to characteristics of suitable wind power sites, wind turbines, wind generators, advantages and limitations.

Unit – II Fuel Cell and Hydro Power Generation **(10)**

Fuel Cell: Principle of fuel cells, thermodynamic analysis of fuel cells, types of fuel cells, applications of fuel cells.

Hydro power generation: Essential features of water power plant, classification of hydro-plant, hydraulic turbine, surge tanks, governing of hydraulic turbine, selection of water turbine.

Unit - III Geothermal and Ocean Energy **(10)**

Geothermal: Potential sites, estimations of geothermal power, nature of geothermal sites, Advantages and disadvantages of geothermal energy .

Ocean Energy: Principle of ocean thermal energy conversion (OTEC), Tidal power generation, Tidal energy potential and technologies, Energy from waves, Wave energy conversion, Wave energy technologies, advantages and limitations.

Unit – IV Biomass based Energy Generation **(10)**

Biomass: Energy from biomass, sources of biomass, different species, conversion of biomass into fuels, Energy through fermentation, Pyrolysis, gasification and combustion Biogas plants, Properties and characteristics of biogas.

Case study on different Renewable Power Plants. Design of integrated renewable energy systems using software tools.

References/Textbooks:

1. D.P. Kothari, K.C. Singal and Rakesh Ranjan, "Renewable Energy Sources and Emerging Technologies", 2nd Edition, PHI.
2. Gupta, B. R. Generation of electrical energy. S. Chand Publishing, 2017.
3. Robest L Loftness, "Energy hand book", 1st Edition, Van Nostrand Reinhold Co.
4. Mehmet Kanoglu, Yunus A. Cengel, John M. Cilbala, "Fundamentals and applications of Renewable Energy", McGraw Hill., 2020.
5. https://nptel.ac.in/courses/108/102/108102145/
6. https://nptel.ac.in/courses/103/103/103103206/

Course Outcomes

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

CO 1 Understand working principle of different Renewable energy generation.
CO 2 Describe different types of wind and hydro turbines
CO 3 Analyze different types of Fuel cell, Geo-Thermal and Biomass energy.
CO 4 Evaluate hybrid system with renewable energy sources.

ELECTRICAL ENGINEERING DEPARTMENT

EEOE308 Fuzzy Systems and Applications

Pre-requisite: MAIC11, MAIC12, EEPC207

L	T	P	Credits	Total contact hours
3	0	0	3	42

Brief Description:

The Fuzzy Systems & Applications course gives a solid grounding of fundamental concepts of fuzzy logic and its applications. This course is aspiring to be a part of computational intelligence directly or indirectly in near future should get these concepts and deals with the fuzzy systems theory, the multiple values in fuzzy logic system deals with, are described in the course. This course also provides case studies of certain fuzzy logic usage in real-life.

Course Contents:

Unit-I **(10)**

Introduction to Fuzzy Sets, Logic and Systems & Applications, Classical Set Theory, Fuzzy sets versus crisp sets, Fuzzy set theory: Representation of fuzzy set, Operations on Fuzzy Sets-complements, union and intersection, Properties of Fuzzy Sets.

Unit-II **(12)**

Membership Functions: Mathematical Notation, Features of Membership Functions, Linguistic variables, linguistic hedges, Fuzzy relations and fuzzy quantities, fuzzy intervals, fuzzy numbers, Fuzzy Arithmetic, extension principle, Fuzzy reasoning, fuzzy implications, generalized modus ponens, Fuzzy If-Then Rule Base, Inference Engine, Fuzzy inference system, Mamdani fuzzy models, Defuzzification, Takagi-Sugeno fuzzy models, Tsukamoto fuzzy models.

Fuzzification, fuzzy arithmetic, numbers, extension principle – fuzzy inference system-Defuzzification –fuzzy rule based systems –fuzzy nonlinear simulation –fuzzy decision making–fuzzy optimization

Unit-III **(10)**

Fuzzy logic controllers, principles, review of control systems theory, various industrial applications of FLC adaptive fuzzy systems, fuzzy decision making, Multi objective decision making, fuzzy classification, means clustering, fuzzy pattern recognition, image processing applications, and fuzzy optimization.

Unit-IV **(10)**

MatLab simulations using the fuzzy toolbox, case studies and applications, intelligent control of complex systems.

Case Studies

References/Textbooks:

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications, John Wiley and sons, 2010.
2. J.-S.R.Jang, C.-T.Sun, E.mizutani, Neuro Fuzzy & Soft Computing, Pearson Education
3. S. Rajsekharan, Vijayalaxmi Pai, "Neural Networks, Fuzzy logic and Genetic Algorithms, Synthesis and applications", Prentice Hall.
4. Klir.G, Yuan B.B. "Fuzzy sets and Fuzzy Logic Prentice Hall of India private limited, 1997.

Course Outcomes:

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

CO 1. Understand the basic ideas of fuzzy sets and crisp sets, operations and properties of fuzzy sets, membership functions and also about fuzzy relations & reasoning. Develop the skill in basic understanding on fuzzy set theory and systems.

CO 2. Explore the knowledge of fuzzy inference systems & classification of fuzzy inference systems and defuzzification process.

CO 3. Able to combine the information of decision theory &fuzzy set theory to solve problems that include uncertainty.

CO 4. Develop and implementation of a fuzzy logic controller for various systems.

Electronics and Communication Engineering Department
ECOE-303: Wireless Communication

L	T	P	Credits	Contact Hours
3	0	0	3	40

About the Course

This course provides fundamental aspects of digital communication and idea of frequency reuse in cellular networks. Wireless networks being deployed in real-life scenarios are introduced. Emphasis is given to understand how to build applications and services using 4G and 5G standards for digital transformation.

Course Contents:

Unit – I (8)

Information in binary format, information transfer, introduction to and history of cellular communication, cellular concept, frequency reuse

Unit – II (9)

Wireless channel-models, path loss, shadowing, diversity in wireless communication, channel capacity, mechanism of high-rate data transmission, interference management and system capacity, outage, scheduling, and its effect on capacity, link budget

Unit – III (10)

Wireless LANs, IEEE 802.11 standards, Bluetooth, RFID, ZigBee
Cellular networks and its services, 4G, LTE standards, Delivery of multimedia services,

Unit – IV (13)

5G wireless networks, applications and services, role of 5G in digital transformation and IIoT
Deployment of 5G networks in India
Environmental impact of 5G networks, 5G networks and sustainability, 5G enabled sustainability networks

Text / References Books:

1. Wireless Communications: Principles and Practice by Theodore S. Rappaport, Pub: Pearson
2. Erik Dahlman, “4G, LTE-Advanced Pro and The Road to 5G”

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand the basic cellular concept and frequency reuse of mobile cellular, challenges of wireless channel
2. Analyze the system capacity
3. To evaluate sustainability issues
4. To develop sustainable solutions for digital transformation

ELECTRONICS & COMMUNICATION ENGINEERING DEPARTMENT
ECOE-304: LOGIC DESIGN AND ANALYSIS USING VERILOG

L	T	P	Credits	Total contact hours
3	0	0	3	42

Course Objectives

This course aims to provide students with the understanding of the different technologies related to HDLs, construct, compile and execute Verilog HDL programs using provided software tools. Design digital components and circuits that are testable, reusable, and synthesizable. Students are provided with access to the CAD tools to use hardware description language to model, analyze and design various digital circuits/systems.

UNIT I 8hrs

INTRODUCTION TO HDL (VERILOG): Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Programming Language Interface, Module, Simulation and Synthesis Tools, Test Bench. Language Constructs and conventions: Introduction, Keywords, Identifiers, White Space Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Memory, Operators, System Tasks.

UNIT II 12hrs

GATE LEVEL MODELLING**:** Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Additional Examples, Design of Flipflops with Gate Primitives, Delays, Strengths and Contention Resolution, Net Types, Design of Basic Circuits.

BEHAVIOURAL MODELLING: Introduction, Operations and Assignments, Functional Bifurcation, Initial Construct, Always Construct, Examples, Assignments with Delays, Wait construct, Multiple Always Blocks, Designs at Behavioural Level, Blocking and Non-blocking Assignments, The case statement, Simulation Flow. If and if-else constructs, assign-design construct, repeat construct, for loop, the "disable" construct, while loop, forever loop, parallel blocks, force-release construct, Event.

UNIT III 12hrs

MODELLING AT DATAFLOW LEVEL: Introduction, Continuous Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators. Switch Level Modelling: Introduction, Basic Transistor Switches, CMOS Switch, Bi- directional Gates, Time Delays with Switch Primitives, Instantiations with Strengths and Delays, Strength Contention with Tri-reg Nets

FUNCTIONS, TASKS,USER-DEFINED PRIMITIVES: Introduction, Function, Tasks, User- Defined Primitives (UDP), FSM Design (Moore and Mealy Machines). System Tasks, Functions and Compiler Directives: Introduction, Parameters, Path Delays, Module Parameters, System Tasks and Functions, File-Based Tasks and Functions, Compiler Directives, Hierarchical Access.

UNIT IV 10hrs

SYNTHESIS OF DIGITAL LOGIC CIRCUIT DESIGN: Introduction to Synthesis, Synthesis of combinational logic, Synthesis of sequential logic with latches and flip-flops, Synthesis of Explicit and Implicit State Machines. Describing Clock driven Finite-State Machines, Asynchronous driven Finite State Machines, Switch level modeling. HDL modeling of DSS; CORDIC. System Design using ASM Chart, Design and Synthesis of Datapath Controllers. Clocked Sequential Finite State Machines, Asynchronous Sequential Finite State Machines, Sequential Design using LSI & MSI circuits**.**

Case study: Understand the role of electronics in sustainable development. Design & analysis of digital system towards sustainable computing.

Text Book:

1. T. R. Padmanabhan, B. Bala Tripura Sundari, Design Through Verilog HDL, John Wiley & Sons, INC., Publication, 2004.
2. Michael, D. Ciletti, Advanced digital design with the Verilog HDL, Pearson Education India, 2002

Reference Books:

1. Samir Palnitkar, Verilog HDL Pearson Education, 2nd Edition, 2009.
2. J. Basker, A Verilog HDL Primer, Star Galaxy Publishing, 3rd Edition.
3. Zainalabdien Navabi, Verilog Digital System Design, TMH, 2nd Edition.

Course Outcomes

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

CO1: Explain different design constraints in Verilog HDL

CO2: Categorize different modelling styles

CO3: Model the combinational and sequential circuits using Verilog HDL

CO4: Illustrate the Synthesis of Digital Logic Circuit Design

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES
B. Tech (Open Elective Course)
Course Title: Human Behavior at Workplace

Course Category: OE **Internal: 50 Marks**
Course Code: HSOE 305 **Theory: 50 Marks**
Credits: 3 (L-3) **Total: 100 Marks**
Semester: 6th **Time: 3 hrs**

Course Objectives

The contents of the course will aid the students to understand, predict and influence individual and group behavior. The course is designed to give special attention to the major challenges and the paradigm shift faced by individuals and groups in today's organizations. It will make students aware of one's own behavior and understand others' behavior.

Unit I

Understanding the behavior of human at workplace, Field of Organizational Behavior: Individual, Groups & Systems as building blocks, Historical background of OB: The Hawthorne Studies and the Ahmadabad experiment.

Unit II

Understanding and Managing Individual Behavior: Personality: Meaning, "Big –Five" Personality Traits, MBTI, Perception: Meaning, Role of Object, Environment and Observer; Judging Others, Attitude, Emotions & Emotional Intelligence, Learning: Meaning, Theories: Classical Conditioning, Operant Conditioning & Social Learning; Methods to shape Behavior (reinforcement, punishment, & extinction).

Unit III

Groups in Organization-Groups-Types, their development stages, concept of role, status, norms size and cohesiveness. Group decision-making techniques, Group Think & Group Shift; Transactional Analysis: Johari Window, Four Life positions, Strokes.

Unit IV

Stress & Conflict- meaning & causes of stress, types of conflicts (intra individual & interactive), coping strategies for stress & conflict; Leadership: Concept, Trait, Behavioral and Contingency Theories; leadership styles, successful & effective leadership. Management Grid of Leadership.

Course Outcomes

After the completion of the course students will be able to understand the role of individual, groups and structure in achieving organizational goals effectively and efficiently. Students will be able to develop creative and innovative ideas that could positively shape the organizations. Students will be able to accept and embrace in working with different people from different cultural and diverse background in the workplace.

Suggested Readings

- Baron and Greenberg, (2011), Behavior in Organizations. 10th edition. PHI.
- Kinicki and Krietner, (2011), Organizational Behavior. Tata McGraw Hill Publications.
- Newstrom, (2011), Organizational Behavior at Work. Tata McGraw Hill Publications.
- Kandelwal and Nelson, (2013), Organizational Behavior. 7th edition. Cengage India
- Gregory Moorhead, G Ricky Wiffin (2012), Managing Organizational Behavior. Cengage India.
- Jones and Mathew, (2011), Organization Designs. Theory and Change. 7th edition. Pearson Education.
- Keith, Davis. and John, Newstrom, (2010), Organizational Behavior: Human Behavior at Work. Tata McGraw Hill.
- Kalliath, Brough and Manimala, (2009), Organizational Behavior. Tata McGraw Hill.
- Rao. V. S. P (2010), Organizational Behavior. Himalaya Publishing House

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES
B. Tech (Open Elective Course)
Course Title: Intellectual Property Rights

Course Category: OE | **Internal: 50 Marks**
Course Code: HSOE 306 | **Theory: 50 Marks**
Credits: 3 (L-3) | **Total: 100 Marks**
Semester: 6th | **Time: 3 hrs**

Course Objectives

1. To recognize the importance of IP rights and to enable students to understand basic concepts of Intellectual Property Rights.
2. To make the students to understand the statutory provisions of different forms of IPR.
3. To learn the procedure of obtaining patent, copyrights, trademarks and industrial design.

Note: Six questions to be set covering all the units. The examinees shall have to attempt any five questions of their choice.

Unit-I: Concept and Relevance of IPR

Concept of Property; Concept of IPR, Industrial Property, Artistic and Literary Property, Sui Genesis systems, Role of IPR in Socio-Economic development and Technological innovation; IPR in India – Genesis and Development, Implications of IPR for International Trade.

Unit-II: Copyrights and Patents

Meaning and scope, concept of originality, neighboring rights/Related Rights, Economic and Moral Rights of Authors, copyright ownership issues, obtaining copyright registration, Infringement of copyright under Copyright Act; Remedies. Meaning of Patent, object and value of Patent Law, kind of inventions protected by Patent-Patentable and Non Patentable inventions, Process and Product Patent, application process, Legal requirements for Patents-Granting of Patent-Rights of a Patent-exclusive rights, Exceptions, Infringement, remedies.

Unit-III: Trademarks and Trade Related IPRs

Trademarks: Rights of trademarks, kinds of signs used as trademarks- types, purpose and functions of a trademark, trademark protection, trademark registration processes, Infringement, remedies. **Industrial Design**: Definition of Design, Protection, Concept of Novelty and Infringement of Design and remedies for infringement. Geographical indication of goods, undisclosed information, etc. Provisions of TRIPS agreement, Implications

Course Outcomes

On successful completion of this course the students will be able to distinguish and explain various forms of IPRs, identify criteria to fit one's own intellectual work in particular forms of IPRs, apply statutory provisions to protect particulars form of IPRs and analyse rights and responsibilities of holder of Patent, Copyright, Trademark, Industrial Design etc.

Suggested Readings

1. Prabuddha Ganguli, (2001): Intellectual Property Rights (Tata McGraw Hill)
2. W.R. Cornish, (2013): Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights (Sweet and Max Well London)
3. Blakeney, (1996): Trade Related Aspects of Intellectual Property Rights: A Concise Guide to the TRIPS Agreement (Sweet and Max Well London)

Course Code	:	CHOE302			
Course Title	:	Bio and Chemical Sensors			
Number of credits	:	L	T	P	Total
		3	0	0	3
Prerequisites (Course code)	:	Enrolling students must have studied one Chemistry Paper in B. Tech. First Year			
Course Type	:	OE			

Course Learning Objectives:

- To enable the students to acquire knowledge in the field of Sensor and biosensor
- To introduce new developments in chemical sensors and biosensor in various field related energy, environment, medicine and engineering.
- To make them apply the knowledge that meet the specified needs with appropriate consideration for the industrial applications.

Course Content:

Unit 1

Principle and fundamentals of Chemical Sensors: Definition and Components, Recognition Methods, Transduction Methods, Selectivity and Specificity, Detection and Quantification, Response Time. Classification: Optical, Chemical and Biological Sensors. Cation-binding sensors: Basic concepts, cation receptors, synthesis and structure of crown ethers, cryptands, calixarenes, Macrocyclic and template effects. Anion-binding sensor: Basic Concepts, anion host design, anion receptors, Shape and selectivity. Important applications in environment and engineering. **(10 L)**

Unit 2

Fundamental of Biosensors; Different types of biosensors; Nanomaterials (Quantum dots, carbon nanotubes and metal nanoparticles) in biosensor; Electron microscopes (SEM, TEM and AFM) for nanomaterial based sensor working principle and Interpretation of results. Nucleic acids in biosensor.

(8 L)

Unit 3

Spectrochemical Transduction methods and mechanism: UV-Vis and Fluorescence spectroscopy, Chemiluminescence and Bioluminescence, Steady-state fluorescence, Fluorescence quenching and enhancement, PET, FRET, ICT, AIE and AIQ. Measurement: Method of limit of detection (LOD), limit of quantification(LOD) and binding constant calculations. **(8 L)**

Unit 4

Chemical and Bio sensors applications and limitation in Defence Industries, Medical Diagnostic and Patient monitoring, Environmental monitoring, agriculture industries, Food safety, water safety, electrical and electronics. Future prospects in: Paper based sensors, wearable sensor, Smartphone based sensor and bio-marker for medical therapeutics **(8 L)**

Course Outcomes:

Upon successful completion of this curriculum students will be able to:

CO-1	Learn the fundamental principles and design of chemical and bio-sensors.
CO-2	Gain the basic knowledge of sensor and bio-sensor and their applications.
CO-3	Understand the importance sensors in different research areas.

Reference Books:

1. Florinel-Gabriel Bănică, Chemical Sensors and Biosensors: Fundamentals and Applications (Wiley 2012)
2. Bansi Dhar Malhotra and Chandra Mouli Pandey, Biosensors: Fundamentals and Applications (A Smithers Group Company, 2017)
3. Sadana and N. Sadana, Handbook of Biosensors and Biosensor Kinetics, Amsterdam; London: Elsevier Science, 2010.
4. U. E. Spichiger-Keller, Chemical Sensors and Biosensors for Medical and Biological Applications, Weinheim; New York: Wiley-VCH, 1998.
5. J.-M. Lehn; Supramolecular Chemistry-Concepts and Perspectives (Wiley-VCH, 1995)
6. P. D. Beer, P. A. Gale, D. K. Smith; Supramolecular Chemistry (Oxford University Press, 1999)
7. J. W. Steed and J. L. Atwood; Supramolecular Chemistry (Wiley, 2000)

PHOE303: PHYSICS OF ADVANCED SEMICONDUCTOR DEVICES

L	T	P	Credits	Total contact hours
3	0	0	3	36

Brief Description about the course: This course contains physical principles, theories and operational characteristics of advanced semiconductor electronic devices. Also the introduction and fabrication of next generation electronic devices for IIoT and AI applications has been included.

Course Contents

Unit-I: (10 hours)

Physics and Properties of Semiconductors- A Review

Fundamentals of Semiconductors: Intrinsic and Extrinsic Semiconductors, Drift and diffusion of carriers, Generation and recombination of charges, continuity equation, Direct and indirect bandgap semiconductors, Organic semiconductor, Fermi and Quasi Fermi levels.

Junctions and Devices: Background on Solid State electronics, Types of junctions: Metal-Metal; Metal-Semiconductor; Homo-junction; Hetero-junction, Single layer and multilayer Devices and their characteristics.

UNIT-II: (8 hours)

Physics of Metal-Oxide-Semiconductor (MOS) Devices

MOS Capacitors: Ideal and Non- Ideal Capacitance-Voltage (C-V) characteristics; Parameter extraction: Threshold voltage, doping concentration, fixed oxide charges, interface traps/states etc.; Current-Voltage (I-V) characteristics, current conduction mechanisms: Schottky conduction, Poole-Frenkel conduction, Fowler-Nordheim tunnelling etc.

Metal-Oxide-Filed Effect Transistors (MOSFETs): Basic Device Characteristics; Device Scaling and Short-Channel Effects.: Threshold voltage Roll off, Drain Induced Barrier Lowering, Sub-threshold swing, tunneling etc.

UNIT-III: (10 hours)

Physics of Advanced Electronic Devices:

Transistors: Fin Field-Effect Transistors (FinFETs), Tunnel Field Effect Transistors, Single Electron Transistors, Carbon Nanotube transistors, 2D semiconductor based nano transistors and thin film transistors,

Non-volatile memory devices: Resistive Random Access Memory, Ferroelectric Random Access Memory, Phase change memory and Magnetic memory)

UNIT-IV: (8 hours)

Semiconductor Sensors:

Semiconductor based Sensors: Gas sensors, Thermal sensors, Chemical sensors, Pressure sensors, bio-sensors and their applications in sustainable technologies.

Course Outcomes:

At the end of the course students will be able to:
CO1: Implement the internal workings of the current generation semiconductor devices.
CO2: Apply the relevant Physics concepts for realizing and solving Electronics Engineering problems and challenges.
CO3: Apply the background in semiconductor-based electronic devices in nano and quantum electronics.
CO4: Solve technical and strategic problems related to electronic device fabrication and operations in industry.

Text Books/Reference Books:

1. S. M. Sze., K. K. Ng, “Physics of Semiconductor Devices”, United Kingdom, Wiley, 2021. ISBN:9780471143239
2. Karl Hess, “Advanced Theory of Semiconductor Devices”, John Wiley, 2008: ISBN: 978-0-780-33479-3
3. Bonani, Fabrizio, Ghione, Giovanni, “Noise in Semiconductor Devices”, Springer, 2001. ISBN 978-3-662-04530-5
4. Colinge, J.-P., “FinFETs and Other Multi-Gate Transistors”, Springer, 2008. ISBN 978-0-387-71752
5. M. S. Tyagi, “Introduction to Semiconductor Materials and Devices”, John Wiley, 2008: ISBN: 978-0-471-60560-7
6. S. M. Sze, “Semiconductor Sensors”, Wiley-Interscience, 1994. ISBN: 978-0471546092
7. Santosh K. Kurinec, “Nanoscale Semiconductor Memories”, CRC Press, 2017. ISBN: 9781351832083.

PHOE304: OPTICAL FIBER COMMUNICATION SYSTEMS

L	T	P	Credits	Total contact hours
3	0	0	3	36

Pre-requisite: **PHIC101**

Brief Description about the course: The course provides essential knowledge of fiber optical technology, light guidance inside the optical fibers, and various potential applications in optical communication system and other fields.

Course contents:

Unit-I (10 Hours)

Introduction: Basic elements of the fiber optic communication system; Single and multimode optical fibers; Ray analysis of optical fiber: Propagation mechanism of rays in an optical fiber; Meridional rays, Skew rays, Fiber numerical aperture; Electromagnetic mode theory for optical propagation.

Unit-II (10 Hours)

Propagation Mechanics: Mode theory for circular waveguides: step index optical fibers; Propagation characteristics of step index optical fibers; graded index optical fibers; Fabrication of optical fibers: MOCVD and fiber drawing techniques.

Unit-III (8 Hours)

Fiber Optics Losses and Dispersion: Linear and nonlinear losses, Signal degradation in optical fibers due to dispersion and attenuation; Pulse dispersion in graded index optical fibers, Material dispersion, Waveguide dispersion and design considerations.

Unit-IV (8 Hours)

Fiber Devices and Applications: Optical fiber amplifiers: EDFA, Gain spectrum and gain band width, EDFAs for WDM transmission, Various potential applications of the optical fibers other than the telecommunication industry.

Course Outcomes:

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

CO1: Apply the concept of optical fiber technology and their applications.

CO2: Solve technical and strategic problems related to the fabrication of optical fibers.

CO3: Apply the relevant physics concepts for realizing and solving light guidance in different structures.

CO4: Realize the various potential applications of the optical fibers in telecommunication and other industries.

Text Books/Reference Books:

1. Keiser, "**Fiber optic communication**" McGraw Hill, 2009.
2. F. C. Allard, **"Fiber Optics Handbook for engineers and scientists"**, McGraw Hill, 2009.
3. J. Gowar, "**Optical communication system**", Printice Hall, 1993.
4. T. Tamir, **"Integrated optics"**, Academic Press, 2010.
5. S.E. Miller & A. G. Chynoweth, "**Optical Fibers Telecommunication**", Academic Press, 1979.

MEOE432: RENEWABLE ENERGY SYSTEMS

L	T	P	Credits	Total contact hours
3	0	0	3	40

Brief description about the course

The main purpose of this course is to introduce students with conventional and Renewable energy sources environmental impacts, challenges and future trends, fundamentals, potential, estimation and, applications: Solar Energy, Wind Energy, Hydropower, Biomass, Geothermal Energy, Ocean Energy. The Renewable energy resources availability, potential and suitability as a substitute for conventional energy resources in future energy demand. Having completed the courses, the student should have Knowledge about different renewable energy resources. Advanced knowledge about potential of using renewable energy technologies as a complement to and to the extent possible, replacement for conventional technologies, and possibilities to combining renewable and non-renewable energy technologies in hybrid systems.

UNIT - I

Forms of Energy, Nuclear energy, Hydro energy, Renewable energy, Energy demand, Energy statistics, Comparison of fuels such as wood, charcoal, coal, kerosene, Diesel, petrol, furnace oil, LPG, biogas and electricity on calorific value and cost basis, Efficiencies of various Energy production methods. Ministry of Power, Ministry of New and Renewable Energy, Energy Auditing and Management, Energy Conservation Act, Bureau of Energy Efficiency, Schemes and policies of PCRA.

(08 hrs)

UNIT – II

Solar angles, day length, angle of incidence on tilted surface; Sun path diagrams; Shadow determination; Extraterrestrial characteristics; Effect of earth atmosphere; Measurement & estimation on horizontal and tilted surfaces; Analysis of Indian solar radiation data and applications. Solar Collectors, Effective energy losses; Thermal analysis; Heat capacity effect; Testing methods; Evacuated tubular collectors; Flat-plate collectors: types; Thermal analysis; Thermal drying. Selective surfaces - Ideal coating characteristics; Types and applications; Anti-reflective coating; Preparation and characterization.

(10 hrs)

UNIT – III

Energy Generation from wastes: Biochemical Conversion: Sources of energy generation, Industrial waste, agro residues; Anaerobic Digestion: Biogas production; Determination of BOD, DO, COD, TOC, & Organic loading, Aerobic & Anaerobic treatments – types of digesters –factors affecting bio-digestion - Activated sludge process. Methods of treatment and recovery from the in industrial waste water – Case Studies in municipality and medical.

(12 hrs)

UNIT – IV

Wind energy conversion principles; General introduction; Types and classification of WECS; Power, torque and speed characteristics. – Site Selection Criteria – Advantages – Limitations – Wind Rose Diagram – Indian Wind Energy Data – Organizations like C-WET etc., Wind Energy Conversion System - Design - Aerodynamic design principles; Aerodynamic theories; Axial momentum, blade element and combine theory; Rotor characteristics; Maximum power coefficient; Prandlt's tip loss correction.

(10 hrs)

NOTE:

The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Text Books / References:

1. Renewable Energy Sources by Twidell & Weir, Taylor and Francis, 2nd Special Indian Edition.
2. Non-conventional Energy Sources by G.D. Rai, Dhanpat Ral and Sons.
3. Renewable Energy Resources by Tiwari and Ghosal, Narosa.

Course Outcomes:

CO 1: Understanding of commercial energy and renewable energy sources.
CO 2: Knowledge in working principle of various energy systems.
CO 3: Capability to do basic design of renewable energy systems.
CO 4: Upon completion of this course, the students will be able to identify the new Methodologies / technologies for effective utilization of renewable energy sources.

PIOE427: INDUSTRIAL ENGINEERING AND MANAGEMENT

L	T	P	Credits	Total contact hours
3	0	0	3	40

Brief description about the course

Industrial Engineering Management course focuses on optimizing complex systems and processes in various industries. It combines engineering principles with business management techniques to improve overall productivity and performance. Industrial engineers analyze and evaluate various factors, and manage business/industrial systems involving people, materials, methods, and machines.

UNIT-I

Definition, role, and scope of industrial engineering, industrial engineering approach and techniques, principles of organization, elements of organization, types of organization.

Plant layout, site selection, types of plant layout, factors affecting layout, plant building, flexibility and expansion. **(8 hrs)**

UNIT-II

Materials Management: Introduction, inventory, inventory costs, inventory cost relationship, inventory control models, ABC analysis MRP, elements of MRP.
Work study: Method study, method study techniques, work measurement techniques, time study, observed time, basic time, normal time, allowances, standard time. **(10 hrs)**

UNIT III

Sales Forecasting Introduction, objectives of sales forecasting, types of forecasting, methods of sales forecasting; collective opinion method, Delphi technique, moving average method, time series analysis, simple exponential smoothing, measurement of forecasting errors.

Quality Management: Quality, dimensions of quality, quality control, basic QC tools, introduction to statistical quality control, quality assurance six-sigma introduction. **(12 hrs)**

UNIT-IV

Basics of project management, network analysis, Critical path method, Program evaluation and review technique, Comparison between CPM and PERT

Advancement in Industrial Management: Industry 4.0, lean management, sustainable industrial practices, case studies pertains to advanced industrial practices **(10 hrs)**

NOTE:

The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Text Books / Reference

1. Production and operations management by S.N.Chary Publication Tata Mc Graw Hill (TMH)
2. Industrial Engineering and Organization Management by S.K. Sharma & Savita Sharma Publication Kataria & sons
3. Industrial Engineering and Production management by Martland T Telsang Publication S. chand
4. Modern Production Management by Elwood S. Buffo Rakesh K. Sarin Publication John Wiley & Sons
5. Jocobs, C.A., “Production and Operations Management”, Tata McGraw Hill
6. Handbook of Industrial Engineering: Technology and Operations Management, by Gavriel Salvendy, publication John Wiley & Sons
7. Mitra, A., “Fundamentals of Quality Control and Improvement”, John Wiley & Sons, Inc.

Course Outcomes

CO1: Understand industrial engineering concepts to optimize the industrial resources

CO2: Use plant layout concepts to develop and expand the industrial layouts.

CO3: Apply forecasting and materials management for smooth functioning of industry on shop floors

CO4: Analyze the quality of product and services in industrial scenario with concept of quality management

PIOE428: TOTAL QUALITY MANAGEMENT

L	T	P	Credits	Total contact hours
3	0	0	3	40

Brief description about the course

Total Quality Management is a business improvement strategy to management that focuses on continuous improvement, customer satisfaction, and the involvement of all employees in the organization. This course provides a holistic and comprehensive management philosophy that aims to enhance the quality of products, services, and processes within an organization.

Unit-I

Products and services, quality and productivity, dimensions of quality: manufacturing and service, continuous improvement**,** quality management practices, need of TQM, concept of TQM, elements of TQM, pillars of TQM, companywide organization for quality management, quality awards.

(8 hrs)

Unit-II

TQM Leadership and Techniques: Motivation and involvement for total quality, strategic planning, corporate culture, total employee involvement, total commitment, role of information in total quality, soft and hard practices of TQM, quality circle, seven QC tools, failure mode effect analysis, gemba kaizen, 6S, benchmarking, zero defects, PDCA cycle. **(12 hrs)**

Unit-III

TQM Framework and Systems: Success factors and obstacles in TQM implementation, Implementing TQM, TQM framework, quality management systems; ISO 9000 Series of standards, ISO 9001 structure, ISO 14000 series standards, concepts of ISO 14001, requirements and benefits of ISO 14001.

(12 hrs)

Unit-IV

TQM Case and Sustainable Practices: Sustainable TQM, TQM 4.0, lean-TQM, total productive maintenance, TQM case studies in manufacturing and service sector. **(8 hrs)**

NOTE:

The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Text Books / Reference

1. Besterfield, D.H, Michna, C.B, Besterfield, G. H and Sacre, M.B, "Total Quality Management" Pearson Education Asia.
2. Mukherjee, P. N., "Total Quality Management" Prentice Hall of India.
3. Rajaram, S., "Total Quality Management" Biztantra.
4. Ramasamy, S. "Total Quality Management" Mc Graw Hill Education.

Course Outcomes

CO 1: Understand the fundamentals of quality management practices.

CO 2: Discuss the need of customer expectations, employee involvement and supplier partnership.

CO 3: Apply the TQM tools and techniques to improve the product and process quality.

CO 4: Describe quality Management system standards and certification process.

PIOE429: LOGISTICS AND SUPPLY CHAIN MANAGEMENT

L	T	P	Credits	Total contact hours
3	0	0	3	40

Brief description about the course

To understand concept of Supply chain management and apply this knowledge to understand the working of corporate world.

UNIT-I

Understanding the Supply Chain, Performance, Drivers and Obstacles, Objectives of supply chain, Stages of supply chain, Supply chain process cycles, Push/pull view of supply chain processes, Importance of supply chain flows, Examples of supply chain, Strategic decisions in supply chain management. Supply Chain Performance, Supply chain strategies, achieving strategic fit, Product life cycle, Supply Chain drivers and Obstacles, four drivers of supply chain – inventory, transportation, facilities, and information, Obstacles to achieve strategic fit. **(9 hrs)**

UNIT-II

Planning Demand and Supply in a Supply Chain, Role of forecasting in a supply chain, Forecasting methods in a supply chain, Basic approach to demand forecasting, Aggregate planning resources. Managing economies of scale in a supply chain, Role of cycle inventory in a supply chain.

Transportation and Coordination in a Supply Chain, Facilities affecting transportation decisions, Transport selection, Modes of transportation and their performance characteristics, Trade-offs in transportation decision, Making transportation decisions in practice, Models for transportation and distribution, Third party logistics (3PL). **(12 hrs)**

UNIT-III

Coordination in a Supply chain, Lack of supply chain coordination and the Bullwhip effect, Effect of lack of coordination on performance, Obstacles to coordination, Achieving coordination in practice.

Source Management and IT in Supply Chain, Inventory management in supply chain, Information technology in supply chain, Typical IT solution, Reverse supply chain, Reverse supply chain Vs. Forward supply chain. **(9 hrs)**

UNIT-IV

Advanced topics in SCM: Green, Lean, Sustainable, Global and Agile supply chain Management, Quality in Supply Chain. Integration and Collaborative Supply Chain, Circular Supply Chain Management.

Cases in Supply Chain: Case Studies such as Newspaper, Mumbai Tiffanwala, Disaster Management, Organic Food, Fast Food, Hostel Mess etc. **(10 hrs)**

NOTE:

The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Text Book / Reference Books

1. Christopher Martin, "*Logistics and Supply Chain Management*", Pearson Education Asia.
2. Chopra Sunil and Meindl Peter, "*Supply Chain Management – Strategy, planning and operation's"*, Pearson Education, Asia.
3. Kapoor K K, KansalPurva, "*Marketing logistics: A Supply Chain Approach*", Pearson Education Asia.
4. Mohanty, R.P and Deshmukh, S.G., "*Supply Chain Management*", Pearson Education Asia.
5. Fawcett, S. E., Ellram, L. M and Ogden, J. A., "Supply Chain Management" Pearson Education Asia.
6. Dixit Garg, Sunil Luthra and Sachin Mangla., "Supply Chain and Logistics Management". New Age International Publishers

Course Outcomes

CO1: Understand the decision phases and apply competitive & supply chain strategies.

CO2: Understand drivers of supply chain performance.

CO3: Analyze factors influencing network design and forecasting in a supply chain.

CO4: Understand the role of aggregate planning, inventory, IT and coordination in a supply chain.