DEPARTMENT OF CIVIL ENGINEERING

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 possible sustainable 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 M Micael

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.

DEPARTMENT OF CIVIL ENGINEERING

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 sustainable communities; 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 possible sustainable 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 and Prospects', 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.

DEPARTMENT OF COMPUTER ENGINEERING

CSOE 304: Operating System

Course Code	**:**	**CSOE 304**
Course Title	**:**	**Operating System**
Number of Credits and L/T/P scheme	**:**	**3 & 3/ 0/ 0**
Prerequisites (Course code)	**:**	
Course Category	**:**	**OE**

Course Learning Objectives

1. To understand the services and design of an operating system.
2. To understand the structure and organization of file system
3. To understand the process states and various concepts such as scheduling and synchronization related with it.
4. To understand different memory management approaches.
5. Students should be able to use system calls for managing processes, memory and file system.
6. students should understand the data structures and algorithms for implementation of OS.

Course Content

Unit-I: Computer system architecture and organization, Introduction and evolution of OS, Introduction to distributed OS, Real time systems and multimedia systems. OS structures: OS services, system calls and programs, OS design and implementation. Processes: Process concept, scheduling policies, algorithms, multilevel queuing, operations on process, Inter-process communication. Threads: multithreading models and threading issues. CPU scheduling: Criteria and algorithms, multiprocessor and thread scheduling.

Unit II: Process synchronization: critical sections, classical two process and n-process solutions, hardware primitives for synchronization, semaphores, monitors, classical problems in synchronization (producer-consumer, readers-writer, dining philosophers, etc.).

Deadlocks: modelling, resource allocation, characterization, prevention and avoidance, detection and recovery.

Unit III: Memory management: Swapping, contiguous memory allocation, paging, multilevel paging, segmentation, demand paging, page replacement algorithms, allocation of frames, thrashing, working set model. Input/Output: I/O system and services, device controllers and device drivers, disks, scheduling algorithms and management.

Unit IV: File system interface: access methods, access control, directory structures, file organization, file sharing and protection. system performance, protection and security, , OS design considerations for security, access control lists and OS support, internet and general network security. Operating system as service provider: Access control matrix, access control list, capability matrix, encryption and access permissions in Linux and Windows.

Reference Books:

1. A. Silberschatz, Peter B. Galvin and G. Gagne, "Operating System Concepts," (9th or newer edition), Wiley.
2. H. Brinch, "Operating System Principles," Prentice Hall of India.
3. Dhamdhere, "Systems programming & Operating systems," TataMcGrawHil
4. A. N. Habermann, "Introduction to Operating System Design," Galgotia publication, New Delhi.

5. A.S. Tanenbaum, "Modern Operating Systems," Prentice Hall of India.

Course Outcomes

At the end of the course student will be able to

1. Understand functions, structures and history of operating systems
2. Able to know the design issues associated with operating systems
3. Master various process management concepts such as scheduling, synchronization, multithreading and deadlocks
4. Understand the various concepts associated with memory management such as virtual memory, demand paging, page replacements algorithms
5. Be familiar with various protection and security mechanisms
6. Be familiar with virtualization and operating system components

DEPARTMENT OF COMPUTER ENGINEERING

ITOE 304: Operating System

Course Code	**:**	**ITOE 304**
Course Title	**:**	**Operating System**
Number of Credits and L/T/P scheme	**:**	**3 & 3/ 0/ 0**
Prerequisites (Course code)	**:**	
Course Category	**:**	**OE**

Course Learning Objectives

1. To understand the services and design of an operating system.
2. To understand the structure and organization of file system
3. To understand the process states and various concepts such as scheduling and synchronization related with it.
4. To understand different memory management approaches.
5. Students should be able to use system calls for managing processes, memory and file system.
6. students should understand the data structures and algorithms for implementation of OS.

Course Content

Unit-I: Computer system architecture and organization, Introduction and evolution of OS, Introduction to distributed OS, Real time systems and multimedia systems. OS structures: OS services, system calls and programs, OS design and implementation. Processes: Process concept, scheduling policies, algorithms, multilevel queuing, operations on process, Inter-process communication. Threads: multithreading models and threading issues. CPU scheduling: Criteria and algorithms, multiprocessor and thread scheduling.

Unit II: Process synchronization: critical sections, classical two process and n-process solutions, hardware primitives for synchronization, semaphores, monitors, classical problems in synchronization (producer-consumer, readers-writer, dining philosophers, etc.).

Deadlocks: modelling, resource allocation, characterization, prevention and avoidance, detection and recovery.

Unit III: Memory management: Swapping, contiguous memory allocation, paging, multilevel paging, segmentation, demand paging, page replacement algorithms, allocation of frames, thrashing, working set model. Input/Output: I/O system and services, device controllers and device drivers, disks, scheduling algorithms and management.

Unit IV: File system interface: access methods, access control, directory structures, file organization, file sharing and protection. system performance, protection and security, , OS design considerations for security, access control lists and OS support, internet and general network security. Operating system as service provider: Access control matrix, access control list, capability matrix, encryption and access permissions in Linux and Windows.

Reference Books:

1. A. Silberschatz, Peter B. Galvin and G. Gagne, "Operating System Concepts," (9th or newer edition), Wiley.
2. H. Brinch, "Operating System Principles," Prentice Hall of India.
3. Dhamdhere, "Systems programming & Operating systems," TataMcGrawHil
4. A. N. Habermann, "Introduction to Operating System Design," Galgotia publication, New Delhi.
5. A.S. Tanenbaum, "Modern Operating Systems," Prentice Hall of India.

Course Outcomes

At the end of the course student will be able to

1. Understand functions, structures and history of operating systems
2. Able to know the design issues associated with operating systems
3. Master various process management concepts such as scheduling, synchronization, multithreading and deadlocks
4. Understand the various concepts associated with memory management such as virtual memory, demand paging, page replacements algorithms
5. Be familiar with various protection and security mechanisms
6. Be familiar with virtualization and operating system components

DEPARTMENT OF ELECTRICAL ENGINEERING

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.

DEPARTMENT OF ELECTRICAL ENGINEERING

EEOE308: Fuzzy Systems and Applications

Pre-requisite: MAIC101, MAIC102, 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

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.
2. Explore the knowledge of fuzzy inference systems & classification of fuzzy inference systems and defuzzification process.
3. Able to combine the information of decision theory &fuzzy set theory to solve problems that include uncertainty.
4. Develop and implementation of a fuzzy logic controller for various systems.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

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

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ECOE-305 IMAGE PROCESSING APPLICATIONS

Pre-requisite: Engg. Maths

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

Brief Description about the course:

Image processing is a rapidly growing field that deals with the use of digital images to various fields of life including medical, automation, etc. This course helps to understand and apply the various concepts of image processing into different fields.

Course Learning Objectives:

The student should be able to understand and apply the various concepts of Digital Image Processing in real life.

Course Contents:

UNIT I 10hrs.

Introduction, Components of an image processing system, different image formats, Image Perception: Image models, sampling & quantization, neighbors of a pixel, connectivity, labeling of connected components.

UNIT II 10hrs.

Intensity Transformation and its applications, image improvement and modifications using Histogram processing. Use of Image Restoration and Reconstruction: "Noise models, Restoration in the presence of Noise only, Frequency domain filtering, Inverse filtering, Wiener filtering, Geometric mean filtering. Image reconstruction from projections. Lossy and lossless compression for some real life applications, Some basic compression methods, Image compression standards.

UNIT-III 8hrs.

Color Image Processing: Color Models, Pseudocolor Image Processing, Bacics of full color image processing, color transformations, segmentation, smoothing and sharpening, Noise in color Images. VMF, VDF, etc. Morphological Image Processing for image identification, boundary extraction, etc.

UNIT-IV 14hrs.

Image steganography, Watermarking, Super-resolution, Copy paste attack on images.
A small project on real life application depending upon the branch of the student.

Reference Books:

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, 3rd Edition, 2016.
2. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson 2002.
3. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, 'Digital Image Processing using MATLAB', Pearson Education, Inc., 2000.
5. Hany Farid, 'Photo Forensics' The MIT Press, 2016.

Course outcomes:

At the end of the course student will be able to:
CO1: Understand and apply the Image filtering, Restoration, segmentation, etc.
CO2: Apply the vector approach to handle the color images.
CO3: Apply the ‘Morphological operation’ for various applications.
CO4: Will be able to apply the image processing concepts in his /her respective branch of Eng.

DEPARTMENT OF MECHANICAL ENGINEERING

PIOE427: INDUSTRIAL ENGINEERING AND MANAGEMENT

Pre-requisite: **Nil**

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

DEPARTMENT OF PHYSICS

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.

DEPARTMENT OF PHYSICS

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.

DEPARTMENT OF CHEMISTRY

CHOE 302: BIO AND CHEMICAL SENSORS

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)

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES

HSOE-305: 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 ARCHITECTURE & PLANNING

AROE-321: DESIGN THINKING & INNOVATION

L	T	P	S	Credits	Total
2	1	0	0	3	3

Brief description of the Course:

This course aims to inculcate Design Thinking among Professionals as a method to solve problems using a structured and systematic process; understanding users, identifies and analyses a problem or need, and researches relevant information. Afterwards ideas are explored and analysed, until an appropriate innovative solution to the problem or need is arrived at. Design Thinking along with Innovation, combines user requirements, finds creative solutions, explores suitable technology alternatives, and results in a new business enterprise or solves existing problems for an organization.

Course Content:

UNIT-I: Introduction and Process

Origin and Purpose of Design and Innovation, Human Centred Design, Examples of Good and Bad Design, Design Thinking and its Benefits, Applications of Design Thinking,

The Fundamentals and Key Features of Design Thinking Process, Cognitive Models Applied in Design Thinking. Innovation: Meaning, Types and Features.

UNIT-II: User Needs Analysis and Tools

Context, Environment & Users, Identifying User Need, Brain Storming,

Visualization, Journey Mapping, Value Chain Analysis, Mind Mapping, Rapid Concept Development, Assumption, Prototype, Co-Creation, Learning Launches, Story Telling, Business Models and Presentation Methods.

UNIT-III: Ideation and Prototyping

Idea generation Basic design directions, Themes of thinking, Inspiration and references, Brainstorming, Value, Inclusion, Sketching, Presenting ideas

Refinement of Ideas, thinking in images, thinking in signs, Appropriation, Humour, Personification, Visual metaphors, Modification, thinking in words, Words and language, Type ‘faces’, thinking in shapes, thinking in proportions, thinking in colour.

UNIT-IV: Case Studies & Project

Case studies on design thinking for real-time interaction and analysis, Live examples on the success of collaborated design thinking, Case studies on design thinking and business acceptance of the design Simulation on the role of virtual eco-system for collaborated prototyping. The project requires selecting the design thinking tools, writing a reflection, and completing peer reviews, Project Presentation and Report.

Books and references:

1. John.R.Karsnitz, Stephen O’Brien and John P. Hutchinson, “Engineering Design”, Cengage learning (International edition) Second Edition, 2013.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press, 2009.
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011
4. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.
5. Yousef Haik and Tamer M.Shahin, “Engineering Design Process”, Cengage Learning, Second Edition, 2011.
6. Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author).

Online Resources:

1. www.tutor2u.net/business/presentations/. /productlifecycle/default.html
2. https://docs.oracle.com/cd/E11108_02/otn/pdf/. /E11087_01.pdf
3. www.bizfilings.com › Home › Marketing › Product Developmen
4. https://www.mindtools.com/brainstm.html

5. https://www.quicksprout.com/. /how-to-reverse-engineer-your-competit
6. www.vertabelo.com/blog/documentation/reverse-engineering
7. https://support.microsoft.com/en-us/kb/273814
8. https://support.google.com/docs/answer/179740?hl=en
9. https://www.youtube.com/watch?v=2mjSDIBaUlM
10. thevirtualinstructor.com/foreshortening.html

Course Outcomes:

Upon successful completion of the course, the students will be able to CO1: Identify problems and be able to find solutions for real life problems.

CO2: Apply the fundamentals/essentials of the Design Thinking and Innovation process. CO3: Apply the tools to be used as part of the DT&I problem solving process.

CO4: Prepare Prototype and Carry out 3D Modeling and Detailing, Usability Studies, etc.