PCE1001 Transportation Engineering

UNIT - I Traffic Engineering and Management

**Traffic Characteristics:** Urban Road user characteristics- Vehicle and Traffic Stream Characteristics.

**Traffic Studies:** Volume, speed, travel time and delay, O-D, Accident and parking studies –LOS concept, factors affecting capacity and LOS, capacity of different types of facilities.

**Traffic Control and Management:** Signs, markings, islands and signals; At-grade and grade separated Intersections; Rotaries; Basic principles of intersection signalization; Signal Design. Traffic Regulation, Traffic Systems Management and Travel Demand Management - Congestion Management, Traffic Calming and Pricing-Design of Cycle Tracks, Pedestrian Facilities and parking design.

**Intersection Design and Analysis:** Design of Intersection – At grade intersection – Uncontrolled, Channelisation, Rotary, Traffic Signal Control, Signal Co-ordination, Grade Separated Intersection - Types Design and Analysis.


UNIT - II Urban and Transportation Planning

**Urban Planning:** Classification of urban settlements, Urban infrastructure developmentZoning Regulation, Layout and Building Regulations.Economic and social concepts in urban and regional planning-Financing of Urban Developments projects and planning.Town and Country planning act.


Transportation Surveys: Transportation surveys – definition of study area, zoning, home-interview survey, cordon-line and screen line surveys, traffic surveys, inventory of transport facilities, inventory of land-use and economic activities.

UNIT - III Highway Design

Highway alignment: Horizontal: Theoretical, general and design considerations; Super elevation; Simple, compound, reverse and transition curves; Guidelines for design; Vertical: Terrain; Grades; Climbing lanes; General considerations in vertical curves; Crest and sag vertical curves; Coordination of horizontal and vertical curves; Guidelines for design of hill roads.

Design controls and criteria: Vehicle, driver and traffic characteristics and their influence on geometric design of highways; Access control - At grade intersection conflict points, channelization.

Cross section elements: Considerations with regard to cross section elements such as, carriageway width, right-of-way, camber, shoulders, kerbs, footpaths, drainage elements, traffic barriers and medians; Frontage roads - Pedestrian crossings - Bicycle facilities - Bus bays.

Sight distances: Stopping, decision, overtaking and intermediate sight distances - Sight distances on horizontal curves and at intersections - Applications of sight distances for various situations

UNIT - IV Pavement Materials, Design and Evaluation

Pavement Materials and Construction: subgrade soils - aggregates - Bituminous binders and modified binders - Bituminous paving mixtures – Mix Design, Material testing and evaluation-
Construction of gravel and stabilized bases - Cement concrete for highway construction - Types of pavements - Stresses in bituminous pavements and concrete pavements - Various design methods for Flexible and rigid pavements.

**Pavement Evaluation and Maintenance:** Failures in pavements - evaluation and equipments - structural stability assessment of pavements - repair and maintenance - overlays - Pavement serviceability rating and index.

**PCE1002 Computer methods and applications in Structural Engineering / Structural Engineering**

**UNIT - I Reinforced Cement Concrete Structures and Prestressed Concrete Structures**
Concrete structures – Design of reinforced concrete elements, flat slabs and yield line theory based design, design of water tanks, retaining walls, inelastic behavior of concrete structures, ductile detailing. Design of long and short span bridges, analysis and design of tall buildings, stability of tall buildings, wind effects on structures. Prestressed concrete - Design of flexural members - continuous and cantilever beams, design of tension and compression members, composite members, losses of prestress, design of prestressed bridges, chimneys, poles, sleepers.

**UNIT - II Advanced Steel Structures**
Design of members subjected to combined forces - Design of connections - Riveted, Bolted and Welded - Analysis and design of industrial buildings - Sway and Non-sway frames - Plastic analysis of structures - Design of light gauge steel structures.

**UNIT - III Dynamics and Earthquake Engineering**
earthquake forces, Earthquake resistant design of masonry and RC structures, Capacity based design and detailing, Structural systems, Shear walls, Rigid Frames, Principles and guidelines for earthquake resistant design, Design guidelines for earthquake resistant masonry buildings, Vibration control techniques, Tuned Mass Dampers, Seismic base isolation.

UNIT - IV Concrete Technology and Repair and Rehabilitation Of Structures
Concrete making materials - Mix Design - Special Concretes - High strength Concrete - High Performance Concrete - High density Concrete - Fibre Reinforced Concrete - Geopolymer Concrete - Bacterial Concrete - Nano Concrete - Ready mixed Concrete - Self compacting Concrete - Concrete made out of Industrial Wastes - Fresh and hardened concrete properties-Concreting Techniques - Life cycle behaviour of Structures - Different forms of cracks - factors responsible for deterioration of concrete - Defects in steel, masonry and concrete structures - causes - effects-Damage assessment - strength and durability parameters - NDT - Repair Techniques-Strengthening of structural elements - Engineered Demolition.

UNIT - V Structural Analysis and Finite Element Analysis
Axial deformation of bars, Analysis of framed structures, Plates and shells, Applications of finite element for elastic stability, Dynamic analysis.

PCE1003 Advanced Construction Technology / Construction Engineering and Management / Infrastructure Engineering

UNIT - I Construction Planning, Scheduling and Control

UNIT - II Project Formulation and Appraisal and Contract Laws and Regulations
Project Formulation, Project Costing, Project Appraisal, Project Financing, Private Sector Participation- Contract Laws and Regulations - Construction contracts, Indian contract act,

UNIT - III Resource Management and Control and Quantitative Techniques In Management

UNIT - IV Concrete Technology and Repair and Rehabilitation of Structures
Concrete making materials - Mix Design - Special Concretes - High strength Concrete - High Performance Concrete - High density Concrete - Fibre Reinforced Concrete - Geopolymer Concrete - Bacterial Concrete - Nano Concrete - Ready mixed Concrete - Self compacting Concrete - Concrete made out of Industrial Wastes - Fresh and hardened concrete properties-Concreting Techniques - Life cycle behaviour of Structures - Different forms of cracks - factors responsible for deterioration of concrete - Defects in steel ,masonry and concrete structures - causes - effects-Damage assessment - strength and durability parameters - NDT - Repair Techniques-Strengthening of structural elements - Engineered Demolition.

UNIT - V Construction Techniques and Equipment
Equipment for earthwork, asphalt and concrete plants and materials handling - Equipment for dredging, trenching, tunneling, drilling, blasting, pile driving, demolition, dewatering and grouting - Cranes- Modern equipment- Construction Equipment Management - Construction techniques for sub structure construction - Super structure construction techniques for buildings including tall buildings, prestressing and post tensioning – Construction techniques for the construction of special structures like towers, silos, chimneys, TLT, skyscrapers, bridges, domes, jetties, breakwater structures, support structure for heavy machinery, articulated structures and space decks – Demolition Techniques.

PCE1004 Geotechnical Engineering / Soil Mechanics and Foundation Engineering
UNIT - I Soil Properties and Strength Behaviour
Different soil deposits — classification and identification — clay minerals — diffused double layer — swelling and shrinkage behavior — liquefaction potential — factors affecting compressibility, permeability, shear strength — conduction phenomena-Factors affecting stress-strain characteristics — triaxial testing and stress path — pore pressure parameters — failure theories — constitutive law for soil — limitations of model — critical state line — dilation effect.

UNIT - II Subsurface Investigation and Instrumentation

Method of exploration for preliminary and detailed design — Geophysical methods — Drilling in difficult subsoil conditions — bore logs — factor influencing sampling and samplers in onshore and offshore — field tests — interpretation of test results — instrumentation methods.

UNIT - III Shallow and Deep Foundations

Types of shallow foundations — conceptual design principles — ultimate safe bearing capacity under axial and eccentric loading — components of settlement of soil — stress path method — allowable settlement and bearing capacity — raft foundation — soil structure interaction — structural design of shallow foundation — foundation for tower and offshore environment — machine foundation- Classification of piles based on usage, function, and material — vertical and lateral load carrying capacity of piles and pile group — settlement of piles — structural design of pile and pile caps — settlement of caisson.

UNIT - IV Earth and earth retaining structures

Earth pressure theories — active and passive cases — stability of retaining structures both for regular and earthquake forces — design of cantilever and anchored sheet pile walls — lateral pressure on sheeting in braced excavation — earth pressure around tunnel lining, shafts and silos — soil anchors and soil pinning — diaphragm walls — stability of infinite and finite slopes — stability charts — slope stabilization.

UNIT - V Ground Improvement and Geoenvironmental Engineering

Need for ground improvement — column methods — sand, stone and lime columns — soil nailing — root piles — soil reinforcement — functions of geosynthetics in soil — soil grouting — electro-chemical stabilization- Consequence of waste on the behaviour of soil — soil-pollutant interaction — remediation of contaminated sites — stabilization of waste with soil
PCE1005  Environmental Engineering / Environmental Management

Environmental chemistry
Aquatic chemistry, atmospheric chemistry, soil chemistry-environmental chemicals and their fate

Environmental Microbiology
Classification and characteristics of Microorganisms-microbes and nutrient cycles- metabolism of microorganisms- pathogens in wastewater- toxicology

Design of water and wastewater treatment systems
Sources and types of water pollutants, water quality standards- conventional and advances in water treatment. Physical and chemical treatment of waste water- sludge treatment and disposal-Principles of biological treatment-Design of water and wastewater treatment plant units-Residual management- construction operation and maintenance aspects;

Industrial wastewater management, treatment & disposal
Industrial pollution prevention & waste minimization-Industrial wastewater treatment-Wastewater reuse and residual management, Zero liquid Discharge Systems

Air pollution and control
Air Pollutants-Types-NAAQS-Emission and Ambient Air sampling and Analysis-Effect of Meteorological Parameters-Control of particulate contaminants-Control of gaseous contaminants-Indoor air quality management-Noise Pollution and Control

Solid and hazardous waste management
Sources, classification and regulatory framework- Waste characterization and source reduction-Storage, collection and transport of wastes-Waste Processing technologies-Waste disposal

Environmental and socio-economic impact assessment
Sustainable Development and Climate Change
Sustainability and Development, Principles and Frame Work - Climate Change-Adaptation and Mitigation

PCE1006 Water Resources Engineering

UNIT - I

UNIT - II
streams - Evaluation of well loss parameters – Partial penetration of wells – Interference of wells Determining aquifer parameters for unconfined, leaky and non-leaky aquifers – steady and transient conditions - Slug test – Locating hydro geological boundaries – Image well theory – Determination of well characteristics and specific capacity of wells – Well characteristics of large diameter wells.

UNIT - III

UNIT - IV

UNIT - V
PCE1007 Irrigation Water Management


PCE1008 Coastal Engineering and Management

Wind and waves - Sea and Swell -Introduction to small amplitude wave theory - use of wave tables- Mechanics of water waves - Linear (Airy) wave theory, Introduction to Tsunami Behaviour of waves in shallow waters, Introduction to non-linear waves and their properties - Waves in shallow waters - Wave Refraction, Diffraction and Shoaling -Hindcast wave generation models, wave shoaling; wave refraction; wave breaking; wave diffraction random and 3D waves- Short term wave analysis - wave spectra and its utilities - Long term wave analysis- Statistics analysis of grouped wave data. Dynamic beach profile; cross-shore transport; along shore transport (Littoral transport), sediment movement Field measurement; models, groins, sea walls, offshore breakwaters, artificial nourishment - planning of coast protection works - Design of shore defense structures -Case studies. Physical modeling in Coastal Engineering - Limitations and advantages - Role of physical modeling in coastal engineering - Numerical modeling - Modeling aspects - limitations - Case studies using public domain models, Tsunami mitigation measures
**PCE1009  Geomatics / Geo Informatics / Remote Sensing / Spatial Information Technology**

**UNIT - I**

**UNIT - II**

**UNIT - III**

**UNIT - IV**

**UNIT - V**

**PME2001  CAD / Engineering Design / Machine Design**

**UNIT - I**
Design concepts: Design fundamentals, methods and material selection; Design for Quality; Failure mode effect analysis and design for six sigma; Design of experiments; Statistical consideration and reliability.

**UNIT - II**
Introduction to computer graphics fundamentals; Curves and surfaces modeling; Concepts of Solid modeling; Visual realism; Assembly of parts and product data Exchange. Finite Element Analysis related to 1D and 2D problems. Problems of static and dynamic analysis using Finite Element Analysis.

UNIT - III


UNIT - IV


UNIT - V


PME2002 CAM

UNIT - I
Design concepts: Design fundamentals, methods and material selection; Design for Quality; Failure mode effect analysis and design for six sigma; Design of experiments; Statistical consideration and reliability.

UNIT - II
Introduction to computer graphics fundamentals; Curves and surfaces modeling; Concepts of Solid modeling; Visual realism; Assembly of parts and product data Exchange. Finite Element Analysis related to 1D and 2D problems. Problems of static and dynamic analysis using Finite Element Analysis.

UNIT - III

UNIT - IV

UNIT - V
Engineering Data Management (EDM), Product Data Management (PDM), Collaborative Product Definition Management (cPDM), Collaborative Product Commerce (CPC), Product Lifecycle Management (PLM) - Additive manufacturing processes-Benefits Applications – rapid tooling - Reverse Engineering – Digitizing technique.

PME2003 Product Design and Development
UNIT - I

Design concepts: Design fundamentals, methods and material selection; Design for Quality; Failure mode effect analysis and design for six sigma; Design of experiments; Statistical consideration and reliability.

UNIT - II
Introduction to computer graphics fundamentals; Curves and surfaces modeling; Concepts of Solid modeling; Visual realism; Assembly of parts and product data Exchange. Finite Element Analysis related to 1D and 2D problems. Problems of static and dynamic analysis using Finite Element Analysis.

UNIT - III

UNIT - IV

UNIT - V
Introduction to marketing research, exploratory research design, measurement and scaling, frequency distribution and data analysis, Additive manufacturing processes-Benefits Applications – rapid tooling - Reverse Engineering – Digitizing techniques.

PME2004 Energy Engineering

UNIT - I

UNIT - II

UNIT - III

UNIT - IV

UNIT - V
Boiler basics and performance analysis, combustion principles and heat loss analysis - Thermic Fluid Heaters – Furnaces – Insulation and Refractories - Cogeneration types, principles and

**PME2005 Thermal Engineering spl. in Refrigeration and Air Conditioning**

UNIT - I

UNIT - II

UNIT - III

UNIT - IV

UNIT - V

PME2006 Internal Combustion Engineering

UNIT - I

UNIT - II

UNIT - III

UNIT - IV

UNIT - V

PME2007 Manufacturing Systems Management and Lean Manufacturing

UNIT - I Advanced Manufacturing Processes
Advances in manufacturing processes – Casting, Welding, forming, Unconventional machining processes, Additive manufacturing, Micro and nano-machining processes, Metrology for quality control.

UNIT - II Manufacturing Management and Operations Research
Facility, capacity & layout planning, Forecasting, Scheduling, Project Management, Production planning and control, Inventory control, Maintenance strategies. Linear programming, Sequencing, Replacement.

UNIT - III Quality Control
Statistical process control, online/offline quality control, Process capability, Design of experiments, Reliability, Maintainability

UNIT - IV Lean Manufacturing
Seven wastes, Lean Tools to eliminate Muda – 5S, TPM, Standardised work, Poka-Yoke, SMED, Kanban, JIT, Value stream mapping, Six Sigma – Methodology, tools.

UNIT - V Manufacturing Automation
Automation and control techniques, Numerical control, Robotics, Material handling, FMS, Cellular manufacturing.

PME2008 Welding Engineering

UNIT - I Phase Diagrams and Heat Treatment

UNIT - II Welding Processes and Design

UNIT - III Welding of Ferrous Materials

UNIT - IV Welding of Non-Ferrous Materials

UNIT - V Defects, Weldability and Standards
Weld defects, Remedies-Joining of dissimilar materials, weldability and testing of weldments, Failure analysis, Introduction to International Standards and Codes.

PME2009 Materials and Metallurgical Engineering

UNIT - I Phase Diagrams and Heat Treatment

UNIT - II Phase Diagrams and Heat Treatment

UNIT - III Metal Forming

UNIT - IV Metallic and Non-Metallic Materials
Metallurgy of Iron and Steel Making, Alloy steels, Cast irons, Non-Ferrous Metallurgy- Cu, Al, Ni, mg, Ti, Pb, Zn, Sn and their alloys. Precious metals, Ceramics, Composites and Polymers.

UNIT - V Characterisation and Inspection

PME2010 Industrial Engineering and Quality Engineering and Management

Unit - I Probability and statistics
One dimensional random variables - two dimensional random variables - multivariate methods - testing of hypotheses - factor analysis - discriminate analysis - cluster analysis.

Unit - II Operations Research and Simulation
Linear Programming - Network Analysis - Decision And Game Theory - Queuing Theory – Random Numbers And Random Variates - Simulation Experiment.

Unit - III Work Design and Facility layout
Method study - Work measurement - Applied work measurement - Physical ergonomics - environmental factors - Plant location - Facilities layout - Group technology and line balancing - Materials handling

Unit - IV Operations Management
Demand forecasting - Production planning - Inventory planning and control - Capacity analysis and operational control - single machine scheduling - parallel machine scheduling - job shop scheduling

Unit - V Quality control and Reliability

**PME2011 Advanced Manufacturing Engineering / Computer Integrated Manufacturing**

**UNIT - I**
Theory of metal cutting, tool materials, conventional and unconventional machining processes, super finishing processes, high speed machining, tool condition monitoring, tool based micromachining, MEMS based micro-machining.

**UNIT - II**
Additive manufacturing techniques, processing techniques of different composites, hybrid composites, Optical microscopy, TEM, SEM, AFM, Hardness, micro hardness, Impact test, Synthesis of nano materials, Top down and bottom up approaches, surface mount technology.

**UNIT - III**
Measurements, errors, accuracy, precision, calibration, surface roughness, interferometers, laser metrology, co-ordinate measuring machine, in-process inspection, vision system, image processing, lean manufacturing, Just In Time, Total Quality Management, Smart manufacturing, machine learning and IoT.

**UNIT - IV**
Finite Element Analysis, welding types, HAZ, defects, special casting processes, casting defects, metal forming, plastic deformation, stress strain curves for different materials, work hardening, strain hardening, fatigue, failure analysis, material selection, creep, wear resistance, heat treatment, powder metallurgy.

**UNIT - V**
PME2012  Printing and Packaging Technology

UNIT - I  Fundamentals of Printing and Packaging

UNIT - II  Printing Processes
Offset, Flexo, Gravure, Screen, Digital - Principle, Image carrier preparation, Machine configuration.

UNIT - III  Printing and Packaging Materials

UNIT - IV  Packaging Technologies
Paper and Board Conversion, Plastic Conversion, Closures, Packaging Machineries, Automotive and Industrial Packaging, Food Packaging, Healthcare Packaging

UNIT - V  Testing and Quality Control

PME2013  Mechatronics

UNIT - I  Mechanics

UNIT - II  Electronics

UNIT - III Sensors and Drives


UNIT - IV Control Systems and Controllers


UNIT - V Robotics, Machine Vision and Cnc Machines


**PME2014 Manufacturing Engineering / Production Engineering**

**UNIT - I**

Engineering Mechanics, Solid Mechanics, Kinematics of Machines - Design of machine elements - Jig fixture and tool designs.

**UNIT - II**


**UNIT - III**

Engineering Materials and metallurgy - Machining Processes - Special purpose machine tools - Unconventional/Advanced Machining processes

**UNIT - IV**


**UNIT - V**

Inventory management - Plant location and layout - Materials handling - Method, study - work measurement - Break even analysis - Cost accounting - Quality control - Control charts acceptances sampling – TQM- TPM – Operational Research - Design of Experiments

**PME2015 Automobile Engineering / Automotive Engineering / Automotive Materials and Manufacturing**

**UNIT - I Automotive Chassis**

UNIT - II Automotive Transmission


UNIT - III Vehicle Body Engineering and Vehicle Dynamics


UNIT - IV Automotive Electrical and Electronics


UNIT - V Engines Emission Control, Alternative Fuels and Hybridelectric Vehicles


PME2016 Aeronautical Engineering / Aerospace Technology

UNIT - I

UNIT - II

UNIT - III

UNIT - IV

UNIT - V

PME2017 Avionics

UNIT - I

UNIT - II

UNIT - III
UNIT - IV

UNIT - V

PME2018 Solar Energy

UNIT - I

UNIT - II

UNIT - III

UNIT - IV

UNIT - V

**PEE3001 High Voltage Engineering**

UNIT - I High Voltage Generation and Measurement

Voltage stress, testing voltages, AC to DC conversion, analysis of single phase rectifier, voltage multiplier, Cockcroft-Walton, Electrostatic generators, analysis of cascaded transformer and resonant circuit, Marx generator circuit analysis, generation of switching surges, non-standard impulse and VFTO, analysis of impulse current generator circuits, measurement of High AC, DC and Impulse voltages, Field sensors, voltage divider, impulse current measurement, fast digital transient recorders

UNIT - II Insulation Technology

Properties of dielectrics in static fields, behaviour of dielectrics in alternating fields, breakdown mechanisms in gaseous, solid and liquid dielectrics, thermal modelling, Application of insulating materials in power equipment

UNIT - III Electromagnetic Field Computation and Insulation Design
Review of basic field theory – Maxwell’s equations – Laplace, Poisson and Helmholtz equations for EM field analyses, governing equations, problem definition, boundary conditions, circuit parameters from the EM field solutions-Electrical field distribution and breakdown strength of insulating materials - factors affecting the breakdown strength - electric field distribution in homogenous and multi-dielectric isotropic materials- electrical field control techniques-insulation design and electric stress control in insulators, bushings, transformers and surge arresters

UNIT - IV High Voltage Testing Techniques

Classification of testing methods,IS/IEC/IEEE standards, measurement techniques, diagnostic techniques and online measurement, Determination of probability values, Distribution function, confidence limits, ‘Up and Down’ method, multi stress ageing, life data analysis, Testing of insulators, bushings, air break switches, isolators, circuit breakers, power transformers, voltage transformers, current transformers, surge arresters, cable testing methodology, non-destructive insulation test techniques, pollution tests and design of high voltage lab.

UNIT - V Transients In Power Systems and EHV transmission

Lightning overvoltage’s, switching and temporary overvoltage’s, travelling waves on transmission line, insulation co-ordination, Standard transmission voltages- Calculation of line parameters, voltage gradients of conductors, design concepts of EHV and HVDC lines

PEE3002 Embedded Systems Technology

UNIT - I Microprocessor and Microcontroller Based System Design

8051, PIC and ARM architecture, Peripherals, interfacing, applications and programming.

UNIT - II Embedded System Design

Basic components, Embedded System design flow, Hardware/Software co-design, selection of processor and memory devices- Memory management methods - Timers and counting devices- sensors, actuators- Nyquist criterion-sampling for signals-RTOS Based Embedded System Design- Embedded System Application Development

UNIT - III Software For Embedded Systems
Assembly language, C, Embedded C and Python programming, Distributed embedded computing concepts, Android OS concepts, Software development tools, IDE - Applications.

UNIT - IV Communication For Embedded System

UNIT - V Digital Design and Vlsi
Digital systems-Combinational and sequential design- CMOS design-FPGA technologies-HDL - SoC

**PEE3003 Electrical Machines / Power Electronics And Drives**

UNIT - I Electrical Machines

Principles of Electromagnetic energy conversion - Dc machines- reference frame theory-induction machines- synchronous machines

UNIT - II Power Converters

Switched mode DC-DC converters; buck, boost, sepic and cuk topologies-single phase and three phase controlled converters- single phase and three phase vsi and csi - performance parameters-pwm techniques-modern inverters- control techniques

UNIT - III DC, AC and Special Electrical Drives

Mechanical systems fundamental- converter and chopper control of dc drives- closed loop and digital control of d.c drive- stator and rotor controlled induction motor - field oriented control of induction machines- synchronous motor drives- permanent magnet brushless dc motors- permanent magnet synchronous motors- switched reluctance motors- stepper motors

UNIT - IV Microcontroller and DSP Based System Design

8051 architecture and programming- pic microcontroller- peripheral of pic microcontroller- motor control signal processors- assembly language programming- peripherals of signal processors- event manager and drive control- applications
UNIT - V Power Electronics For Power Systems

Electrical machines for renewable energy conversion- analysis of wind and pv systems- hybrid renewable energy systems – power quality analysis of single phase and three phase system- conventional load compensation methods- load compensation using dstatcom-series compensation of power distribution system-analysis of hvdc converters and hvdc systems control – thyristor and vsc based facts controllers

PEE3004 Power Engineering and Management

UNIT - I Deregulation In Power Systems


UNIT - II Power Business Management


UNIT - III Grid Integration of Renewable Energy Systems

Concept of Micro Grids and their types, Different types of grid interfaces, Issues related to grid integration - Interconnection standards and grid code requirements for integration-Network Integration of Wind Power -Influence of Wind Farms on Network Dynamic Performance-Power Systems Stabilizers and Network Damping capability of Wind Farms - Stand Alone and Grid Connected PV System

UNIT - IV SMART GRIDS and SCADA
Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid - Smart Grid drivers, functions, opportunities, challenges and benefits - Smart Grid Technologies (Transmission) - Smart Grid Technologies (Distribution) - Smart Meters and Advanced Metering Infrastructure (AMI) - Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL) - CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid

UNIT - V Energy Management and Auditing


PEE3005 Electrical and Electronics Engineering / Electrical Energy System / Power System Engineering

UNIT - I Power System Analysis, Operation and Control


UNIT - II Power System Protection

Over Current And Earth Fault Protection - Transformer Protection - Busbar Protection - Distance And Carrier Protection Of Transmission Lines - Generator Protection And Motor Protection - Substation Automation

UNIT - III Power System Dynamics


UNIT - IV Power Converters And Facts Devices
Single Phase Ac-Dc Converter - Three Phase Ac-Dc Converter - Single Phase Inverters - Three Phase Inverters - Multilevel Inverters - Static Var Compensator - Thyristor And Gto Thyristor Controlled Series Capacitors - Voltage Source Converter Based Facts Controllers - Controllers And Their Coordination – Hvdc Transmission

UNIT - V Restructured Power System
Introduction To Restructuring Of Power Industry - Transmission Congestion Management - Locational Marginal Prices And Financial Transmission Rights - Ancillary Service Management And Pricing Of Transmission Network - Reforms In Indian Power Sector

PEE3006 Control System / Control and Instrumentation / Electronics and Control / Instrumentation Engineering / Process Control Instrumentation

UNIT - I Measurement and Instrumentation

UNIT - II Control System

UNIT - III Process Control
Basics of process control - Degrees of Freedom - Interacting and non-interacting systems - Characteristic of ON-OFF, P, P+I, P+D and P+I+D control modes - Reset windup - PID Controller tuning - Cascade control - Feed forward control - Multi-loop PID Controller:-
Decoupling Control - Multivariable PID Controller - DCS - SCADA - PLC programming - Realization of PID Controller using OPAMPs and Embedded system

UNIT - IV Advanced Control Schemes
Smith predictor control - Control, Model Reference LOR, LQG, DMC, GPC. IMC - IMC PID Adaptive Control Adaptive control: Gain Scheduled Adaptive and Self Tuning Controller - Optimal Control.

UNIT - V State and Parameter Estimation and Soft Computing Techniques

PIC4001 Applied Electronics Engineering / Electronics and Communication Engineering / Vlsi Design

UNIT - I Semiconductor Devices, Electronic Circuits
Biasing, BJTs and MOSFETs, Amplifiers, Low & High frequency analysis, IC MOSFET, Oscillators; Analog ICs - A-D & D-A Convertors, Applications of Analog ICs; Digital Electronics - Combinatorial circuits and Sequential circuits

UNIT - II Communication
Line coding, amplitude modulation and demodulation, spectra of AM and FM, PCM, DPCM, digital modulation schemes: amplitude, phase and frequency shift keying (ASK, PSK, FSK), QAM, MAP and ML decoding, TDMA, FDMA and CDMA

UNIT - III Basics Of Signals And Systems, Digital Signal Processing
Fourier series and Fourier transform, DFT, FFT, Z-transform, digital filter design techniques; Digital image Processing - Spatial and Frequency domain techniques, image enhancement, Segmentation, Restoration, Compression techniques, Laplace transforms, Zeros, Poles, Stability, Gain Margin, Phase Margin

UNIT - IV Microprocessor and Micro Controller
8085 & 8086 Microprocessor architectures - Memory Interfacing and I/O interfacing; 
**Embedded Systems** - 8051 & PIC Microcontroller - Special Function Registers, Interfacing, PIC Development Tools And Programming; 
**VLSI** - FPGA architectures

**UNIT - V Low Power Vlsi**

Power Dissipation, Power Optimization, Low Power CMOS Circuits, Power Estimation, Synthesis and Software Design For Low Power

**PIC4002 Biomedical Engineering / Medical Electronics**

**UNIT - I Semiconductor Devices, Electronic Circuits**

Biasing, BJTs and MOSFETs, Amplifiers, Low & High frequency analysis, IC MOSFET, Oscillators; 
**Analog ICs** - A-D & D-A Convertors, Applications of Analog ICs; 
**Digital Electronics** - Combinatorial circuits and Sequential circuits

**UNIT - II Communication**

Line coding, amplitude modulation and demodulation, spectra of AM and FM, PCM, DPCM, digital modulation schemes, amplitude, phase and frequency shift keying (ASK, PSK, FSK), QAM, MAP and ML decoding, TDMA, FDMA and CDMA

**UNIT - III Basics Of Signals And Systems, Digital Signal Processing**

Fourier series and Fourier transform, DFT, FFT, Z-transform, digital filter design techniques, Adaptive Filter Structures; 
**Digital image Processing** - Spatial and Frequency domain techniques, image enhancement, Segmentation, Restoration, Compression techniques, Laplace transforms, Zeros, Poles, Stability, Gain Margin, Phase Margin

**UNIT - IV Biomedical Instrumentation**

Bio Potential Recording, Biomedical Transducers And Amplifiers, Non Electrical Parameter Measurements, Diathermy and Stimulator

**UNIT - V Human Assist Devices**

Scanning Techniques - Heart Lung Machine and Artificial Heart, Cardiac Assist Devices, Artificial Kidney, Prosthetic and Orthotic Devices, Respiratory and Hearing Aids.

UNIT - I Semiconductor Devices, Electronic Circuits
Biasing, BJTs and MOSFETs, Amplifiers, Low & High frequency analysis, IC MOSFET, Oscillators; Analog ICs - A-D & D-A Convertors, Applications of Analog ICs; Digital Electronics - Combinatorial circuits and Sequential circuits

UNIT - II Communication
Line coding, amplitude modulation and demodulation, spectra of AM and FM, PCM, DPCM, digital modulation schemes, amplitude, phase and frequency shift keying (ASK, PSK, FSK), QAM, MAP and ML decoding, TDMA, FDMA and CDMA

UNIT - III Basics Of Signals and Systems, Digital Signal Processing
Fourier series and Fourier transform, DFT, FFT, Z-transform, digital filter design techniques, Adaptive Filter Structures; Digital image Processing - Spatial and Frequency domain techniques, image enhancement, Segmentation, Restoration, Compression techniques, Laplace transforms, Zeros, Poles, Stability, Gain Margin, Phase Margin

UNIT - IV Electromagnetic Theory

UNIT - V Optical Communication
Optical sources and detectors, fiber types, Dispersion Compensation Schemes; Microwave - Passive Microwave Devices And Circuits, Microwave Generation, Microwave Measurements; Wireless communication - Channel Models, Digital Modulation, Multi antenna Communication, Cellular Concepts; Communication networks - Internet Routing Protocols, Mobile & Adhoc Networks.

36
UNIT - I Probability and Statistics
Random Variables, Probability Distributions, Correlation, Regression, Testing of hypothesis;

Theory of Computation - Finite State Machine, Pushdown Automata, Context Free Grammar, Turing Machine

UNIT - II Data Structures and Algorithms
Arrays, Lists, Stacks, Queues, Trees, Graphs, Searching and Sorting Algorithms; Programming – C, Object Oriented Programming

UNIT - III Databases
Relational Databases, Query Language, E-R modeling, Normalization, Query Processing, Transaction Processing, Integrity and Security; Operating Systems – Process Management, Scheduling, Deadlocks, Memory Management, File Systems

UNIT - IV Networking
TCP/IP model, Layers, Functions and Protocols; Security – Cryptography, Symmetric Key and Public Key Algorithms; Computer Architecture – Instruction Set Architectures, Arithmetic Operations, Pipelines and Hazards, Caches

UNIT - V Software Engineering
Analysis, Design, Coding, Testing and Maintenance, Metrics, Object Oriented Analysis and Design; Web Technology – Scripting Languages, Client-Server Applications, Database Connectivity; Cloud Computing – Virtualization; Big Data Analytics, NoSQL.

PTE5001 Textile Technology
UNIT - 1 Fibre Science
Physical and chemical properties, moisture, tensile, frictional, optical, thermal, electrical properties of fibres; structure investigation techniques; different methods of fibre production, electrospinning; post spinning operations- spin finish application, drawing and heat setting

UNIT - II Yarn Formation
Principles of opening and cleaning; theory of carding, drafting and twisting; mechanisms - opening, cleaning and carding; drawing, combing, roving formation and yarn formation; alternative spinning systems; calculations; yarn defects; process control in spinning; structural mechanics of yarn.

UNIT - III Fabric Formation
Principles of winding, winding defects and control; warping, sizing, beam preparation; principles of weaving, settings, calculations; fabric defects, process control in weaving preparatory and weaving; fabric structure; principles of shuttleless weaving, mechanisms, calculations; principle and mechanism of weft and warp knitting; principles of non-woven fabric manufacturing.

UNIT - IV Yarn and Fabric Quality Evaluation
Fibre, yarn and fabric properties – measurement and analysis; low stress mechanical properties of fabrics – measurement and analysis

UNIT - V Dyeing and Finishing
Preparatory process for dyeing, dyeing and printing of different fibres; adsorption isotherms, thermo dynamics of dyeing – dye affinity, activity of dyes, heat of dyeing, entropy; rate of dyeing and half dyeing time; colour measurement and matching; finishes

PTE5002 Textile Chemistry

UNIT - 1 Fibre Science
Physical and chemical properties, moisture, tensile, frictional, optical, thermal, electrical properties of fibres; structure investigation techniques; different methods of fibre production, electrospinning; post spinning operations- spin finish application, drawing and heat setting.

UNIT - II Fabric and Garment Quality Evaluation
Fabric properties – measurement and analysis; low stress mechanical properties of fabrics – measurement and analysis

UNIT - III Dyeing
Preparatory for dyeing; basic characteristics of dyes and pigments; classification of dyes and principle of application of dyes; chemistry and technology of application of different dyes; determination of fastness properties; theory of dyeing

**UNIT - IV Printing**
Methods and styles of printing; printing machines; constituents of printing paste; printing with direct, reactive, acid and disperse dyes; printing with pigments; Instrumental colour assessment and matching.

**UNIT - V Finishing**
Water and soil repellent finishes; softening finish; antistatic finish; fire retardant finish; antibacterial finish; application of nanotechnology in finishing; assessment of finishes

**PTE5003 Apparel Technology / Fashion Technology**

**UNIT - I Quality Evaluation of Fabrics and Garments**
Yarn numbering, fabric specification, fabric structure, fabric properties- measurement and analysis, low stress mechanical properties of fabrics- measurement and analysis, fabric inspection-different systems, fabric defect-analysis and control; quality assessment of garments

**UNIT - II Apparel Manufacture**
Standardization of size charts, 3D body scanning; flat pattern techniques, dart manipulation; grading; marker planning- manual and computerised; cut order planning; garment production machinery and work-aids; influence of fabric characteristics on sewing parameters, sewing needle design, sewing thread, trims and accessories

**UNIT - III Clothing Comfort**
Role of wetting and wicking on comfort properties of garments, thermal comfort, body and tactile sensations, comfort perception and preferences, evaluation of moisture comfort, thermal comfort and physiological comfort

**UNIT - IV Speciality Textiles and Garments**
Intimate wear, protective wear and sportswear- selection of fibre and fabric parameters, testing; seamless apparel, stretch pattern development and garment construction; smart garments; garments for hygiene applications; home textiles
UNIT - V Production Planning and Control

Productivity concepts; method study, work measurement; ergonomics; different production systems of garment industry; production planning, line balancing; apparel costing; application of statistics in process control

PTE5004 Nano Science and Nano Technology

UNIT - I


UNIT - II


UNIT - III


UNIT - IV


UNIT - V

Nanostructures in Biological systems and Toxicology: Cellular nanostructures - DNA nanotechnology - Protein and enzyme - Carbohydrates and GLYCO nanoparticles - Lipids and lipid based nanoparticles - Lipid based nanocarriers - Microbes and antibody based nanocarriers - Nanomaterials for drug delivery - Toxicology – Nanotoxicology - Protocols in toxicology studies - Risk assessment and execution

PTE5005  Leather Technology

UNIT - I Chemistry and Physics of Collagen

Molecular Structure of Collagen, Chemistry of Collagen and its Distribution, Collagen Crosslinks, Isolation and Characterisation of Collagen, Biosynthesis of Collagen, Collagen Degradation, Physico-Chemical Techniques for Collagenous Matrices.

UNIT - II Instrumental Methods In Leather Science

Spectroscopic Techniques, Chromatographic Techniques, Applications of Spectroscopic and Chromatographic methods in Leather Science, Electroanalytical Methods, Principles of Microscopic and other testing methods in Leather.

UNIT - III Science of Leather Making

Chemical Principles involved in Pre Tanning operations, Chemistry of Tanning materials, Mechanism of Tanning, Post Tanning and Finishing.

UNIT - IV Leather and Leather Process Design Engineering

Speciality Leathers, Cleaner Processing – Beamhouse, Tanning, Post Tanning and Finishing, Advanced Finishing Techniques, Property requirements of various leathers.

UNIT - V Tannery Waste Management And Engineering

Science and Technology of Leather Chemicals – leather, auxiliaries, syntans, fatliquors, pigments, binders, plasticizers, feel modifiers

PTE5006   Footwear Science and Engineering

UNIT - I  Anatomy and Solid Modelling of Foot
Anatomy of Human Foot, Growth and Deformities, Bio Mechanics, Essentials of Therapeutic Footcare, Solid Modelling.

UNIT - II  Technology of Footwear Manufacturing
Design and Pattern Development, Cutting, Pre-Closing and Closing, Lasting, Post Lasting and Finishing.

UNIT - III  Footwear Chemicals, Polymers, Components And Accessories

UNIT - IV  Modern Footwear Styling and Computer Applications In Footwear

UNIT - V  Technology For Specialty and Non Leather Footwear
Lasting, Good Year Welted Construction, Stitch down and other Constructions, Sports & Moulded Footwear, Orthopedic & Therapeutic Footwear

PTE5007   Ceramic Technology
UNIT - I  Material Science
Structure of solids - imperfections - point, line, surface, volume - phase diagrams - Gibbs Phase Rule, single component system, two component system - Diffusion - Fick’s Law and its applications - Properties - Physical, mechanical, electrical, thermal and optical.

UNIT - II  Processing Ceramics

UNIT - III  Glass and Refractory

UNIT - IV  Electronic Ceramics

UNIT - V  Advanced Ceramics
Properties and Applications - silica, alumina, zirconia, carbides, nitrides Composites - Types - CMC, PMC, MMC, Reinforcements - fibers, whiskers, particles - properties - applications

PTE5008  Plastic Technology / Polymer Technology / Rubber And Plastics Technology

UNIT - I  Polymer Science
Polymers - Functionality of Monomers - Polymerization mechanisms-Industrial polymerization techniques - Molecular weight of polymers and their significance - States of aggregation in polymers - Amorphous polymers - Tg - Factors affecting Tg - Semicrystalline Polymers - Tm - Crystal nucleation and growth - Spherulite formation - Factors affecting crystallinity - Structure Property relationships in Polymers - Classification of Polymers.
UNIT - II Plastics Materials
Preparation, Properties and Applications of Polyolefin based plastics- Plastics based on Styrene and acrylates -PVC, Fluoroplastics - Polyamides and polyesters - Natural and synthetic fibers - Thermosets including epoxy and unsaturated polyester resins - Engineering Plastics - High performance and specialty polymers.

UNIT - III Rubber Materials
Natural Rubber - Rubber Latex - Synthetic Rubbers - BR, CR, IIR, SBR, NBR, EPM and EPDM - Structure Property relationship and applications of General Purpose Rubbers - Special Purpose Rubbers- Silicone Rubbers - Fluorocarbon and Fluorosilicone rubbers, Polyurethanes and Thermoplastic Elastomers.

UNIT - IV Polymer Processing and Testing
Test for Processability - Melt Viscosity - Melt Flow characteristics - Non-Newtonian behaviour -MFI - Gelation and Gel time - Molecular weight studies - Compounding and Mixing processes - Forming Operations - Extrusion, Injection molding, Blow molding, Compression and Transfer molding, Rotational molding, Thermoforming, Calendering, Reaction Injection Molding - Vulcanization Tests for rubber - Test for Mechanical, Electrical and Optical Properties - Test for durability; Thermal analysis, Spectroscopic and Morphological studies.

UNIT - V Product Design And Applications
Effect of Temperature and time on mechanical properties of Polymers - Creep - Stress relaxation - Design of Simple geometries - Spring rates of rubber products - Design to Specific Spring rates, Rubber under complex loading, Rubber products under dynamic conditions - Property considerations in designing of Plastics Parts, Design of moulds and dies for Rubber and Plastics products, Applications of polymers in the field of civil, automobile, aeronautical, electronics and biomedical Engg.

PTE5009 Biotechnology / Bioengineering / Biomedical Engineering / Bioinformatics / Biopharmaceutical Technology / Industrial Biotechnology / Microbial technology

UNIT - I Biochemistry, Cell Biology and Microbiology

UNIT - II Molecular Biology and Immunology

Nucleic acids, DNA Replication, Protein synthesis, regulation of gene expression in prokaryotes and eukaryotes. Recombinant DNA Technology, DNA libraries, PCR, Blotting, Gene sequencing, Gene silencing and genome editing techniques, Signal transduction pathways and their elucidation. Cells of Immune system, types of immunity, Hematopoiesis, Immunoglobulin structure, types and functions, Antigen-Antibody interaction, Hypersensitivity reactions, Autoimmune disorders and Immunology of infectious diseases, Structure and functions of MHC molecules. Monoclonal antibodies and vaccine technology. Cell culture technologies, Regenerative medicine & transplantation technology, Biosafety, Animal Ethics, Reduction in animal uses, Human experiments - basic clearances, Research methodology

UNIT - III Statistics and Bioinformatics

Measures of central tendency and dispersion; Probability and Statistics: Mean, median, mode and standard deviation. Probability distributions (Binomial, Poisson and normal); Sampling distribution; parametric and non-parametric statistics; Confidence Interval; Errors; Levels of significance; Regression and Correlation; t-test; Analysis of variance and multiple range tests, chi-square test, experimental design, data transformation. Sequence analysis-types, algorithms, multiple sequence alignment and Phylogeny. Biological databases-DNA and protein. Structure prediction and visualization tools, docking and molecular modeling. Basics of Systems Biology and Linux Operation System. Data mining and analytical tools for genomics and proteomics studies.
UNIT - IV  Bioprocess Technology and Analytical Techniques

Enzyme kinetics, Enzyme immobilization, Types of bioreactors, bioreactor scale up, Transport phenomena in bioprocess. Media design and optimization for fermentation process, sterilization kinetics. Fermenter description, Engineering principles of bioprocessing- Upstream and Downstream processing, Bioprocess design and development- Scale-up operations, Microbial production of primary and secondary metabolites and various bioproducts etc. Environmental biotechnology-Pollution, Bioremediation and biodegradation. Theory and instrumentation, of the following: Spectroscopy- Beer Lambert’s Law, stokes shift, IR, NMR and Mass Spectrometry, Optical Rotatory Dispersion, Chromatography- Principle, HPLC, HPTLC, GC and hyphenated techniques (LC-MS), TGA, DTA, DSC and XRD, Electrophoresis, Microarray.

UNIT - V  Plant and Animal Biotechnology

Totipotency, Regeneration of plants, Plant growth regulators and elicitors, Tissue culture and Cell suspension culture system, Production of secondary metabolites by plant suspension cultures, transgenic plants. Animal cell culture, media composition and growth conditions, Animal cell and tissue preservation, Anchorage and non-anchorage dependent cell culture, Kinetics of cell growth, Hybridoma technology, Stem cell technology

PSH7009  Applied Plant Science / Biochemistry / Bioinformatics / Botany / Biotechnology / Biomedical Science / Biomedical Instrumentation Science /Biological sciences / Immunology/Clinical Immunology / Genomics /Human Genetics / Life sciences / Microbiology / Molecular biology / Molecular virology / Plant Biology and Plant Biotechnology / Zoology

UNIT - I  Basic Chemistry and Statistics

Atoms, Molecules, Atomic number, Mass number, Isotopes, Molecular weight, Equivalent weight, Bonding (covalent and non-covalent bonds), Water, Acid, Base, Buffer and pH, Stoichiometric calculations- Molarity, Molality, Normality etc., Basic thermodynamics, Laws of thermodynamics. Good laboratory practice, Measures of central tendency and dispersion; Probability and Statistics: Mean, median, mode and standard deviation. Probability distributions (Binomial, Poisson and normal); Sampling distribution; parametric and non-
parametric statistics; Confidence Interval; Errors; Levels of significance; Regression and Correlation; t-test; Analysis of variance and multiple range tests, chi-square test, experimental design, data transformation.

UNIT - II Fundamentals in Biology


UNIT - III Immunology

Immunity-cell classification, tissues and organs of the immune systems, Antigens, epitopes and antibody reactivity, structure of antibodies, Classification and functions. Complement system. Arrangement of Ig genes and their expression and diversity, B - and T - cells development and cytokines. Major histocompatibility complex and their importance. Immune response to infections, classification of allergy, allergens.

UNIT - IV Recombinant DNA Technology and Bioinformatics

Restriction and modifying enzymes, Vectors, Selection and screening strategies, Southern, northern and western blot. PCR and its types. Real time PCR-SYBR green, Taqman and

UNIT - V Analytical Methods


PTE5010 Biopharmaceutical Technology / Biochemistry / Immunology/ Clinical Immunology/ Microbiology / Pharmaceutical technology / Pharmaceutical chemistry / Pharmacy / Pharmaceutics / Pharmaceutical analysis / Pharmacoinformatics / Pharmacology / Pharmacognosy

UNIT - I Pharmaceutical Biotechnology


UNIT - II Pharmaceutical Chemistry and Pharmacology

UNIT - III Statistics, Pharmaceutical Analysis and Regulatory Affairs

Measures of central tendency and dispersion; Probability and Statistics: Mean, median, mode and standard deviation. Probability distributions (Binomial, Poisson and normal); Sampling distribution; parametric and non-parametric statistics; Confidence Interval; Errors; Levels of significance; Regression and Correlation; t-test; Analysis of variance and multiple range tests, chi-square test, experimental design, data transformation


UNIT - IV Pharmaceutics


UNIT - V Biopharmaceutics and Pharmacokinetics
Mechanism of drug absorption, Factors affecting drug absorption, distribution and biotransformation. Biopharmaceutical classification system, Invitro-invivo correlation, Comparison of dissolution profiles by model dependent and model independent methods. Bioavailability and bioequivalence studies. Basic concepts of Pharmacokinetics, determination of pharmacokinetic parameters from urine and plasma data after drug administration by Compartment and Non-compartment models, Non-linear Pharmacokinetics

**PTE5011**  Biochemistry / Food Technology / Food Process Engineering / Food and Nutritional Biotechnology / Food Safety and Quality Management / Food Safety and Quality Assurance / Food Science and Technology / Food Science and Nutrition / Microbiology

**UNIT - I Food Chemistry and Nutrition**


**UNIT - II Food Microbiology and Microbial Technology**

Characteristics of microorganisms: morphology of bacteria, yeast, mold and actinomycetes, spores and vegetative cells, gram-staining. Microbial growth kinetics. Food spoilage. Toxins from microbes, bioreactor and upstream processing, fermentation processes: batch, continuous and fed batch, fermented food products (plant and animal-based products), microbial production of food additives viz. preservatives, colorants, flavours. SCP, Food contaminants viz. aflatoxins. Food intoxication, infection.
UNIT - III Food Product Processing and Preservation

Principles and methods of food preservation: thermal processing, canning, chilling, freezing, dehydration, addition of preservatives and food additives, microwave, irradiation, fermentation, hurdle technology, intermediate moisture foods, use of non-thermal technologies, alternate thermal technologies (ohmic heating, dielectric heating, infrared and induction heating), biological technologies (antibacterial enzymes, bacteriocins, proteins and peptides). Food grain processing and products, Fruits and vegetables processing and Preservation, Plantation crops processing and products: tea, coffee, cocoa, spice, extraction of essential oils and oleoresins from spices. Milk and milk products processing, Processing of animal products: Waste utilization: by-products from plant and animal food processing.

UNIT - IV Statistics, Food Engineering, Packaging and Labelling

Measures of central tendency and dispersion; Probability and Statistics: Mean, median, mode and standard deviation. Probability distributions (Binomial, Poisson and normal); Sampling distribution; parametric and non-parametric statistics; Confidence Interval; Errors; Levels of significance; Regression and Correlation; t-test; Analysis of variance and multiple range tests, chi-square test, experimental design, data transformation.

Mass and energy balance, Momentum transfer, Heat transfer, Mass transfer, Mechanical operations: size reduction of solids, high pressure homogenization, filtration, centrifugation, settling, sieving, mixing & agitation of liquid. Thermal operations, Mass transfer operations. Principles of refrigeration, cold chain logistics, food plant equipment design Food packaging and storage: packaging materials, recent trends in packaging, principle of package design, nutritional requirements of labelling, aseptic packaging, controlled and modified atmosphere storage, traditional and advanced food storage unit.

UNIT - V Food Quality Management/ Safety Regulations

Objectives and importance of quality control, quality systems and tools used for QA including control charts, acceptance and auditing inspections, CCP, reliability, safety, recall and liability. Food and hygiene regulations. Total quality management and good management practices, HACCP and codex in food. International and National Food laws. USFDA, ISO and FSSAI.

PTE5012 Chemical Engineering

UNIT - I
Fluid Mechanics, Process Calculations, Chemical Technology, Mechanical Operations

UNIT - II
Thermodynamics, Heat Transfer, Mass Transfer

UNIT - III
Chemical Reaction Engineering, Process Instrumentation Dynamics and Control, Process Plant Safety and Risk Analysis

UNIT - IV

UNIT - V

PTE5013 Petroleum Refining and Petrochemicals Engineering

UNIT - I
Fluid Mechanics, Process Calculations, Chemical Technology, Mechanical Operations

UNIT - II
Thermodynamics, Heat Transfer, Mass Transfer

UNIT - III
Chemical Reaction Engineering, Process Instrumentation Dynamics and Control, Process Plant Safety and Risk Analysis

UNIT - IV
Petroleum Exploration, Drilling technology, Petroleum Geology, Enhanced Oil Recovery, petroleum production operations, Petroleum refinery engineering, Petrochemicals, Natural Gas Engineering.

UNIT - V

**PTE5014 Fire Engineering and Safety Management / Industrial Safety Engineering**

UNIT - I Probability and Reliability

Probability – random variable, special distributions, sampling, curve fitting, time series analysis, reliability – concept, failure data analysis, prediction models, reliability management, risk assessment – Computer programming and software tools.

UNIT - II Safety and Risk Assessment in Chemical Industries

Safety in chemical industry – concept of safety and safety auditing, hazardous chemicals – precautions in handling, tolerance limits of industrial emissions, carcinogens – health hazards of insecticides – computer aided hazards analysis, hazard, risk issues and hazard assessment, instrumentation, testing, risk analysis quantification and software, consequences analysis, dispersion model analysis and case studies – industrial safety and hazards management.

UNIT - III Safety Management And Fire Engineering Explosion Control

Safety, accident investigation and reporting, safety performance monitoring, safety education and training – physics & chemistry of fire, fire prevention and protection, industrial fire protection systems, building fire safety, explosion protection systems – relief systems, toxicology, leaks and leakages – process simulators – fire and explosive control and transport phenomena.

UNIT - IV Safety in Engineering Industries

Safety in engineering industry – metals and woodworking machines, guarding, welding and gas cutting, cold forming and hot working, finishing, inspection and testing – safety in material

UNIT - V Safety Regulations and Fundamentals in Environmental Protection


PTE5015 Environmental Science and Technology

UNIT - I
Fluid Mechanics, Process Calculations, Chemical Technology, Mechanical Operations

UNIT - II
Thermodynamics, Heat Transfer, Mass Transfer

UNIT - III
Chemical Reaction Engineering, Process Instrumentation Dynamics and Control, Process Plant Safety and Risk Analysis

UNIT - IV
Unit operations and processes in Environmental Technology, Biological Wastewater Treatment, Separation Processes in Environmental Applications

UNIT - V
Air Pollution Control, Environmental Impact Assessment, Solid and Hazardous Waste Management, Environmental Biotechnology, Modeling of Environmental Systems

PAP6001 Digital Architecture / General Architecture / Landscape Architecture

Evolution and principles of city planning; types of cities & new towns; planning regulations and building byelaws; eco-city concept; Concept of housing and neighborhood; housing standards, policies and typology, housing infrastructure; housing programs in India; selfhelp housing. settlement system planning; growth of cities & metropolises; rural-urban migration; urban conservation; urban renewal; Traffic and Transportation Planning. Indian architecture
from Indus civilization to Modern contemporary period. European architecture from Egyptian modern architectural styles to contemporary period. Vernacular and traditional architecture. Principles of landscape design and site planning; history of landscape styles, elements and materials, plant characteristics. environmental considerations in landscape planning. Application of computers in architecture and planning; understanding elements of hardware and software; computer graphics; programming languages and usage of software packages. Components of Ecosystem and environment, climate responsive and energy efficient building design. Principles of Building Science - lighting, architectural acoustics etc. Building Services on Water supply, sewerage and drainage systems, electrification of buildings, air-conditioning intelligent buildings; fire fighting systems, building safety and security systems -principles, types, standards and uses; Infrastructure, Services and Amenities in city level planning. Behavioral characteristics of all types of building materials ;principles of strength of materials; design of structural and principles of disaster resistant structures. Building Construction and Management: Building construction techniques, methods and details; professional practice; project management techniques. Development Administration and Management: Planning laws; development control and zoning regulations.

**PAP6002 Town and Country Planning**

Process of evolution of human settlement planning - Planning systems in India - Type of planning surveys - Sociological and Economic concepts and frameworks - Social and economic Impacts of urban growth and expansion - City-region, urban sprawl, and urban fringe - Current trends in the traffic and transportation development sector in India.- Pedestrian planning- Parking and Public Transport Surveys - Inventory of Transport facilities - Different modes - Private transport - Scope and function of statistics in planning analysis - Distribution and structure of population - Population projection methods - Research processes and planning processes - Access to Information: nature, types and sources - Hypothesis - Housing character and its information with reference to culture and technological changes and development - Impact of industrialization and urbanization on housing and built environment - Green house and eco friendly housing - Housing market and housing finance -Gated community-emergence and management system - Contemporary theories and concepts in city planning - Concept and need for regional planning and regional development - Multi-level planning, block and District
planning. Environmental concerns at local, regional and global levels - environmental impact assessment practice in India - Sustainability and environmental - Legislative requirements, public awareness and community participation - Evolution, scope and significance of planning legislation - Review of Town and Country Planning Act of Tamil Nadu - Professional role responsibility and planning consultancy service - project cycle - Planning process and project planning - Funding options for urban development projects - Planning Norms and standards - Basic concepts of government and governance - Governance and urban governance - Urban and rural administration in developed, and developing countries - e-Governance-concepts, theories and practices - e-Readiness indices - Approaches to understanding organizations - Human resource planning and management - Participatory governance - Public relations- Introduction to real property ownership - Real estate investment analysis and portfolio management - Classification of spatial and non-spatial data application of spatial data in urban and regional plans - Ecotourism - Leisure, recreation and society - Tourist and local community - Tourist site planning- processes and sustainability - Urban development through Five Year Plans - Budgetary allocation from central and state governments for urban development - Asset management - Disaster cycle - Disaster-types, causes and consequences - Disaster preparedness and rehabilitation - Spatial planning and technology interface - Socio-economic and environmental Impact of techno cities - communities and people in building smart cities and smart communities - Information need and the role of web in planning - Web sites and information sources in urban and regional planning.

**PSH7001 Media Science**

**UNIT - I Mass Communication**


**UNIT - II Journalism and Current Affairs**

Fundamental values and principles of journalism- different forms & genres- New trends- Duties and Responsibilities- Theoretical approaches & Ethics- Fundamentals of News Reporting -
Developing the news and news values – Press in India - Current Affairs - Aptitude and Reasoning ability

UNIT - III Electronic Media
Evolution and Growth of Media - Traditional media & new media - Types of Media: Radio, TV, Film, Print - Digital Media Revolution - Internet History & impacts - Applications of Information and Communication Technologies (ICTs) - Fundamentals of computer hardware and software - Mobile Application - Computer graphics and animation - 2D and 3D animation - User interface and experience

UNIT - IV Research in Communication
Nature and process of communication - Functions of communication - Theories and Models of communication - Development communication: Role of media in Development communication - Communication research: research problem - objectives - variables - sampling - population - qualitative research methods: field observation - focus groups - interviews - case studies - quantitative methods: content analysis - survey research - questionnaire - statistics.

UNIT - V Trends In Media and Critical Issues
Media Laws and Human Rights - Environmental science: understanding of ecology and ecological issues - Health and Children Rights in Media – Feministic theories - Media literacy - culture and Media

PSH7002 Applied Mathematics / Mathematics

UNIT - I Algebra and Graph Theory

UNIT - II Real and Complex Analysis
Real Analysis: Sequences and series – Uniform convergence – Compactness – Connectedness – Implicit functions – Taylor’s theorem – Maxima and Minima for functions of two variables –

UNIT - III  Functional and Numerical Analysis

UNIT - IV Mechanics, Calculus of Variations, Differential and Integral Equations

UNIT - V Probability and Random Variables

PSH7003  Computer Science / Information Technology

UNIT - I Discrete Mathematics and Theoretical Computer Science

UNIT - II Programming Languages and Software Engineering

UNIT - III Databases and System Software

UNIT - IV Data Communication and Networking

UNIT - V E-Technologies

PSH7004 Material Science / Physics

UNIT - I Mathematical Physics

Vector algebra and vector calculus – Tensor analysis. Linear algebra, matrices, Cayley-Hamilton theorem. Eigenvalues and eigen vectors. Linear ordinary differential equations of

UNIT - II Classical Physics

UNIT - III Quantum Mechanics

UNIT - IV Solid State Physics

UNIT - V Electronics And Instrumentation
Semiconductor devices. Analog electronic circuits: op-amp, mathematical operations, analog computation, filters, oscillators. Voltage regulators. Digital electronics: Types of logic gates,
combinational and sequential circuits, flip-flops, shift-registers, counters, multiplexing and de-multiplexing – microprocessors. Transducers and bridge circuits, instrumentation amplifier, sample-and-hold circuits, impedance matching, signal conditioning and noise reduction, shielding and grounding, lock-in detector, box-car integrator and modulation techniques.

**PSH7005 Medical Physics**

**UNIT- I Basics of Radiation Physics and Radiological Instruments**


**UNITS - II Radiation Therapy Physics**

Radiation therapy with sealed and unsealed radionuclides - Physics of modern radiotherapy machines - 3D CRT, IMRT, SRS & SRT, IGRT, Cyber knife and proton beam therapy - Radiation dosimetry protocols (TRS 398), calibration of thetherapy equipments - quality assurance of radiotherapy machines - Treatment planning system in radiation therapy - Brachytherapy radionuclide and their ideal properties - LDR, MDR and HDR - pulsed dose rate brachytherapy - source specification and calibration - reference air kerma rate and air kerma strength - Interstitial, Intracavitary, intraluminal and surface mould brachytherapy - montecarlo based source dosimetry - quality assurance of brachytherapy equipments.

**UNIT - III Biological Effects of Radiation**

Physics of radiation absorption - cell survival curves - Fractionation in radiation therapy - dose rate effect - oxygen enhancement ratio (OER) - Relative biological effect (RBE) - Linear Energy Transfer (LET) - molecular mechanism of DNA & chromosomal damage due to radiation - 5 R's of Radiobiology - Bioeffect models - NSD, CRE, TDF and ERD - Hyperthermia - Radio sensitizers - Radio protectors - Effects of radiation on embryo and fetus - Acute and chronic radiation effect and syndrome.
UNIT - IV Radiation Hazard Evaluation and Control

Basic concepts of radiation protection standards - philosophy behind radiation protection - 
External radiation protection and internal radiation protection - ICRT recommendations - 
Radiation dose limits - system of radiological protection - radiation exposure - equivalents dose 
- effective dose - committed dose - Evaluation of external and internal radiation hazard and 
control - ALI - DAC - MPBB - Planning and shielding calculation of radiation therapy 
equipments installations - Transport of Radioactive materials - radioactive waste disposal - 
radiation emergencies, medical management and legislation.

UNIT - V Physics of Medical Imaging:

Physics of diagnostic radiology - production and properties of X-rays - X-ray tube electrical 
circuits - tube rating - X-ray film, properties and processing - Intensifying screens - factors 
affecting radiographic imaging - fluoroscopy - computer tomography (CT) - Magnetic 
Resonance Imaging (MRI) - Gamma camera - Single photon emission computer tomography 
(CPECT) - positron emission tomography (PET) - quality assurance of diagnostic equipments - 
Technetium Generator - Radiopharmaceuticals - Propagation of ultrasound through body tissues 
- Acoustic impedance - ultrasound scanning modes - double Doppler shift - laser tissue 
interaction mechanism - optical properties of lasers - medical application of non ionizing 
radiation.

PSH7006 Chemistry

UNIT - I Organic Chemistry

IUPAC nomenclature of organic compounds, Principles of stereochemistry, conformational 
analysis, isomerism and chirality, Reactive intermediates and organic reaction mechanisms, 
Concepts of aromaticity, Pericyclic reactions, Named reactions, Transformations and 
rearrangements, Principles and applications of organic photochemistry, Free radical reactions, 
Reactions involving nucleophotic carbon intermediates, Oxidation and reduction of functional 
groups, Common reagents (organic, inorganic and organometallic) in organic synthesis, 
Chemistry of natural products such as steroids, alkaloids, terpenes, peptides, carbohydrates, 
nucleic acids and lipids, Selective organic transformations — chemoselectivity, regioselectivity, 
stereoselectivity, enantioselectivity, Protecting groups, Chemistry of aromatic and aliphatic 
heterocyclic compounds.
UNIT - II Inorganic Chemistry

Atomic structure, Chemical periodicity; Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules; Concepts of acids and bases; Chemistry of the main group elements and their compounds - Allotropy, synthesis, bonding and structure; Chemistry of transition elements and coordination compounds – bonding theories, spectral and magnetic properties, reaction mechanisms; Inner transition elements – spectral and magnetic properties, analytical applications; Organometallic compounds - synthesis, bonding, structure and reactivity, Organometallics in homogenous catalysis, Cages and metal clusters; Bioinorganic chemistry – photosystems, porphyrines, metalloenzymes, enzyme catalysis, oxygen transport, electron- transfer reactions, nitrogen fixation. Solidstate chemistry - defects in solids, preparation of solids, properties - conductance, thermal, mechanical, thermoelectric, magnetic - Applications. Nuclear chemistry.

UNIT - III Physical Chemistry


UNIT - IV Analytical Chemistry

Sampling and error analysis, wet chemical methods of analysis electroanalytical techniques, thermal methods of analysis, separation techniques, basic principles and applications of spectroscopy – rotational, vibrational, electronic, Raman, ESR, NMR, mass spectrometry and mohsbaumer spectroscopy.

UNIT - V Applied Chemistry
Polymer chemistry, Molecular weights and their determinations, Kinetics of chain polymerization, catalysis and its industrial application, corrosion and its control, coatings, fuel/solar cells, pollution and its control, nanochemistry and technology, environmental chemistry, green chemistry.

**PSH7007 Applied Geology / Geology**

**UNIT - I Geomorphology and Geological Remote Sensing**


**UNIT - II Mineralogy and Petrology**


**UNIT - III Stratigraphy, Palaeontology and Economic Geology**

Cratons of India, Proterozoic stratigraphy and mineral deposits, Phanerozoic stratigraphy of Spiti, Assam, Kutch, Narmada, Trichinopoly-Ariyalur, and Bengal Basins. Gondwana supergroup, Siwalik system, Himalayan orogeny, stratigraphy boundaries, and mass extinction in Indian stratigraphy records. Fossil records through Geological time scale, fossil preservation, morphology and significance of body and ichnofossils, molluscs, trilobites, graptolites, brachiopods. Organic mineral walled microfossils. Foraminifera, Ostracoda and dinoflagellates. Gondwana plant fossils. Ore genesis, ores and metamorphism, origin and distribution of metal, non-metal, refractory, abrasives, placer, phosphatic, minerals and coal, petroleum deposits,
nuclear minerals of Proterozoic to recent geological time, strategic, critical and essential minerals.

**UNIT - IV Structural Geology, Geophysics, Geochemistry**
Deformation structures and their characteristics, stress-strainand rheological properties of rocks, structural behaviour of igneous intrusions, petrofabric analysis, joint and shear fractures, Moh’s circle and criteria for failure of rocks. Faults, dynamics, and types; folding mechanisms, types and structural analysis. Physical properties of the Earth, electrical, seismic, magnetic and gravity methods of prospecting. Geochemical cycles, Mineral stability, compositional changes in minerals, river and sea waters. Distribution of trace components in rocks and melts and its application in petrogenesis. Goldschmidt’s classification of elements. Isotope dating methods.

**UNIT - V Hydrogeology and Engineering Geology**

**PSH7008 English**

**UNIT - I**


**The Augustan Age:**

Pope, Dryden, Thomas Gray, Addison & Steele, Swift, Goldsmith, William Congreve, John Bunyan, Henry Fielding, Oscar Wilde, Samuel Johnson

**UNIT - II The Romantic Age to the Twentieth Century**

UNIT - III American Literature


UNIT - IV World Literature


UNIT - V English Language Teaching and Linguistics

PMS8001 Master of Business Administration with any specialization
