SECTION-I (Compulsory For all Branches)

Engineering Mathematics:

Linear Algebra*:* Matrix algebra; Systems of linear equations; Eigen values and eigenvectors.

Calculus*:* Functions of single variable; Limit, continuity and differentiability; Mean value theorems; Evaluation of definite and improper integrals; Partial derivatives, Total derivative, Maxima and minima, Gradient, Divergence and Curl, Vector dentities, Directional derivatives, Line, Surface and Volume integrals, Stokes, Gauss and Green's theorems.

Differential equations*:* First order equations (linear and nonlinear); Higher order linear differential equations with constant coefficients; Cauchy's and Euler's equations; Initial and boundary value problems, Laplace transforms; Solutions of one dimensional heat and wave equations and Laplace equation.

Complex variables*:* Analytic functions; Cauchy's integral theorem; Taylor and Laurent series; Residue theorem.

Probability and Statistics*:* Definitions of probability and sampling theorems; Conditional probability; Mean, median, mode and standard deviation; Random variables; Poisson, Normal and Binomial distributions.

Numerical Methods*:* Numerical solutions of linear and non-linear algebraic equations; Integration by trapezoidal and Simpson's rule; Single and multi-step methods for differential equations.

PGET SYLLABUS FOR M.TECH. (CHEMICAL ENGINEERING)

Process Calculations and Thermodynamics: Laws of conservation of mass and energy; Use of tie components; recycle, bypass and purge calculations; Degree of freedom analysis. First and Second laws of thermodynamics. First law application to close and open systems. Second law and Entropy; Thermodynamic properties of pure substances: Equation of state and departure function, Properties of mixtures: Partial molar properties, fugacity, excess properties and activity coefficients; Phase equilibria; Chemical reaction equilibria.

Fluid Mechanics and Mechanical Operations: Fluid statics; Newtonian and non- Newtonian fluids; Bernoulli equation; Friction factor; Energy balance; Dimensional analysis; Shell balances; Flow through pipeline systems; Flow meters, Pumps and compressors, Packed and fluidized beds, Elementary boundary layer theory, Size reduction and size separation; Free and hindered settling; Centrifuge and cyclones; Thickening and classification; Filtration; Mixing and agitation; Conveying of solids.

Heat Transfer: Conduction, convection and radiation; Heat transfer coefficients, Steady and unsteady heat conduction; Boiling, condensation and evaporation; Types of heat exchangers and evaporators and their design.

Mass Transfer: Fick's laws, molecular diffusion in fluids, mass transfer coefficients, film, penetration and surface renewal theories; Momentum, heat and mass transfer analogies; stagewise and continuous contacting and stage efficiencies; HTU & NTU concepts design and operation of equipment for distillation, absorption, leaching, liquid- liquid extraction, drying, humidification, dehumidification and adsorption.

Chemical Reaction Engineering: Theories of reaction rates; Kinetics of homogeneous reactions, interpretation of kinetic data, single and multiple reactions in ideal reactors, non-ideal reactors; Residence time distribution, single parameter model; Non-isothermal reactors; Kinetics of heterogeneous catalytic reactions; Diffusion effects in catalysis.

Instrumentation and Process Control: Measurement of process variables; sensors, transducers and their dynamics, transfer functions and dynamic responses of simple systems, process reaction curve, controller modes (P, PI, and PID); Control valves; analysis of closed loop systems including stability, frequency response and controller tuning, cascade, feed forward control.

Plant Design and Economics: Process design and sizing of chemical engineering equipment such as compressors, heat exchangers, multistage contactors; Principles of process economics and cost estimation including total annualized cost, cost indexes, rate of return, payback period, discounted cash flow, optimization in design.

Chemical Technology: Inorganic chemical industries:- sulfuric acid, NaOH, fertilizers (Ammonia, Urea, SSP and TSP); Natural products industries (Pulp and Paper, Sugar, Oil, and Fats); Petroleum refining and petrochemicals; Polymerization industries; Polyethylene, polypropylene, PVC and polyester synthetic fibers.

Environmental Engineering: Water Requirements; quality and standards, basic unit processes and operations for water treatment, distribution of water. Sewage and sewerage treatment: Quantity and characteristic of waste water sewerage; primary and secondary treatment of waste water; sludge disposal; effluent discharge standards, Solid and Hazardous waste management, Pollutants in Environment, Environmental Impact Assessment.

PGET SYLLABUS FOR M.TECH. (STRUCTURAL ENGINEERING, ENVIRONMENTAL ENGINEERING-CIVIL BACKGROUND)

Structural Engineering:

Mechanics: Bending moments and shear forces in statically determinate beams, simple stress and strain relationship, stress and strain in two dimensions, principal stresses, stress transformation, Mohr's circle, simple bending theory, flexural shear stress, thin-walled pressure vessels, uniform torsion.

Structural Analysis: Analysis of statically determinate trusses, arches and frames, displacements in statically determinate structures and analysis of statically indeterminate structures by force/energy methods, analysis by displacement methods (slope-deflection and moment-distribution methods), influence lines for determinate and indeterminate structures, basic concepts of matrix methods of structural analysis.

Concrete Structures: Basic working stress and limit states design concepts; analysis of ultimate load capacity and design of members subject to flexure, shear, compression and torsion (beams, columns isolated footings); basic elements of prestressed concrete: Construction Technology and Management-CPM/PERT analysis, Cost Analysis, Mass Haul Diagram.

Steel Structures: Analysis and design of tension and compression members, beams and beam-columns, column bases, connections - simple and eccentric, beam-column connections, plate girders and trusses, plastic analysis of beams and frames.

Soil Mechanics: Origin of soils, soil classification, three-phase system, fundamental definitions, relationship and inter-relationships, permeability and seepage, effective stress principle, consolidation, compaction, shear strength.

Foundation Engineering: Sub-surface investigation - scope, drilling bore holes, sampling, penetrometer tests, plate load test, earth pressure theories, effect of water table, layered soils, stability of slopes - infinite slopes, finite slopes, foundation types - foundation design requirements, shallow foundations, bearing capacity, effect of shape, water table and other factors, stress distribution, settlement analysis in sands and clays, deep foundations - pile types, dynamic and static formulae, load capacity of piles in sands and clays.

Fluid Mechanics and Hydraulics: Hydrostatics applications of Bernoulli equation, laminar and turbulent flow in pipes, pipe networks, concept of boundary layer and its growth, uniform flow, critical flow and gradually varied flow in channels, specific energy concept, hydraulic jump, forces on immersed bodies, flow measurement in channels, tanks and pipes, dimensional analysis and hydraulic modeling, applications of momentum equation, potential flow, kinematics of flow, velocity triangles and specific speed of pumps and turbines.

Hydrology: Hydrologic cycle, rainfall, evaporation infiltration, unit hydrographs, flood estimation, reservoir design, reservoir and channel routing, well hydraulics.

Irrigation: Duty, delta, estimation of evapo-transpiration, crop water requirements, design of lined and

unlined canals, waterways, head works, gravity dams and Ogee spillways. Designs of weirs on permeable foundation.

Transportation Engineering:

Highway planning, geometric design of highways, testing and specifications of paving materials, design of flexible and rigid pavements.

Environmental Engineering:

Water requirements, quality and standards, basic unit processes and operations for water treatment, distribution of water, sewage and sewerage treatment, quantity and characteristic of waste water sewerage, primary and secondary treatment of waste water, sludge disposal, effluent discharge standards, solid and hazardous waste management, pollutants in environment, Environmental Impact Assessment., water quality standards for construction, rainwater harvesting, water conservation methods, energy conservation in buildings.

SECTION-II

PGET SYLLABUS FOR M.TECH. (COMPUTER SCIENCE & ENGINEERING)

Digital Electronics: Number Representation, binary arithmetics, Logic gates, Combinational circuits, Sequential circuits, memory devices.

Computer Organization: Machine instructions and addressing modes, ALU and data-paths, hardwired and micro-programmed control pipelining, memory interface, I/O interfaces, serial communication interface, parallel processing, memory management.

Structured and object oriented programming concepts (with reference to "C/ C++"): Program control, functions, recursion, scope, binding, parameter passing, pointers, array handling, structures and unions, file handling, concepts of Object Oriented Programming.

Data Structures: Notion of abstract data types, stacks, queues, linked lists, trees, heap, graphs, Tree and graph traversals, hashing, sorting, searching.

Theory of Computation: Regular languages and finite automata, context free languages and pushdown automata, Turing machines.

Complier Design: Lexical analysis, parsing, syntax directed translation, runtime environment, code generation, linking.

Operating Systems: Definition and significance of OS, OS as resource manager, Classical concepts processes, concurrency, synchronization, deadlock, threads and inter-process communication, CPU scheduling, memory management, file systems, I/O systems, protection and security, DOS, UNIX and windows.

Database Management Systems: Relational model, ER diagram, relational algebra, database design, normalization, SQL, transactions management and concurrency control.

Computer Networks: OSI reference model, sliding window protocols, LAN technologies (Ethernet, Token ring), TCP/UDP, IP, Networking addresses, transmission medias, Networking devices-Hub, switches, gateways and routers.

Software Engineering: Basics of s/w engineering, Software Process models, software project planning and management.

SECTION-II

PGET SYLLABUS FOR ELECTRONICS & COMMUNICATION ENGINEERING

Electrical Circuit Analysis

Electrical sources – DC, AC, Voltage, current and power sources. Electrical components - passive and active. Basic circuit laws, mesh and nodal analysis. AC waveforms-frequency, phase, amplitude, peak, rms, calculation of power. Response of passive components to AC waveforms – impedance. Frequency domain analysis of RLC circuits, resonance. Transient analysis of electric circuits, Steady state analysis of circuits, network theorems - Superposition, Thevenin, Norton and Maximum Power Transfer, two port networks.

Electrical Machine and Instruments

Basic requirements of electrical machines, single phase and three phase circuits and analysis, transformers, small power AC machines, small power DC machines, electric meters - galvanometer, ammeter, voltmeter, wattmeter. Measurement of R, L and C, various bridges. Laboratory Electronic Instruments - CRO, function generator and power supplies.

Analogue Electronics

Basic Semiconductor theory, PN junctions, PN junction diodes, Zener Diode, Rectifiers and Regulator circuits. BJTs, JFET and M OSFET: characteristics, biasing, different configurations. Detailed analysis of BJT and FET biasing circuits. Single and multistage amplifiers. Amplifier with different types of feedbacks. Power Amplifiers, Oscillators, linear integrated circuits - process technology, differential amplifiers and current mirrors. Op-amp circuits and applications.

Digital Electronics

Boolean algebra, Logic families. Minimization techniques for Boolean expression-K-map reduction. Combinational circuits. Sequential circuits. Timing diagram and State diagram. Semiconductor memories. Wave shaping circuits.

Communications

Elements of communication system. Random signals: Random variables, autocorrelation, power spectral density Theory of Modulation and detection in analogue and digital systems. Sampling and data reconstructions; Quantization Time division and frequency division multiplexing techniques. Noise and it 's effect on communication systems. Fundamentals of Information Theory, Introduction to error control coding. Telecommunication network model and Sw itching technologies. Basics of Mobile Communications and Optical fiber Communications.

Signal Processing

Signal types and their representation - Time Domain, Frequency Domain. Discrete and Continuous Transforms- Laplace, Fourier and Z- Transforms. Introduction to Systems- Linear and Non-Linear, Continuous and Discrete time Systems. System Characterization-Time Domain and Frequency Domain. Systems St ability Criterion. DFT and FFT. Digital Filters- FIR, IIR and Filter transformations and implementations.

Electromagnetics

EM Spectrum, Elements of vector calculus, EM waves and their Propagation through free space. Electrostatic and Magnetostatic Fields. Plane Waves, Maxwell's Equations. Transmission Lines. Waveguides. Antennas.

Microelectronics and VLSI Design

VLSI Design flow, VLSI circuits and system representation, CM OS processing technology, M OS Transistor Theory, Short channel effects, Elements of Physical Design, Logic Design with M OSFETs, CM OS inverter, Transmission gate, Analysis of CM OS Logic Gates, VLSI Logic circuits, Memories and Programmable Logic circuits.

Control Systems

Basic control system components: Block diagram description, reduction of block diagrams. Open loop and closed loop (feedback) systems and stability analysis of these systems. Signal flow graphs and their use in determining transfer functions of systems; transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis: root loci, Routh - Hurwitz criterion, Bode and Nyquist plots. Control system compensators, Proportional-Integral-Derivative (PID) control. St ate variable representation.

PGET SYLLABUS FOR M.TECH. (MECHANICAL ENGINEERING)

Strength of Materials: Mechanical Properties and Testing, Deflection of Beams, Torsion of Shafts, Columns and Struts, Strain Energy, Pressure Vessels, Composite Materials: its Classification and Processing Methods, Advanced Mechanics of Solids.

Theory of Machines: Mechanisms and Machines, Gear and Gear Trains, Cams, Engine Dynamics, Governors, Balancing, Gyroscope.

Design of Machine Elements: Design for Production, Belt, Rope and Chain Drives, Design of Shaft, Bearings and Springs, Tribology.

Mechanical Vibrations: Fundamentals of Vibration, Vibration of Single Degree of Freedom System, Vibration of Multi Degree of Freedom, Vibration of Continuous Systems, Static and Dynamics Testing of Machine Tools.

Engineering Thermodynamics: First Law of Thermodynamics, Second Law of Thermodynamics, Availability and Irreversibility, Pure Substances, Air Standard Cycles.

Manufacturing Technology: Workshop Practices, Fundamental Machine Tool Operations, Ferrous Materials, Non-Ferrous Metals and Alloys, Ceramics, Plastics and other Materials, Casting, Welding, Bulk Metal Forming Processes, Forging, Extrusion, Rolling, Non-conventional Manufacturing Processes.

Machine Tool Engineering: Fundamental of Metal Cutting, Machine Tool Design, Machine Tool Structures, Gear Box Design, Machine Tool Testing, Vibration in Machine Tools, NC, CNC, DNC, Machine Tools, Automation in Manufacturing: FMS and CIMS.

CAD/CAM: Fundamentals of Computer Aided Design, Geometrical Transformation, Plane Curves, Geometrical Modeling, Application of CAD Techniques to Finite Element Mesh Generation, Computer Aided Manufacturing, Additive Manufacturing, Robotics and AGVs.

Industrial Management: Production and Productivity, Work Study and Ergonomics, Plant Layout and Material Handling, Production Planning and Control, Inventory Control, Computer Aided Process Planning, Group Technology, Concurrent Engineering, Reverse Engineering, Statistical Quality Control, Total Quality Management.