SYLLABUS

POLY LECTURER IN CIVIL ENGINEERING

TECHNICAL MATHEMATICS

Matrices – Identification of Matrices, matrix operations, adjoint and inverse. Determinants – Evaluation of second and third order, minors and cofactors, solutions of simultaneous linear equation in three unknown using Cramer's rule. Binomial Series – Expansions using Binomial theorem. Trigonometric functions – Signs of functions in each quadrant. Trigonometric values of angles, properties of trigonometric functions, applications of the identities sin (A ± B), cos (A ± B) and tan (A ± B). Coordinate geometry – Equations to a straight line – slope-intercept form, intercept form, Angle between two lines, condition for two lines to be perpendicular, parallel. Differentiation – Limits and continuity, derivatives of functions, equation to tangents and normals. Maxima and minima of functions of one variable. Integration of functions – Integration of different types of functions.

Applications of integration – Area bounded by a curve and X or Y axis, solutions of differential equations using the method of variable separable, solutions of linear differential equations of first order.

BASIC MECHANICAL ENGINEERING

The importance of IC Engines: Definition, classification – two stroke engines, four stroke engines, working of two stroke engines and four stroke engines with the help of line sketches, comparison between two stroke and four stroke engines, comparison between petrol and diesel engines, function of fly wheel, clutch, gearbox, propeller shaft and differential in power transmission, explain with sketch the working of differential, briefly explain power transmission of 4 wheel vehicle with line diagram. The importance of Power Plants: Introduction, classification of power plants – working of hydroelectric power plant with schematic sketches – working of thermal (Steam and Diesel) power plant with schematic sketches – working of nuclear power plant with schematic sketches

BASIC ELECTRICAL ENGINEERING

Review with discussion of electric current, potential difference, power, EMF, resistance and its laws, Ohms law and series parallel circuit, electromagnetism, generation of AC and DC supply. Idea of Basic electrical circuit: Electrical supply and load and its functioning, division of voltage and current in a parallel and series circuit – simple problems, units of power and energy, solution of DC circuit with calculation of energy consumption in an installation

Circuit parameters: Resistance, Capacitance and inductance. AC circuit with R, L, C. Simple solution of typical AC circuit with resistance, impedance, power and power factor. Electrical circuit of an installation: Earthing, lightning protection.

ESSENTIALS OF ELECTRONICS ENGINEERING

Active and passive devices – review only. LED – working, applications, comparison of LED lighting and CFL lighting. Full wave rectifier – diagram and explanation, 5 V power supply – with bridge rectifier and 7805. SMPS – block diagram and advantages. Integrated circuits. SMDs – advantages. Static electricity – precautions in handling electronic circuits. Switches: ON / OFF, push to ON, push to OFF, push to ON / OFF, SPST, SPDT, DPDT. Working and application of limit switches, proximity switches, relays. Microcontrollers: Simple block diagram of 8 bit microcontrollers – application. Mobile technology: CDMA and GSM. Compare – 2G and 3G technologies. Inverter & UPS: Block diagram. Compare – inverter and UPS. Online and off line UPS – differentiate. Battery selection for UPS and inverter. E-waste: Health hazards of e-waste

BASIC COMPUTER SCIENCE

Functional units of a computer.

Programming in C – control structures, functions.

MECHANICS OF SOLIDS AND STRUCTURAL ANALYSIS

Concept of stress and strain, Bending moment and shear force, Stresses in beams, Deflection of beams, Theory of columns, Truss analysis, Displacement response of statically determinate structural systems using energy methods, Principle of virtual work, Statically indeterminate structures, Strain Energy methods, Moving loads and influence lines,

Arches. Slope Deflection Method, Moment Distribution Method, Clapeyrons Theorem (Three Moment Equation), Kani's method of analysis.

FLUID MECHANICS AND WATER RESOURCES ENGINEERING

Fluid Statics- Fluid pressure, Buoyancy and floatation, Fluid Kinematics, Dynamics of fluid flow, Flow through orifice and notches, Flow through pipes, Boundary layer, Drag and Lift on immersed bodies. Hydraulic machines- flow through vanes (moving and stationary) Impulse and reaction Turbines, Centrifugal Pumps, Open channel flow, Uniform flow, Hydraulic Jump, Gradually varied flow, DimensionaL analysis and model testing. Hydrologic cycle, Precipitation, Infiltration and Evaporation-measurement and data analysis. Runoff-components and computation, Hydrograph, Unit Hydrograph and S-Hydrograph. Irrigation types and methods-Soil water plant relationships, Frequency of irrigation, Computation of crop water requirement. Stream flow measurement -Stage-discharge curve. Meandering of rivers, river

training works. Surface water systems: diversion and storage systems, reservoir - estimation of storage capacity and yield of reservoirs - reservoir sedimentation -useful life of reservoir. Groundwater – Aquifer types and properties - Steady radial flow into a well. Estimation of yield of an open well.

SURVEYING AND LEVELING, QUANTITY SURVEYING AND VALUATION

Basics of Surveying, Leveling and Contouring, Area and Volume Computation, Theodolite Survey, Mass Diagram, Triangulation, Theory of Errors, Electronic Distance Measurement, Total Station Survey, Global Positioning Systems, Remote Sensing, Geographical Information System Analysis of rates - Data book and schedule of rates, Analysis of rates for various items of work, Detailed specification. Types of

Estimate. Detailed estimate including quantities, abstract and preparation of various items of works, Preparation of bar bending schedules for various RCC works. Valuation- Methods of valuation, Depreciation, Fixation of rent.

BUILDING MATERIALS, CONSTRUCTION TECHNOLOGY, CONSTRUCTION MANAGEMENT

Construction Materials – Timber, Mortar, Iron and Steel, Structural steel, Modern materials. Concrete–Admixtures, Making of concrete, Properties of concrete, Mix proportioning. Building construction Foundations, Cost-effective construction, Masonry, Lintels and arches.

Floors and flooring, Roofs and roof coverings, Doors, windows and ventilators, Finishing works. Tall Buildings – Steel and Concrete frame, Prefabricated construction, Slip form construction. Vertical transportation – Stairs, Elevators, Escalators and Ramps. Building failures and Retrofitting, failures in RCC and Steel structures. Construction Planning and Scheduling, Construction disputes and settlement, Ethics in Construction, Construction safety, Principles of materials management, Quality management practices, Construction procedures

ENVIRONMENTAL ENGINEERING

Water sources and demand, Quantity estimation, Population forecasting, Quality of water. Water treatment- Physical methods, Chemical methods. Design of sedimentation tank, flocculator, clariflocculator, filters, Membrane treatment techniques. Disinfection methods.

Distribution of water, Pumps, Hardy Cross method of analysis Waste water- Sources, Characteristics, Oxygen demand. Design of sewers,

Circular sewers, Partial flow and full flow conditions. Sewer appurtenances, Disposal of wastewater, Streeter Phelps equation, Oxygen sag curve, Treatment methods, Aerobic and anaerobic methods, Design of various treatment units-Screening, Grit chamber, Sedimentation tank, Activated Sludge process, Trickling filter, Rotating biological contactor, Septic tanks, Imhoff tanks, Oxidation ditches, Oxidation ponds, Upflow anaerobic sludge blanket reactors, Sludge digestion, Sludge drying bed. Air pollution-sources, effects on human, Control of air pollutants, Air quality legislations.

DESIGN OF STRUCTURES

Limit state method of design, Analysis of reinforced rectangular beams, Shear strength of RC beam, Design of shear reinforcement, Bond and development length, Curtailment of reinforcement, Design for torsion, Design of one way slab, Cantilever slab, Continuous slab (detailing only), Two way slabs, Limit state of serviceability, Deflection, Cracking, Stair cases -design & detailing. Columns-effective length design of axially loaded short columns with rectangular ties and helical reinforcement. Columns subjected to compression, Uniaxial bending and biaxial bending, Design of slender columns, Design of wall/strip footing- design of footings, Design of cantilever retaining wall without surcharge, design principles of counter fort retaining wall, Circular slabs simply supported, fixed and partially fixed subjected to udl, Design of water tanks, Design philosophy and requirements, joints, IS code recommendations, Pre-stressed concrete, Concept of prestressing, materials and methods of prestressing, Prestressing systems, losses of prestress, Analysis of prestressed beams (rectangular and I-sections) at stages of transfer and service Steel and steel structures – Bolted and welded connections, Tension members, Compression members, Beams, Roof trusses, Purlins. Timber structures- columns, composite beams (concepts only).

GEOTECHNICAL ENGINEERING

Major soil deposits of India, Classification and three phase system of soil, Permeability of soils, Principle of effective stress, Shear characteristics of soil, Consolidation (Terzaghi's theory of onedimensional consolidation only) and Compaction. Stability of finite slopes-Swedish Circle Method and Friction circle method, Stresses in subsoil due to loaded areas of various shapes, Boussinesq's formula, Newmark's chart Lateral earth pressure-Rankine's and Coulomb'

theories Bearing capacity of soil, Estimation of magnitude of settlement, Site investigation, Standard Penetration Test and Plate load test, Design of shallow, deep and machine foundations, Ground improvement techniques.

TRANSPORTATION ENGINEERING AND URBAN PLANNING

Classification and alignment of highways, Geometric design of highways, Properties and testing of pavement materials, CBR method of flexible pavement design, Construction and maintenance of pavements, Design of runways, taxiways and aprons. Traffic characteristics Traffic studies and analysis, Traffic control devices. Airport characteristics- Aircraft component parts. Site selection, Terminal area planning Airport marking and lighting. Traffic regulation rules, Highway capacity, Traffic safety, Influencing factors and preventive measures for traffic accidents, Basic diagrams of traffic flow theory. Ralways geometric design of tracks, railway operation control, Maintenance. Alignment, Ventilation and drainage of tunnels, Types of harbours and docks. Goals and objectives of planning; Components of planning, Regional planning, Theories of urbanization, Study of Urban Forms, Zoning, Development of new towns, Town Development Plan, Town planning acts.