

**Syllabus of lateral entry in B.Tech in Civil Engineering
(Mizoram University Engineering Entrance Examination)**

Building Materials and Constructions

Engineering Materials: Physical properties of construction materials: stones, bricks, timber, sand, tiles, lime, surkhi, mortar, concrete, varnishes, plastics, rubber, damp-proofing materials, termite treatment materials, materials for low cost buildings, seasoning and preservation of timber.

Building Construction: Building components and their functions : walls, floors, roofs, ceilings, staircase, doors and windows, ventilation, air-conditioning, lighting & acoustics etc. Finishing of buildings: plastering, pointing, painting, use of building codes.

Design of Structures

Design of RC Structures : Concept of mix design; Limit State and Working Stress method of design; Recommendations of I.S Codes of one way and two-way slabs, staircase, simple and continuous beams of rectangular T and L sections, compression members under direct load with or without eccentricity, isolated and combined footings, elevated and underground water tanks; Methods and systems of prestressing, anchorages, losses in prestress; design of prestress girder; Design of Cantilever and Counterford type retaining walls.

Engineering Mechanics

Static : Coplaner and multiplaner system; Varignon's theorem, free body diagrams, conditions of equilibrium; second moment of plane figure; force and funicular polygon; principle of virtual work; suspension systems of catenary.

Dynamic: Units and dimensions; Gravitational and absolute systems; MKS & S.I. Units; Vectors, concept of force, concept of particle and rigid body.

Kinematics: Rectilinear and Curvilinear motion; relative motion; instantaneous centre.

Kinetics: Mass moment of inertia; simple harmonic motion, momentum and impulse; equation of motion of rigid body rotating about a fixed axis.

Strength of Materials

Simple Stress and strain; Elastic constants; tension and compression in one direction; riveted and welded joints.

Shear force and bending moment; Theory of simple bending; shear stress distribution in cross section of beams; beams of uniform strength; Strain energy in direct stress, bending and shear.

Fluid Mechanics

Dynamics of fluid flow: Equation of continuity; energy and momentum Bernoulli's theorem; cavitation, velocity potential and stream function; rotational and irrotational flow, free and forced vortices; flow net. Dimensional analysis and its application to practical problems

Viscous flow: Flow between static and moving parallel plates, flow through circular tubes; film lubrication; velocity distribution in laminar and turbulent flow; boundary layer.

Water Resources Engineering:

Hydrology: Hydrological cycle, precipitation evaporation; transpiration; depression storage; infiltration; overland flow; hydrograph; flood frequency analysis; flood estimation; flood routing through a reservoir; channel flow routing- Muskingam method.

Ground water flow: Specific yield; storage coefficient; coefficient of permeability; confined and unconfined aquifers; radial flow into well under confined and unconfined conditions; tube wells; pumping land recuperation tests; ground water potential.

Sanitation and Water Supply (Environmental Engineering):

Sanitation: Site and orientation of buildings; ventilation and damp proof course; house drainage;
conservancy and water-borne systems of waste disposal; sanitary appliances; latrines and urinals.

Disposal of sanitary sewage: Industrial waste; domestic waste; storm sewage-separate and combined systems; flow through sewers; design of sewers; sewer appurtenances-manholes, inlet junctions, siphon, ejections etc.

Sewer treatment: Working principles; units, chambers; sedimentation tanks; trickling filters;
oxidation ponds; activated sludge; recycling of waste water; septic tanks; soak pit; disposal of sludge.

Irrigation Engineering

Water requirement for crops: Quality of irrigation water; consumptive use of water ; water depth and frequency in irrigation; duty of water; irrigation methods and their efficiencies.

Distribution system for canal irrigation: Determination of require canal capacity; canal losses;
alignment of main and distributory canals

Design of canals : Unlined canals in alluvium; the critical tractive stress; principles of sediment transport; regime theories, lined canals; hydraulic design and cost analysis; drainage behind lining.

Canal structures: Design of regulation works; cross drainage and communication works-cross regulators, head regulators, canal aqueducts, metering flumes etc; canal outlets.

Water logging; Its causes and control; design of drainage system; soil salinity

Diversion headworks: Principle and design of weirs of permeable and impermeable foundations; Khola's theory; energy dissipation; stilling basin; sediment excluders

Storage works: Types of dams including earth dam and their characteristics; principles of design; criteria for stability; foundation treatment; joint and galleries; control of seepage.

Spillways: Different types and their suitability; energy dissipation; spillway crest gates.

River training: Objectives of river training; methods of river training

Soil Mechanics

Soil Mechanics : Properties and Classification of soils; Atterburg limits; void ratio; moisture content; permeability-laboratory and field tests (Darcy's Law); seepage and flow nets; flow under hydraulic structures; uplift and quick sand condition; unconfined and direct shear test; triaxial test; earth pressure theories (Rankine's theory and Coulomb's wedge theory); stability of slopes; theories of soil consolidation (Terzaghi's theory); compaction of soil; rate of settlement; total and effective stress analysis; pressure distribution of soils; Boussinesque and Waterguard theories; soil stabilization.

Surveying, Estimation & Costing

Surveying : General principles; surveying instruments and their adjustments; recording of survey observations; plotting of maps and sections; errors and their adjustments. Measurement of distances, direction and heights; correction to measured lengths and bearings; correction for local attraction; measurement of horizontal and vertical angles; leveling operations; refraction and curvature correction. Chain and compass survey; theodolite and techeometric traversing; traverse computation; plan table survey; solution of two and three points problems; contour surveying. Setting out directions and grades; types of curves; setting out of curves and excavation lines for building foundations. Field astronomy; concept of global positioning

system; remote sensing concepts; map substitute.

Estimating and costing : Estimating quantities of various items of civil works like roads, bridges, building, water supply structures, dams, irrigation canals, hydro-power structures, airports, railways etc. estimating the costs of various items of works on the basis of prevalent market rates, analysis of rates of civil works items.

Transportation Engineering

Roads : Classification of roads; planning of highway systems; alignment and geometric design; horizontal and vertical curves; grade separation. Road construction materials; types of pavements, design of pavements and pavement structures; construction methods; evaluation of pavement failure and strengthening. Maintenance of roads. Drainage system-surface and sub-surface drainages. Traffic engineering : Forecasting techniques, traffic survey- origin and destination survey; highway capacity; channelised and unchannelised intersections; traffic signs and road safety measures. Principles of highway financing.

Tunnelling : Alignment; methods of construction; disposal of muck; drainage; lighting & ventilation; traffic control; emergency management.

**Syllabus of lateral entry in B.Tech in Electronics & Communication Engineering
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Electronics device and Circuit : Diodes, Half wave, full wave rectifier, Zener Diode, Voltage regulator Bipolar Junction Transistor(BJT), Common Base, Common Collector, Common Emitter configuration, Biasing circuit, Field Effect Transistor, Light Emitting Diode, Silicon Control Rectifier (SCR).fundamental of Operational Amplifier(OP-AMP).

Switching Circuits: Switching action of transistor, multivibrator, Asatable multivibrator, Monostable multivibartor, bistable multivibartor.

Digital Electronics : Binary number system, Decimal to binary conversion, binary to decimal conversion, octal, hexadecimal , binary addition, subtraction, logic gates, De-Morgan's theorem, Boolean algebra, half adder, Full adder, Flip Flop, combinational circuits.

Communication: Modulation, need of modulation, Amplitude Modulation(AM), Frequency modulation(FM), Generation of AM and FM, Demodulation, Pre-emphasis, De-emphasis, Principle of radio transmission and reception, radio receiver, Television fundamental, monochrome and colour television.

Wave propagation : Basic concept of antenna, types of wave propagation, surface wave propagation, space wave propagation, duct propagation, ionospheric propagation. Transmission lines, charactersictics impedance of coaxial and two wire lines, Basic concept of wave guides.

Instrumentation and measurement: Electrical measuring instruments, Galvanometer, Ammeter, power measurement, cathode ray oscilloscope (CRO), Digital meters.

Microprocessor: Basic concepts of Microprocessor, Instruction sets of 8-bit microprocessor 8085, 8-bit address bus, data bus, accumulator, registers, Interrupt, peripherals.

**Syllabus of lateral entry in B.Tech in Electrical Engineering
(Mizoram University Engineering Entrance Examination)**

Electrical Circuits: Phasors and phasor algebra, balanced and unbalanced poly-phase circuit, Test signals, Star-Delta transformation, Network theorems, Parameters of electromagnetic circuits, resonance in R-L-C Series and Parallel circuits, Network analysis by mesh and node methods.

Basic Electronics: Conductors, Semiconductors and Insulators: Electrical Properties, Band Diagram, Formation of P-N Junction, Zener Diode, Rectifier, Principle and Mechanism of Transistor and FET.

Electrical Engineering Materials: Conducting, Insulating materials and Magnetic materials, Properties and applications

Electrical Instruments and Measurements: Principles of measurements: Classification, accuracy and sensitivity, damping and control forces, shunt and multiplier, Measurement of resistance: Low, medium and high. Principle and uses of DC potentiometers, AC Bridges. Indicating instruments: Multimeter, PF meters, synchroscope.

Electrical Machines: Classification of D.C. machines: Constructional features, e.m.f., torque, excitations, motor performance, speed, power, size considerations, speed control, efficiency.

Transformers: Induced e.m.f., equivalent circuits, regulation, different efficiencies. Three phase induction machines: Torque characteristics, Starting, equivalent Circuits.

Generation, Transmission and Distribution:

Generation: Thermal, Hydel and Nuclear Power Stations, Prime movers and alternators.

Transmission: Voltage levels, line conductors, electrical line parameters of short and medium lines, voltage regulation, corona.

Distribution: D.C. and A.C. systems, voltage level, types of distribution feeders and distributors, voltage drop and effects, power factor improvement plant. **Switchgear:** Switches, isolators, circuit breakers and their types. Protection: Fault current and protective devices, fuses, relay functions, alternator, over voltage-causes.

Power Electronics: Power diodes and Darlington Pair. Thyristor: Principle, thyristor family, firing circuits, applications, Selenium rectifiers, uncontrolled and controlled rectification, Power MOSFETS.

Digital Electronics: Digital signals, gates, Boolean algebra, logic families, multiplexures / demultiplexure, Encoders/decoders, flip-flops, registers, counters and applications of logic gates, OPAMPS in timing circuits, A/D and D/A conversion.

Microprocessor and Computer Programming: Evolution of Microprocessor, specific feature of Microprocessor, explanation of 8085 Microprocessor, Instruction cycle of 8085 Microprocessor, application of Microprocessor, Concept of low level and high level languages, Block-diagram, concept of flow chart, and algorithm, Assemblers, Macros, sub-routines, co-routines, loaders, linkers, editors and compilers, programming and file handling in C and C++.

**Syllabus of lateral entry in B.Tech in Computer Engineering and Information & Technology
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Computer Organization & Architecture: Evolution of Computers; Numbers representation – Binary, Octal, Decimal, Hexadecimal; CPU – ALU, Control Unit, Architectures; Memory – Storage units, RAM, different ROMs, cache, Hard Disks; IO Devices – Keyboard, Monitor, Printers.

Computer Networks: Concepts; Network Architectures; Protocols, interfaces and services; OSI reference Model – Layers and their tasks; Networks – Telephone, internet, LAN, WAN, cable; Error control; Connection-oriented & Connectionless networks; Switching – Circuit, Message and Packet; Applications of Networks.

Object Oriented Methodologies: Overview – Need and advantages, characteristics, comparisons with procedural oriented; Concepts – Objects, classes, data encapsulation, inheritance, polymorphism, operator and function (method) overloading; Analysis and Design applications;

Database Management Systems: Introduction; Data models, schema and instances; Architecture; ER diagram, DDL and DML; SQL – SELECT, INSERT DELETE, UPDATE, ALTER, views etc; Functional Dependencies; Normalisation; Transaction Processing; Concurrency Control; Security and Integrity; Distributed databases;

Operating Systems: Introduction – Concepts, structure; Processes – Creation, scheduling algorithms, IPC, Memory management – replacement algorithms, paging, segmentation, virtual memory; Files – Files & Directories, File systems, security; I/O – Devices, serial & parallel, clocks, transfer modes (Programmed, Interrupt, DMA); Deadlocks; Distributed operating Systems.

Data structure and C Programming: Introductions; Functions – calling with/ without arguments, pass by values/ references, returning values; declarations and definitions of identifiers; Operators – Arithmetic, relational, logical, assignment, conditional, ternary; variables – declarations, usage, scope; statements and conditions; loop control – while, for, do-while; structures and unions; sample programs. sorting, searching, link list, arrays.