

Syllabus for Tezpur University Entrance Examination, 2022

B. Tech. (Mechanical Engineering) Lateral Entry Entrance Examination, 2022

Engineering Mechanics: Force systems, force, moment of a force about a point and about an axis, couple moment as a free vector, equivalent force systems; Equilibrium, free body diagram, equations of equilibrium, problems in two and three dimensions; Kinematics and Kinetics of particles, particle dynamics in rectangular coordinates and in terms of path variables, Newton's law for rectangular coordinates, Newton's law for path variables, central force motion; Energy, kinetic energy, potential Energy, conservation of energy.

Solid Mechanics: Introduction, stress at a point, types of stress, strain, shear and normal strain. stress-strain diagram, true stress and true strain, Hooke's law, Poisson's ratio, material properties for isotropic materials and their relations, generalized Hooke's law, stress-strain relationship; Elastic constants, Young's modulus, shear modulus, Poisson's ratio, relationships between elastic constants.

Machine Design: Static and dynamic loading, threaded joints, riveted joints, welded joints, design of gears, belt drives, brakes, bearings.

Theory of Machines: Mechanism and machines, flywheel, friction, gears, kinematic analysis.

Thermodynamics: Basic definitions, thermodynamic systems and properties, thermodynamic processes and cycles; Different types of work and heat transfer; First law of thermodynamics, internal energy, enthalpy, non-flow and flow processes; steady state, steady flow energy equation (SFEE); Second law of thermodynamics, Kelvin Planck and Clausius statement, irreversibility, Carnot cycle and Carnot's theorem, applications of second law to closed and open systems, heat engine, heat pump and refrigerator, entropy, Clausius theorem, Clausius inequality, entropy principle and its application, entropy generation in closed and open system, absolute entropy; Available energy; Vapour power cycles.

Heat Transfer: Steady state heat conduction, 1-D heat conduction equations in plane wall, heat generation, conduction through multilayer walls, heat conduction in cylinders and spheres, critical radius of insulation, heat transfer through extended surfaces, fin efficiency; Radiation heat transfer, radiation intensity, emissive power etc., radiation shield, shape factor; Convection heat transfer: introduction to natural and forced convection, internal and external flow, various dimensionless numbers; Heat exchangers: parallel flow, counter flow, cross flow heat exchangers, multipass shell and tube exchangers, phase change heat exchangers, LMTD and NTU methods; Introduction to mass transfer, Fick's law of mass diffusion.

Fluid Mechanics: Concept of fluid and fluid properties, Newton's Law of viscosity; Fluid Statics, forces on fluid element, different types of pressure and measuring instruments, hydrostatic forces on plane and curved surfaces, buoyancy and stability of submerged and floating bodies; Fluid kinematics, steady, unsteady, uniform and non-uniform flow, laminar and turbulent flow, streamline, path line, streak line; Equations for conservation of mass, momentum and energy, Euler's and Bernoulli's equation, measurement of flow through pipes and different flow measuring devices; Dimensional analysis, kinematic and dynamic similarity, various dimensionless numbers; Potential flow, stream function, vorticity, velocity potential, uniform flow, major and minor losses, friction factor; Boundary layer equations, the flat plate boundary layer; Introduction to compressible flow,; Impulse and reaction turbine, Pelton

Syllabus for Tezpur University Entrance Examination, 2022

wheel, Francis and Kaplan turbine, Rotodynamic and positive displacement pumps, reciprocating pump, centrifugal pump, specific speed, cavitation.

IC Engine: Construction and working principle of SI and CI engines, Construction and working principle of four stroke and two stroke engines, theoretical cycles used in IC engines, performance analysis of IC engines.

Materials Science: Classification and properties of engineering materials, bonds in solids and characteristics of metallic bonding, general classifications, properties and applications of alloy steel, stainless steel, cast iron and non-ferrous materials; Crystal systems and imperfections, crystallography, Miller Indices for directions and planes, voids in crystals, packing density, crystal imperfections, point, line, surface and volume defects; Phase Diagrams and Phase Rules, principles and various types of phase diagrams, Fe- Fe₃C diagram, TTT and CCT diagrams; Heat treatment in steels, pearlitic, bainitic and martensitic transformations.

Manufacturing Technology: Rolling, extrusion, sheet-metal forming, forging, welding, mechanism of metal cutting, machining processes, machinability; Modern machining processes.

Industrial Engineering: Work study, method study and work measurement; Plant layout, types of production, types of layout, tools and techniques for plant layout; Project scheduling, PERT and CPM; Production control, Gantt chart; Material handling.