Eligibility Criteria and Syllabus for the B.Tech. (Lateral Entry) programs

Tezpur University Entrance Examination 2023

School of Humanities and Social Sciences

Sl. No	Programmes	Eligibility	Syllabus
1.	**Lateral Entry to B.Tech. in Civil Engineering**	10th standard examination with minimum 60% marks or equivalent grade point in aggregate as well as separately in Mathematics, and minimum 70% aggregate marks or equivalent grade point in AICTE approved diploma programme in the respective or allied discipline. The duration of the diploma programme must be: 02 years diploma after 10+2 OR 03 years after 10th (Matriculation) in conventional system OR 04 Year after 10th (Matriculation) in modular	<u>Mathematics</u> Complex Numbers, Partial fractions, Permutation and combination, Binomial Theorem, Series, Trigonometric Ratios, Properties of Triangle, Volume and Surface Area, Co-ordinate Geometry, Functions, Differentiation, Integration, General aptitude and reasoning. <u>Civil Engineering</u> Building Construction & Materials, Civil Engineering Drawing, Surveying, Structural Mechanics, Hydraulics, Concrete Technology, Transportation Engineering, Design of RCC Structure, Geotechnical Engineering, Design of Steel Structure, Environmental Engineering &Pollution Control, Water Resources Engineering
2.	**Lateral Entry to B.Tech. in Computer Science and Engineering**	10th standard examination with minimum 60% marks or equivalent grade point in aggregate as well as separately in Mathematics, and minimum 70% aggregate marks or equivalent grade point in AICTE approved diploma programme in the respective or allied discipline. The duration of the diploma programme must be: 02 years diploma after 10+2 OR	1. 10+2 level Physics and Mathematics 2. C/C++ programming 3. Algorithms and Data Structures - Array, stack, queue, linked list, sorting, selection, searching. 4. Basic Electronics and Digital Logic - Digital circuits and signals, Logic Families, Logic Gates and Boolean algebra, Number Systems. 5. Computer Networks - Basic concepts, Network Classifications, Network topology, OSI model, Basics of TCP/IP. 6. Database Management Systems

		03 years after 10th (Matriculation) in conventional system OR 04 Year after 10th (Matriculation) in modular	- Basic concepts, ER model, Relational model, Query languages. 7. Communicative English
3.	**Lateral Entry to B.Tech. in Electrical Engineering**	10th standard examination with minimum 60% marks or equivalent grade point in aggregate as well as separately in Mathematics, and minimum 70% aggregate marks or equivalent grade point in AICTE approved diploma programme in the respective or allied discipline. The duration of the diploma programme must be: 02 years diploma after 10+2 OR 03 years after 10th (Matriculation) in conventional system OR 04 Year after 10th (Matriculation) in modular	**CORE ELECTRICAL** **DC Circuit Analysis**: Electric Circuits Laws: Basic electric circuit terminology, Ohm's law, Kirchhoff's current law (KCL) and Kirchhoff's Voltage law (KVL), circuit parameters (resistance, Inductance and capacitance), series and parallel combinations of resistance, Inductance and capacitance , Nodal analysis. Energy Source, Ideal and Practical voltage and current sources and their transformation, Dependent voltage sources and dependent current sources, D.C. Circuit Analysis, Power and energy relations, Analysis of series and parallel DC circuits, Loop and Nodal methods of circuit analysis, Superposition theorem, Thevenin's and Norton's theorems, maximum Power theorem, Delta - star (Y) Transformation. **A.C. Circuit Analysis**: Basic terminology and definitions, Phasor and complex number representation, solutions of sinusoidally excited RLC circuits, Power and energy relations in A.C. circuits, Applications of network theorems to A.C. circuits, Resonance in series and parallel circuits, Concepts of active & reactive powers. Steady State A.C three phases Circuits: Concept of a 3-phase voltage, wye (Y) circuits. Delta (Δ) circuits, Current and voltage relations in Y and Δ Circuits, Characteristics of a 3 -phase system, Magnetically Coupled circuits, Mutual inductance. **Single Phase Transformers**: Introduction, classification, construction, electromotive force (e. m. f.) equation, Equivalent circuit model, Phasor diagrams, Losses and efficiency, Voltage regulation, Transformer tests (polarity test, open circuit test and short circuit test), Auto-transformers **Direct current Generators**: General introduction, principles of operation of D.C Generators, construction of D.C Generators, Types of DC Generators, e.m.f equation, Types of windings, power stages and efficiency, commutation and armature reaction, characteristics of D.C Generators. **Direct current Motors**: Principles of operation of D.C Motors, construction of D.C Motors, Types of DC Motors, Back e.m.f and Torque equation, torque and speed of D.C Motors, characteristics of various types of D.C motors, speed control of D.C motors. **Induction Motors:** Construction and working principle of 3 phase Induction motors, types of rotors, rotating magnetic field, slip, effect of slip on rotor parameters, torque equation, torque-speed

			characteristics, effect of rotor resistance on torque-speed characteristics, Single phase induction motors, staring and applications. **PHYSICS:** Vector Analysis, Collision of particles, Vibration and acoustics, Electromagnetic Theory, Maxwell's equations, Quantum mechanics, Solid state physics, Superconductivity, Diffraction, Special Theory of Relativity. **MATHEMATICS:** Differential Calculus, ordinary, linear and non-linear differential equations, Partial Differential Equations, Fourier series, Matrices.
4.	**Lateral Entry to B.Tech. in Electronics and Communication Engineering**	10th standard examination with minimum 60% marks or equivalent grade point in aggregate as well as separately in Mathematics, and minimum 70% aggregate marks or equivalent grade point in AICTE approved diploma programme in the respective or allied discipline. The duration of the diploma programme must be: 02 years diploma after 10+2 OR 03 years after 10th (Matriculation) in conventional system OR 04 Year after 10th (Matriculation) in modular	1. **Materials and Components:** Structure and properties of Electrical Engineering materials: Conductors, Semiconductors and Insulators, Magnetic, Ferroelectric, Piezoelectric, Ceramic, Optical and Super conducting materials. Passive components and characteristics Resistors, Capacitors and Inductors; Ferrites, Quartz crystal Ceramic resonators, Electromagnetic and Electromechanical components. 2. **Physical Electronics Electron Devices and lCs:** Electrons and holes in semiconductors, Carrier Statistics, Mechanism of current flow in a semiconductor, working principle and basic structure of BJTs and FETs. 3. Network Theory: Network analysis, Loop Analysis, Mesh Analysis; Network Theorems, Superposition Theorem, Thevenin's Theorem, Notron's Theorem, Reciprocity Theorem, Millman's Theorem, Star-Delta Connections, Two port networks. 4. **Electronic Measurements and Instrumentation:** Basic concepts, standards and error analysis; Measurements of basic electrical quantities and parameters; Electronic measuring instruments and their principles of working;analog and digital, comparison, characteristics, application Transducers; Electronic measurements of non-electrical quantities like temperature, pressure, humidity, etc. 5. **Analog Electronic Circuits:** Transistors biasing and stabilization, small signal analysis, power amplifiers, frequency response, wide banding techniques, feedback amplifiers, Tuned amplifiers, Oscillators, Rectifiers and power supplies, Op Amp.

			6. **Digital Electronic Circuits:** Binary number system, Octal, Hexadecimal and BCD numbers system, Boolean algebra, simplification of Boolean functions, Karnaugh map and applications, IC logic, Combination logic circuits, Half adder, Full adder, Digital comparator, Multiplexer, Demultiplexer, Flip Flops, R-S, J-K, D and T flip-flops, different types of counters and registers, A/D and D/A converters, semiconductor memories. 7. **Control Systems:** Types of Control system, Open Loop and Closed Loop Control system, Effect of feedback on stability and sensitivity; Block Diagram Reduction Technique, Signal Flow Graph, Stability Analysis, Routh's Stability Criterion. 8. **Communication System:** Basic Mathematical Tools like Fourier Series, Modulation and detection in analogue and digital system; Sampling and data reconstructions; Propagation of signals at HF, VHF, UHF and microwave frequency. 9. **Computer Engineering:** Number system, Data representation Programming; Elements of a high level programming language PASCAL/C, use of basic data structures, Fundamentals of computer architecture, processer design, control unit design, memory organization, I/O system organization, microprocessors, architecture and instruction set of microprocessors 8085, Assembly language programming.
5.	**Lateral Entry to B.Tech. in Mechanical Engineering**	10th standard examination with minimum 60% marks or equivalent grade point in aggregate as well as separately in Mathematics, and minimum 70% aggregate marks or equivalent grade point in AICTE approved diploma programme in the respective or allied discipline. The duration of the diploma programme must be: 02 years diploma after 10+2 OR 03 years after 10th (Matriculation) in conventional system OR 04 Year after 10th (Matriculation) in modular	**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 Plank 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 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.
6.	**Lateral Entry to B.Tech. in Food Engineering and Technology**	10th standard examination with minimum 60% marks or equivalent grade point in aggregate as well as separately in Mathematics, and minimum 60% aggregate marks or equivalent grade point in AICTE approved diploma programme in the respective or allied discipline. The duration of the diploma programme must be: 02 years diploma after 10+2 OR 03 years after 10th (Matriculation) in conventional system OR 04 Year after 10th (Matriculation) in modular system	**Part-I: General Engineering: Thermodynamics, Heat & mass transfer, Fluid mechanics (weightage: 40%)** **Engineering Thermodynamics:** Zeroth law, first law, second law. Concepts of enthalpy, internal energy, entropy and absolute temperature. Properties of pure substances and mixtures, reversibility and irreversibility. Thermodynamics cycles. Refrigeration and air conditioning: Refrigeration cycles, heat pump. Application of refrigeration in food processing and preservation. Food freezing systems. Steam: steam generation, steam properties and application. Psychometrics: properties of air water vapor mixer; psychrometric properties, charts and relations and psychro metric calculations. **Heat and Mass Transfer:** Principles of heat and mass transfer to heat, different methods of heat transfer, Fourier's Law, Steady state heat transfer through plain and composite slabs, cylindrical and spherical surfaces. Natural and forced convection, concept of overall heat transfer coefficient,

			LMTD, heat exchangers in food processing, effectiveness of heat exchanger. Fick's Law of diffusion and basic concepts of convective mass transfer. **Basic Fluid Mechanics**: Physical properties of fluids, classification of fluid flow, continuity equations, Bernoulli's equation and its application, steady state flow equation, concept of viscosity, Newtonian and non-Newtonian fluids. Poiseuille's equation. Navier Stoke's equation, flow through parallel plates and circular pipes. Concept of Reynold's number and its application. Pipe and pipe flow, fittings. Pumps, types of pumps and their application and selection. **Part-II: Food Engineering and Technology (weightage: 60%)** **Food Engineering Operations**: Materials and introduction energy balance for food engineering processes. Size reduction, mechanical expression, mechanical separation, mixing and agitation, emulsification, and homogenization. Filtration, membrane separation, sedimentation, centrifugation, crystallization, extraction, distillation, absorption, humidification, and dehumidification. Thermal processing of foods, Food concentration: Evaporation, equipment, their selection and calculation. Freeze concentration. Drying and dehydration methods, different kinds of dryers, their selection and design. **Food Microbiology:** Microbiology and reproduction of bacteria. Pure culture technique: serial dilution, pour plate, streak plate, spread plate, slant, broth and enrichment culture, lyophilization. Microbial Growth: Definition, Growth curve, account of different phases, synchronous growth, doubling/ generation time. Relationship between number of generations and total number of microbes. Disinfecting agents and its dynamics. Enzymes, specificity of enzymes, coenzymes, cofactors, Enzymes inhibitors and activators. Applications of enzymes in food industry, immobilized enzymes. Definition, scope and present status of Biotechnology and its applications, Microbial propagation and production of SCP**,** Fermentation: Fermented and non-Fermented food, cereal fermentation. **Food Chemistry**: Importance of different food constituent, Carbohydrate and its classification and functions. Proteins, classification, and properties of amino acids. Lipid's structure, physical and chemical properties. Vitamins and minerals in food. Food spoilage: Types and factors, Food enzymes.

			Food preservation techniques: Addition of salt, sugar, oil, spices, preservative, drying, evaporation, heat treatment, irradiation, refrigeration, freezing, plant physiology: Transpiration, Ripening, Senescence, Post-Harvest technology and its importance, Climacteric and non-climacteric fruits. **Food Product technology:** Parboiling, Milling of rice, wheat, malting, storage atmospheres: Quality control and quality assurance, different quality attributes: qualitative, hidden and sensory, HACCP and its application, Food adulteration: types, Estimation of moisture, crude, fat, proteins, crude fibre, ash, sampling and its types, BIS, AGMARK, FPA, PFA, FAO, FSSAI.