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

Tezpur University Entrance Examination 2023

			School of Engineering
Sl. No	Programmes	Eligibility	Syllabus
1.	Lateral Entry to B.Tech. in Civil Engineering	Passed minimum 3 years/2 years (Lateral Entry) diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category SC/ST)in any branch of Engineering and Technology.	Mathematics 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. Civil Engineering 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	Passed minimum 3 years/2 years (Lateral Entry) diploma examination	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

		with at least 45% marks (40% marks in case of candidates belonging to reserved category SC/ST)in any branch of Engineering and Technology.	- 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 - Basic concepts, ER model, Relational model, Query languages. 7. Communicative English
3.	Lateral Entry to B.Tech. in Electrical Engineering	Passed minimum 3 years/2 years (Lateral Entry) diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category SC/ST)in any branch of Engineering and Technology.	**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 DCcircuits, 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 | Passed minimum 3 years/2 years (Lateral Entry) diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category SC/ST)in any branch of Engineering and Technology. | 1. **MaterialsandComponents:**StructureandpropertiesofElectricalEngineering materials: Conductors, Semiconductorsand Insulators, Magnetic,Ferroelectric, Piezoelectric, Ceramic, Optical and Super conducting materials.Passive components and characteristics Resistors, Capacitorsand Inductors;Ferrites,QuartzcrystalCeramicresonators,ElectromagneticandElectromechanicalcomponents.
2. **Physical Electronics Electron Devices and ICs:** Electrons and holes insemiconductors,CarrierStatistics,Mechanismofcurrentflowinasemiconductor,workingprincipleandbasicstructureofBJTsandFETs.
3. Network Theory: Network analysis, Loop Analysis, Mesh Analysis; NetworkTheorems, Superposition Theorem, Thevenin's Theorem, Notron'sTheorem,Reciprocity Theorem, Millman's Theorem, Star-Delta Connections, Twoportnetworks.
4. **Electronic Measurementsand Instrumentation:** Basic concepts, standardsanderroranalysis;Measurementsofbasicelectricalquantitiesandparameters; Electronicmeasuringinstrumentsandtheirprinciplesofworking;analoganddigital,comparison,characteristics, applicationTransducers;Electronicmeasurementsofnon-electricalquantitiesliketemperature,pressure,humidity,etc.
5. **AnalogElectronicCircuits:** Transistorsbiasingandstabilization,smallsignalanalysis,poweramplifiers,frequencyresponse,widebandingtechniques, feedback amplifiers, Tuned amplifiers, Oscillators, Rectifiers andpowersupplies,OpAmp.
6. **Digital Electronic Circuits:** Binary number system, Octal, Hexadecimal andBCD numbers system, Boolean algebra, simplification of Boolean functions,Karnaugh map and applications, IC logic, Combination logic circuits, Halfadder, Full |

adder, Digital comparator, Multiplexer, Demultiplexer, Flip Flops,R-S,J-K,DandTflip-flops,differenttypesofcountersandregisters,A/DandD/Aconverters,semiconductormemories.

7. **Control Systems:** Types of Control system, Open Loop and Closed LoopControlsystem,Effectoffeedbackonstabilityandsensitivity; Block DiagramReduction Technique, Signal Flow Graph, Stability Analysis, Routh's StabilityCriterion.

8. **CommunicationSystem:** Basic MathematicalToolslike FourierSeries,Modulationand detection in analogue and digital system; Sampling and datareconstructions; Propagation of signals at HF, VHF, UHF and microwavefrequency.

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 | Passed minimum 3 years/2 years (Lateral Entry) diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category SC/ST)in any branch of Engineering and Technology. | **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 forrectangular 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 Kaplanturbine,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 offour 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**	Passed minimum 3 years/2 years (Lateral Entry) diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category SC/ST)in any branch of Engineering and Technology.	**Part-I: General Engineering: Thermodynamics, Heat & mass transfer, Fluid mechanics (weightage: 40%)** **Engineering Thermodynamics:**Zerothlaw, firstlaw,second law. Concepts of enthalpy,internalenergy,entropy andabsolutetemperature. Propertiesofpure substancesand mixtures,reversibilityandirreversibility. Thermodynamics cycles. Refrigerationand airconditioning:Refrigeration cycles, heatpump. Application of refrigerationin food processingand preservation. Foodfreezing systems. Steam:steam generation,steamproperties and application. Psychometrics:propertiesofairwater vapor mixer;psychrometric properties, chartsand relations andpsychrometric calculations. **Heat and Mass Transfer:** Principlesofheatandmasstransferto heat,different methodsofheat transfer, Fourier's Law, Steady stateheattransferthroughplainand compositeslabs, cylindricaland sphericalsurfaces. Naturalandforcedconvection, conceptofoverallheattransfercoefficient, LMTD,heatexchangers infood processing, effectiveness ofheatexchanger. Fick's Lawofdiffusion andbasic conceptsofconvectivemass transfer. **Basic FluidMechanics**:Physicalpropertiesoffluids,classificationoffluidflow, continuityequations, Bernoulli's equation and itsapplication, steady stateflow equation,conceptofviscosity, Newtonian andnon-Newtonian fluids. Poiseuille's equation. NavierStoke'sequation, flowthrough parallelplates andcircularpipes. ConceptofReynold's numberand itsapplication. Pipeand pipeflow,fittings.Pumps, typesofpumps and theirapplicationand selection. **Part-II: Food Engineering and Technology(weightage: 60%)** **Food Engineering Operations**:Materialsandintroduction energybalance for food engineeringprocesses. Sizereduction,mechanicalexpression,mechanicalseparation, mixingand agitation,emulsification, and homogenization. Filtration,membrane separation,sedimentation, centrifugation, crystallization, extraction, distillation, absorption, humidification,and dehumidification. Thermalprocessing offoods, Food concentration:Evaporation,equipment, theirselectionand calculation. Freeze concentration. Drying anddehydrationmethods, differentkindsofdryers,their selectionand design. **FoodMicrobiology:** Microbiology and reproductionofbacteria. Pure culture technique:serialdilution, pourplate, streak plate, spread plate,slant, broth and enrichmentculture,lyophilization.MicrobialGrowth: Definition, Growthcurve, accountofdifferentphases,synchronous growth, doubling/generationtime. Relationship between numberofgenerations and totalnumberofmicrobes. Disinfecting agents anditsdynamics. Enzymes, specificity ofenzymes, coenzymes, cofactors, Enzymesinhibitors and activators.Applications ofenzymesinfood industry, immobilizedenzymes. Definition, scopeandpresentstatus ofBiotechnology and its applications,Microbialpropagation andproduction ofSCP**,** Fermentation: Fermented and non-Fermentedfood,cerealfermentation.

			Food Chemistry:Importanceofdifferentfood constituent, Carbohydrateandits classificationandfunctions. Proteins, classification,and properties ofaminoacids. Lipid's structure, physicaland chemicalproperties. Vitamins andmineralsin food. Food spoilage:Types and factors, Food enzymes. **Foodpreservation techniques**:Additionofsalt, sugar, oil, spices, preservative, drying, evaporation, heattreatment,irradiation,refrigeration,freezing, plant physiology:Transpiration,Ripening, Senescence, Post-Harvesttechnologyand its importance, Climactericand non-climactericfruits. **FoodProducttechnology:**Parboiling,Millingofrice,wheat,malting,storage atmospheres:Qualitycontrolandqualityassurance,differentqualityattributes: qualitative,hiddenandsensory,HACCPanditsapplication,Foodadulteration:types, Estimationofmoisture,crude,fat,proteins,crudefibre,ash,samplinganditstypes, BIS,AGMARK,FPA,PFA,FAO, FSSAI.