

Entrance Exam for M.Tech. for the session 2021-2022, in Electrical Engineering with Specialization: Instrumentation & Control Engineering of Jorhat Engineering College, Jorhat-785007, Assam:-

Prologue: This course shall be conducted in the Department of Electrical Engineering, Jorhat Engineering College, Jorhat-785007, Assam. Jorhat is connected by Air, Rail and Road from other places of India.

Scope of this M.Tech course: Instrumentation & Control is the heart of most of the industries (including Oil, Marine, Railways, Aircrafts, Robotics, Defense and Space research organizations, etc.) now-a-days and hence almost every modern industry is expected to have a separate department/division to supervise and maintain “Instrumentation & Control”. Apart from ample job opportunities, this course also supports to prepare the students for research leading to PhD in reputed institutions all over the world.

[Eligibility: B.E./B.Tech in Electrical/ Instrumentation/ Electronics & Electrical/ Power Electronics & Instrumentation/ Electronics & Instrumentation, with at least 55% marks for General Category and 50% marks for Reserve Category]

Sample of Type of Examination (liable to change from time to time): Total marks: 100

- i. Qs 1 to Qs 40 (MCQ type), carrying 1 mark each with 25% negative mark for each wrong answer.
- ii. Qs 41 to Qs 50 (MCQ type) carrying 2 marks each with 25% negative mark for each wrong answer.
- iii. Qs 51 to Qs 60 (Fill up the blanks), carrying 2 marks each.
- iv. Qs 61 to Qs 65 (Subjective), carrying 4 marks each.

Syllabus for Entrance Exam for M.Tech. in Electrical Engineering 2021-2022

(Approximately 8 to 15 Questions from each section)

1. **Basic Electrical Engineering** (Network Theorems, D.C. networks, A.C. network fundamentals & phasor concepts, Series-Parallel A.C. networks, Energy & Power in electric circuits)
2. **Electrical Circuit Analysis/Signals & Systems** (Transients, Resonance, Transforms & properties: Laplace, Fourier, Z-transform, Discrete-time Fourier Transform, Discrete Fourier Transform, Fast Fourier Transform, Electrical Circuit Analysis using Laplace & Fourier Transforms, Properties of networks in terms of poles and zeros, Transfer function, Resonant circuits, Three-phase circuits, Two-port networks.)
3. (A) **Analog Electronics** (BJ Transistors and their CB, CE & CC configurations, h-parameter models, emitter-resistor model, FETs and circuit models, Feedback amplifiers, Power amplifiers: Class A, B, AB, C amplifiers)
(B) **Linear Electronics** (Op Amp fundamentals and circuits, Oscillators, Filters, ADC, DAC, Pulse shaping circuits & waveform generators, Rectifiers & Regulated power supplies)
4. (A) **Digital Electronics & Logic Design** (IC logic families : DTL, TTL, ECL, NMOS, PMOS & CMOS gates and their comparison, Logic gate circuits, Combinatorial

Logic design using K-map, Multiplexer, Demultiplexer, Decoder, Encoder, Adder, Subtractor, Comparator, Multiplier, Divider, Latch, Sequential logic circuits: Flip-flops, Registers, Counters & Waveform generators, ROMs & Semiconductor Memories)

- (B) **8085 Microprocessor & interfacing** (Architecture, Assembly language programming, Memory interfacing – Address & Word expansion, IO interfacing - Memory map & IO map, Peripheral Interfacing Devices: 8255, 8253, 7-segment LED display)
5. (A) **Electrical Machines** (Theory, construction, losses & efficiency, operation of Transformer, D.C. Machines, Synchronous Machines, Single Phase Induction motor, 3-phase Induction machines, Universal motor)
- (B) **Power Electronics & Electric Drives** (Power devices – Diode, Power transistor, Thyristor, Triac, Gate Turn-Off Thyristor (GTO), Power MOSFET, UJT; Diac & IGBT; Rectifier, Inverter, Chopper, Cycloconverter, Voltage Controller & Regulated power supply; Electric Drives - Four-quadrant operation of motor loads, Starting & braking, Solid-state controllers of drives, Industrial applications)
6. **Fundamentals of Computing using C** (Sorting: Sequential, Bubble, Selection, Insertion, Quicksort, Merge-sort, Binary Search, Arrays, Lists, Stacks, Queues, Trees, Graphs, Addition, Subtraction, Multiplication of Matrices & Sparse-matrices, Writing to Files & Computer monitor, Reading from keyboard & files)
7. (A) **Electrical Measurements & Measuring Instruments** (Classification of measuring instruments, Galvanometer, Ammeter, Voltmeter, Wattmeter, Energymeter, Frequency meter, Fluxmeter, Oscilloscope, Damping, Potentiometers, Bridges, Measurement of Current, Voltage, emf, Power, Frequency, Flux ϕ , mmf, Magnetic Field Intensity H, Resistance, Inductance, Capacitance, High Voltage measuring system & Measurements,
- (B) **Transducers:** Classification and Selection of Transducers, Construction principle and Applications of Diaphragms, Bellows, Bourden tubes, Springs, Capacitive, Piezoelectric and Photoelectric transducers)
8. **Automatic Control Systems** (Concept of automatic control systems; Classifications of Control systems; Block diagram and signal flow graphs; Mathematical modelling of physical systems: Potentiometer, Synchros, DC & AC Servomotors, Rotating Amplifier, Stepper Motor, Tachogenerators; Transient and steady state response of control systems; Effect of feedback on stability and sensitivity; Root locus techniques; Frequency response analysis: Bode plot, Concepts of gain and phase margins; Constant-M and Constant-N Nichol's Chart; Approximation of transient response from Constant-N Nichol's Chart; Approximation of transient response from closed loop frequency response; Design of Control Systems, Compensators)

References & Books: Refer GATE and IES examination guide books and standard text books in each subject.
