Department of Electronics & Communication Engineering
School of Technology
North Eastern Hill University, Shillong- 793022

F.No.7.18/ECE/M.Tech Admission/2020 Date: 15-10-2020

M.Tech in ECE Entrance Examination (MEE-2020) 2020

The admission into the M.Tech program will be done on the basis of a written test of **60 minutes** duration (Please refer to the syllabus below) consisting of 30 multiple choices questions (MCQs).

A merit list will be prepared based on the composite score of the following:

(a) Marks secured in the Online Entrance Examination.
(b) Weightages given to the candidates as per NEHU rules.
(c) Weightages given to the GATE qualified candidates with valid GATE score as per NEHU rules.

The decision of the admission committee in all matters shall be binding and final.

Date, time and venue of the written test are as follows:

Date of Online Test	28th Oct, 2020 (Wednesday)
Time of Online Test	2.30 PM - 3.30 PM

In case of a candidate failing to report online in the specified date and time as mentioned, he/she will forfeit his/her claim to appear for the entrance test.

Important Dates

List of eligible Candidates.	26th Oct 2020
Date of M.Tech Entrance Test	28th Oct, 2020
Publication of Merit List with Admission Notification	2nd Nov 2020
Date of Admission	3rd -5th Nov 2020
Display of Remaining Vacant Seats (if any)	9th Nov 2020
Date of Admission for Wait Listed Candidates	11th Nov 2020
Commencement of Classes	9th Nov 2020

Note: The above mentioned dates are tentative.

Sd/-
Chairman
M.Tech (ECE) Admission Committee

Detailed syllabus along with marks distributions for the entrance test of the M.Tech program:

Electronic Devices: Energy bands in silicon, intrinsic and extrinsic silicon. Carrier transport in silicon: diffusion current, drift current, mobility, and resistivity. Generation and recombination of carriers. p-n junction diode, Zener diode, tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED, PIN and avalanche photo diode, Basics of LASERs. Device technology: integrated circuits fabrication process, oxidation, diffusion, ion implantation, photolithography, n-tub, p-tub and twin-tub CMOS process**. [3 Marks]**

Networks: Network graphs: matrices associated with graphs; incidence, fundamental cut set and fundamental circuit matrices. Solution methods: nodal and mesh analysis. Network theorems: superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems, Wye-Delta transformation. Steady state sinusoidal analysis using phasors. Linear constant coefficient differential equations; time domain analysis of simple RLC circuits, Solution of network equations using Laplace transform: frequency domain analysis of RLC circuits. 2-port network parameters: driving point and transfer functions. State equations for networks**. [3 Marks]**

Analog Circuits: Small Signal Equivalent circuits of diodes, BJTs, MOSFETs and analog CMOS. Simple diode circuits, clipping, clamping, rectifier. Biasing and bias stability of transistor and FET amplifiers. Amplifiers: single-and multi-stage, differential and operational, feedback, and power. Frequency response of amplifiers. Simple op-amp circuits. Filters. Sinusoidal oscillators; criterion for oscillation; single-transistor and op-amp configurations. Function generators and wave-shaping circuits, 555 Timers. Power supplies**. [3 Marks]**

Digital Circuits: Boolean algebra, minimization of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinatorial circuits: arithmetic circuits, code converters, multiplexers, decoders, PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift-registers. Sample and hold circuits, ADCs, DACs. Semiconductor memories. **[3 Marks]**

Microprocessor (8085, 8086): Architecture, programming, memory and I/O interfacing**. [3]**

Signals and Systems: Definitions and properties of Laplace transform, continuous-time and discrete-time Fourier series, continuous-time and discrete-time Fourier Transform, DFT and FFT, z-transform. Sampling theorem. Linear Time-Invariant (LTI) Systems: definitions and properties; causality, stability, impulse response, convolution, poles and zeros, parallel and

cascade structure, frequency response, group delay, phase delay. Signal transmission through LTI systems**. [3 Marks]**

Control Systems: Basic control system components; block diagrammatic description, reduction of block diagrams. Open loop and closed loop (feedback) systems and stability analysis of these systems. Signal flow graphs and their use in determining transfer functions of systems; transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis: root loci, Routh-Hurwitz criterion, Bode and Nyquist plots. Control system compensators: elements of lead and lag compensation, elements of Proportional-Integral-Derivative (PID) control. State variable representation and solution of state equation of LTI control systems**. [3 Marks]**

Communications: Random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density. Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis of these operations, super-heterodyne receivers; elements of hardware, realizations of analog communication systems; signal-to-noise ratio (SNR) calculations for amplitude modulation (AM) and frequency modulation (FM) for low noise conditions. Fundamentals of information theory and channel capacity theorem. Digital communication systems: pulse code modulation (PCM), differential pulse code modulation (DPCM), digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), matched filter receivers, bandwidth consideration and probability of error calculations for these schemes. Basics of TDMA, FDMA and CDMA and GSM**. [3 Marks]**

Electromagnetics: Elements of vector calculus: gradient, divergence and curl; Gauss and strokes theorems, Maxwells' equation: differential and integral forms. Wave equation. Poynting vector. Plane waves: propagation through various media; reflection and refraction; phase and group velocity; skin depth. **[3 marks]**

Microwave and Antenna Engineering: Transmission lines: Characteristic impedance; impedance transformation; smith chart; impedance matching pulse excitation. Wave guides: modes in rectangular waveguides; boundary conditions; cut-off frequencies; dispersion relations, dipole antennas; antenna arrays; radiation pattern; reciprocity theorem; antenna gain**. [3 Marks]**