



इलेक्ट्रॉनिकी एवं संचार अभियांत्रिकी विभाग
पूर्वोत्तर पर्वतीय विश्वविद्यालय
स्थायी परिसर, शिलांग - ७९३ ०२२ (मेघालय)
Department of Electronics & Communication Engineering
North-Eastern Hill University
Permanent Campus, Shillong – 793 022 (Meghalaya)

F.7-16(3)/ECE/PEnE-E/2024-1

Date: 07 September, 2024

NOTIFICATION

Ph.D. Entrance Examination in ECE (PEnE-E) - 2024

The admission into the PhD programme for a limited number of seats available in the department shall be done on the basis of a written test (please refer the detailed syllabus at page 2) of one-hour duration (weightage: 70%) followed by a personal interview (PI) (weightage: 30%). Merit list shall be prepared as per NEHU regulation RC-23 clause 3. Total available Ph.D. positions are: 18. One Ph.D. seat is available under the Visvesvaraya Ph.D. Scheme of MeITY.

The decision of the admission committee in all matters shall be binding and final. Date, time and venue of the Entrance Test as well as the Admission Process are as follows:

Last Date of submission of online Application Form	(Tuesday) 15-10-2024
List of eligible candidates	(Thursday) 17-10-2024
Date of Written Test and the Interview	(Tuesday) 05-11-2024
Reporting Time	9.30 A.M. (at the venue) Document verification will start from 9.30 AM
Time of Written Test	11:00 A.M. to 12:00 NOON.
Time of interview (For Eligible candidates only)	03:00 P.M. onwards
Venue	Department of ECE, School of Technology, NEHU, Shillong 793022
Declaration of result	(Wednesday) 06-11-2024
Provisional admission (Last Date)	(Thursday) 14-11-2024
Waiting list admission (if any)	(Monday) 18-11-2024

In case, any candidate fails to report online at the reporting time on the specified date and time mentioned above, he/she will forfeit his/her claim to appear for entrance test and Interview.

Notes:

1. The above-mentioned dates are tentative. In case of any changes of the dates, same will be notified in the NEHU website.
2. All qualifying candidates will be provisionally admitted.
4. Qualifying candidates need to provide an undertaking mentioning that he/she will forfeit the claim against his/her candidature if not satisfying the desired criteria supported by all original testimonies.
5. The qualifying candidates decided to take admission will have to pay their fees before **14th November, 2024 failing which their admission will stand cancelled.**
6. If any qualifying candidate is found to be not fulfilling the desired criteria upon physical verification of documents, his/her admission will stand cancelled and the admission fees will be returned to the concerned candidate after deducting the processing fees as per the norm of university.

Sd/-
Chairman PhD (ECE)
Admission Committee 2024



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Syllabus for Ph.D. Entrance Examination in Electronics and Communication Engineering (PEnEE-2024)

Part – I

(a) **Introduction to Research Methodology:** Meaning, Objectives, importance, types, Approaches, Characteristics of Scientific Method, Criteria of Good Research.

(b) **Problem Identification & Formulation:** Defining and formulating the research problem, Problem identification process; Components of the research problem; Formulating the research hypothesis; Writing a research proposal.

(c) **Reviewing the literature:** Searching the existing literature, reviewing the selected literature, **Identifying gap areas from literature review, Development of working hypothesis.**

(d) **Research Design:** Meaning & Need, Features of a Good Design, Important Concepts Relating to Research Design.

(e) **Data Collection and Analysis:** Collecting data, Methods of data collection, Data Preparation, **Data Processing, Hypothesis testing.**

(f) **Research Report Writing:** Types of research reports – Brief reports and Detailed reports; Report writing: Structure of the research report- Preliminary section, Main report, Interpretations of Results and Suggested Recommendations; Report writing: Formulation rules for writing the report: Guidelines for presenting tabular data, Guidelines for visual Representations.

(g) **Use of Tools/Techniques for Research:** Methods to search required information effectively, Reference Management Software like Mendeley/Zotero; Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism.

(h) **Quantitative Techniques and Mathematical Modelling:** Quantitative research – Concept of measurement, causality, generalization. Vector spaces - norms - Inner Products - Eigen values using QR transformations. Numerical Computing, Solutions of equations in one variable, Polynomial equations and Transcendental equations, Bisection Methods, False Position method, Newton-Raphson Method, Secant Method etc. Conditional probability, independence and Bayes theorem, continuity property of probabilities; random variable: probability distribution, density and mass functions, functions of a random variable; expectation, characteristic and moment-generating functions; joint distribution and density functions.

(h) **Ethics in Research:** Meaning of Research Ethics; Clients Ethical code; Researchers Ethical code; Ethical Codes related to respondents; Responsibility of ethics in research.

Part – II

(i) **Electronics Fundamentals:** Physics of semiconductors, diodes, BJT, FET and their applications; op-amps and oscillators with their applications.

(j) **Digital Electronics & Microprocessors:** Number systems, logic gates, combinational & sequential circuits; basic of microprocessors, architecture & assembly language programming of 8085 microprocessor.

(k) **Silicon Electronic-Photonic Fundamentals:** Optical properties of silicon, Silicon-Photonic (SiPh) based waveguides, Y-branch, Directional Couplers, Mach-Zehnder Interferometers, PN and P-I-N optical phase shifter and modulators, passive and active SiPh devices and circuits on Silicon-on-Insulator (SoI), Photonic Integrated Circuits (PICs) basics.



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(l) **Analog Communication Systems:** Linear modulation & demodulation: time domain expression & frequency domain spectra of AM, DSBSC, SSB-SC, VSB; power & bandwidth. Angle Modulation: Representation of FM and PM Signals, Spectral Characteristics of AM and Angle-Modulated Signals.

(m) **Digital Communication Systems:** Sampling and quantisation, frequency domain signal representation, Signal coding Techniques (Pulse digital modulation): digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), Basics of TDMA, FDMA and CDMA, Fundamentals of information theory and channel capacity theorem.

(n) **Signal Processing:** 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. Continuous-time and discrete-time Fourier Transform, DFT and FFT. Filter Design- analog and digital IIR and FIR filters, Multirate signal processing, Filter banks.

(o) **Control system:** Basic Control System Components, Feedback Principle, Transfer Function, Type and Order of system, Block Diagram Representation, Signal Flow Graph, Transient and steady-state analysis of LTI systems, Routh-Hurwitz stability criteria, Bode, Nyquist and root-locus plots.

(p) **EM Theory, Microwave and Antenna:** Maxwell's equations: boundary conditions, wave equation; Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth; Transmission lines: equations, characteristic impedance, impedance matching, S-parameters, Smith chart; Waveguides: modes, boundary conditions, cut-off frequencies; Antennas: antenna types, radiation pattern, gain and directivity, antenna arrays.

PATTERN OF TEST PAPER (28 Questions)

14 (Fourteen) Questions from Part – I

Remaining 14 (Fourteen) Questions from Part – II

The test paper shall be of multiple-choice type questions (MCQ). Each question shall have four choices as possible answers, of which, only **one** will be correct. Each question carries 2.5 marks.

Instructions to Candidates:

Use of unfair means by a candidate in written test, whether detected at the time of test, evaluation or at any other stage, will lead to cancellation of his/her candidature as well as disqualification of the candidate from appearing in written test in future.

Candidates are advised to check their email id (*given in their application form*) and the NEHU website on regular basis for any update.

Sd/-
Chairman,
PhD (ECE) Admission Committee 2024