

## Department of Electronics and Communication Engineering

### NOTIFICATION

#### Ph.D. admission Notice for 2022-23

(Under Visvesvaraya Ph.D. Scheme for Electronics and IT: Phase-II, Part 1-Substitution seat)

North-Eastern Hill University (NEHU), Shillong, proudly announces that the university has been selected as one of the Centres for the prestigious **Visvesvaraya PhD Scheme for Electronics and IT: Phase-II supported by the Ministry of Electronics & Information Technology (MeitY), Govt. of India. The University has been granted one substitution seat in the Department of ECE for the year 2022-23.**

Online applications are invited for admission into full-time Ph.D. with fellowship under this scheme for the Academic Session 2022-23. The details of the scheme is available at <https://phd.digitalindiacorporation.in/home>

The interested candidates ( Eligibility: Candidates with 55% marks for general and 50% marks for SC/ST at the M.Tech. in Electronics and Communication Engineering or equivalent or allied/cognate subjects can submit the online application ([www.nehu.ac.in](http://www.nehu.ac.in)) form along with relevant enclosures as per guidelines available on the university website in admission prospectus-2023-24.

To shortlist candidates from amongst the applicants, a written test (detailed syllabus is given in Annexure-II) of one and half hour duration (total marks 50) will be conducted followed by a personal Interview (PI). Merit list shall be prepared as per NEHU rules. Date, time, and venue of the written test as well as personal interview are as follows:

Last Date of submission of online Application Form	25 <sup>th</sup> June 2023
Date of Written Test and the Interview	28 <sup>th</sup> June 2023
Time of Written Test	11:00 A.M. to 12.30 P.M.
Time of interview	03:00 P.M. onward
Venue	Department of ECE, School of Technology, NEHU, Shillong 793022
Reporting Time	9.30:A.M. (at the venue) Document verification will start from 9.30 AM

In case any candidate fails to report on the specified date and time mentioned above, she/he will forfeit her/his claim to appear for the entrance examination and Interview. Please note that only the candidates who are eligible as per the advertisement shall be provisionally allowed to appear in written Tests and Personal Interviews.



You are hereby informed to bring the following documents in ORIGINAL for verification, failing which you will not be allowed to appear in the entrance test and personal interview:

1. Pass certificates of all board/council/University examinations starting from HSLC or equivalent.
2. Mark sheets / grade cards of all board/council/University examinations starting from HSLC or equivalent.
3. Documents to substantiate the grade conversion into percentage of marks for qualifying examination, if applicable.
4. Valid certificate for SC/ST issued by Deputy Commissioner (DC) or competent authority under the seal of DC's office only (for SC/ST candidates only).
5. No Objection Certificate from Employer as per format approved by NEHU Authority (In case of Employment) (As shown in Annexure-III).
6. Valid GATE/NET scorecard, if any.
7. Printed copy of Application Form along with supporting documents.
8. Any other certificates in support of your application.

**The major features of the scheme for full-time scholars are given below:**

**Fellowship:** Rs. 38,750/- per month in 1<sup>st</sup> and 2<sup>nd</sup> years and @Rs. 43,750 per month in 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> years of Ph.D. (support till Ph.D. completion or 4 years 11 months, whichever is earlier)

**Reimbursement of Rent (RoR):** This component is linked with the fellowship of PhD Candidate. The rate of RoR is 24%, 16% & 8% (of fellowship) for X, Y & Z class cities/towns respectively. The classification of the cities is as per the notification issued by the Ministry of Finance for the reimbursement of HRA.

**Research contingency Grant Support:** An amount of Rs. 1,20,000/Year/Full-time PhD candidate for support duration of Ph.D. candidate.

**Support for attending International conferences:** Support up to Rs. 1.5 lakhs/Full-time PhD candidate.

**Visit to Labs abroad:** Support for each selected Full-Time PhD candidate upto Rs. 10.5 lakhs for visit to labs abroad.

**No. of positions:**

One (01) seat in Electronics and Communication Engineering Department on substitution basis in the area of optical communication/opto-electronics/ Photonic Integrated Circuits

Chairperson  
Ph.D. Admission Committee  
(ECE)

## Annexure-I

The detailed syllabus of written test for PhD Entrance Examination-2022-23 in the Department of Electronics and Communication Engineering

### 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.
- (i) **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**

- (j) **Electronics Fundamentals:** Physics of semiconductors, diodes, BJT, FET and their applications; op-amps and oscillators with their applications.
- (k) **Digital Electronics & Microprocessors:** Number systems, logic gates, combinational & sequential circuits; basic of microprocessors, architecture & assembly language programming of 8085 microprocessor.
- (l) **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.
- (m) **Analog Communication Systems:** Linear modulation & demodulation: time domain expression & frequency domain spectra of AM, DSB-SC, SSB-SC, VSB; power & bandwidth. Angle Modulation: Representation of FM and PM Signals, Spectral Characteristics of AM and Angle-Modulated Signals.
- (n) **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.
- (o) **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, Filter banks.
- (p) **EM Theory, Microwave and Antenna:** Maxwell's equations: boundary conditions, wave equation; Plane wave 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.



**Annexure-II**

Format for No-Objection Certificate from Employer in Official Letterhead

Ref No:

Date:

To

The Registrar,

North-Eastern Hill University

Mawkynroh-Umshing, Shillong-22

Sub: No objection certificate for joining full time Ph.D. programme in the Department of ECE, NEHU, Shillong

Dear Sir/ Madam,

It is hereby certified that Mr./Ms \_\_\_\_\_ has been working in this organization as \_\_\_\_\_ since \_\_\_\_\_. This organization has no objection to his/her being admitted to the Ph.D. programme in Department of Electronics and Communication Engineering North-Eastern Hill University from the session starting on \_\_\_\_\_. He / She will be granted leaves as required for pursuing his/her PhD programme as per NEHU regulations. .

Signature:

Date:

Name:

Place:

Designation

Seal of competent authority.