

Ref: NEHU/BME/2023/407

Date: 15/09/2023

**NOTIFICATION**

**Ph.D. admission Notice for 2023-24**

**(Under Visvesvaraya Ph.D. Scheme for Electronics and IT: Phase-II)**

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 seat in the Department of Biomedical Engineering for the year 2023-24.**

Online applications are invited for admission into full-time Ph.D. with fellowship under this scheme for the Academic Session 2023-24. The details of the scheme are available at <https://phd.dic.gov.in/>

*Eligibility: (i). A candidate is eligible who has passed M. Tech./M. E. in Biomedical Engineering/Biotechnology/Electrical/ Electronics and Communication/ Mechanical/ Computer/ Instrumentation and Control Engineering or M. Sc. in Biomedical instrumentation, Electronics, Biophysics, Instrumentation candidates having completed M.Tech. degree in the above areas or M.D. / M.S. or students with Master's Degree in Physiotherapy (2 years program) from any UGC recognized University or equivalent having secured a minimum of 55% aggregate marks (relaxable by 5% for SC/ST candidates) applicable as per NEHU norms. (ii). The admission will be based on the combined entrance test and interview conducted by the department. (iii). Admission will be as per applicable NEHU norms.*

To shortlist candidates from amongst the applicants, a written test (detailed syllabus is given in Annexure-I) of one-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	08-10-2023
Display the List of eligible candidates	12-10-2023
Date of Written Test and the Interview	30-10-2023
Time of Written Test	10:30 A.M. to 11.30 A.M.
Venue	Department of BME, School of Technology, NEHU, Shillong 793022
Date and time of Reporting	30-10-2023 at 9.30 to 10:15 A.M. at the venue for documents verification
Declaration of result	31-10-2023
Provisional admission	06-11-2023
Waiting list admission (if vacancy available)	09-11-2023

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 5 years, 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) in Biomedical Engineering Department in the area of Artificial Intelligence in the Healthcare/Biomedical Engineering/Bioelectronics/Image Processing/Signal Processing/Biomaterials and Tissue Engineering/Biomechanics and Rehabilitation Engineering/Biomedical Instrumentations/Robotics.

Sd/-  
Chairperson  
Ph.D. Admission Committee  
(BME)



## Annexure-I

**The detailed syllabus of written test for PhD Entrance Examination 2023-24 (Under Visvesvaraya Ph.D. Scheme for Electronics and IT: Phase-II) in Department of Biomedical Engineering, North-Eastern Hill University, Shillong**

### Part-A

- (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,
- (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 their 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/MSOffice, 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 B

- (a) **Electrical Circuits:** Voltage and current sources – independent, dependent, ideal and practical; v-i relationships of resistor, inductor and capacitor; transient analysis of RLC circuits with dc excitation; Kirchoffs laws, superposition, Thevenin, Norton, maximum power transfer and reciprocity theorems; Peak, average and rms values of ac quantities; apparent, active and reactive powers; phasor analysis, impedance and admittance; series and parallel resonance, realization of basic filters with R, L and C elements, Bode plot.
- (b) **Signals and Systems:** Continuous and Discrete Signal and Systems – Periodic, aperiodic and impulse signals; Sampling theorem; Laplace and Fourier transforms; impulse response of systems; transfer function, frequency response of first and second order linear time invariant systems, convolution, correlation. Discrete time systems – impulse response, frequency response, DFT, Z – transform; basics of IIR and FIR filters.
- (c) **Analog and Digital Electronics:** Basic characteristics and applications of diode, BJT and MOSFET; Characteristics and applications of operational amplifiers difference amplifier, adder, subtractor, integrator, differentiator, instrumentation amplifier, buffer, filters and waveform generators. Number systems, Boolean algebra; combinational logic circuits – arithmetic circuits, comparators, Schmitt trigger, encoder/decoder, MUX/DEMUX, multi-vibrators; Sequential circuits – latches and flip-flops, state diagrams, shift registers and counters; Principles of ADC and DAC; Microprocessor- architecture, interfacing memory and input- output devices.
- (d) **Measurements and Control Systems:** SI units, systematic and random errors in measurement, expression of uncertainty – accuracy and precision index, propagation of errors; PMMC, MI and dynamometer type instruments; de potentiometer; bridges for measurement of R, Land C, Q-meter. Basics of control system – transfer function.
- (e) **Sensors and Bioinstrumentation:** *Sensors* – resistive, capacitive, inductive, piezoelectric, Hall effect, electrochemical, optical; Sensor signal conditioning circuits; application of LASER in sensing and therapy. *Origin of biopotentials and their measurement techniques*– ECG, EEG, EMG, ERG, EOG, GSR, PCG, Principles of measuring blood pressure, body temperature, volume and flow in arteries, veins and tissues, respiratory measurements and cardiac output measurement. *Operating principle of medical equipment* -sphygmomanometer, ventilator, cardiac pacemaker, defibrillator, pulse oximeter, hemodialyzer; Electrical Isolation (optical and electrical) and Safety of Biomedical Instruments.
- (f) **Human Anatomy and Physiology:** Basics of cell, types of tissues and organ systems; Homeostasis; Basics of organ systems – musculoskeletal, respiratory, circulatory, excretory, endocrine, nervous, gastrointestinal and reproductive.
- (g) **Medical Imaging Systems:** Basic physics, Instrumentation and image formation techniques in medical imaging modalities such as X-Ray, Computed Tomography, Single Photon Emission Computed Tomography, Positron Emission Tomography, Magnetic Resonance Imaging, Ultrasound.
- (h) **Biomechanics:** Kinematics of muscles and joints – free-body diagrams and equilibrium, forces and stresses in joints, biomechanical analysis of joints, Gait analysis; Hard Tissues – Definition



of Stress and Strain, Deformation Mechanics, structure and mechanical properties of bone – cortical and cancellous bones; Soft Tissues – Structure, functions, material properties, viscoelastic properties, Maxwell & Voight models; Biofluid mechanics – Flow properties of blood in the intact human cardiovascular system.

- (i) **Biomaterials:** Basic properties of biomaterials – Metallic, Ceramic, Polymeric and Composite; Fundamental characteristics of implants – biocompatibility, bioactivity, biodegradability; Basics of drug delivery; Basics of tissue engineering. Biomaterial characterization techniques – Rheology, Atomic Force Microscopy, Electron Microscopy, Transmission Electron Microscopy Fourier Transform Infrared Spectroscopy.

### **PATTERN OF TEST PAPER**

The test paper shall be of multiple-choice type questions (**MCQ**). There will negative marking in each wrong answer.



**Annexure-II**

Format for No-Objection Certificate from Employer in Official Letterhead

Ref No:

Date:

To  
The Registrar,  
North-Eastern Hill University  
Mawkyntroh-Umshing, Shillong-22

Sub: No objection certificate for joining full time Ph.D. programme in the Department of BME, 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 Biomedical 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.