Department of Electrical Engineering

Indian Institute of Science, Bangalore

Important information to the research applicants called for interview

Dear Research Applicant,

This page is relevant to you only if you had applied for admission to Ph.D. and have been invited for an interview at the Department of Electrical Engineering, IISc in the November 2021.

Based on your performance in GATE and/or your academic record, you have been invited to appear for a rigorous, technical interview online. For the final selection, your performance in the interview will be decisive. Please note the following information towards preparation for interview:

1. **Interview Structure**: At the time of interview, you will choose one of the following two interview committees (irrespective of specialization in BE/B-Tech or ME/M-Tech):

   Committee I: For students wishing to pursue research in one of the broad areas of Power Electronics, High Voltage Engineering & Power Apparatus OR Power Systems.

   Committee II: For students, who wish to pursue research in one of the broad areas of Signal Processing, Image Processing, Control Systems, Computer Vision, Pattern Recognition OR Machine Learning.

   In addition, you will be asked to indicate preferences for the subject areas (within the chosen committee) in which you wish to pursue research. ***See the* choice form *for more information*.** If selected, you may be asked to work in any one of the areas indicated by you at the time of interview. It is advised that you visit https://ee.iisc.ac.in/research/, to know more about the research pursued in the department.

2. **What to Read:** The interview is intended to test understanding of relevant subjects that you would have studied in BE/B-Tech and/or ME/M-Tech degree, with emphasis on the chosen area of research.
    - In **committee I**, you will be asked questions in two to three of the following topics: Network Theory, Electronic Circuits, Power Electronics, High Voltage Engineering, Power Apparatus, Power Systems, Machines, Signals & Systems, Control Systems, etc.
    - In **committee II**, the topics will be Signal Processing, Image Processing, Computer Vision, Pattern Recognition, Machine Learning, Programming and Data Structures, Signals & Systems, Control Systems, etc.

    In addition, you will be interviewed in one or two of the Mathematics subjects, to be chosen from the following, depending upon your educational background and/or the intended area of research: Linear algebra, Calculus, Differential equations, Probability, Numerical techniques, etc.
3. **Our Expectation**: Essentially, we seek those candidates, who possess the innate ability to think and logically address a question; not merely answer from memory.
4. **Direct Ph.D. Program**: We can admit applicants with only a BE/B-Tech degree also for Ph.D directly, if their performance in the interview is exceptionally good.
5. **External Research Program Applicants**: In addition to the above, you need to give a very brief (a few minutes) presentation to the committee on your proposed area of research work.

We trust that this provides the required minimal information you need to prepare for the interview. Please fill up the **Research Interview - Choice of likely research area (Click here)**. This form is sent to your email (as in the application form) and you are required to fill it up at the earliest.

For any queries mail to **office.ee@iisc.ac.in**.

With our very best wishes,

Chairman, Department of Electrical Engineering

Choice of research areas:

Kindly note you can choose either Stream I OR Stream II, but not both. Within each stream, you can select multiple topics.

I. Stream I: Power Systems, Power Electronics and High voltage Engineering

	Sub-areas	
a	**High Voltage Engineering, Pulsed Power Engineering, EHV/UHV Power Transmission, Electromagnetic fields in insulation and power engineering**	
b	**Power Systems-Operation, Protection and AI Applications, High performance /Parallel Computing applications to power systems, Power electronics applications to power systems, Machine Learning applications to power systems, smart grids, Power system stability and control, Microgrids, Power system protection, Data Analytics in Smart Grids**	
c	**Power Electronics**, Industrial Drives, Electrical Machines**	

(OR)

II. Stream II: Systems and Signal Processing

	Sub-areas	
a	**Machine Learning and Pattern Recognition**	
b	**Image/Video Processing, Computer Vision**	
c	**Signal Processing**	
d	**Biomedical Signal and Image Processing, Medical Imaging, Computational imaging**	
E	**Control System, Control over networks, Multiagent control.**	

**** Detailed listing of research topics currently pursued in Power Electronics**

Design, fabrication, and testing of power electronic converters. PWM techniques for multi-level and multi-phase inverters. Innovations in topology and modulation strategy, such as soft and low-frequency switching, etc., for performance improvement. Characterization of WBG devices such as GaN, SiC, etc. Dynamic modelling and closed-loop controller design for power converters. Design of high-frequency magnetics. Design of high-speed electrical machines and corresponding drive development. EMI and EMC. Here is a list of applications: low and medium voltage grid-integration of renewables and storage, charging of electric vehicles, motor drive, battery/supercapacitor cell voltage balancing, high voltage converters for medical applications, microgrids, generation of power from supercritical CO2, power converters for space applications, control and power hardware in the loop, etc.