Dear Student,

Congratulations on being selected to be interviewed for admission to the research programme at ECE, IISc. Our department is one among the top ECE departments in the country with faculty members that have rich academic and industry experience from leading universities and companies. The research programme at ECE, IISc, gives the student an opportunity to solve challenging problems that will impact the development of future technologies.

You would have received a letter from our admissions office inviting you to an interview at IISc during 21-25 May, 2018 for admission to our research programme. I am writing this letter to inform you about the interview procedure in our department, so that you can prepare well for it.

Upon arrival, you will be asked to indicate one or two proposed research areas based on your research interests. A sample list of areas is attached.

All candidates, across all research areas, will be examined on their analytical ability in two of the following areas of basic mathematics:

- Calculus and Differential Equations
- Matrix Analysis and Linear Algebra
- Fourier, Laplace, and z-Transforms
- Probability Theory and Random Processes
- Discrete Mathematics (combinatorics, graphs).

You will also be asked to indicate two of the above areas on which you will be tested.

Our interview process consists of an initial written test. The written test will be on the two areas of basic mathematics that you chose. The written test will be of 30 minutes duration starting at 9:15 am (for those asked to report at 9:00 am), and starting at 2:15 pm (for those asked to report at 2:00 pm) on each day. Please allow for traffic delays, and for travel within the IISc campus, to ensure that you are at the ECE department main lobby, IISc, at your reporting time.

A sample set of questions on each topic can be found on our webpage:
http://ece.iisc.ac.in/index.php/admissions/interview-information

The written test will be immediately followed by an oral interview for those candidates shortlisted based on their performance in the written test.

In the oral interview, you may be asked further questions on the chosen mathematics topics. The problems posed will not involve lengthy calculations, but will test the basics, and the ability to think “on one’s feet”. You may also be asked questions in the proposed area of research or any related area. These questions will be from topics of undergraduate study and topics of post-graduate study (as applicable). The nature of the questions will be to explore the student’s clarity of thought and depth of understanding of the topics, rather than descriptive system level knowledge.

Please visit the following website to familiarise yourself with the interview process:
http://ece.iisc.ac.in/index.php/admissions/interview-information

I look forward to seeing you.

With best wishes,

(A CHOCKALINGAM)
Chair
Department of ECE
Indian Institute of Science
BANGALORE – 560 012

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13 April, 2018
Please tick the degree applied for (M.Tech) Research/Ph.D)

Name of the Candidate: ____________________________
Appl.No. ____________________________

Date of Interview: ____________________________
Session: Forenoon/Afternoon ____________________________

Choose TWO areas of basic mathematics from the following:-

- Calculus and Differential Equations
- Matrix Analysis and Linear Algebra
- Fourier, Laplace, and z-Transforms
- Probability Theory and Random Processes
- Discrete Mathematics (combinatorics, graphs).

NOTE: Immediately after the interview, You have an option to change the priority order of the departments that you had indicated in your application form. Please inquire with the interview committee or office staff on the procedure.

Signature of the candidate: ____________________________
Preferences for Areas of Research (May 2018)

Please indicate your first and second preferences from the following areas (Mark 1, 2 for the areas; underline the sub-topics).

A. Communication and Networks:
- Information theory, network coding theory, information theoretic security, error control coding, coded modulation.
- Cooperative communications and network coding, coding for distributed storage, coding for storage media (HDD, flash, CDs, DVDs), data compression, index coding for wireless networks.
- Visible light wireless communication, space-time coding, low complexity MIMO/walluser detection, media-based modulation index modulation.
- Optical networks.
- Machine learning, decision making and optimization.

B. Signal Processing:
- Compressive sampling theory and sparse signal processing, recovery algorithms and applications.
- Source localization and tracking, indoor positioning.
- Signal processing for MIMO wireless communication systems, wireless sensor networks including sp SP algorithms and testing of PIR-based WSN.
- Image processing in brains and machines.
- Image and video processing - perceptual quality assessment and enhancement for camera pipeline processing, virtual reality streaming and computer-vision.

C. Microelectronics:
- Nanotransistors with Si, III-V, 2D materials (Graphene, TMD), spintronics, novel memory, CMOS sensors, Semiconductor optoelectronics, ultra-low power devices.
- Semiconductor spintronic devices, 2D valleytronics, photodetectors and IR detectors, solar cell.
- Analog, mixed-signal and RF integrated circuits.

D. RF & Microwave:
- Computational electromagnetics. Solutions to Maxwell's equations: boundary element method, finite difference time domain method, finite element method; high speed interconnect simulation; RF in automobiles.
- Antenna array analysis and design, Radar sensors.
- RF Circuits: Wireless power transfers; RF energy harvesting circuits.
- 5G mmWave Beamsteering circuits.

E. Photonics:
- Optical communication and networks.
- Photonic Integrated circuits.
- Optoelectronics.
- Nanophotonics.
- Bio photonics & Microscopy.
- Micro-opto-electro-mechanical system (MOEMS).
- Photonic Quantum Communications.

F. Cyber - Physical Systems:
- Hybrid system, co-design, distributed control, large scale IoT (Internet of Things) test beds, distributed computing architectures/Robotics.

NOTE: Immediately after the interviews, students have an option to change the priority order of the departments that they had indicated in their application forms.

Signature of the candidate: