

**Department of Computer Science and Engineering
Indian Institute of Technology Madras**

**Modified Procedure for PhD Interview
22nd May, 2021**

The PhD interviews would be conducted in research area-specific Panels. There are three interview panels and a candidate needs to choose at most two of the three panels for his/her interview. If selected for admission by a Panel, the candidate is expected to work with one of the members of the same Panel, as his/her research supervisor. The Panels are listed below and the details of panels are given later.

- Panel A: Theoretical Computer Science
- Panel B: Systems
- Panel C: Intelligent Systems

The aim of the interview process is to assess the knowledge and problem solving ability of the candidate in subjects that are fundamental to the research areas of the panel chosen by the candidate. In addition, the candidate would also be assessed for independent thinking and research aptitude.

This year, a large number of candidates preferred to be interviewed in two panels. Due to time constraints, the procedure for interview is modified as follows:

For every panel, there will be two rounds of interviews, Round 1 and Round 2. All the candidates who gave a panel as their first preference or second preference will be interviewed in Round 1 by that panel. Only those candidates whose performance in the Round 1 of a panel is above a threshold will be interviewed in the Round 2 of that panel. The final selection for the PhD program is based on the performance in Round 2.

For instance, if a candidate has opted for Panel C alone, the candidate would appear for Round 1 interview of Panel C. If another candidate has opted for Panel A as the first choice and Panel B as the second choice, then the candidate would appear for Round 1 interview of Panel A and Round 1 interview of Panel B. Further, depending upon the performance in individual Round 1 interviews, the candidate may be interviewed for Round 2 of either Panel A or Panel B or both.

For different panels, questions in Round 1 will be from the topics listed below.

Panel A: Discrete Mathematics (Combinatorics, basic graph theory, basic algebra and elementary properties of numbers as relevant), Data Structures and Algorithms, and Automata Theory

Panel B: Programming in C language

Panel C: Programming, Mathematical ability and Analytical ability

Dates for Interviews:

Round 1 interviews for Panel A and Panel B: 28th May, 2021

Round 1 interviews for Panel C: 28th and 29th May, 2021

Round 2 interviews for all Panels: 31st May, 2021 and 1st June, 2021

The details of the research areas and the subjects fundamental to the areas for each of the Panels are given below.

Panel A: Theoretical Computer Science and Related Areas

Research Areas for Panel A:

Cryptography, Secure Message Transmission, Provable Security of Cryptographic Protocols and Primitives.

Distributed Algorithms, Graph theory, Graph Algorithms, Parameterized Algorithms, Approximation Algorithms, Convex Relaxations, Computational Geometry, Algorithmic Game Theory.

Computational Complexity Theory, Structural and Circuit Complexity, Arithmetic Circuit Complexity, Lower Bounds, Derandomization, Analysis of Boolean Functions, PCPs and inapproximability. Advanced automata theory.

Lists of Subjects Fundamental to Research Areas of Panel A:

A candidate appearing for interview [in Round 2](#) in front of Panel A is required to select one subject from each of the two lists, List A1 and List A2, given below. The questions for the candidate during the interview will be related to these two subjects.

List A1:

- Discrete Mathematics (Logic, Proofs, Counting and Combinatorics, Sets, Relations, and Functions)
- Graph Theory.
- Theory of Computation.
- Data Structures & Algorithms.
- Probability Theory
- Linear Algebra
- Number Theory

List A2:

- Advanced Algorithms (Graphs OR Approximation OR Distributed OR Parameterized)
- Basics of Cryptography
- Basic Complexity Theory

Panel B: Systems and Related Areas

Research Areas for Panel B:

Object oriented systems, Software engineering, Distributed systems, Operating Systems, Databases, Cloud computing, Cluster computing, High-performance computing, Real-time systems, Parallel and distributed computing, Wireless networks, Optical networks, Wireless networks, Adhoc Networks, Sensor networks, Software Defined Networks/Network Function Virtualization, Internet of Things, Network Security.

VLSI, CAD systems for VLSI design, Software aspects of VLSI design Hardware and System Security, Side Channel Analysis, Cryptanalysis.

Computer Architecture, Compiler design, Program analysis applied to compiler optimizations, fault localization, large software systems, programming language design, Parallelization.

Lists of Subjects Fundamental to Research Areas of Panel B:

A candidate appearing for interview **in Round 2** in front of Panel B is required to select one subject from each of the two lists, List B1 and List B2, given below. The questions for the candidate during the interview will be related to these two subjects.

List B1:

- Digital Logic Design
- Computer Organization and Architecture
- Compilers
- Operating Systems
- Computer Networks
- Database Management Systems

List B2:

- Advanced Operating Systems
- Advanced Computer Architecture
- Advanced Database Systems
- Distributed Systems
- Wireless Networks
- Parallel Processing
- Formal Methods
- Secure Systems
- Cloud Computing
- Theory of Programming Languages.
- Program Testing/Verification
- Program Analysis and Compiler Optimizations
- Any other Systems related courses

Panel C: Artificial Intelligence, Human Computer Interface, and Related Areas.

Research Areas for Panel C:

Artificial Intelligence, Knowledge-Based Systems, Case-Based Reasoning, Memory-Based Reasoning, Mathematical Logic, Knowledge Representation, Automated Planning, Theory and Applications of Ontologies, Semi-Structured Data and XML, Data and Text Mining, Graph Indexing, Graph Mining, Trajectory Analytics, Bioinformatics.

Machine Learning, Reinforcement Learning, Deep Learning, Social Network Analysis, Data and Text Analytics, Neural Networks, Kernel Methods, Pattern Recognition, Natural Language Processing, Speech Technology, Computer Vision, Visual Perception, Digital Image Processing, Multi-Camera Vision Systems, Sensor Planning, Surveillance, Computer Graphics.

Bioinformatics, Computational Brain Research, Computational Biology, Systems Biology/Genomics.

Lists of Subjects Fundamental to Research Areas of Panel C:

A candidate appearing for an interview [in Round 2](#) in front of Panel C is required to select one subject from each of the two lists, List C1 and List C2, given below. The questions for the candidate during the interview will be related to these two subjects.

List C1:

- Programming and Data Structures
- Probability and Statistics
- Discrete Mathematics
- Linear Algebra
- Computer Organization and Architecture
- Operating Systems
- Signals and Systems

List C2:

- Artificial Intelligence
- Machine Learning
- Reinforcement Learning
- Natural Language Processing
- Computer Vision
- Speech Technology
- Computational Biology
- Computer Graphics