

# Application and Admission Procedure- PhD (CSE)

## How to Apply

1. Fill up the online application form. ([Click here](#))  
Last date of application - **24<sup>th</sup> Nov, 2015**
2. The candidates will be screened based on the information provided in the online application form.

## Entrance Test

- The shortlisted candidates will have to appear in a written test and an interview (if shortlisted after the programming test) at IIT-Delhi on 8<sup>th</sup> Dec, 2015.
  - **Venue:** IIT-Delhi
    - Reporting date: 8<sup>th</sup> Dec, 2015 (Tuesday)
    - Registration time: 8:30 A.M.
    - Following is the tentative schedule for the rest of the day.
    - Written test starts: 10:00 A.M.
    - Lunch: 12:30 P.M. (only for candidates)
    - Interview (for selected candidates): 02:30 P.M.
- **Documents:** Shortlisted candidates MUST bring with them the following documents for the purpose of verification of facts furnished in the application form.
  1. One recent passport size photograph
  2. Original mark sheets, degree and certificates (including X, XII, undergraduate, etc.)
  3. Proof of date of birth and photo identification
  4. Copies of all publications (if any)
  5. GATE/GRE/TOEFL/other score card (if any)
  6. Original copies of awards
  7. Sponsoring Certificate (for sponsored candidates)
  8. Any other document (in original form) that you have mentioned in the application form

You must bring with you COPIES of the above documents without fail. In case your last semester exam is not yet over or the results have not yet been declared, you should bring mark sheets / grade cards of all the previous semesters whose results have been declared.

## Written Test (for CSE)

- **Written test:** The written test will have two sections (Part A and B) as described below. The questions will be on standard B.Tech. level concepts (MSc for non CS/IT areas). Syllabus for the test is given below. The questions may be a mixture of multiple choice, fill in the blanks, one-two line answers, and similar short answers. They will not require long descriptive answers. Use of calculators and similar computing devices will not be permitted.

- **Part-A** is compulsory. This section will have questions from **discrete maths, data structures, algorithms and programming concepts**.
  - Syllabus:
    - Sets, Relations, Boolean Algebra, Combinatorics, Summation, Asymptotic notation, Recurrences, Basic data structures (arrays, linked-list, stacks, queues), Trees, Graphs, Sorting, Graph algorithms, Dynamic programming, Divide and conquer, Heaps, Hash tables, Basic programming concepts.
- In **Part-B**, candidates need to choose ANY ONE from the following 5 subsections. The candidate will have to specify their choice during registration ON THE MORNING of the test.

### 1. **Linear algebra, probability, statistics, logic.**

§ Syllabus:

Mathematical Logic: Propositional Logic; First Order Logic.  
 Probability: Conditional Probability; Mean, Median, Mode and Standard Deviation; Bayes Theorem, Random Variables; Distributions; uniform, normal, exponential, Poisson, Binomial.  
 Probability & Statistics: Probability space, conditional probability, Bayes theorem, independence, Random variables, joint and conditional distributions, standard probability distributions and their properties, expectation, conditional expectation, moments; Weak and strong law of large numbers, central limit theorem; Mean, Median, Mode and Variance, Testing of hypotheses, Distributions; uniform, normal, exponential, Poisson, Binomial.  
 Linear Algebra: Algebra of matrices, determinants, systems of linear equations, Eigen values and Eigen vectors.

### 2. **Computer networks, operating systems**

§ Syllabus:

Computer Networks: ISO/OSI stack, LAN technologies (Ethernet, Token ring), Flow and error control techniques, Routing algorithms, Congestion control, TCP/UDP and sockets, IP(v4), Application layer protocols (icmp, dns, smtp, pop, ftp, http); Basic concepts of hubs, switches, gateways, and routers. Network security basic concepts of public key and private key cryptography, digital signature, firewalls.  
 Operating System: Processes, Threads, Inter-process communication, Concurrency, Synchronization, Deadlock, CPU scheduling, Memory management and virtual memory, File systems, I/O systems, Protection and security.

### 3. **Databases and software engineering**

§ Syllabus:

Databases: ER-model, Relational model (relational algebra, tuple calculus), Database design (integrity constraints, normal forms), Query languages (SQL), File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control. Information Systems and Software Engineering: information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project, design, coding, testing, implementation, maintenance.

#### 4. **Computer hardware**

§ Syllabus:

Digital Logic: Logic functions, Minimization, Design and synthesis of combinational and sequential circuits; Number representation and computer arithmetic (fixed and floating point). Computer Organization and Architecture: Machine instructions and addressing modes, ALU and data-path, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage.

#### 5. **Artificial intelligence, machine learning and image processing**

§ Syllabus:

*Image understanding and representation, Image transformations, Filtering, noise removal, Edge detection, Color image processing, and transformations, Decision tree, and Bayes classification.*

**Programming Test:** There will be a separate programming test for CSE applicants.

Allowed programming languages for test: C / C++ / C# / Java

## Interview

- Shortlisted candidates (after the written/programming tests) will be interviewed on the same day.
- A final shortlist, based on the performance in the tests and the interview will be the final list of admitted candidates.
- All admission decisions (i.e. screening, shortlisting, and selection) made by the IIIT-D PhD Admission Committee will be final.