UNIVERSITY OF DELHI
DEPARTMENT OF COMPUTER SCIENCE

Ph.D. Computer Science Admissions 2012-2013

Important Dates and Timings

Ph.D. Computer Science	
Application Form	Click Here.
Receipt of completed application forms	Latest by 8th June 2012
Date of Entrance Test	26th June 2012
Reporting Time for Entrance Test	10:30 A.M.
Interview Schedule	Will be announced on our website. Please keep track of the website http://cs.du.ac.in. .

UNIVERSITY OF DELHI
DEPARTMENT OF COMPUTER SCIENCE

Bulletin of Information
2012 - 2013

Ph.D. Computer Science

Dr. Vasudha Bhatnagar
HEAD OF THE DEPARTMENT

FACULTY MEMBERS

1.	Ms. Vidya Kulkarni	Associate Professor
2.	Mr. P.K.Hazra	Associate Professor
3.	Dr. S. K. Muttoo	Associate Professor
4.	Dr. Naveen Kumar	Associate Professor
5.	Dr. Punam Bedi	Associate Professor
6.	Dr. Neelima Gupta	Associate Professor
7.	Dr. Vasudha Bhatnagar	Associate Professor

ADJUNCT FACULTY

1.	Dr. Yogish Sabharwal	IBM India Research Lab, New Delhi

ADMINISTRATIVE STAFF

1. Mr. Ram Rai Singh Bedi   Office In-charge

2. Mr. Kanhiya Lal   J.A.C.T.

3. Ms. Himani Saini   J.A.C.T.

4. Mr. Rajbir Giri   Office Attendant

5. Mr. Balkishan   Office Attendant

TECHNICAL STAFF

1. Ms. Devki Rawat   Technical Assistant

2. Mr. Nikhil   Technical Assistant

3. Mr. Banshraj Ram   Laboratory Attendant

4. Mr. Anand Singh   Laboratory Attendant

5. Mr. Nishant Beniwal   Laboratory Attendant

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WEBSITE: http://cs.du.ac.in

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1. Introduction

Established in the year 1922, University of Delhi is one of the most prestigious institutions in India. Since its inception it has been a centre of academic excellence. The Department of Computer Science was established in University of Delhi in the year 1981, with the objective of imparting quality education in the field of Computer Science.

Doctor of Philosophy (Ph.D.)

The department has strong research interests in diverse branches of Computer Science and offers a Doctor of Philosophy (Ph.D.) programme aimed at producing quality researchers.

2. Important Dates and Timings

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Interview Schedule	Will be announced on our website. Please keep track of the website http://cs.du.ac.in.

Note:

i.   All information related to admission, including Entrance Test results and schedule for counseling shall be notified on the department website http://cs.du.ac.in.

ii. The Entrance Test will be conducted at University of Delhi only.

iii.   Send the completely filled application form to the following address along with the Bank draft:

<div align="center">

Department of Computer Science
(Faculty of Mathematical Sciences)
1st Floor, New Academic Block
University of Delhi
Delhi - 110007 (INDIA)

</div>

A pdf copy of application may be sent by email to phd.admissions.cs.du@gmail.com along with scanned copy of the draft. Application must be accompanied with a self-addressed envelope stamped with sufficient postage.

Note: **The Department will not be responsible for non-delivery or delayed delivery of the form sent by post or email.**

3. Eligibility Conditions

The following categories of candidates can be registered for the degree of Doctor of Philosophy by the Departmental Research Committee, provided that they fulfill the eligibility conditions:

1)   Students having fellowships/scholarships instituted by the University/National and international agencies under schemes approved /recognized by the University, through procedure laid down by the University, may be registered provisionally by the Departmental Research Committee and Board of Research Studies, and confirmed after completion of course work, by the respective Board of Research Studies.

2)   Students who are otherwise eligible for admission to the Ph.D. Programme and do not have any financial assistance, will be admitted through an entrance examination to be conducted by the respective departments or / and through an interview by the Departmental Research Committee. Students provisionally admitted to the Ph.D. Programme through an entrance examination or interview will be awarded University Grants Commission fellowships for programmes of doctoral research or any other fellowship that is launched by the national agencies. The number of fellowships under this category will be determined annually by the Department.

3)   Foreign students with their national or other fellowships recognized by the University or sponsored by their employers, may be given provisional admission, followed by confirmation through due process after a stipulated period of time.

4)   The University/College teachers holding a permanent, temporary or Adhoc positions and having completed two years of service as teacher in a Department/Constituent Colleges of the University of Delhi.

5) Candidates sponsored by their employers shall be considered only if they get study leave for a period of two years to fulfill residency requirements of the University of Delhi.

6) Permanent teachers/employees, who are in service in any other recognized University/College/Research Institute in India and have a minimum of three years teaching/research experience, will be considered if they get study leave for a period of two years to fulfill residency requirements of the University of Delhi.

4. Ph.D. Ordinance

Candidates are advised to go through the University Ordinance before applying for the program. Click here to see the Ph.D. Ordinance.

5. Application Fee

Ph.D. Computer Science	Rs.600 for General Category
	Rs.300 for SC/ST/PH Category

Mode of Payment	Payment should be made by crossed Bank Draft in favour of **"Registrar, University of Delhi"** Payable at New Delhi.

Drafts issued by all SCHEDULED commercial banks are acceptable.

6. Admission Ticket for Ph.D. Computer Science

In case of non-receipt of the Admission Ticket for any reason, a request may be made to the department with two copies of photograph along with proof of having sent the application, not earlier than three days prior to the date of the Entrance Test for issue of a duplicate admission ticket. The candidate will be required to show the admission ticket at the time of the test. No candidate will be admitted to the Examination Hall without the admission ticket.

7. Admission of Foreign Nationals

Foreign students seeking admission in the department and satisfying the eligibility criteria as mentioned in (3) are required to apply through the Deputy Dean (Foreign Students), Foreign Students Registry (FSR), c/o Room No. 11, First Floor Conference Center University of Delhi, Delhi - 110 007 (India). However, those foreign students who have passed the Master's Degree examination (or are appearing for the same) from an Indian University would be required to appear for the Entrance Test conducted by the Department of Computer Science. In addition to applying through the Foreign Student's Registry office, these students would also be required to fill up the application form of the Department of Computer Science. On qualifying for admission, the admission of the foreign students will be finalized

through the FSR office of University of Delhi. No foreign students will be admitted directly by the Department.

Foreign students are advised to submit TOEFL/IELTS score.

8. Admission Procedure

For the candidates not funded by any agency, admission to the Ph.D. program in the department consists of the following stages:

i.   Admission to the Ph.D. programme consists of two-step screening process: Entrance Test/GATE (98 percentile or higher)/NET followed by interview.

ii. Entrance Exam consists of two parts:

Part I: Objective Type
Part II: Subjective

Note: Part II shall be evaluated only for candidates securing at least 40% in Part I.

iii. Candidates shortlisted on the basis of Part II of Entrance Test/GATE (98 percentile or higher)/NET will be called for interview.

iv. Candidates shortlisted on the basis of interview will be required to look for a supervisor and fill up the application form, which he/she will get from the office of Board of Research Studies (Ground Floor), Faculty of Mathematical Sciences, University of Delhi, Delhi-110007, for the purpose of admission to the program.

v.   The final admission (provisional) admission is subject to approval of the DRC and BRS(MS).

Exemptions from Screening:

i.   JRF or any national Fellowship

ii. Permanent/Temporary teachers of University of Delhi with at least two years of experience.

iii. Project Associates appointed by the selection committee including VC's nominee and duly approved by the University.

iv. University Teaching Assistantship

9. Course Work Requirement

A student should undertake two 3 credits courses as follows:

i.   **Fundamentals (RCS 101):** Data Structures, Algorithms & Systems.

ii. One of the following:

- **Research Electives (RCS 102):** A combination of three electives as advised by the Advisory Committee of one credit each shall constitute the full course. Only limited number of combinations may be available in a particular semester.

  a) Neural Networks
  b) Swarm Intelligence
  c) Algorithmic Graph Theory
  d) Approximation Algorithms
  e) Theory of NP Completeness
  f) Software Quality Assurance
  g) Adhoc Networks
  h) Human Computer Interaction (HCI)
  i) Combinatorial Optimization
  j) Image Processing
  k) Software Testing
  l) Information Security
  m) Information Hiding Techniques

- **RCS 103:** One of the following

  a) Special Topics in Computer Networks
  b) Special Topics in Data Mining
  c) Special Topics in Computational Intelligence
  d) Special Topics in Theoretical Computer Science
  e) Special Topics in Information Security
  f) Special Topics in Soft Computing
  g) Special Topics in Database Systems
  h) Special Topics in Artificial Intelligence

Syllabi for Ph.D. Courses

Job-commitment

Candidates admitted through an entrance exam cannot take up a job for at least two years.

10. Fellowships

i. University Fellowship: Candidates admitted through an entrance exam shall be entitled for the award of University scholarship of Rs. 5000/- (number of seats to be confirmed).

ii. UGC Scholarship: Candidates admitted through an entrance exam can also apply for the UGC scholarship of Rs. 8000/- (to be confirmed) Number of such **scholarships is limited and the selection is through a selection committee as announced from time to time.**

11. Syllabus for the Entrance Test

Ph.D. Computer Science

Programming Fundamentals, Data Structures, Discrete Structures, Algorithms, Operating Systems, Computer Networks, Computer System Architecture. Refer to the syllabus of MCA at the department website for the details.

12. Jurisdiction of Statutory Authorities

Information contained in this bulletin is subject to any subsequent directives of the statutory authorities.

13. Sample Questions

Sample Paper for Admission to Ph.D. Program

Part I
Time: 30 min Max Marks: 15
Each Q carries 1 mark. ¼ marks will be deducted for every wrong answer. Part II of only those candidates will be evaluated who will score at least 6 marks in Part I.

1. Consider a linked list whose node has two fields: "info" field containing information and "next" field containing address of the next node in the list. The code to insert a node pointed to by q, at the end of the list is
   (1) for (ptr = list; ptr-> next != Null; ptr = ptr->next)
       ptr -> next = q;
   (2) for (ptr = list; ptr != Null; ptr = ptr->next)
       ptr -> next = q;
   (3) for (ptr = list; ptr-> next != Null; ptr = ptr->next);
       ptr ->next = q;
   (4) for (ptr = list; ptr != Null; ptr = ptr->next)
       ptr = q;

2.   What will be the output of the following code segment, if the function is called as fn(10, 20) ?

```
int fn(int x, int y) {
int temp = x;
if (temp < y) {
temp = y;
return y;
}
else
return x;
cout << "Larger of " << x << " and " << y << " is " << max;
}
```

(1) Program will not compile as the function has two return statements.
(2) Larger of 10 and 20 is 10.
(3) Larger of 10 and 20 is 20.
(4) No output.

3.   The internal data structure used by the system (compiler/assembler) to implement procedure calls is
(1) Arrays
(2) Linked list
(3) Queues
(4) Stacks

4.   To insert an element into a sorted list, which of the following is true?
(1) The element can be inserted in a sorted array in constant time.
(2) The element can be inserted in a sorted linked list in constant time.
(3) The element can be inserted in a binary search tree in O(log n) time, where n is the number of elements in the list.
(4) None of the above.

5.   You have an array of student records in descending order of their roll-numbers. Which algorithm will put the array in increasing order of the roll-numbers in minimum time?
(1) Insertion sort
(2) Quick sort
(3) Merge sort
(4) Selection sort

6.   Consider Insertion Sort performed on an array of n elements. The number of comparisons performed by the algorithm to insert the ith element into the sorted sublist consisting of the first $i - 1$ elements in the worst case is
(1) n
(2) 1
(3) i - 1
(4) n -1

7. Consider the following algorithm to compute x^n for any x. Assume $n = 2^m$, where m is a non negative integer.
    prod = x;
    for i = 1 to m do
    prod = prod * prod;
    Output prod;
    The recurrence relation for the time complexity of the above algorithm is
    (1) $T(n) = T(n/2) + 1$
    (2) $T(n) = T(n-1) + n$
    (3) $T(n) = 2*T(n/2) + 1$
    (4) None of the above

8. In the cable TV with multiple channels running several programs with commercial breaks, which of the following is/are used?
    (1) Frequency Division Multiplexing only
    (2) Time Division Multiplexing only
    (3) Both Frequency Division Multiplexing and Time Division Multiplexing
    (4) Code Division Multiplexing

9. What is the role of MAC sub-layer in computer networks?
    (1) Map the IP addresses to MAC addresses.
    (2) Control the access to the channel so that the chances of collision are reduced.
    (3) Route the data frames from one LAN to another.
    (4) Enhance the quality of the signal.

10. Http is a/an
    (1) application layer protocol
    (2) transport layer protocol
    (3) network layer protocol
    (4) Internet layer protocol

11. Which of the following is true?
    (1) There is no internal fragmentation in paging scheme.
    (2) There is no external fragmentation in segmentation scheme.
    (3) There is no internal fragmentation in segmentation scheme.
    (4) There is no fragmentation in paging scheme.

12. Which of the following sets of scheduling schemes suffer from the problem of starvation?
    (1) Shortest Job First and Round Robin.
    (2) Priority Scheduling and First Come First Serve.
    (3) Round Robin and First Come First Serve.
    (4) Shortest Job First and Priority Scheduling.

13. The binary representation of -16 in signed 2's complement requires at least _____ bits.
    (1) 4

(2) 5
(3) 3
(4) 6

14. A 32-bit processor has
    (1) 32 registers
    (2) 32 I/O devices
    (3) 32 Mb of RAM
    (4) a 32-bit bus and 32-bit registers

15. Cache memory enhances
    (1) memory capacity
    (2) memory access time
    (3) secondary storage capacity
    (4) secondary storage access time

Part II
Time: 1 hour Max Marks: 30

1. Write a recursive function in C to compute the maximum of n elements in an array.

3

2. What is the difference between "int" and "long int" in a typical programming language?

1

3. What is the height of a binary search tree with n nodes in the worst case?

1

4. What is the difference between "data type" and "data structure"?

2

5. What are the main advantages and disadvantages of arrays over linked list?

2

6. Write a "for-loop" in C/C++/Java to insert an element x in an array A containing n elements at position k (k<n).

2

7. Which sorting algorithm is best suited to sort the roll numbers of the students in a university? The roll numbers are 7 digit numbers. What is the time complexity of the algorithm?

2

8. A large integer is an integer number that cannot be stored in a constant number of memory words and the number of words it requires grows as the value of the integer number grows. Give an algorithm to add two large integers.

3

9. What is the difference between local IP address and public IP address?

2

10. Give two advantages of framing, in a computer network.

2

11. Write -48 in 2's complement representation.

2

12. What do you understand by a core-2-duo processor?

1

13. Differentiate between logical address and physical address. Explain very briefly with the help of an example.

3

14. What do you understand by virtual memory space? Explain very briefly with the help of an example.

2

15. What is the role of an operating system in a computer? Write in no more than 15 words.

2