

**DEPARTMENT OF OPERATIONAL RESEARCH  
FACULTY OF MATHEMATICAL SCIENCES  
UNIVERSITY OF DELHI  
DELHI-110 007**

**Admission to Ph.D. Programme in Operational Research**

**General Information**

The Ph.D. Programme consists of two parts. In part-I, the student is required to study a compulsory course on Research Methodology and two courses from the list of courses offered by the Department from time to time. In part-II, the student is required to write a dissertation under an approved supervisor from the Department.

The major thrust areas include: (i) Mathematical Programming (ii) Inventory and Production Management (iii) Theory of Reliability (iv) Supply Chain Management (v) Marketing (vi) Software Reliability (vii) Queuing Theory and Stochastic Modeling.

**Eligibility:** The candidate should have a minimum of 55% marks (or equivalent CGPA score) in Master's Degree in Operational Research or in an allied subject with at least two papers in Operational Research with 60% or above marks from a recognized university/institute. Additionally, the common eligibility criteria as per University rules will also be applicable.

**Note:** As per University rules, for admission to the Ph.D. Programme, the OBC/SC/ST candidates shall be given 5% relaxation in the minimum eligibility marks.

**How to apply:** Online registration through University Admission Portal for M.Phil./Ph.D. admissions.

**Selection Procedure:**

- The admission to Ph.D. programme is through Written Examination based on Multiple Choice Question pattern.
- The Entrance Test will be a qualifying examination with qualifying marks as 50%. The syllabus for the entrance test will consist of 50% questions on research aptitude/methodology and 50% subject-specific questions.
- The shortlisted candidates on the basis of Written Examination will be called for the Interview.

**Notes:**

- There will be a common Written Examination for both M.Phil. and Ph.D. programmes in Operational Research.
- No TA/DA will be paid for attending the Written Test and Interview.

**Syllabus for Ph.D. Entrance Examination:** The syllabus for the written examination is from the following areas.

**Operational Research** Definition and scope of operations research, Formulation of simple linear programming problems, Linear independence and dependence of vectors, Simplex method, Duality, Complementary slackness theorem, Simple transportation and assignment problems, Convex functions and their basic properties, Lagrange theorem, KKT optimality conditions, quadratic programming, Characteristics of Inventory system, Simple economic lot size inventory models with and without shortages, Economic production quantity model, Reorder level, Simple single period stochastic inventory model, Definition of Queues and their characteristics, Queueing models with Markovian input and Markovian service, M/M/1 & M/M/C queueing models, Definitions of reliability and availability, Reliability of multi components systems, Failure time distributions- exponential and weibull.

**Research Methodology** Criteria of good research, Ethical issues in research such as plagiarism, falsification, integrity and misleading authorship, Statistical measures, Measurement and scaling techniques, Probability, Conditional probability, Theorem of total probabilities, Bayes theorem, Random variables, Sampling fundamentals, Sampling distributions, Sampling theory, Estimation, Testing of hypothesis, Correlation and regression

### **Course Structure**

There will be 3 Courses for the Ph.D. Coursework. Each student shall undertake one compulsory course on Research Methodology (Course Code: Ph.D. - 01) and two other courses decided by his/her Supervisor

### **Courses (i)-(ix) : Any two of the following**

- (i) Ph.D.–02: Inventory and Production Management
- (ii) Ph.D.–03: Marketing Management
- (iii) Ph.D.–04: Mathematical Programming
- (iv) Ph.D.–05: Theory of Reliability
- (v) Ph.D.–06: Software Reliability
- (vi) Ph.D.–07: Queueing Systems
- (vii) Ph.D.–08: Supply Chain Management
- (viii) Ph.D.–09: Financial Engineering
- (ix) Ph.D.–10: Network Optimization

Note: Re-examination or supplementary exam of Ph.D. Coursework if needed will be conducted in July.