

## M.Sc. Operational Research at University of Delhi, North Campus

M.Sc. Operational Research is a two-year post graduate course. The number of seats in this course is 93 (including all reservations). This course includes a number of techniques of Operational Research: Linear, Nonlinear, Parametric and Network Optimization, Queueing, Inventory, Reliability, Marketing, Quality Control etc.. The curriculum emphasizes on formulation of OR models and algorithms. Students are encouraged to develop skills in setting up and analyzing Operational Research models. The course demonstrates factors and restrictions involved in building and using models for planning and management problems. Case studies, Projects and use of OR software are constituents of the course.

### Eligibility

#### Eligibility for Admission:

Examination passed	Percentage Required
1. Any Master's Degree examination of the University of Delhi or an examination recognized as equivalent thereto with atleast two papers in Mathematics/ Computer Science/Statistics/Operational Research at graduation/ higher level.	55% marks in aggregate
OR	
2. Any Bachelor's Degree examination under 10+2+3 scheme of examination of the University of Delhi or an examination recognized as equivalent thereto with atleast two papers in Mathematics/ Computer Science/Operational Research/ Statistics.	55% marks in aggregate

### Note:

1. The candidates who are appearing in the final year examination of the degree on the basis of which admission is sought are also eligible to apply.
2. Applicants who have graduated under 10+2+3 scheme or an equivalent scheme are eligible for admission.
3. The admissions to M.Sc. Operational Research and M.A./ M.Sc. Applied Operational Research shall be finalized by submitting the proof of the eligibility conditions document not later than 31st August, 2014. Provisional admission of the students who fail to meet the eligibility conditions and /or fail to submit result of their qualifying degree examination latest by August 31, 2014 shall be annulled without any prior notice to the candidate.

### AGE

As per Ordinance I of the University, there is no minimum age bar for admission to the under-graduate and post-graduate courses in the University and its colleges except in the courses where the respective regulatory bodies (such as MCI, AICTE etc.) have prescribed the minimum age requirement in their regulations.

## No. of Seats

Category wise breakup of Seats

<b>M.Sc. OPERATIONAL RESEARCH</b>	
<b>Categories</b>	<b>No. of Seats</b>
General	47
Schedule Caste	14
Schedule Tribe	7
OBC	25
<b>Total</b>	<b>93</b>
PWD*	3
Sports*/ECA*	upto 05 (upto 5%)
CW*	5
Foreign Nationals*	upto 05 (upto 5%)

\* supernummary as per the University of Delhi rule

## Syllabus for entrance examination

**Vocabulary and analytical skills:** This part is intended to test the candidate's vocabulary and analytical skills at a level essential for accurate comprehension and presentation of material appropriate for this degree. The language background expected will be of the level of English at Senior Secondary Examination. The paper will include passages for comprehension, test of vocabulary (synonyms and antonyms), elementary grammar and syntax. The section on Analytical Ability and Reasoning will include standard questions on pattern recognition, logic, Venn diagrams etc. It is not intended to be subject-specific.

**Mathematics:** Vector Space, subspace and its properties, linear independence and dependence of vectors, matrices, rank of a matrix, reduction to normal forms, linear homogenous and non-homogenous equations, Cayley-Hamilton theorem, characteristic roots and vectors. De Moivre's theorem, relation between roots and coefficient of nth degree equation, solution to cubic and biquadratic equation, transformation of equations.

Calculus : Limit and continuity, differentiability of functions, successive differentiation, Leibnitz's theorem, partial differentiation, Euler's theorem on homogenous functions, tangents and normals, asymptotes, singular points, curve tracing, reduction formulae, integration and properties of definite integrals, quadrature, rectification of curves, volumes and surfaces of solids of revolution.

Differential Equations: Linear, homogenous, separable equations, first order higher degree equations, algebraic properties of solutions, linear homogenous equations with constant coefficients, solution of second order differential equations. Linear non-homogenous differential equations.

Real Analysis : Neighbourhoods, open and closed sets, limit points and Bolzano Weierstrass theorem, continuous functions, sequences and their properties, limit superior and limit

inferior of a sequence, infinite series and their convergence. Rolle's theorem, mean value theorem, Taylor's theorem, Taylor's series, Maclaurin's series, maxima and minima, indeterminate forms.

**Statistics:** Measures of central tendency and dispersion and their properties, skewness and kurtosis, introduction to probability, theorems of total and compound probability, Bayes theorem, random variables, probability mass and density functions, mathematical expectation,

moment generating functions, Binomial, Poisson, Geometric, Exponential and Normal distributions and their properties, method of least squares, correlation and regression, introduction to sampling, sampling distributions and tests of significance based on t, Chi-square and F-distributions.

**Operational Research:** Definition & scope of Operational Research, Formulation of simple Linear Programming Problems, Simplex method and basics of Duality.

Characteristics of Inventory System, Simple Economic Lot Size Inventory models, 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, Availability, Reliability of multicomponents systems, failure time distributions: exponential and Weibull.

**Computer Science:** Flowcharts and algorithms, Number system: binary, octal, hexadecimal; Truth values, Logical operations, Logic functions and their evaluation.

Computer basics, Computer generations and classifications, Fundamentals of high level languages, Fundamentals of Operating System, C Programming Language.