

UNIVERSITY OF DELHI
DEPARTMENT OF OPERATIONAL RESEARCH

- **M. Sc. Operational Research**
- **M.A./ M. Sc. Applied Operational Research
(SOUTH CAMPUS)**



BULLETIN OF INFORMATION
2014-2015

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M.Sc. Operational Research and M.A. / M.Sc. Applied Operational Research

Schedule of Admission

1	(a) Starting date of obtaining Application Forms for Common Entrance Test	10th March, 2014 (Centralized Registration : Common Web Portal)
	(b) Last date for receipt of completed Application Forms	18th April, 2014
2	Date of Common Entrance Test	Sunday, June 1, 2014 (10:00 A.M.)
3	Declaration of result of Common Entrance Test	9th June, 2014*
4	Group Discussions and Interviews	16th -20th June, 2014*
5	Admission List	End of June, 2014*

***Tentative Dates**

Notes:

(1) The list of candidates selected for interview will be notified in the Department of Operational Research and on the Website (www.du.ac.in). It is, therefore, the responsibility of the candidates to contact the Department personally.

(2) The Common Entrance Test will be conducted at University of Delhi only.

I. Introduction

University of Delhi, established in 1922, is the premier University of the country and is known for its high standards in teaching and research and attracts eminent scholars to its faculty.

Part of University of Delhi, the Department of **Operational Research (OR)** is the only of its kind in India. Its philosophy in both teaching and research is to combine intellectual rigour with a strong emphasis on practical applications. It has an international reputation for developing both quantitative and qualitative modeling methods. The alumni of the department hold important positions in the best of Indian as well as multinational companies.

Operational Research as a subject was introduced in the University of Delhi in 1963 with the introduction of a two year Post Graduate programme. A decade later the Department of Operational Research was independently set up under the Faculty of Mathematical Sciences. It is the first Department to start a Post Graduate programme of Operational Research in India.

In 1994, the Department also introduced Post Graduate programme in **Applied Operational Research (AOR)** at South Campus. Besides these courses, the Department also offers **M.Phil** and **Doctorate** programmes.

OR is the discipline of applying advanced analytical methods to help make better decisions, by using techniques such as mathematical modeling to analyze complex situations. It gives executives the power to make more effective decisions and build more productive systems.

OR has firmly embedded itself in a wide range of sectors, including manufacturing, transport, retailing, marketing, the financial and service sectors, defense, revenue management, consultancy, supply chain management, engineering etc..It also addresses a wide variety of issues in communication systems, computer operations, design and networking, inventory planning, manufacturing, distribution and many other topics that aim to improve business productivity.

World over many companies (IBM, AMR Corp. parent company of American Airlines, Proctor & Gamble, Hewlett Packard Corp., Merrill Lynch and Company, Taco Bell Corp., British Airways) are making extensive use of Operational Research techniques and have dedicated OR groups working for them. In India too, many companies like TISCO, Reliance Petrochemicals, JK Tyres, Hindustan Levers Limited, Asian Paints, GE Capital, Inductis, Progeon, Skytech Solutions etc. are applying OR for increasing their productivity gains.

The overall aim of the M.Sc. OR and M.A. /M.Sc AOR programmes is to produce good analysts who will be in high demand from OR groups in business, government and management consulting companies. This means that in addition to acquiring skills in formal techniques of OR, students learn to apply theories and concepts in a creative and

practical way. They also develop the intellectual and personal skills needed to work on complex issues in an organization often as a part of team. The programme places heavy emphasis on practical experiences for which extensive interaction with the industry is built into the curriculum. The final year students are required to engage themselves in industry oriented projects as a part of their regular course work. Students spend a lot of time working within an established **OR** (or related) group, gaining preliminary experience of how analysis is carried out in an organizational setting and submit their findings in the form of a project report for evaluation.

II. Courses Offered

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.

M.A. / M.Sc. Applied Operational Research at University of Delhi, South Campus

M.A. / M.Sc. Applied Operational Research is a two-year post graduate course. The number of seats in this course is **47** (including all reservations). This course was started in the year 1994. The curriculum lays heavy emphasis on experimental and process-oriented learning. The pedagogical tools include the use of case studies and industry oriented project work. Besides building up skills of individual decision making, lot of emphasis is laid on developing team skills and value focused decision making.

M.Phil and Doctor of Philosophy (Ph.D) Programmes

The Department has strong research interest in different subject areas of OR and offers M.Phil and Doctor of Philosophy (Ph.D) programmes aimed at producing quality researchers.

III. Eligibility Conditions for Admission to M.Sc. Part-I in Operational Research and M.A. /M.Sc. Part-I in Applied Operational Research, 2014-2015

Examination passed	Percentage Required
(a) 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

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
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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.*

IV. 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.

V. *Relaxations/ Concessions*

(a) **Scheduled Caste / Scheduled Tribe**

The minimum eligibility requirement for the Scheduled Caste/ Scheduled Tribe candidates will be that they must have passed the qualifying school/ degree examination. Provided that the minimum eligibility for admission to post-graduate courses be the minimum pass marks of the qualifying examination concerned of the University of Delhi. In the case of the Scheduled Castes/ Scheduled Tribe candidates who had passed the last qualifying examination from other Universities, they should have secured at least the same percentage of pass marks at the qualifying examination as prescribed for the equivalent examination of Delhi University for purposes of admission to the Post-graduate course of this University.

That where the admission is based on screening/ written test, both for under-graduate and post-graduate courses, the Scheduled Castes/ Tribes candidates would also be required to take the test but their merit list be drawn separately and permitted as per the reservation quota.

However, for admission to the M.Phil and Ph.D. programmes, the SC/ST candidates shall be given 5% relaxation in the minimum eligibility marks.

(b) **Other Backward Classes**

The OBC candidates shall be given a relaxation in the minimum eligibility in the qualifying examination and in the minimum eligibility (if any) in the admission entrance test to the extent of 10% of the minimum eligibility marks prescribed for the General category candidates. For example, if the minimum eligibility for admission to a course is 50% for the General Category candidates, the minimum eligibility for the OBCs would be 45% i.e. (50% less 10% of 50%).

All those OBC candidates who meet the minimum eligibility marks in the qualifying examination and the minimum eligibility marks (if any) in the entrance test shall be eligible for admission to in the order of their merit, keeping in view the availability of seats reserved for them.

The OBC candidates who belong to the '**Non-Creamy Layer**' and whose castes appear in the **Central List** of the OBCs only shall be eligible to be considered for admission under the OBC Category.

(c) **Persons with Disabilities (PWD)**

5% Relaxation in the minimum eligibility in qualifying the School/ Degree Examinations shall be given to the Persons with Physical Disability with not less than 40% disability.

Candidates seeking admission under reservation shall be required to fulfill other criteria of admission as detailed in eligibility conditions except relaxation of 5% marks in the minimum eligibility conditions. In case of a course where admission is by entrance examination 5% concession shall be granted in the minimum eligibility condition for admission to the test.

(d) **Children/ Widows of the eligible Armed Forces Personnel (CW)**

A concession of 5% marks in the minimum eligibility requirements in the qualifying examinations.

(e) The candidates belonging to the Scheduled Caste, Scheduled Tribes, and Persons with Physical Disability shall be charged the admission form/ entrance examination fee at concessional rates.

VI. Reservations

(a) **Scheduled Caste/ Scheduled Tribe/ Other Backward Classes**

Reservation of seats in admissions to various under-graduate and post-graduate courses, including the M.Phil. programme, shall be in the following manner:

Scheduled Caste	=	15 % of total intake in each course
Scheduled Tribe	=	7½ % of total intake in each course
Other Backward Classes	=	27% of total intake in each course

The seats reserved for the SC/ ST shall be filled by the SC/ ST candidates only. However, in case of non-availability of the eligible candidates the reserved seats may be interchanged between the SC & ST. If still any seat remains unfilled, the same shall be left vacant.

The seats reserved for the OBCs remain vacant; the said seats shall be filled with the OBC students. Only if OBC candidates possessing the minimum eligibility marks are not available in the OBC Category then the vacant OBC

seats shall be converted into General Category seats in accordance with the admission schedule notified by the University.

(b) Supernumerary seats

- (i) Persons with Disabilities (PWD) = 3% of total intake (1% each for the persons with low vision or blindness, hearing impaired and loco motor disability or cerebral palsy (interchangeable in case of non-availability of candidates in the sub-categories).
- (ii) Children/ Widows of the eligible Armed Forces Personnel (CW Category) = 5% of the seats in each course.

As per the guidelines approved by the Academic Council, admission of candidates belonging to CW categories have to be made in the following order of priorities :

- I
 - I. Widows/ Wards of Defence personnel killed in action;
 - II. Wards of serving personnel and ex-servicemen disabled in action;
 - III. Widows/ Wards of Defence personnel who died in peace time with death attributable to military service;
 - IV. Wards of Defence personnel disabled in peace time with disability attributable to the military service; and
 - V. Wards of Ex-servicemen personnel and serving personnel including personnel of police forces who are in receipt of Gallantry Awards; Category-V (Gallantry Awards) include : Param Vir Chakra, Ashok Chakra, Sarvottam Yudh Seva Medal, Maha Vir Chakra, Kirti Chakra, Uttam Yudh Seva Medal, Vir Chakra, Shaurya Chakra, Yudh Seva Medal, Sena, Nau Sena, Vayusena Medal, Mention-in-Depstaches, President's Police Medal for Gallantry, Police Medal for Gallantry.
- (iii) Foreign Nationals = 5% seats in first year of each course in Colleges.

The foreign nationals seeking admission in the University / its colleges shall have to get themselves registered with the Foreign Students Registry in compliance with the schedule notified by the

FSR. No foreign students will be admitted directly by the Department/ Colleges.

The address of the Foreign Students Registry is :

Conference Centre, opposite Department of Botany, University of Delhi, Delhi-110007.

(iv) Sports/ ECA Persons = upto 5% of total intake in each course.

Admission under these categories shall be made in accordance with the guidelines issued by the University from time to time.

3. The merit list for the general category seats will comprise of all the candidates in the order of merit. No one will be excluded from the same. In other words, it will also include SC/ ST/ OBC candidates if they come in the general merit. A candidate cannot be excluded from the general category merit list just because he belongs to SC/ST/OBC. Such a candidate is entitled to be considered under the general category, as well as under the reserved category. Admission to open category seats will be strictly in the order of merit without excluding SC/ ST/ OBC candidates.
4. As per A.C. Resolution 40 dated 24/04/1997, no student of the University shall be permitted to pursue two degree courses simultaneously either from the University of Delhi or from other University except the part-time diplomas/ certificates of the University of Delhi.

VII. Certificate Required for Reserved Categories:

- (a) **SC/ST/OBC Certificate** : For admission to a seat reserved for Scheduled Castes/ Scheduled Tribes/OBC, attested copy of certificate should be submitted from an approved district authority stating the Scheduled Caste/Tribe/ OBC to which the candidate belongs. A list of approved authorities is given below:
 - (i) District Magistrate/ Additional District Magistrate/ Collector/ Deputy Collector/ Deputy Commissioner/Additional Deputy Commissioner/ Ist Class Stipendiary Magistrate/City Magistrate, not below the rank of 1st Class Stipendiary Magistrate / Sub- Divisional Magistrate/ Taluka Magistrate/ Executive Magistrate/ Extra Assistant Commissioner.
 - (ii) Chief Presidency Magistrate/Additional Chief Presidency Magistrate/ Presidency Magistrate.
 - (iii) Revenue Officer not below the rank of Tehsildar.

- (iv) Sub Divisional Officer of the area where the candidate and / or his/ her family resides.
- (v) Administrator / Secretary to Administration / Development Officer (Lacadive and Minicoy Islands).

(b) Entitlement Card/ Certificate: The Children or Widows/ Wives of Officers and Men of the Armed Forces including Para Military Personnel killed or disabled in action, Wives/ Widows/ Children of Officers and Men of the Armed Forces including Para Military personnel who died/were disabled while on duty will be required to provide attested photocopy of Entitlement Card/ Certificate from the competent authority. Authorities Competent to issue certificates under CW category :-

- Secretary, Kendriya Sainik Board, Delhi
- Secretary, Rajya Zila Sainik Board
- Office-in-Charge, Records Office
- Ist Class Stipendiary Magistrate
- Ministry of Home Affairs (for Police personnel in receipt of Gallantry Awards)

(c) Certificate for PWD Candidates: For admission to a seat reserved for PWD candidate, the candidates should submit a medical certificate from competent medical authorities along with their application form for Entrance Examination. However, the admission of PWD candidates shall be subject to their medical examination and appropriate recommendations of the Chief Medical Officer, WUS Health Centre, University of Delhi (Main Campus). The recommendations of the above mentioned authority shall be final for all purposes.

However, the original certificate as mentioned above in (a), (b) and (c) would be required to be produced for verification at the time of admission.

VIII. Category-Wise Break-up of Seats

M.Sc. OPERATIONAL RESEARCH

Categories	No. of Seats
General	47
Schedule Caste	14
Schedule Tribe	07
OBC	25
Total	93
PWD*	03
Sports*/ECA*	upto 05 (upto 5%)
CW*	05
Foreign Nationals*	upto 05 (upto 5%)

** supernummary as per the University of Delhi rules*

M.A./M.Sc. APPLIED OPERATIONAL RESEARCH

Categories	No. of Seats
General	24
Schedule Caste	07
Schedule Tribe	03
OBC	13
Total	47
PWD*	01
Sports*/ECA*	upto 02 (upto 5%)
CW*	02
Foreign Nationals*	upto 02 (upto 5%)

** supernummary as per the University of Delhi rules.*

IX. Admission Procedure

(a) Registration fee

As the Eligibility Conditions are same for admission to both the Courses M.Sc. Operational Research Part-I at North Campus and M.A./M.Sc. Applied Operational Research Part-I at South Campus, the candidates may opt for admission to both the Courses. Accordingly, the Common Entrance Test fee would be as follows :

Course Name	Entrance Test Fee	
	General Category & OBC	Scheduled Caste/ Scheduled Tribe/ PWD Category
M.Sc. Operational Research and/or M.A./ M.Sc. Applied Operational Research	Rs. 500/-	Rs. 250/-

(b) Mode of Payment

Payment should be made online on the University web-portal.

(c) Common Entrance Test

It will consist of written test and interview.

(i) Written Test (85%) :

It will be of 3 hrs.duration with multiple choice questions. There will be negative marking for every wrong answer. It will consist of two parts :

Part-I : General Aptitude (20%) : General English, Comprehension, Logic, Analytical ability and Reasoning.

Part-II :Quantitative Aptitude (65%): Questions from Mathematics, Statistics, Operational Research and Computer Science.

(ii) Interview (15%)

Based on the performance in written test, a consolidated merit list consisting of 3 times of the number of seats available in each category for admission in each course would be prepared for interview.

Note: In all cases the decision of the Mathematical Sciences Courses Admission Committee will be final and binding on the candidates.

(d) *Admission Ticket*

The Admission Tickets will be issued online via e-mail system.

(e) *Evaluation of OMR Sheet*

Applications for obtaining copies of the evaluated OMR sheets for the entrance examinations conducted by the Departments of the University through ORS (OMR Response Sheet) and/or copies of the evaluated answer scripts for descriptive type entrance examinations, shall be entertained in accordance with the rules notified by the University vide Notification No. CE/2012 dated 16th July 2012.

Rs. 500/- per paper for ORS and/ or for descriptive evaluated answer script is to be deposited with the University Cashier between 9:30 a.m. to 1.00 p.m. and 1:30 p.m. to 3:00 p.m. on all working days after verification of the application form by the concerned Department of the University.

X. *List of Colleges offering M.Sc. Course in OR, North Campus*

1. Hindu College
2. Hans Raj College
3. Indraprastha College (for Women)
4. Kirori Mal College
5. Ramjas College
6. St. Stephen's College

M.A./M.Sc. Applied Operational Research is offered at South Campus.

XI Course Structure of the M.Sc. Operational Research Programme

	Duration (hrs.)	Sem. Exam Marks	Int. Ass. Marks	Total	Credits
First Year: Semester I					
Course 101 : Mathematical Programming-I	3	70	30	100	4
Course 102 : Inventory Management-I	3	70	30	100	4
Course 103 : Queueing System-I	3	70	30	100	4
Course 104 : Statistics-I	3	70	30	100	4
Course 105 : C++ & Unix					
(a) Theory	3	50	20	70	4
(b) Practical	3			30	

	Duration (hrs.)	Sem. Exam Marks	Int. Ass. Marks	Total	Credits
First Year: Semester II					
Course 201 : Mathematical Programming-II	3	70	30	100	4
Course 202 : Scheduling Techniques	3	70	30	100	4
Course 203 : Marketing Management	3	70	30	100	4
Course 204 : Reliability & Maintenance Theory	3	70	30	100	4
Course 205 : Java Programming					
(a) Theory	3	50	20	70	4
(b) Practical	3			30	

	Duration (hrs.)	Sem. Exam Marks	Int. Ass. Marks	Total	Credits
Second Year: Semester III					
Course 301 : Mathematical Programming-III	3	70	30	100	4
Course 302 : Statistics-II	3	70	30	100	4
Course 303 : Software Reliability	3	70	30	100	4
Course 304 : Database Management System & Visual Programming					
(a) Theory	3	50	20	70	4
(b) Practical	3			30	
Course 305 : Any course out of the following :					
(i) A course of equivalent credit offered					

	by another department.					
(ii)	Financial Management	3	70	30	100	4
(iii)	Logistics & Supply Chain Management	3	70	30	100	4

Duration	Sem. Exam	Int. Ass.	Total	Credits
(hrs.)	Marks	Marks		

Second Year: Semester IV

Course 401-403 : Any three of the following :

(i)	Marketing Research	3	70	30	100	4
(ii)	Inventory Management-II	3	70	30	100	4
(iii)	Queueing System-II	3	70	30	100	4
(iv)	Multicriteria Decision Models	3	70	30	100	4
(v)	Dynamic Optimization	3	70	30	100	4
(vi)	Decision Theory	3	70	30	100	4
(vii)	Portfolio Management	3	70	30	100	4
(viii)	Quality Management	3	70	30	100	4
(ix)	Data Warehousing and Data Mining	3	70	30	100	4
(x)	A course of equivalent credit offered by another department.	3	70	30	100	4

Course 404 –405 : **Project Work**

The Project work will be taken under approved supervisors from amongst the members of the staff and the report is to be submitted for evaluation by April 30.

It will carry 200 marks.

Project Report	100 marks		
Viva-Voce	50 marks		
Internal Assessment	50 marks	200	8

Note 1 : Each paper will carry 100 marks including 30 marks earmarked for Internal Assessment.

Note 2: Students will be encouraged to use relevant software, viz. LINDO/LINGO/ MATLAB/SPSS/ Mathematica, etc. during their course of study.

Note 3 : Four lectures per week will be devoted to papers 101 to 104, 201 to 204, 301 to 303 & 305 and 401-403 and three lectures per week for the theory part of papers 105, 205 & 304. Each part of practical papers 105, 205 & 304 will be assigned two practical periods per week.

Note 4 : Papers 105, 205 & 304 consists of two parts (a and b) with the following subdivision of 30 marks for Part-b :

Practical Examination : 20 marks

Oral : 05 marks

Record Book : 05 marks

Note 5 : The format and modus operandi of Internal Assessments will be decided and announced by the Department at the beginning of a semester.

Course Structure of the M.A./ M.Sc. Applied Operational Research Programme

	Duration (hrs.)	Sem. Exam Marks	Int. Ass. Marks	Total	Credits
First Year: Semester I					
Course 101 : Mathematical Programming-I	3	70	30	100	4
Course 102 : Inventory Management-I	3	70	30	100	4
Course 103 : Queueing System-I	3	70	30	100	4
Course 104 : Statistics-I	3	70	30	100	4
Course 105: C++ & Unix					
(a) Theory	3	50	20	70	4
(b) Practical	3			30	

	Duration (hrs.)	Sem. Exam Marks	Int. Ass. Marks	Total	Credits
First Year: Semester II					
Course 201 : Mathematical Programming-II	3	70	30	100	4
Course 202 : Scheduling Techniques	3	70	30	100	4
Course 203 : Marketing Management	3	70	30	100	4
Course 204 : Statistics-II	3	70	30	100	4
Course 205 : Java Programming					
(a) Theory	3	50	20	70	4
(b) Practical	3			30	

	Duration (hrs.)	Sem. Exam Marks	Int. Ass. Marks	Total	Credits
Second Year: Semester III					
Course 301 :Mathematical Programming-III	3	70	30	100	4
Course 302 :Reliability & Maintenance Theory	3	70	30	100	4
Course 303 :Software Engineering	3	70	30	100	4
Course 304 : Database Management System & Visual Programming					
(a) Theory	3	50	20	70	4
(b) Practical	3			30	

Course 305 : Any course out of the following :

(i)	A course of equivalent credit offered by another department.					
(ii)	Logistics & Supply Chain Management	3	70	30	100	4
(iii)	Financial Management	3	70	30	100	4

	Duration (hrs.)	Sem. Exam Marks	Int. Ass. Marks	Total	Credits
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Second Year: Semester IV

Course 401-403 : Any three of the following :

(i)	Marketing Research	3	70	30	100	4
(ii)	Inventory Management-II	3	70	30	100	4
(iii)	Queueing System-II	3	70	30	100	4
(iv)	Quality Management	3	70	30	100	4
(v)	Multicriteria Decision Models	3	70	30	100	4
(vi)	Data Warehousing and Data Mining	3	70	30	100	4
(vii)	A course of equivalent credit offered by another department.	3	70	30	100	4

Course 404 –405 : **Project Work**

The Project work will be taken under approved supervisors from amongst the members of the staff and the report is to be submitted for evaluation by April 30.
It will carry 200 marks.

Project Report	100 marks		
Viva-Voce	50 marks		
Internal Assessment	50 marks	200	8

Note 1: Each paper will carry 100 marks including 30 marks earmarked for Internal Assessment.

Note 2: Case Studies will be an integral part of teaching and evaluation in Courses 101-104, 201-204, 301-303, 305 & 401-403. Semester Theory Examination in the said courses will include a compulsory part of 20 marks towards the Case Study.

Note 3: Students will be encouraged to use relevant software, viz. LINDO/LINGO/MATLAB/SPSS/ Mathematica, etc. during their course of study.

Note 4: Four lectures per week will be devoted to papers 101 to 104, 201 to 204, 301 to 303 & 305 and 401-403 and three lectures per week for the theory part of papers 105, 205 & 304. Each part of practical papers 105, 205 & 304 will be assigned two practical periods per week.

Note 5 : Each of papers 105, 205 & 304 consists of two parts (a and b) with the following subdivision of 30 marks for Part-b :

Practical Examination : 20 marks
Oral : 05 marks
Record Book : 05 marks

Note 6 : The format and modus operandi of Internal Assessments will be decided and announced by the Department at the beginning of a semester.

XII. Infrastructure

Library: Students have access to two main libraries, the Central Science Library and Mathematical Sciences Library. Both the libraries have a vast collection of resources on OR including over 50 journals and 10,000 books. The Central Science library also has an Internet Access Center to help students to consult online subject literature.

Seminar Room: The department has an ultra modern seminar room with seating capacity of 70 equipped with round table conference setup with the latest Audio-Visual teaching aids including an LCD Projector, visualizer and 20 microphone sets.

Computer Lab : The computer lab exclusively for OR students has over 30 systems (Pentium III & IV) with a switch based Local Area Network (LAN) operating under windows 2000 and Linux servers. The students can work on various platforms such as DOS, Linux, Windows 95, 98 and 2000 servers provided. The systems are supported by high speed Laser printers, scanners and CD writers. The lab is equipped with a variety of OR and statistical softwares such as *SPSS 11.5, Mat Lab, Oracle 9i, Mini Tab, MAPPLE, QSB, MS Project, Hyper Lingo, MS Office, Visual Studio-6.0 and Turbo C++*. Lab also has Internet connectivity through campus wide fiber optic network.

Lecture Rooms: The lecture rooms have seating capacity of 90 students and are equipped with the modern teaching aids like an LCD projector, visualizer, audio system. The internet facility is also available in all the lecture rooms to augment the teaching.

Infrastructure at University of Delhi South Campus

Computer Lab: The computer lab exclusively for OR students has over 20 systems (Pentium IV) with a switch based Local Area Network (LAN) operating under windows 2000 and Linux servers. The lab is equipped with a variety of OR and statistical softwares such as *SPSS 15.0, Hyper Lingo and Minitab*. Lab also has Internet connectivity through campus wide fiber optic network.

XIII. Departmental OR Society

The Department has an active OR Society, a student elected body that regularly organizes various educational and cultural events. The society provides a platform for the students to interact with academicians and professionals from the industry. Workshops and seminars that are organized witness an active and enthusiastic participation of the students.

Placements

The Placement Cell at the Department is headed by a Placement Coordinator. It assists the students in pursuing their career in the areas of their interest and facilitates their entry into the industry. In this work, student committees help the coordinator to maximize results of the efforts. The placement cell makes arrangements for organizations on the campus recruitment. The campus recruitment programme ensures that all the students secure meaningful and challenging placement in keeping with the mission of the Department. A glance of the companies where our students have been placed in the past is as follows:

American Express Bank	Mode Modellers
Crane Software	Progeon
GE Capital	Safe Express
Hewlett Packard Corp	Schneider Electric
India Bulls	SkyTechCorp. Inductis
Symphony Corp.	
Market Rx	Cognizant
Absolute Data	Dunn Humby
Adventity	Evalueserve
Smart Cube	

XIV. Hostel Accommodation

Limited hostel accommodation is available on the campus. Students should contact directly the following University Hostels for accommodation:

For men:

1. Gwyer Hall
2. P.G. Men's Hostel
3. Jubilee Hall
4. International Students House
5. Mansarovar Hostel
6. D.S. Kothari Hostel
7. V.K.R.V. Rao Hostel
8. Aravali P.G. Hostel (South Campus)
9. Saramati P.G. Hostel (South Campus)

For women:

1. University Hostel for women

2. Meghdoot Hostel
3. International Students House for Women
4. North East Students House
5. Ambedkar-Ganguli Students House for Women
6. Geetanjali Hostel (South Campus)

XV. *Syllabus for the Common Entrance Test*

PART-I

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.

PART-II

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 Weiestrass 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.

Roll No.

Form No.



UNIVERSITY OF DELHI
DEPARTMENT OF OPERATIONAL RESEARCH

Self Attested
Photograph

Application Form for Common Entrance Test

M.Sc. OPERATIONAL RESEARCH

M.A./ M.Sc. APPLIED OPERATIONAL RESEARCH
(Academic Session 2014-2015)

Name (Ms./Mr.).....
(in Block letters)

Date of Birth..... Age (as on 1st Oct, 2014)..... Nationality.....

Category : GEN() SC() ST() OBC() PWD() CW() Sports/ECA()

Father's Name..... Mother's Name.....

Address for Communication.....
(in Block letters)

Permanent Address.....

Pin Code..... City..... State..... Area (Rural/Urban)

Telephone No. Mobile No. E-Mail Id.....

Exam. Passed	University	Year	Max. Marks	Marks Obt.	% of marks in aggregate	Subjects Offered
Bachelor's degree*						
Master's degree*						
Any Other						

* Please specify

Univ. Enrolment No. : (Issued earlier by University of Delhi, if the candidate had earlier passed any course from Delhi University)

Courses Offered : M.Sc. (OR) M.A./M.Sc. (AOR) Both

DD No. Date of Issue..... Name of the Issuing Bank.....

Documents Required :

1. Self Attested copy of class X certificate.
2. Self Attested copy of III year marks sheet, if result declared.
3. Self Attested copies of I year, II year marks sheets & Final year Admit Card, if result not declared along with a certificate stating list of papers appeared.
4. Self Attested copies of marks sheets for Post-graduate degree, or if result not declared, attested copy of Part-I marks sheet & Final year Admit Card along with a certificate stating list of papers appeared.
5. One self-addressed & stamped (worth Rs. 17/- local & Rs. 33/- for outstation) envelope of size 9" x 4".
6. Self Attested copy of SC/ST/CW/PWD certificate duly attested, wherever required.

DECLARATIONS

1. I have passed/appeared/appearing in the eligibility examination.
2. I have carefully read the M.Sc. (OR) and M.A./M.Sc. (AOR) admission eligibility requirements and I understand that my candidature is liable to be cancelled if I am not found eligible for admission at any stage.

Date _____

Signature of the Candidate

Roll No.

M.Sc. (OR) and/or M.A./ M.Sc. (AOR)

Form No.

Name of the Candidate :

Father's Name :

Address :

Photograph

Signature of the Candidate

ADMIT-CARD

Roll No.

**ADMISSION TICKET
FOR M.Sc. (OR) and/or M.A./ M.Sc. (AOR)**

Form No.

Test Date : June 1, 2014
Reporting Time : 09:30 A.M.
Finishing Time : 01:00 P.M.

Name of the Candidate :

Father's Name :

Address :

Photograph

Note : Entry in the Examination Hall is not allowed after 10 :00 A.M.

Signature of the Candidate

Examination Centre

Head

