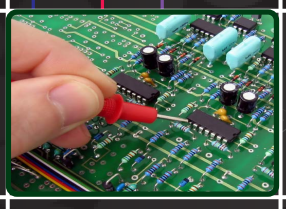
SANGAI INTERNATIONAL UNIVERSITY

Syllabus B. Sc. (Honours) Operational Research



Syllabus B. Sc. (Honours) Operational Research

Proposed Syllabus and Scheme of Examination

for

B. Sc. (Honours) Operational Research

Submitted

to

University Grants Commission
New Delhi

under

Choice Based Credit System

May 2015

PREAMBLE

Operational Research (OR) is a discipline to aid decision making and improving efficiency of the system by applying advanced analytical methods. As a formal discipline it originated in the efforts of military planners during World War II.

The tools of Operational Research are not from any one discipline; rather Mathematics, Statistics, Information Technology, Economics, Engineering, etc. have contributed to this discipline of knowledge. Today, it has become a professional discipline that deals with the application of scientific methods for decision-making, and especially to the allocation of scare resources.

The courses in Operational Research offer a unique blend of traditional coursework, practical skills, and real world problem solving experience designed to position students for success in today's competitive world.

PROPOSED SCHEME FOR CHOICE BASED CREDIT SYSTEM IN

B. Sc. Honours (Operational Research)

	CORE COURSE (14)	Ability Enhancement Compulsory Course (AECC) (2)	Ability Enhancement Elective Course (AEEC) (2) (Skill	Elective: Discipline Specific DSE (4)	Elective: Generic (GE) (4)
I	Introduction to Operational Research and Linear Programming (Theory+ Practical) Mathematics – I	(English/MIL Communication) /Environmental Science			GE-1
II	Advanced Linear Programming(Theory+ Practical) Statistics – I	Environmental Science/ (English/MIL Communication)			GE-2
III	Optimization – I(Theory+ Practical) Mathematics – II Object Oriented Programming(Theory+ Practical)		OR-AEE-1		GE-3
IV	Production and Inventory Management(Theory+ Practical) Statistics – II Database Management System		OR-AEE-2		GE-4
V	Queueing and Reliability Theory(Theory+ Practical) Optimization – II			OR-DSE-1 OR-DSE -2	
VI	Decision Analysis and Game Theory Scheduling Techniques(Theory+ Practical)			OR-DSE -3 OR-DSE -4	

SEMESTER I			
Paper Code	**COURSE NAME**		**Credits**
OR-AEC-1	(English/MIL Communication) /Environmental Science	Ability Enhancement	2
OR-C-101	Introduction to Operational Research and Linear Programming	Core Discipline	4
	Practical/OR Lab		2
OR-C-102	Mathematics – I	Core Discipline	5
	Tutorial		1
OR-GE-1	Any one from the List of **Generic Elective / Interdisciplinary Courses** from other Subjects	Generic Elective / Interdisciplinary	4/5
	Practical/Tutorial		2/1
SEMESTER II			
OR-AEC-2	Environmental Science/ (English/MIL Communication)	Ability Enhancement	2
OR-C-201	Advanced Linear Programming	Core Discipline	4
	Practical/OR Lab		2
OR-C-202	Statistics – I	Core Discipline	5
	Tutorial		1
OR-GE-2	Any one from the List of **Generic Elective / Interdisciplinary Courses** from other Subjects	Generic Elective/Interdisciplinary	4/5
	Practical/Tutorial		2/1
SEMESTER III			
OR-C-301	Optimization – I	Core Discipline	4
	Practical/OR Lab		2
OR-C-302	Mathematics – II	Core Discipline	5
	Tutorial		1
OR-C-303	Object Oriented Programming	Core Discipline	4
	Practical/OR Lab		2
OR-AEE-1	Any one from the List of **Ability Enhancement Electives**	Skill Enhancement Electives	2
OR-GE-3	Any one from the List of **Generic Elective / Interdisciplinary Courses** from other Subjects	Generic Elective / Interdisciplinary	4/5
	Practical/Tutorial		2/1
SEMESTER IV			
OR-C-401	Production and Inventory Management	Core Discipline	4
	Practical/OR Lab		2
OR-C-402	Statistics – II	Core Discipline	5
	Tutorial		1
OR-C-403	Database Management System	Core Discipline	4
	Practical/OR Lab		2
OR-AEE-2	Any one from the List of **Ability Enhancement Electives**	Skill Enhancement Electives	2
OR-GE-4	Any one from the List of **Generic Elective / Interdisciplinary Courses** from other Subjects	Generic Elective / Interdisciplinary	4/5
	Practical/Tutorial		2/1

SEMESTER V			
OR-C-501	Queueing and Reliability Theory	Core Discipline	4
	Practical/OR Lab		2
OR-C-502	Optimization – II	Core Discipline	5
	Tutorial		1
OR-DSE-1	Any one from the List of **Discipline Specific Elective(DSE)**	Discipline Specific Elective	5
	Tutorial		1
OR-DSE-2	Any one from the List of **Discipline Specific Elective(DSE)**	Discipline Specific Elective	5
	Tutorial		1
SEMESTER VI			
OR-C-601	Decision Analysis and Game Theory	Core Discipline	5
	Tutorial		1
OR-C-602	Scheduling Techniques	Core Discipline	4
	Practical/OR Lab		2
OR-DSE-3*	Any one from the List of **Discipline Specific Elective(DSE)**	Discipline Specific Elective	5
	Tutorial		1
OR-DSE-4*	Any one from the List of **Discipline Specific Elective(DSE)**	Discipline Specific Elective	5
	Tutorial		1

*** Project Work/Industrial Training will be offered in the Sixth Semester.**

Core Papers (Credit: 06 each) (14 papers)

OR-C -101. Introduction to Operational Research and Linear Programming (Theory+ Practical)
OR-C -102. Mathematics – I
OR-C -201. Advanced Linear Programming (Theory+ Practical)
OR-C-202. Statistics – I
OR-C -301. Optimization – I (Theory+ Practical)
OR-C -302. Mathematics – II
OR-C -303. Object Oriented Programming (Theory+ Practical)
OR-C -401. Production and Inventory Management (Theory+ Practical)
OR-C -402. Statistics – II
OR-C -403. Database Management System
OR-C -501. Queueing and Reliability Theory (Theory+ Practical)
OR-C -502. Optimization – II
OR-C -601. Decision Analysis and Game Theory
OR-C -602. Scheduling Techniques (Theory+ Practical)

Discipline Specific Elective Papers (Credit: 06 each) (4 papers to be selected)

1. Logistics and Supply Chain Management
2. Quality Management
3. Managerial Economics
4. Project Management
5. Business Data Analysis
6. Time Series and Econometrics
7. Quantitative Marketing and Finance
8. Project Work / Industrial Training (Sixth Semester)

Generic Elective Papers (GE) (Credit: 06 each) (04 papers of any discipline to be selected from other Departments/Disciplines)

Ability Enhancement Electives (skill based) (Credit: 02 each) (2 papers to be selected)

1. Data Analysis
2. Operational Research Applications
3. Introduction to Information Technology
4. Numerical Methods

Generic Elective Papers (GE) (Credit: 06 each) (Any four to be offered to other Departments / Disciplines)

1. Introduction to Operational Research and Linear Programming
2. Inventory Management
3. Network Models and Scheduling Techniques
4. Integer Programming and Theory of Games
5. Queueing and Reliability Theory
6. Optimization Techniques

Core Papers in Operational Research

OR-C-101. Introduction to Operational Research and Linear Programming

Objective: The Objective of the paper is to introduce the basic concepts of Operational Research and linear programming to the students.

Basics of Operational Research: Origin & Development of Operational Research, Definition and Meaning of Operational Research, Different Phases of an Operational Research Study, Scope and Limitations of Operational Research, Mathematical Modeling of Real Life Problems.

Linear Programming: Introduction to Linear algebra. Solution of a system of Linear Equations, Linear independence and dependence of vectors, Concept of Basis, Basic Feasible solution, Convex sets. Extreme points, Hyperplanes and Halfspaces, Convex cones, Polyhedral sets and cones.

Linear Programming Problem Formulation, solution by Graphical Method, Theory of Simplex Method, Simplex Algorithm, Two phase Method, Charnes-M Method, Degeneracy, Theory of Duality, Dual-simplex method.

References /Suggested Readings:

1. G. Hadley: Linear Programming. Narosa, Reprint, 2002.
2. G. Hadley: Linear Algebra, Narosa, Reprint, 2002.
3. Hamdy A. Taha: Operations Research-An Introduction, Prentice Hall, 9th Edition, 2010.
4. A. Ravindran, D. T. Phillips and James J. Solberg: Operations Research- Principles and Practice, John Wiley & Sons, 2005.
5. F.S. Hillier. G.J. Lieberman: Introduction to Operations Research- Concepts and Cases, 9th Edition, Tata Mc-Graw Hill, 2010.

Practical/Lab to be performed on a computer using OR/Statistical packages

1. To solve Linear Programming Problem using Graphical Method with
   - (i) Unbounded solution
   - (ii) Infeasible solution
   - (iii) Alternative or multiple solutions.
2. Solution of LPP with simplex method.
3. Problem solving using Charnes-M method.
4. Problem solving using Two Phase method.
5. Illustration of following special cases in LPP using Simplex method
   - (i) Unrestricted variables
   - (ii) Unbounded solution
   - (iii) Infeasible solution
   - (iv) Alternative or multiple solutions.

6. Problems based on Dual simplex method.