

# Operations Research Applications – Linear and Integer Programming - Web course

## COURSE OUTLINE

This course discusses applications of Operations Research with specific applications in Linear and Integer Programming. The first part discusses various topics such as Linear Programming, Transportation problems, Assignment and Allocation problems, Location problems, Packing problems, Flow problems and distribution problems. We discuss several important formulations and applications under each problem. Each of these are described in a module with additional applications and a case study. Each module is for 4 hours.

The second part discusses four application domains and areas such as Workforce planning, Health, Education and Airlines. Each has five applications and each module is for 2 hours.

## COURSE DETAIL

Module No:	Description	Lectures
1	<b>Linear Programming formulations</b> <ul style="list-style-type: none"> <li>• Introduction and solutions</li> <li>• Linear Programming Applications</li> <li>• Duality and Sensitivity analysis</li> <li>• Additional Applications and Case</li> </ul>	4
2.	<b>Transportation Problem and its variants</b> <ul style="list-style-type: none"> <li>• Introduction and solutions</li> <li>• Variants of Transportation problem</li> <li>• Additional Applications and Case</li> </ul>	3
3.	<b>Assignment Problem and its variants</b> <ul style="list-style-type: none"> <li>• Introduction and solutions</li> <li>• Assignment problem – Related problems and Variants</li> <li>• Additional Applications and Case</li> </ul>	3
4.	<b>Integer Programming and its Location</b> <ul style="list-style-type: none"> <li>• Introduction and integer programming formulations</li> <li>• Location problems</li> <li>• Additional Applications and Case</li> </ul>	3



NP-TEL

NPTEL

<http://nptel.ac.in>

Management

### Pre-requisites:

- Any first course in Linear Programming or in Operations Research
- Fundamentals of Operations Research (NPTEL)

### Coordinators:

**Prof. G. Srinivasan**  
Department of  
Management  
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5.	<b>Loading and Machine scheduling</b> <ul style="list-style-type: none"> <li>• Introduction and single machine problems</li> <li>• Flow shop and other scheduling problems</li> <li>• Additional Applications and Case</li> </ul>	3
6.	<b>Packing problems</b> <ul style="list-style-type: none"> <li>• Introduction and 1 dimensional bin packing</li> <li>• Two dimensional and three dimensional bin packing problems</li> <li>• Additional Applications and Case</li> </ul>	3
7.	<b>Flow and Path problems</b> <ul style="list-style-type: none"> <li>• Introduction and shortest path problems</li> <li>• Flow problems and minimum spanning trees</li> <li>• Additional Applications and Case</li> </ul>	3
8.	<b>Distribution Problems</b> <ul style="list-style-type: none"> <li>• Introduction and travelling salesman problems</li> <li>• Variants of travelling salesman problem</li> <li>• Vehicle Routeing problems</li> <li>• Additional Applications and Case</li> </ul>	4
9.	<b>Application - Workforce Planning</b> <ul style="list-style-type: none"> <li>• Line Balancing, Baggage Handling, Nurse scheduling</li> <li>• Hierarchical Workforce Planning, Projects</li> </ul>	2
10.	<b>Application - Healthcare Systems</b> <ul style="list-style-type: none"> <li>• Allocation of operation rooms, Medicine transportation and scheduling, Vaccine procurement</li> <li>• Home healthcare, Mobile healthcare</li> </ul>	2
11.	<b>Application - Education</b> <ul style="list-style-type: none"> <li>• Allocating children to schools, School bus routeing and scheduling, modelling school meals</li> <li>• Comparing and selecting a school, timetabling problem</li> </ul>	2
12.	<b>Application - Airline</b>	2

- Network design, Routeing problem, Fleet allocation
- Crew optimization, Baggage handling

<b>Total</b>	<b>34</b>