

**Decision Modeling -Course Structure (2022-2023 Monsoon Semester)**

Course Type	Course Code	Name of Course	L	T	P	Credit
Core	MSC 507	Decision Modelling	3	0	0	9

**Course Objective**

This course shall expose the candidates to various quantitative models for decision making that aim at finding optimum or close to optimum results. Major emphasis shall be on problem formulation and selection of appropriate software packages for solution and interpretation of results.

**Learning Outcomes**

Upon successful completion of this course, students will:

- Understand how to formulate a mathematical model for a business or an industrial engineering problem.
- Get familiar with the various types of Operations Research Tools and techniques and their solution procedure.
- Get familiar with the some application software like MS Solver, for solving OR problems.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	<b><u>Linear Programming:</u></b> Linear programming – Examples from industrial cases, formulation & definitions. Graphical Method and Simplex Algorithm – slack, surplus & artificial variables, computational details, big-M method, identification and resolution of special cases through simplex iterations.	8	Understand the fundamental concept of decision problems, mathematical formulation of a decision problem and its solution procedure
2	<b><u>Transportation problems:</u></b> TP - Examples, Definitions – decision variables, supply & demand constraints, formulation, Balanced & unbalanced situations, Solution methods – NWCR, minimum cost & VAM, test for optimality (MODI method), degeneracy & its resolution	4	Understand the concept of Transportation models and its applications
3	<b><u>Assignment problems:</u></b> AP - Examples, Definitions – decision variables, constraints, formulation, Balanced & unbalanced situations, Solution method – Hungarian, degeneracy & its resolution	4	Understand the concept of assignment problems and its applications
4	<b><u>Queuing Theory:</u></b> Definitions – queue (waiting line), waiting costs, characteristics (arrival, queue, service discipline) of queuing system, queue types (channel vs. phase),	5	Understand the concept of waiting line models and its applications

	Kendall's notation, Little's law, steady state behaviour, Poisson's Process & queue, Models with examples – single and parallel server and its performance measures		
5	<b><u>Simulation Methodology:</u></b> Definition and steps of simulation; random number generator; Discrete Event System Simulation; Monte Carlo simulation; Application in Scheduling, Queuing systems, Inventory systems	5	To get familiar with the simulation methods for problem solving
6	<b><u>Game Theory:</u></b> Game theory to determine strategic behavior, Elements of cooperative and non-cooperative games, Two-person zero-sum game	4	To get familiar with the concept of game theory
7	<b><u>Decision Theory:</u></b> Decision Making under risk and uncertainty, Pay-off matrix, Opportunity Cost Matrix; Decision trees	4	To get familiar with the concept of decision theory
8	<b><u>Multi Criteria Decision Making:</u></b> AHP and Goal Programming	5	To get familiar with the techniques to solve multiple objective decision problems
	<b>TOTAL</b>	<b>39</b>	

**Text Books:**

1. Operations Research: An Introduction- H.A. Taha, Macmillan, N.Y.
2. Principles of OR with Application to Managerial Decisions: H.M.Wagner, Prentice Hall.

**Reference Books:**

1. Introduction to Operations Research: F.S. Hiller and G.J. Lieberman, Addison Wesley.
2. Operations Research and Management Science, Hand Book: Edited By A. Ravi Ravindran, CRC Press, Taylor & Francis Group.

**Evaluation criteria:**

**Mode of Examinations:** Closed Book

**Marks Breakup:** Mid Sem 28%, End Sem 42 %, Quizzes 15%, Assignments 15%

**Tentative Dates of Examination:**

1. Quiz 1: 7 September (3-3:50 PM) (Tentative)
2. Quiz 2: 26 Oct (3-3:50 PM) (Tentative)
3. Mid Sem: As per the academic calendar 2022-2023
4. End Sem: As per the academic calendar 2022-2023
5. Assignments: Weekly submission on Fridays