Teaching Schedule

Course Objectives: To Identify and develop Linear programming problem of operational research models from the verbal description of the real System.

Course outcomes: Upon completion of the course, students shall be able to
CO1: define and formulate non-linear programming problems for one and several variables.
CO2: develop mathematical skills to analyse and solve dynamic programming and models arising from a wide range of applications.
CO3: solve queening theory and inventory models using appropriate techniques and optimization solvers, interpret the results obtained and translate solutions into directives for action.
CO4: recognize the applications of, basic methods for, and challenges for goal programming and geometric programming.
CO5: formulate a real-world problem as a mathematical programming model.
CO6: know principles of construction of mathematical models of conflicting situations and mathematical analysis methods of operations research.

Unit	Sub Unit	No. of Lect. (s)	Topics	Reference Chapter/ Additional Reading	Teaching Methodology to be used	Active Learning Activities	Evaluation parameter
Non-Linear Programming [18 hours]							
1	1.1	4	Introduction, Nature and Scope of Operations Research, Convex Sets and Convex Functions and their properties	Ch# 24 J. K. Sharma, Operations Research	PPT, Chalk& Talk	**For Slow Learner:** Students must solve some examples given by teacher after completion of unit.	Presentation, Assignment 1 Unit Test 1 Internal Exam
	1.2	3	Lagrange´s Theory and examples				

	1.3	4	Kuhn-Tucker conditions and examples			**For Advanced Learner:** Students will able to interpret and formulate mathematical model to solve non- Linear programming.	
	1.4	4	Search Techniques-One Variable and Several Variables based examples				
	1.5	3	Pontryagin´s Maximum Principle and its applications				
Dynamic Programming and its Application [12 hours]							
2	2.1	4	Introduction, Deterministic processes, Discrete Optimization, Allocation and Assortment Problem	Ch# 22 J. K. Sharma, Operations Research	PPT, Chalk& Talk	**For Slow Learner:** Students must solve some examples given by teacher after completion of unit. **For Advanced Learner:** Students can recognize model to convert Dynamic programming.	Presentation, Assignment 2 Unit Test 1,2 Internal Exam
	2.2	4	Sequential Discrete Optimization, Long-Term Planning Problem, Multi-Stage Decision Process				
	2.3	4	Application of Dynamic Programming in Production Scheduling and routing problems				
Queuing Theory and Inventory Models [18 hours]							
3	3.1	3	Basic Structures of Queuing Models	Ch# 14, 15, 16 J. K. Sharma, Operations Research	PPT, Chalk& Talk	**For Slow Learner:** Students must solve some examples given by teacher after completion of unit. **For Advanced Learner:** Students can solve various Queuing and	Presentation, Assignment 3 Unit Test 3 Internal Exam
	3.2	4	Poisson Queues-M/M/1, M/M/C for finite and infinite queue length				
	3.3	4	Non-Poisson Queue-M/G/1, Machine Maintenance (Steady State)				

	3.4	4	Inventory Control-Deterministic including price breaks and Multi-item with constraints			Inventory models	
	3.5	3	Probabilistic (with and without lead time)				
Goal Programming and Geometric Programming [12 hours]							
4	4.1	4	Introduction, Difference between LP and GP approach, Concept of Goal Programming	Ch# 8, 24 J. K. Sharma, Operations Research	PPT, Chalk& Talk	**For Slow Learner:** Students must solve some examples given by teacher after completion of unit. **For Advanced Learner:** Students will able to solve real world problem using technique of Goal Programming.	Presentation, Assignment 4 Internal Exam
	4.2	4	Graphical solution-method of Goal Programming				
	4.3	4	Modified Simplex method of Goal and Geometric Programming				

Text book:

1. J. K. Sharma, "Operations Research–Theory and Application", 4th Edition, Macmillan Publishers India Ltd.

Reference books:

1. Beale, E. M. L. and Mackley, L., "Introduction to Optimization", John Wiley, 1988.
2. Joshi, M. C. and Moudgalya, K., "Optimization: Theory and Practice", Narosa, New Delhi, 2004.
3. P SankaraIyer, Operation Research–Sigma Series, Tata McGraw-Hill Companies.
4. Frederick S. Hilliesr and Gerald J. Liberman, Introduction to Operation Research, The McGraw-Hill Companies.

Course Objectives and Course Outcomes Mapping:

To Identify and develop Linear programming problem of operational research models from the verbal description of the real system: CO1, CO2, CO3, CO4, CO5, CO6.

Course Units and Course Outcomes Mapping:

Unit No.	Unit	Course Outcomes					
		CO1	CO2	CO3	CO4	CO5	CO6
1	Non-Linear Programming	✓				✓	✓
2	Dynamic Programming and its Application		✓			✓	✓
3	Queuing Theory and Inventory Models			✓		✓	✓
4	Goal Programming and Geometric Programming				✓	✓	✓

Programme Outcomes (PO)

PO1: Knowledge

Provides knowledge about the fundamentals of pure, applied and computing mathematics and its applications to students that creates the opportunities in industries and research centers.

PO2: Core Competence

Creates competency in science and mathematics to formulate, analyses and solve problem and/or also to pursue advanced study or research.

PO3: Breadth

Trains students having good knowledge in unearth core of academia and industry by the roots of mathematics.

PO4: Evaluation

Imparts in students to raise trial and error-based curiosity and problem-solving functionality with research based advanced tutorial for higher level decision makings tools.

Programme Outcomes and Course Outcomes mapping:

Programme Outcomes	Course outcomes					
	CO1	CO2	CO3	CO4	CO5	CO6
PO1	✓	✓	✓	✓		
PO2		✓	✓	✓	✓	✓
PO3			✓	✓		
PO4					✓	✓