



# Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India  
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
CPE6011	Elective-IOperations Research	-	-	2+2*	-	-	2	2
		<b>Examination Scheme</b>						
		ISE	ESE		Total			
			Practical	Oral				
50	-	-	50					

<b>Pre-requisite Course Codes</b>	(Applied Mathematics)
At end of successful completion of this course, student will be able to	
<b>Course Outcomes</b>	CO1 Model and solve problem using linear programming techniques
	CO2 Implement algebraic solution using simplex method
	CO3 Define transportation model and apply transportation algorithm in a known situation.
	CO4 Use montecarlo simulation technique.
	CO5 Use the spreadsheet as a tool effectively for OR topics

Module No.	Topics	Ref.	Hrs.
1	<b>What is Operations Research</b> Introduction.	1, 2	02
2	<b>Modeling with Linear Programming</b> Two-Variable LP Model Graphical LP Solution Solution of a Maximization Model Solution of a Minimization Model Computer Solution with Solver and AMPL LP solution with Excel Solver LP Solution with AMPL Linear Programming Applications Investment Product Planning and Inventory Control Manpower Planning Urban Development Planning Blending and Refining Additional LP Applications	1, 2	07



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<b>3</b>	<b>The Simplex Method and Sensitivity Analysis</b> LP Model in Equation Form Transition from Graphical to Algebraic Solution The Simplex Method Iterative Nature of the Simplex Method Computational details of the Simplex algorithm Summary of the Simplex Method Artificial Starting Solution M-Method Two-Phase Method Special Cases in the Simplex Method Degeneracy Alternative Optima Unbounded Solution Infeasible Solution Sensitivity Analysis Graphical Sensitivity Analysis Algebraic Sensitivity Analysis – Changes in the Right-hand side Algebraic Sensitivity Analysis – Objective function Sensitivity Analysis with Tora, Solver, and Ampl Computational issues in Linear Programming	1, 2	<b>06</b>
<b>4</b>	<b>Duality and Post-Optimal Analysis</b> Definition of the Dual Problem Primal-Dual Relationships Review of Simplex Matrix Operations Simplex Tableau Layout Optimal Dual Solution Simplex Tableau Computations Economic Interpretation of Duality Economic Interpretation of Dual Variables Economic Interpretation of Dual Constraints Additional Simplex Algorithms Dual Simplex Algorithm Generalized Simplex Algorithm	1, 2	<b>05</b>
<b>5</b>	<b>Transportation Model and Its Variants</b> Definition of the Transportation Model Nontraditional Transportation Models The Transportation Algorithm Determination of the Starting Solution	1, 2	<b>05</b>



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	Iterative Computations of the Transportation Algorithm Simplex Method Explanation of the Method of Multipliers The Assignment Model The Hungarian Method Simplex Explanation of the Hungarian Method		
<b>6</b>	<b>Decision Analysis</b> Decision Making under Certainty – Analytic Hierarchy Process (AHP) Decision Making under Risk Decision Tree-Based Expected Value Criterion Variants of the Expected Value Criterion Decision under Uncertainty	1, 2	<b>03</b>
<b>7</b>	<b>Stimulation Modeling</b> Monte Carlo Simulation Types of Simulation Elements of Discrete Event Simulation Generic Definition of Events Sampling from Probability Distributions	1, 2	<b>02</b>
<b>8</b>	<b>Nonlinear Programming Algorithms</b> Unconstrained Algorithms Direct Search Method Gradient Method Constrained Algorithms Separable Programming Quadratic Programming	1, 2	<b>03</b>
<b>9</b>	<b>Introduction to spreadsheet model</b>	1, 2	<b>02</b>
		<b>Total</b>	<b>35</b>

## References:

- [1] Taha, Hamdy A. "Operations Research" Pearson, 2011.
- [2] N.D. Vhora "Quantitative Techniques in Management" TMH , 3rd edition