NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B.Tech. (CSE), Integrated B.Tech.(CSE)-MBA
Course Code:	3CS505ME24
Course Title:	Optimization Techniques
Course Type:	Department Elective–I
Year of Introduction:	2024-25

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Course Learning Outcomes (CLO):

At the end of the course, students will be able to –

1. illustrate key concepts and applications of various optimization techniques (BL2)
2. apply the appropriate optimization technique for the given problem (BL3)
3. analyse appropriate objective functions and constraints to solve real life optimization problems (BL4)
4. evaluate optimization solutions, including interpreting results and making informed decisions based on the optimization outcomes (BL5)

Unit	Contents	Teaching Hours (Total 45)
Unit-I	**Introduction:** Historical Development, Engineering applications of optimization, Statement of an optimization problem, Classification of optimization problems	02
Unit-II	**Classical Optimization Techniques:** Single variable optimization, Constrained and unconstrained multivariable optimization, Relevant applications	06
Unit-III	**Linear Programming and Non Linear Programming:** Standard form of a linear programming problem, Simplex method, Big-M method, Two phase method, Duality in linear programming, Quadratic programming, Stochastic linear programming, Relevant applications, **:** Unimodal function, Interpolation methods, Direct and indirect methods, Relevant applications	10
Unit-IV	**Transportation and Assignment Problem:** The transportation algorithm, Methods for finding Initial solution, Test for optimality of transportation problems, Mathematical model of assignment problem, Hungarian method for solving Assignment problem.	08
Unit-V	**Geometric Programming:** Unconstrained and constrained geometric programming problems, Geometric programming with mixed inequality	06
Unit-VI	**Integer Programming:** Integer linear programming, Integer nonlinear programming, Relevant applications	06
Unit-VII	**Game Theory**: Introduction, Characteristics of Game Theory, Two Person, zero sum games, Pure strategy. Dominance theory,	03
Unit-VIII	**Genetic Algorithms:** Introduction, Representation methods, Selection methods, Operators, Replacement methods, Relevant applications	04

Self-Study:	The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.
Suggested Readings/ References:	1. Rao, S. S., & Rao, S. S., Engineering optimization: theory and practice. John Wiley & Sons. 2. Hadley, G., Linear programming, Narosa Publishing house. 3. Taha, H. A., Operations research: An introduction. Pearson Education India. 4. Deb. K, Optimization for engineering design: Algorithms and examples. PHI Learning Pvt. Ltd. 5. Kumar, D. N., Multicriterion analysis in engineering and management. PHI Learning Pvt. Ltd
Suggested List of Experiments:	-NA-
Suggested Case List:	-NA-