COURSE TITLE	**OPTIMIZATION TECHNIQUES**
COURSE CODE	**01CT0614**
COURSE CREDITS	**3**

Objective:

1 The focus of the course is on convex optimization though some techniques will becovered for non-convex function optimization too. After an adequate introduction tolinear algebra and probability theory, students will learn to frame engineering minimamaxima problems in the framework of optimization problems.

Course Outcomes: After completion of this course, student will be able to:

1 Cast engineering minima/maxima problems into optimization framework.
2 Learn efficient computational procedures to solve optimization problems
3 Apply optimization concepts to deal with real world situations
4 Design the simulation model for the given case study problem

Pre-requisite of course:..Basic Programming Language, Calculus and Linear Algebra

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	**Introduction to Operations Research** Origin of Operations Research, Nature of Operations Research, Impact of Operations Research, Defining Problem and Generating data, Formulating a mathematical model, Deriving solutions from the model, Testing the model	5
2	**mathematical preliminaries** Linear algebra, matrices, vector space, vector calculus, eigen values, eigen vectors, eigen space analysis,, probabilistic theory, elementary multivarient calculus	3
3	**linear programming** Introduction to LP problems, formulation of LP problems, steps for solution of LP problems, graphical solution, maximisation and minimization using simplex algorithm, t, , two phase method, duality in LP, , integer LP, karmakar method	6
4	**transportation problems** Introduction to transportation problem, varient of transportation problem, methods to solve transportation problem	5

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Contents : Unit	Topics	Contact Hours
5	**assignment problems** Introduction to assignment problems, methods to solve assignment problems	3
6	**non-linear programming** Graphical illustration of non linear programming, one variable unconstrained optimization, multi variant unconstrained optimization, Quadratic programming, Separable programming, convex programming	6
7	**network analysis** Network definition, analysis, probability of PERT analysis, project time cost tradeoff,, introduction to resource allocation	5
8	**sequencing** Sequencing needs, processing N jobs in 2 machines, processing N jobs in 3 machines,, processing N jobs in m machines	5
9	**Advance Optimization Algorithms** Genetic Algorithms, Simulated Annealing, Particle Swarm Optimization, Ant Colony Optimization, , Optimization of Fuzzy Systems	5
Total Hours		**43**

Textbook :

1 Introduction to Operations Research, Frederick Hillier, McGraw-Hill,, 2000

2 Simulation Model Design and Execution,, P. Fishwick, Prentice Hall,, 1995

3 Discrete-Event Simulation: Modeling, Programming and Analysis,, George S., Springer, 2001

4 Operation Research, HTaha, Pearson Education., 2016

5 Operation Research, A Verma,, S.K. Kataria & Sons, 2016

6 Operation Research, V Kapoor, Sultan Chand & Sons, 2001

References:

1 Engineering Optimization, Engineering Optimization, . S S Rao, New Age International, 2000

2 Optimization for Engineering Design: Algorithms and Examples, Optimization for Engineering Design: Algorithms and Examples, K Deb, Prentice-Hall of India, 2005

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking
15.00	15.00	30.00	35.00	5.00	0.00

Instructional Method:

1. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
2. Practical examination will be conducted at the end of the semester for evaluation of performance of students in laboratory.
3. Students may use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory, etc.
4. The course delivery method will depend upon the requirement of content and need of the students. The teacher in addition to conventional teaching method (Chalk and Talk) may use any of the tools such as demonstration, role play, Quiz, brainstorming, Flipped class, Project based learning, Collaborative learning, MOOCs etc. for effective teaching.

Supplementary Resources:

1. https://nptel.ac.in/courses/111105039
2. https://optml.mit.edu/teach/6881/

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