COURSE CONTENT

OPTIMIZATION TECHNIQUES AND APPLICATIONS								
I Semester: CAD/CAM								
Course Code	**Category**	**Hours /Week**			**Credits**	**Maximum Marks**		
BCCD02	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	-	-	3	40	60	100
Contact Classes:48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Pre requisites: Operations Research								

I. COURSE OVERVIEW:

Optimization Techniques is a scientific approach to decision making which seeks to determine how best to design and operate a system under conditions requiring allocation of scarce resources. Optimization Technique as a research tool, primarily has a set or collection of algorithms which act as tools for problems solving in chosen application areas. This course has extensive applications in engineering, business and public systems and is also used by manufacturing and service industries to solve their day-to-day problems.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The importance of various methods single variable Non-Linear unconstrained optimization.
II. The effects of direct search and gradient methods in Multi variable Non-Linear unconstrained optimization.
III. The fundamental knowledge of Linear Programming and various algorithms of Integer Programming
IV. The working principle of various Nontraditional Optimization Algorithms.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO1	Recall classical optimization techniques and numerical methods of optimization.
CO2	Apply optimization methods and algorithms to develop and for solving various types of optimization problems.
CO3	Explain different approaches of optimizing (maximizing or minimizing) an engineering problem or a function
CO4	Apply the fundamental concepts of Programming of single variable non-linear unconstrained optimization
CO5	Apply the effects of Programming of multi variable non-linear unconstrained optimization
CO6	Explain the fundamental knowledge of Linear Programming and different types of simulation process.

IV. COURSE CONTENT:

MODULE -I: Single Variable Non-Linear Unconstrained Optimization (09)

Single Variable Non-Linear Unconstrained Optimization: Elimination methods: Uni-Model function-its importance, Fibonacci method, Golden section method. Interpolation methods: Quadratic & Cubic interpolation methods involutes.

MODULE -II: Multi Variable Non-Linear Unconstrained Optimization (10)
Multi variable non-linear unconstrained optimization: Direct search methods – Uni variant method, Pattern search methods – Powell‟s, Hook -Jeeves, Rosen brock search methods. Gradient methods: Gradient of function & its importance, Steepest descent method, Conjugate direction methods: Fletcher-Reeves & variable metric method.

MODULE -III: Linear Programming and Simulation (10)
Linear Programming – Formulation, Simplex method & Artificial variable optimization techniques: Big M &Two-phase methods. Sensitivity analysis: Changes in the objective coefficients, constants coefficients of the constraints. Addition and deletion of variables, constraints.
Simulation –Introduction–Types-steps –applications: inventory & queuing–Advantages and disadvantages.

MODULE -IV: Integer Programming and Stochastic Programming (09)
Integer Programming- Introduction – formulation – Gomory cutting plane algorithm – Zero orone algorithm, branch and bound method; Stochastic Programming: Basic concepts of probability theory, random variables distributions- mean, variance, correlation, covariance, joint probability distribution. Stochastic linear programming: Chance constrained algorithm.

MODULE -V: Geometric Programming (10)
Geometric Programming: Posynomials – Arithmetic - Geometric inequality – unconstrained G.P-constrained G.P(≤type only) Non-Traditional Optimization Algorithms: Genetics Algorithm-Working Principles, Similarities and Differences between Genetic Algorithm & Traditional Methods. Simulated Annealing-Working Principle-Simple Problems. Introduction to Particle Swarm Optimization (PSO) (very brief).

V. TEXT BOOK:
1. Kalyanmoy Deb, “Optimization for Engineering Design”, PHI, 2nd edition, 2012.
2. S. S. Rao, “Optimization Theory & Applications”, New Age International, 2nd edition, 2013.

VI. REFERENCE BOOK:
1. S. D. Sharma, “Operations Research”, TMH, 1st edition, 2012.
2. H. A. Taha, “Operation Research”, TMH, 9th edition, 2014.
3. R. L Rardin, “Optimization in Operations Research, Pearson education, 2nd edition, 2013.

VII. WEB REFERENCES:
1. http://nptel.ac.in/courses/110107092/

VIII. E-TEXT BOOK:
1. http://nptel.ac.in/downloads/110107092/

VIII. MATERIALS ONLINE
1. Course template
2. Tutorial question bank
3. Assignments
4. Model question paper – I
5. Model question paper – II
6. Lecture notes
7. PowerPoint presentation