

# NATIONAL INSTITUTE OF TECHNOLOGY JAMSHEDPUR, JHARKHAND-831014

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Spring Semester 2020

Course Handout

Date: 02/01/2020

Course No. : CSG7122  
Course Title : Optimization Techniques  
Instructor In-charge : Dr Dilip Kumar

## Course Description

Application of linear optimization, Geometry of linear optimization, Graphical method, Simplex method, Duality theory, Sensitivity analysis, Transportation Problem, Assignment Problem, Network flows, branch & bound and cutting planes, convex optimization, Heuristics and approximation algorithms, Application Non-linear programming, Queuing Theory: Fundamentals of queuing system, Poisson process, the birth and death process, special queuing methods, Nonlinear Programming methods.

## Scope:

- To study the fundamental design, analysis, and implementation of basic Optimization Techniques and algorithms.
- To promote the Principles for good program design, especially the uses of Optimization algorithms.
- To solve the various linear and non-linear optimization problems.

## Text Books

T1. J K Sharma, Operation Research, Theory and applications, 2<sup>nd</sup> Edition, Macmillan Business Books.

## Reference Books

R1. S. S Rao, Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi.

R2. E.K.P. Chong and S. H. Zak, An Introduction to Optimization, John Wiley & Sons, N.Y.

R3. A.L. Peressimi, F.E. Sullivan, J.J. Vhl, Mathematics of Non-linear Programming, Springer – Verlag.

## Course Plan

Lecture No	Learning Objective	Topic to be covered	Refer to Chapter, See (Book)
1-4	Introduction to optimization techniques	Introduction, application of linear optimization, standard form of linear problems, Geometry of linear optimization. Formulation of LP.	T1 ch1-2
5-13	Linear optimization	Graphical method, Simplex method, Duality theory, Sensitivity analysis	<b>T1 ch3-6</b>
14-17	Transportation Problem	Mathematical Model of Transportation Problem, Methods for finding Initial solution, Test of optimality.	T1 Ch9
18-21	Assignment Problem	Mathematical Model of Transportation Problem, Methods for finding solution of the Assignment Problem, Travelling salesman problem.	T1 ch10
22-26	Network flows, branch & bound and cutting planes, convex optimization,	Network flows, branch & bound and cutting planes, convex optimization,	R2 ch6
27-31	Heuristics and approximation algorithms, Application Non-linear programming,	Heuristics and approximation algorithms, Application Non-linear programming,	R1 ch5
32-35	Queuing Theory	Fundamentals of queuing system, Poisson process, the birth and death process, special queuing methods.	T1 ch16
36-40	Nonlinear Programming	General Nonlinear Programming problem, Quadratic programming, Stochastic programming.	T1 Ch24

## Evaluation Scheme

EC No.	Evaluation Component	Duration	Weightage	Nature of Component
1.	Mid Semester	2 Hrs	30%	Closed Book
2.	End Sem Exam	3 Hrs	50%	Closed Book
3.	Assignment + Seminar + Mini project		20%	Close/Open Book

**Chamber Consultation Hour: Wednesday, 10:00 – 12:00 Hrs**

**Instructor In-Charge**

**(Dr Dilip Kumar)**