BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI, HYDERABAD CAMPUS
INSTRUCTION DIVISION
SECOND SEMESTER, 2018-2019
COURSE HANDOUT PART-II

Date: 17-12-2018

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : **ME F344 / MF F344**
Course Name : Engineering Optimization
Instructors : **AMIT KUMAR GUPTA, Deepak Nabapure, V Venkateswara Rao**

1. Scope and Objective of the Course:

Engineers, scientists, analysts and managers are often faced with the challenge of making trade-offs between different factors in order to achieve desirable outcomes. Optimization is the process of choosing these trade-offs in the best way. Optimization problems, having reached a degree of maturity over the past several years, are encountered in physical sciences, engineering, economics, industry, planning, and many other areas of human activity. Objective of the course is set to familiarize the students with standard methods of solving optimization problems.

This course deals with details of various aspects associated with optimization. These include description of optimization techniques, namely, Linear programming methods, simplex method, transportation model and its variants, PERT/CPM, inventory models, queuing systems, nonlinear optimization algorithms and evolutionary algorithms.

2. Text Book:

T1 HA Taha, *Operations Research: An Introduction*, Pearson Education/PHI, 8/E, 2007.

3. Reference Books:

R1 SS Rao, *Engineering Optimization: Theory and Practice*, New Age International (P) Limited, Third Edition, 1996

R2 FS Hillier and GJ Lieberman, *Introduction to Operations Research*, TMH, 8/E, 2006.

R3 WL Winston, *Operations Research: Applications and Algorithms*, Thomson Learning, 4th Edition, 2004

R4 A Ravindran, DT Philips and JJ Solberg, *Operations Research: Principles and Practice*, John Wiley & Sons, Singapore, Second Edition, 1987

R5 GC Onwubolu and BV Babu, *New Optimization Techniques in Engineering*, Springer-Verlag, Heidelberg, Germany, First Edition, 2004.

4. Course Plan:

Learning Objectives	Topics to be Covered	Lec. Nos.	Ref. To Text book
Introduction	Introduction to optimization	1	
Modeling with Linear Programming	Two variable LP model, Graphical LP solution (Problem solving: Selected LP applications)	2-3	T1 (2.1-3)
Simplex Method	LP model in equation form, Transition from graphical to algebraic solution The Simplex Method, Generalized simplex tableau in	4 5-8	T1 (3.1-2, 3.3-5)

	matrix form, artificial starting solution, (Problem solving: Simplex, Big-M, 2-phase, TORA)		
Transportation Model and its Variants	Definition of transportation problem, The transportation Algorithm, The Assignment Model (Problem solving: transportation, assignment, TORA)	9-11	T1 (5.1, 5.3-4)
Network Models	Definition, Minimal Spanning tree Algorithm, Shortest route Problem, CPM and PERT (Problem solving: Network, CPM, PERT, TORA)	12-14	T1 (6.1-3, 6.5)
Inventory Models	Deterministic Inventory Models (Problem solving: inventory)	15-17	T1 (11.1-3)
Review of Basic Probability	Random variables, Poisson, Exponential and Normal Distribution	18	T1 (12.2-4)
Queuing Systems	Definition, Birth and Death process, Role of Exponential Distribution, Generalized Poisson Queuing Models, Specialized Poisson Queues. (Problem solving: M/M/1 and M/M/c with infinite and finite system capacities, TORA)	19-22	T1 (15.1-6)
Nonlinear Programming Algorithms	Unconstrained problems, Unconstrained Algorithms Karush-Kuhn-Tucker (KKT) Conditions, Quadratic Programming	23 24-25	T1 (18.1, 19.1) T1 (18.2.2, 19.2.2)
Evolutionary Algorithms	Introduction to Nontraditional Optimization Techniques (Genetic Algorithms, Simulated Annealing, etc.)	26-27	-

5. Evaluation Scheme:

Component	Duration	Weightage	Date & Time	Remarks
Mid-Sem. Test	1.5 hours	25 %		Closed Book
Tutorial assignments		25 %		Open Book
Surprise quizzes		10 %		Open Book
Comprehensive Exam	3 hours	40 %		Closed Book

6. Chamber Consultation Hour: To be announced in the class.

7. Notices: Notices will be displayed on CMS**.**

8. Make up Policy:

Make-up will be granted only to genuine cases with prior permission from the IC. For cases related to illness, proper documentary evidence is essential. No makeup is allowed for assignments, etc.

Instructor-In-Charge
(ME F344 / MF F344)