OTM-831 Operations Research

1. Operations Research (OR) has many applications in science, engineering, economics, and industry and thus the ability to solve OR problems is crucial for both researchers and practitioners. Being able to solve the real life problems and obtaining the right solution requires understanding and modeling the problem correctly and applying appropriate optimization tools and skills to solve the mathematical model. The goal of this course is to teach you to formulate, analyze, and solve mathematical models that represent real-world problems. We will also discuss how to use EXCEL and LINDO for solving optimization problems. In particular, we will cover linear programming, network flow problems, integer programs, nonlinear programs, dynamic programming and queueing models.

Content

2. Topics covered in this subject are an introduction to the field of operations research, simple linear programming, integer programming, non-linear programming, simplex method, queuing theory and models, Network programming and network models, transportation modelling and trans-shipment models, probabilistic models and their optimization, simulations modeling such as Monte Carlo simulations and Markov chains.

3. **Objectives**

   a. To learn how to apply techniques of Operations Research for solving business problems.
   b. Develop understanding of common and important business problems.
   c. Develop problem modeling and solving skills and
   d. learn how to make intelligent business decisions from the point of view of optimization.

Outcomes

4. Upon completion of this course, the student will be able to:

   a. Formulate a real-world problem as a mathematical programming model
   b. Implement and solve the model in EXCEL and LINDO
   c. Understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand
   d. Understand the relationship between a linear program and its dual, including strong duality and complementary slackness

e. Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change
f. Solve specialized linear programming problems like the transportation and assignment problems
g. Solve network models like the shortest path, minimum spanning tree, and maximum flow problems
h. Understand the applications of, basic methods for, and challenges in integer programming
i. Understand how to model and solve problems using dynamic programming
j. Model a dynamic system as a queuing model and compute important performance measures
k. Learn optimality conditions for single- and multiple-variable unconstrained and constrained non-linear optimization problems, and corresponding solution methodologies

5. **Text and reference books**

a. Hiller, F.S. and Lieberman, G.J., Introduction to Operations Research (9th ed.), McGraw-Hill, 2009 4.3
b. Winston, W.L., Introduction to Mathematical Programming (4th ed.), Duxbury Press, 2002
c. Textbook: Practical Management Science: Spreadsheet Modeling and Applications, 2nd Ed. Wayne L. Winston, S. Christian Albright, Mark Broadie, Chris Albright. Duxbury Press. September, 1997. ISBN 0534217745.
d. Lecture Note: http://mcu.edu.tw/~ychen.
e. References: Introduction to Operations Research, 7th. Ed. Frederick Hillier. December, 2000. McGraw-Hill. ISBN 0071181636.