Brooklyn College
Department of Computer and Information Science

CISC 2531 [10.31] Operations Management
3 hours; 3 credits

Study in managerial decision making to solve a wide range of operating management problems. Topics covered include: planning, evaluation and control of operations; forecasting and inventory management; scheduling; project design and management; resource allocation; queuing models; quality of the work environment; and technological change. Design and implementation of management strategy will be emphasized through computer simulation, problems, and cases. This course is the same as BUSN 3430 [Business 31.4]. (Not open to students who have enrolled in or have completed Mathematics 3606 [73.2] or BUSN 3430 [BUS 31.4].)

Textbook

Quantitative Analysis for Management /10e, by Render, Stair and Hanna. Pearson Prentice Hall (with CD) ISBN 0-13-603625-8.

Syllabus

1. Introduction to operations management
What is operations management / quantitative analysis? Discuss steps and possible pitfalls in quantitative analysis process. Mathematical modeling and sensitivity analysis.

2. Review of Statistics
Discuss fundamental concepts in probability: impossible events, certain events, mutually exclusive events, independent/dependent events. Calculating probability using Venn diagrams. Conditional probability. Expectation and variance of discrete and continuous (Normal) distributions.

3. Decision Theory (deterministic models)
Contrast state of nature with alternative. Decision making under uncertainty, when likeliness of states of nature is unknown: maximax, maximin, equally likely, criterion of realism. Setting up regret matrix.

4. Decision Theory (stochastic models)
Decision making when probabilities are known. Expected value as decision making criteria. Value of perfect information; how much to invest in obtaining more information. Decision trees for multiple decisions. Utility theory.

5. Regression
Scatter plots and setting up a linear regression model. Calculating and interpreting correlation coefficient, coefficient of determination. Correlation does not imply causality.

6. Forecasting

Time-series models. Error analysis: MAD, MSE, MAPE. Moving averages, weighted moving averages, exponential smoothing.

7. Linear Programming
Introduction to optimization problems and linear programming. Discuss feasible / non-feasible solutions. Formulating a simple linear programming problem with two variables: identifying variables, constraints, objective function. Solving linear programming problem graphically using the corner-point method.

8. Linear Programming – Applications
Formulating larger-scale linear programming problems and solving with software. Dual and sensitvity analysis. Special cases: infeasibility, alternate optimal solutions, unboundedness, redundancy.

9. Simplex Method
Introduce the Simplex method for simple linear programming problem. Understand that the process is iterative and mimics the corner-point method. Each matrix represents a feasible solution. Explain that this may be tedious and error-prone for humans, but computers can easily complete the computations.

10. Transportation Model
Special kind of LP problem that can be solved by a faster algorithm. Discuss NW corner method and stepping-stone method. Basic approach: find a feasible solution, determine if it is optimal. If it is, stop. If not, iterate to a better solution.

11. Assignment Model
Special kind of LP problem that can be solved by a faster algorithm. Discuss Hungarian (flood) solution method. Basic approach: find a feasible solution, determine if it is optimal. If it is, stop. If not, iterate to a better solution.

12. Network Models
Introduce graph theory and terminology: vertex, edge, path, cycle, connectivity, isomorphism, tree. Discuss minimum spanning tree problem and the efficient solutions posed by Prim and Kruska. Compare it to shortest path problem and Dijkstra's algorithm.

13. Project Management
Projects can be formulated as network models. Tasks have relationship as either predecessor, successor, or parallel. Set up graph based on task dependency and estimated time. Find Critical Path(s) in project.

14. Project Management
Discuss CPM and PERT. Crashing a project to shorten its overall completion time. Monitoring the budget.

Bibliography

Quantitative Analysis, 9th Edition. Barry Render, Ralph M. Stair, Michael E. Hanna, 2006. ISBN: 131536885, Prentice Hall.

Business Forecasting , 9th Edition. John E. Hanke, Dean W. Wichern, 2009. ISBN: 132301202, Prentice Hall.

Introduction To Operations Research, 8th Edition. Hillier, Lieberman, 2005. ISBN: 72527447, McGraw Hill.

Statistics - Concepts and Controversies. David S. Moore, William I. Notz 2006. ISBN: 716786362, W. H. Freeman and Co.

Introduction to Management Science, 10th Edition. Bernard W. Taylor III 2010. ISBN: 136064647, Prentice Hall.

How to Lie with Statistics. Darrell Huff 1954.

Linear Programming and Its Applications. James K. Strayer, 1989. ISBN: 387969306, Springer-Verlag.