

Course title

(2 Credits)

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Pre-requisites:

An Operations Research Course at the undergraduate level.

Course Materials (Readings/textbooks):

- ✧ Textbook, slides and handouts
- ✧ Research articles published in a recent INFORMS Journal - Interfaces

Text Book: Introduction to Operations Research (10th ed.)

<http://product.dangdang.com/23657803.html>

Course Description

This is an advanced course in operations research. You will be introduced to a number of management science techniques that you may need to use at various stages of your career in the industry. As a student of management you will learn to develop appropriate models for different business scenarios, to get answers from these models using various techniques, to analyze and interpret the results, and to use the information to make better business decisions. Topics will include linear and integer programming, optimization, decision analysis.

Learning Objectives/Measurable Learning Outcomes

This course will help you to develop skills in formulating, analyzing, and solving decision-making problems.

Main Contents

Session 1:

Topic :	Linear Programming (Examples, Graphic Methods, CPLEX Interactive Solver)
Read:	Power point slides, Chapter 1, 2, 3 in the textbook
Teaching points	LP, Mathematical Programming, Solver
In-class assignment	

Session 2:

Topic :	Linear Programming (The Simplex Method)
Read:	Power point slides, Chapter 4, 5 in the textbook
Teaching points	The Simplex method
In-class assignment	

Session 3:

Topic :	Linear Programming (Duality and Sensitivity analysis)
Read:	Power point slides, Chapter 6, 7, 8 in the textbook
Teaching points	Primal and Dual Problems, Sensitivity analysis
In-class assignment	

Session 4:

Topic :	Linear Programming (Duality and Sensitivity analysis continued)
Read:	Power point slides, Chapter 6, 7, 8 in the textbook
Teaching points	Weak/Strong duality, Dual Simplex method
In-class assignment	

Session 5:

Topic :	Integer Programming / Transportation and Assignment Problem
Read:	Power point slides, Chapter 9, 12 in the textbook.
Teaching points	Branch and Bound, IP and Unimodular Matrix
In-class assignment	

Session 6:

Topic :	Network Flow Problems (Network Simplex Method / Dynamic Programming)
Read:	Power point slides, Chapter 10 in the textbook.
Teaching points	Network flow problems
In-class assignment	

Session 7

Topic :	Dynamic Programming
Read:	Power point slides, Chapter 11 in the textbook.

Teaching points	Dynamic Programming, Recursive equation
In-class assignment	

Session 8:

Topic :	Constraint and Column Generation for Linear Integer Programming
Read:	Power point slides: Constraint and column generation and the cutting stock problem
Teaching points	Constraint generation, Column generation
In-class assignment	

Assignments Description and Deadlines

Homework Assignment #1. DDL: Oct. 3, 2018

Homework Assignment #2, Case problem: Spring Garden Tools. DDL: Oct. 17, 2018

Homework Assignment #3, Case problem: Mosaic Tiles Ltd.. DDL: Oct. 31, 2018

Homework Assignment #4, Case problem: New Offices at Atlanta Management Systems. DDL: Nov. 14, 2018

Homework Assignment #4, Case problem: Shipping woods to market. DDL: Nov. 28, 2018

Homework Assignment #5. Programming assignment: 0/1 Knapsack problem. DDL: Dec. 12, 2018

Homework Assignment #6. DDL: Dec. 26, 2018

Homework Assignment #7. DDL: Jan. 2, 2019

Additional reading materials (research articles) for in-class presentation

1 - Pieter L. van den Berg, Guido A. G. Legemaate, Rob D. van der Meic. (2017). "Increasing the Responsiveness of Firefighter Services by Relocating Base Stations in Amsterdam." *Interfaces* 47(4):352-361.

2 - E. Rod Butchers, Paul R. Day, Andrew P. Goldie, Stephen Miller, Jeff A. Meyer, David M. Ryan, Amanda C. Scott, Chris A. Wallace, (2001) "Optimized Crew Scheduling at Air New Zealand." *Interfaces* 31(1):30-56.

3 - Silke Jütte, Marc Albers, Ulrich W. Thonemann, Knut Haase, (2011) "Optimizing Railway Crew Scheduling at DB Schenker." *Interfaces* 41(2):109-122.

4 - Sharan Srinivas, Mohammadmahdi Alizadeh, Nathaniel D. Bastian (2017) "Optimizing Student Team and Job Assignments for the Holy Family Academy." *Interfaces* 47(2):163-174.

5 - Hannah K. Smalley, Pinar Keskinocak, Faramroze G. Engineer, Larry K. Pickering, (2011) "Universal Tool for Vaccine Scheduling: Applications for Children and Adults." *Interfaces* 41(5):436-454.

6 - Chuck Holland, Jack Levis, Ranganath Nuggehalli, Bob Santilli, Jeff Winters (2017) "UPS Optimizes Delivery Routes." *Interfaces* 47(1):8-23.

7 - Teresa Bianchi-Aguiar, Elsa Silva, Luis Guimarões, Maria Antónia Carravilla, José F. Oliveira, João Günther Amaral, Jorge Liz, Sérgio Lapela (2016) "Using Analytics to Enhance a Food Retailer's Shelf-Space

Management.” Interfaces 46(5):424-444.

8 - Jehoshua Eliashberg, Sanjeev Swami, Charles B. Weinberg, Berend Wierenga, (2001) “Implementing and Evaluating SilverScreener: A Marketing Management Support System for Movie Exhibitors.” Interfaces 31(3_supplement):S108-S127.

Student Evaluation

Homework/Presentation (25%)

Class participation (5%)

Exam (70%)