

QUANTITATIVE METHODS #407

Winter 2006

Course Coordinator: Sanjay Mehrotra

Tech Institute Room M152

Bring a lap top computer to class. No need for wireless (but it is a nice plus).

You will need to be running Excel and a relatively recent version of the Windows operating system (XP, 2000, NT).

L.	Date	Module and Description		Instructor
<b>Module I: Data Management, Statistics, and Forecasting</b>				
1.	1/4/06	Introduction to Mathematical Modeling	Business modeling examples, the modeling process, certainty and uncertainty in models. Importance of understanding data before modeling, and modeling with spreadsheet in simple decision situations. Data Analysis in spreadsheet.	Mehrotra
2.	1/11/06	Statistics	Review of descriptive statistics, confidence intervals, distribution fit, hypothesis testing, regression analysis.	Ankenman
3.	1/18/06	Forecasting	Quantitative Methods in Forecasting, Time series analysis, seasonal demand, regression.	Ankenman
<b>Module II: Optimization</b>				

4	1/25/06	Linear Programming Models	Decision Variables, objectives, constraints, Blending Models, Product Mix Models, Linear Programming Solver, Sensitivity and what-if analysis	Mehrotra
5	2/1/06	Linear and Nonlinear Models, Financial Optimization	Multi-period planning models, nonlinear models, Markovitz model, Capital budgeting models, Reinvestment models	Mehrotra
6.	2/8/06	Network and Integer Optimization	Assignment, staffing, scheduling, shortest path problems. Transportation and Transshipment models, Introduction to Integer Programs.	Daskin
7.	2/15/06	Integer and multi-objective optimization, location, routing and logistics	Facility location and logistics modeling, multi-objective modeling	Daskin
<b>Module III: Decision Analysis and Simulation</b>				
8.	2/22/06	Decision Analysis	Decision criterion, advanced probabilistic decision models, expected value of perfect and imperfect information, decision trees, and utility functions.	Hazen
9.	3/1/06	Spreadsheet Simulation	Basics of Monte-Carlo simulation, Input and Output analysis.	Nelson
10	3/8/06	Queueing Analysis	Design and analysis of production and service system using queueing models to predict and mitigate delay and congestion.	Nelson
		<b>No Final Examination</b>		



## 1. Course Description

This course provides you with an understanding of how various business situations are modeled and optimized effectively using mathematical modeling and quantitative techniques. Examples of the techniques covered in this course are time-series analysis, regression, optimization (linear, nonlinear, and discrete), probabilistic modeling, decision analysis, and simulation. Application areas include forecasting, finance, operations, production and logistics.

You will learn, through examples, cases, and use of software.

The course is team taught by faculty experts in technology and application areas covered in the course.

## 2. Required Text

### **Decision Modeling with Microsoft Excel**

By Moore, Weatherford, Eppen, Gould and Schmidt

South-Western Thomson Learning, 2001

ISBN # 0-13-017789-X

### **The Cartoon Guide to Statistics**

by Larry Gonick and Woollcott Smith

HarperPerennial, 1994

## 3. Reading and Homework Assignments

Readings and homework for the course are assigned in class or a week prior to the lecture. Each instructor assigning the homework is responsible for grading the assignment. Office hours for the instructor will be available through the instructor. For any homework related discussions you should contact the instructor directly. In case you are unable to reach the instructor, you may contact the course coordinator [Mehrotra]. Phone #s and email addresses of course instructors are listed below.

Name	Phone	Email
Mehrotra	847 491 3155	mehrotra@iems.northwestern.edu
Ankenman	847 491 5674	ankenman@iems.northwestern.edu
Daskin	847 491 8796	daskin@iems.northwestern.edu
Hazen	847 491 5673	hazen@iems.northwestern.edu
Nelson	847 491 3747	nelsonb@iems.northwestern.edu

## 4. Class Web-site

<https://www.courses.northwestern.edu>

Course related material, homeworks, case studies and any additional announcements will be posted on the blackboard website for the course. You will receive emails from the instructor posting the materials as it becomes available.

## **5. Grading and Late Homework Policy**

Your course grade will be based on weekly homework given during the course. Each homework carries equal weight towards your final grade. Homework is due in class on the due date indicated on the homework. No late homework is accepted unless prior arrangements are made with the instructor assigning the homework. There is NO FINAL EXAM in the course.

## **6. NU Disability Policy**

<http://www.northwestern.edu/disability/policies/syllabus.html>

To be eligible for disability-related services; students must have a visibly obvious or documented disability as defined by the Americans with Disabilities Act of 1990 (ADA) and Section 504 of the Rehabilitation Act of 1973. Under the ADA and Section 504, a person has a disability if he/she has a physical or mental impairment that substantially limits one or more major life activities such as walking, standing, seeing, speaking, hearing, sitting, breathing, and/or taking care of oneself.

SSD is the designated office at Northwestern University that obtains and files disability-related documents, certifies eligibility for services, determines reasonable accommodations, and develops plans for the provision of such accommodations. Students with disabilities are also offered auxiliary services, including assessment, library and lab assistants, notetakers, tutoring, assistive/adaptive technology, academic, psycho/social support, and mentorship.

### **Certifying Eligibility for Services**

When appropriate, SSD requests disability-related documents from the appropriate licensed professional to certify a student as having a disability and to determine reasonable accommodations. Students who suspect that they have a disability, and have not received a formal assessment, may be referred to on-campus (Counseling and Psychological Services, Department of Communication Sciences and Disorders) or off-campus resources for an evaluation. Pending receipt of documentation, SSD reserves the right to deny services or accommodations.