

GSB 420  
Quantitative Methods  
Autumn 2007

Instructor: Tim Opiela  
E-mail: [topiela@depaul.edu](mailto:topiela@depaul.edu)  
Website: <https://fac.comtech.depaul.edu/topiela/>  
Office Hours: Tuesday, Wednesday and Thursday: 16:30-17:30, and by appointment.  
Office: DPC 6230 (Loop)  
Tel: 312 362-5584 (Loop)

### COURSE DESCRIPTION:

This course provides a comprehensive review of some basic mathematical and statistical methods and stresses their practical applications in business and economics. The course will equip the student with the quantitative skills required in the MBA program and will also provide a good foundation for addressing typical problems that arise in business. Additionally, the skills acquired in the course will also help the student prepare for the quantitative sections of professional exams, such as the CFA, the CPA and the CMA exams.

This course will stress learning through applications/problem-solving using Excel and/or Minitab software for data analyses. However, the course must be analytical and theoretical to the extent that is necessary to develop a correct understanding of the topics presented. The topics covered in the course include relevant mathematical concepts: graphing functions, solving a system of equations and optimizing using differential calculus. It also focuses on relevant statistical concepts: probability theory, hypothesis testing, regression analysis and forecasting.

TEXT: *Business Statistics a First Course*, 4<sup>th</sup> Edition; Levine, Krehbiel and Berenson,.

SOFTWARE PACKAGES: All of the mathematics and many of the statistical concepts/techniques taught in this course are best learned through problem solving. For ease in computation, we will use two software packages: Excel and Minitab.

### LECTURES AND FOCUS:

Lectures will consist of introduction to the mathematical and statistical concepts through working problems. We will spend a large part of class time working through problems that you might have had some trouble with in your homework.

EXAMS: There will be a Mid-term Exam (10OCT-Wednesday Class, 11OCT-Thursday Class) and a Final Exam (14NOV-Wednesday Class, 15NOV-Thursday Class). The exams will consist of short answer and problems drawn from lectures, assignments and readings. The final exam will not be comprehensive, but the material in the latter part of the class builds on material covered in the first half of the course. Exams will be open book and you will be allowed to have your own notes on one 8 ½ " X 11" piece of paper.

**ASSIGNMENTS:** The only way to learn mathematics and statistics is to work problems, problems and more problems. My website contains problems and solutions for the mathematics portion of the course. My website also lists assignment problems in your statistics text and also has a link for the solutions to these problems. The text is composed mainly of exercises, many of which are interesting applications of the statistical concepts explained in the book. You will have weekly reading (approximately 20 pages per week) and problem solving assignments from the text (a total of 9 assignments, consisting of approximately 10 required problems per week – you are encouraged to work more problems). No late assignments accepted.

**GRADES:** The two exams will comprise 80% of your course grade (40% for each). The remaining 20% will be from your assignments. You cannot make “Fs” on both exams and pass the class. On each exam and on each assignment, you will receive a grade expressed as a percentage. This grade will be weighted 40% for each exam. The assignments will be weighted 20%/ (each assignment will be weighted 0.2/9). As an example, if you receive an 80% on the mid-term exam, a 75% on the final exam and a 95% on each assignment, your course grade will be calculated as a weighted average as follows:

$$(80)(0.4) + (75)(0.4) + (95)(0.0222)(9) = 32 + 30 + 19 = 81, \text{ which is a B-}, \text{ or equivalently, } 2.7.$$

### **TENTATIVE SCHEDULE:**

#### **Mathematics Review – Review Sheets On-line**

##### **Week 1**

##### **Algebra (See Algebra Review and Math Review on-line)**

Topics: Functions, manipulating equations, solving linear equations in two unknowns, solving quadratic equations, and power, logarithms and exponential functions.

Applications: (Supply and demand functions, Macroeconomic model, Production function and Present value.

##### **Week 2**

##### **Calculus (See Calculus Review and Math review on-line)**

Topics: Developing the derivative (concept of slope at a point on a function), Basic rules of differentiation, Partial differentiation, and unconstrained and constrained optimization

Applications: Continuous growth and compounding, profit maximization, advertising and sales.

## **Probability and Statistics**

### **Weeks 3 and 4**

By the start of the third week you should have already read Berenson, Krehbiel and Levine (BKL)

- Chapter 1: Introduction (browse)
- Chapter 1 Appendix: Use of Excel and Minitab
- Chapter 2: Presenting Data in Tables and Charts (browse)

I will not lecture on these chapters, but you are responsible for their content.

**Descriptive Statistics:** BKL Chapter 3, Sections 3.1-3.4.

Measures of central tendency (mean, median, mode). Measures of spread (variance, standard deviation, skewness) correlation. Measures of association (covariance, correlation coefficient).

**Basic Probability:** BKL Chapter 4, Sections 4.1-4.4.

Understanding and computing probabilities (simple, joint, conditional, independence, Bayes' Theorem.)

### **Week 4**

**Probability Models/Distributions:** BKL Chapter 5, Sections 5.1-5.3.

Concept of Probability Models (Random Variables (RV), Mean and Variance of RVs, probability density functions (pdf)).

Discrete Probability Models (Binomial distributions)

### **Week 5**

**Mid-term Exam (includes material on mathematics review and statistics up to the end of chapter 5)**

### **Week 6**

**Probability Models/Distributions (cont.):** BKL Chapter 6, Sections 6.1-6.3.

Continuous Probability Models (the Normal distribution)

**Confidence Interval Estimation:** BKL Chapter 8, Sections 8.1-8.2.

Confidence Interval Estimation for the Mean (concept, t Distribution, degrees of freedom, confidence interval statement)

### **Weeks 7 and 8**

**Hypothesis Testing:** BKL Chapters 9 and 10 (Sections 9.1-9.5 and 10.1 – 10.5)

Hypothesis Test Methodology, Z-statistics, critical value of test statistic, p-value, connection to interval estimation One-tailed tests. Two-tailed tests using same concepts.)

### **Weeks 8 and 9**

#### **Simple Linear Regression**

Basic Linear Regression (Least Squares Method, computing regression coefficients, measures of variation and fit, residual analysis, autocorrelation, inference about slope coefficient, confidence intervals for slope coefficient)

### **Weeks 9 and 10**

#### **Multiple Regression**

Development of Multiple Regression Model (interpretation of multiple coefficients, R-squared and adjusted R-Squared, residual analysis, inference about the slope coefficients, confidence interval estimation,

#### **Dummy Variables**

Use of qualitative variables.

#### **Forecasting**

Basic Forecasting using regression analysis and time series smoothing.

### **Week 11      **Final Exam****