

## **GSB 420 -- Business Analytics Tools**

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### **Course Objective**

The course objective is to provide practical knowledge of mathematics, probability theory, statistics, and regression techniques that are the most relevant and useful in a graduate business program and after completion of an MBA. Mathematics and probability will be useful in some of your MBA courses, but mathematics and probability also are the language of statistics and regression analysis and serious work in statistics and regression analysis requires their use. The course develops ideas, concepts, and vocabulary that graduates of quality MBA programs are expected to know. Although the course is problem oriented, it also is analytical and theoretical to the extent that is necessary in order to develop correct insights and practical understanding of topics presented.

A few ideas to contemplate about probability and statistics:

Attributed to Pierre-Simon Laplace: "Life's most important **questions** are, for the most part, nothing but probability problems."

From the short story *Funes, The Memorious* in 1942 by Argentine author Jorge Luis Borges: [Funes'] memory was infallible.... Funes not only remembered every leaf on every tree of every wood, but every one of the times he had perceived or imagined it....Nevertheless, he was not capable of thought. To think is to forget a difference, to generalize, to abstract. In the overly replete world of Funes there were nothing but details.

Steven Stigler in *Seven Pillars of Statistical Wisdom* (2016) says: Funes was big data without Statistics.

Attributed to H. G. Wells: "Statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write."

### **Reading Material**

The textbook for the course is *Statistics for Managers, Using Microsoft Excel*, Eight Edition by David Levine, David Stephan, and Kathryn Szabat and published by Pearson. Earlier editions, such as the seventh or sixth edition, can be used as well. In addition, supplementary material will be placed on D2L, most importantly reading dealing with the mathematics of linear, quadratic, exponential, and logarithmic functions covered in the beginning of the course.

## Software

Excel is the main software for the course. If you do not have access to Excel, it is available in DePaul's computer labs (six Loop locations and six Lincoln Park locations). In addition, enrolled students may obtain Microsoft Office 365 ProPlus without charge. Minitab may also be used in part of the course, especially in the regression analysis segment. Minitab also is available in all of DePaul's computer labs; and, in addition, it is available remotely through DePaul's Virtual Lab, simply type <http://vlab.depaul.edu> and sign-in as you would to Campus Connect (a 30-day Minitab free trial also is available from the vender if desired).

## Course Outline and Topics

### I. Mathematics

Sets, Counting Rules, and Summation Notation (reading material on D2L)

Functions – linear, quadratic, exponential, logarithmic functions (reading material on D2L)

### II. Probability and Statistics

Sampling, Graphs, and Descriptive Statistics (Chapters 1,2,3)

Calculating Probabilities – basic events, unions and intersections of events  
conditional probabilities, Bayes Formula (Chapter 4)

Random Variables – probability mass functions, probability distribution  
functions, expectations (mean, variance, skewness, kurtosis)  
(Chapters 3,5)

Discrete Probability – Bernoulli, Binomial, Poisson Distributions (Chapter 5)

Continuous Probability – Normal Distribution (Chapter 6)

Sampling Distribution, Confidence Intervals, Hypothesis Testing (Chapters 7,8,9,12)  
(some of this material may be covered in the context  
of regression analysis)

### III. Regression

Simple Regression – understanding typical basic computer output (standard errors of  
coefficients, standard error of estimate, analysis of variance,  $R^2$ ,  
correlation coefficients, hypothesis testing, confidence intervals,  
prediction intervals, F statistic, t statistic) (Chapters 13,14)

Multiple Regression – several predictors, dummy variables (Chapter 14)

Non-linear Models – quadratic, exponential, and logarithmic models, logit functions  
(Chapters 14, 15)

## Assessment

Exam I; approximately 4<sup>th</sup> week; exam covers mathematics; 25% of course grade; 100 points. [We will have finished our work in mathematics and we will begin our work in probability and statistics. However, the exam in approximately the 4<sup>th</sup> week will only cover mathematics.]

Exam 2; approximately 8<sup>th</sup> week, exam only covers probability and statistics; 25% of course grade; 100 points. [By the eight week of class we will have finished our work in probability and statistics and have begun the regression analysis segment of the course. However, the exam in approximately the 8<sup>th</sup> week will only cover probability and statistics.]

Exam 3; 11<sup>th</sup> week, exam only covers regression analysis; 25% of course grade; 100 points

Exam 4; Out-of-Class Exam, 11<sup>th</sup> week, cumulative exam covering entire course; 25% of course grade; 100 points.

Total Possible Points in Course: 400.

### **Assignments**

There are problems that I will ask you to complete outside of class. If you hand in these problems and if in my judgment they are substantially correctly done, then I will raise your grade to the next higher grade. The possible grades in the course are A, A-, B+, B, B-, C+, C, C-,D+,D, and F. By “next higher grade” I mean the next higher grade in the foregoing sequence, for example, from C- to C or from B+ to A-. Problems will not be returned to you (make a copy before you give them to me if you want a copy for yourself); I will keep them in a file and evaluate them when I determine your final grade. Problems are for you to think about and puzzle through, so I will only answer clarification-type questions, not substantive-type questions before they are due. After the due date, I will try to fully explain and solve (either in class or through material made available to you on D2L) only the most important problems for development of the course and exams.

Course dedicated to the memory of Todd Beamer (1969-2001) -- 9/11 hero of United Airlines Flight 93 and DePaul University Kellstadt Graduate School of Business graduate in 1993.