EC151.03 Statistics for Business and Economics

Instructor: Chiu Yu Ko  
Phone: 617-552-6093

Class: Fulton 220 MWF 9:00-9:50am  
Email: kocb@bc.edu

Office: 462D, Department of Economics,  
Website: www2.bc.edu/~kocb/

21 Campenalla Way  
Office Hour: By appointment

COURSE DESCRIPTION
This course is focused on probability, random variables, sampling distributions, estimation of parameters, tests of hypotheses, regression and forecasting.

TEXTBOOK

Grading
Classwork: 40%
Quiz: 30%
Exam: 30%

OBJECTIVE
As an introductory course, the main objective is to learn basic statistics definitions and concepts, which builds the foundation for either advanced courses. Hence, in order to have a firm understanding of material (and reduce workload at home), classworks (most of them will be before the end of class) will be assigned. Moreover, there will be a cumulative quiz after a topic is covered (most likely on Friday).

Though memorizing formulas are important but as Internet makes information and knowledge so
accessible, it is not crucial to memorize equations (as you will learn more formally in advanced classes) compared to applying them correctly (thanks to easy statistical softwares), and therefore all classworks, quizzes and exams are all open-book.

**ACADEMIC INTEGRITY**

Working together on quizzes/exams is a violation of academic integrity. Please familiarize yourself with the Academic Integrity Section of the Boston College Catalog (35-36) or online at [http://www.bc.edu/integrity](http://www.bc.edu/integrity).

**LEARNING SERVICES**

If you have a disability and will be requesting accommodations for this course, please register with either Kathy Duggan (Kathleen.duggan@bc.edu) Associate Director, Academic Support Services, the Connors Family Learning Center (learning disabilities and ADHD) or Suzy Conway (suzy.conway@bc.edu), Assistant Dean for Students with Disabilities (all other disabilities). Advance notice and appropriate documentation are required for accommodations.

**LEARNING SERVICES**

If you know you will miss classwork/quiz, you are allowed to skip it (weight would be shifted accordingly) if you have presented formal proof IN ADVANCE. (same for students athletes)

For the exam, you can attend the ONLY one make-up exam if you have a signed letter from the dean explaining the circumstances and notify me AHEAD OF TIME.
TENTATIVE SCHEDULE

TOPIC ONE: OVERVIEW

1. Overview
   History of Statistics and Probability
   Scope and Methodology

2. Descriptive and Inferential Statistics
   Descriptive: Chart, summary statistics, probability, distribution
   Inferential: estimation, regression analysis, prediction

3. Sample, Data and Measurement
   Sample and Population: Data collection
   Data type: nominal, ordinal, interval, ratio

4. Use and Misuse of Statistics
   Suggested Readings: How to lie with statistics

5. Statistics software
   Spreadsheets, Stata, SPSS

TOPIC TWO: DESCRIPTIVE STATISTICS

1. Numerical representation
   Central Tendency: Mean (weighted mean), Median, Mode
   Dispersion: Range, inter-quartile range, variance, standard deviation (coefficient of variation)
   Shape: Skewness, Kurtosis

2. Visual representation
   Tables: Grouped data, frequency distribution, contingency table
   Graphs: Stem-and-leave graph, box-plot, Histogram, scatter plot, radar chart

TOPIC THREE: PROBABILITY THEORY

1. Definition
   Frequentist versus Bayesian

2. Basic Operations
   Axioms, union, intersection, inclusion-exclusion principle

3. Conditional probability
   Independence, mutually exclusive, Bayes rule
**TOPIC FOUR: RANDOM VARIABLE AND DISTRIBUTIONS**

1. **Random Variable**
   - definition, continuous versus discrete, expectation and variance, Probability mass/density function, Cumulative probability function
2. **Discrete distribution**
   - Bernoulli, Binomial, Possion, uniform
3. **Continuous distribution**
   - Uniform, Normal, Chi-square, student’s t, F-distribution

**TOPIC FIVE: ESTIMATION THEORY**

1. **Estimator**
   - unbiasedness, consistency, efficiency
2. **Sampling Distribution**
   - law of large number, central limit theorem
3. **Estimation**
   - point estimate, interval estimate

**TOPIC SIX: HYPOTHESIS TESTING**

1. **Statistical reasoning**
   - null/alternative hypothesis, significance level, p-value, type I/type II error, power
2. **Testing methods**
   - Fischer’s exact test, Z-test, student’s t-test, Chi-square test, F-test

**TOPIC SEVEN: ANALYSIS OF VARIANCE AND REGRESSITIONAL ANALYSIS**

1. **Multivariate Statistics**
   - Joint Statistics, correlation, covariance
2. **Analysis of Variance (ANOVA)**
   - Assumptions, sum of squares and F-test
3. **Regressional Analysis**
   - Method of Least square, linear regression, significance of coefficients

**TOPIC EIGHT: FORECASTING THEORY AND OTHER TOPICS (If time permits)**

1. **Prediction**
   - Time Series models: ARMA models, applications in finance
2. **Application**
   - Experimental economics, applied applications