

**INTERAMERICAN UNIVERSITY OF PUERTO RICO
METROPOLITAN CAMPUS
FACULTY OF ECONOMICS AND ADMINISTRATIVE SCIENCES
ECONOMICS SCHOOL
INTERNATIONAL BUSINESS PROGRAM, PH.D.**

SYLLABUS

I. GENERAL INFORMATION

TITLE: RESEARCH METHOD II
CODE: BADM 7202
CREDITS: 3 (THREE)
ACADEMIC TERM:
PROFESSOR:
OFFICE HOUR:
PHONE NUMBER:
MAIL ADDRESS:

I. COURSE DESCRIPTION:

Formulation of problems and their solution by utilizing quantitative management methods and statistical analysis. Applications of fundamentals of matrix algebra, differential calculus, linear programming applied to economic analysis.

Mathematical statistics to analyze business and economic data for decision making. Topics covered will be descriptive and inferential statistics, probability theory, random variables and their distributions, decision theory under risk and uncertainty, sampling, estimation theory and hypothesis testing. PC based statistical programs, like Excel, will be used for all calculations and estimations in order to emphasize application of the methods and intuitive reasoning. Ethical issues concerning the application of these methods will be presented and discussed.

II. OBJECTIVES

After completion of this course the student should be able to:

1. Apply probability theory, to problems under risk and uncertainty.
2. Differentiate between dependent and independent events.
3. Apply probability distributions and their corresponding characteristics or moments.
4. Apply sampling theory.
5. Apply statistical inference theory.

III. COURSE CONTENT

Part I. Probability Theory and Applications

- A. Definition of probability
 - 1. A priori: Laplace
 - 2. A posteriori: Von Misses
 - 3. Axiomatic: Kolmogorov
- B. Axioms and probability laws
- C. Borel or Sigma Algebra Spaces
- D. Bayes Theorem and its use for decision-making

- E. Decision Theory under Risk and Uncertainty
 - 1. Decision process under Uncertainty
 - 2. Bounded rationality
 - 3. Suboptimization
 - 4. Payoff Matrix
 - 5. Decision Rules or Models
 - a. Maximin
 - b. Maximax
 - c. Hurwitz
 - d. Minimax Regret
 - e. Laplace
 - 6. Decision process under Risk
 - a. Expected Value
 - b. Expected Opportunity Loss
 - c. Expected Value of Perfect Information (EVPI)
 - 7. Decision trees

Part II. Probability Functions and their Applications

- A. Random Variables
 - 1. Continuous and discrete
 - 2. Sample space
 - 3. Domain and image
- B. Characteristics of probability functions
 - 1. Probability density function (pdf) and probability distribution function (cdf)
 - 2. Moments and expected value
 - a. Mean
 - b. Variance
 - c. Symmetry
 - d. Kurtosis

- e. Variation coefficient
- 3. Expected values of linear functions or random variables
- 4. Cheychev's Theorem and the empirical rule
- C. Joint bivariate probability function
 - 1. Derived functions
 - a. Marginal
 - b. Conditional
 - 2. Characteristics
 - a. Mean
 - b. Variance
 - c. Covariance
 - d. Correlation coefficient
- D. Some probability functions
 - 1. Uniform
 - 2. Geometric
 - 3. Binomial
 - 4. Hyper geometric
 - 5. Poison
 - 6. Normal
 - 7. Chi Square
 - 8. Modified Chi Square
 - 9. Student t
 - 10. Fisher F

Part III. Sampling Theory

- A. Importance of sampling
- B. Types of samples
 - 1. Convenience
 - 2. Judgmental
 - 3. Random
 - a. Simple random
 - b. Systematic sample
 - c. Stratified sample
 - d. Cluster sample
- C. Sample size

Part IV. Statistical Inference Theory and Applications

- A. Domains of statistical inference

- B. Estimation
 - 1. Point estimation
 - 2. Confidence intervals
 - 3. Hypothesis testing

- C. Point estimation theory
 - 1. Definition and purpose of estimation
 - 2. Estimator
 - 3. Estimate
 - 4. Source of estimators
 - a. Formula for the moments
 - b. least squares method
 - c. Maximum likelihood
 - 5. Properties of the Estimators
 - a. Unbiasedness
 - b. Efficient
 - c. Consistent
 - 6. Mean-squared error

- D. Hypothesis testing
 - 1. Analytic exposition
 - a. Null hypothesis
 - b. Alternative hypothesis
 - 2. Types of errors
 - a. Type I error
 - b. Type II error
 - c. Operating characteristic function
 - 3. Tests of significance

- E. Confidence intervals
 - 1. Analytic exposition
 - 2. Relation with point estimation
 - 3. Relation with hypothesis testing

- F. Goodness of fit analysis

- G. Analysis of contingency tables for dependency

- H. Specific hypothesis testing
 - 1. Population mean
 - 2. Population variance
 - 3. Difference between means
 - a. Independent samples
 - b. Dependent samples

- I. Analysis of Variance and Design of Experiments

- J. Simple regression analysis
 - 1. Statistical model
 - 2. Normal equations
 - 3. Estimation using Excel
 - 4. Model statistical evaluation
 - a. ANOVA
 - b. t tests
 - 5. Time series application

IV. COURSE ACTIVITIES

- A. Power Point presentations by professor and student feedback
- B. Class discussion of exercises
- C. Communication among students and professor via e-mail

V. EVALUATION CRITERIA

- A. Partial Examinations: There will be two partial examinations.
- B. Final Examination
- C. Class Group Presentations

All examinations will consist of questions that require detailed problem-solving work. Approximately 40% of the exam questions are based on the examples discussed in class presentations. Another 60% of the exam questions are based on homework problems.

All examinations are closed notes. However, you are allowed to bring in two 3.5 inches index cards, upon which you may write useful formulas, equations, and so forth for each of the mid-term exams, and three 3.5 inches index cards for the final. In addition, please bring a calculator with exponential and logarithmic functions (including y^x). The use of Excel will be needed for the solution of some exercises.

There will be no exam repositions or make-ups.

The final examination is scheduled to last for four hours. Final examination will be comprehensive and will cover the entire course contents with emphasis in the applications of methods.

Final Grade

The total course score will be determined by weighting the two partial exams by 20% each, the final exam by 50% and the model construction project by 10%.

The final grade distribution will be based upon the following scale:

100 -90----A
89- 80----B

79- 70----C
69 – 0 ---F

VII. SPECIAL NOTES

Auxiliary services or special needs

Students who require special assistance or ancillary services must request them at the beginning of the course or as soon as he/ she acquires knowledge of their need, through the corresponding register in

Dishonesty, fraud and plagiarism

dishonesty, fraud, plagiarism and any other inappropriate behavior with regard to the academic work constitute major infringements sanctioned by the Reglamento General de Estudiantes.. Major infringement, according to the Reglamento General de Estudiantes, may have as a consequence, among other sanctions. the suspension from the University for a defined period of time greater than one year or permanent expulsion from the University,.

Use of electronic devices

Cell phones and any other electronic device that could disrupt the processes of teaching and learning or alter the environment conducive to academic excellence will be deactivated. Pressing situations will be addressed, as appropriate. Handling of electronic devices to access, store or send data during evaluations or examinations is prohibited. .

VIII. EDUCATIONAL RESOURCES

Required Texts

Basic Business Statistics, 12/E. Mark L. B., David M. L., Timothy C. K. Pearson. Pearson 2012.
ISBN-10: 0132168383 ISBN-13: 97801321683809780.

Probability and Statistical Inference, 8/E. Robert V. H. , Elliot Tanis, H., ©2010 . Pearson.
ISBN-10: 0321584759

IX. BIBLIOGRAPHY

Chen, T.-Y.; et al. (May, 2013). European Journal of Operational Research, Vol. 226
Issue 3, p615-625.

Durbach, I. N.; & et al. (August,2012). A comparison of simplified value function
approaches for treating uncertainty in multi-criteria decision analysis, Vol. 40 Issue 4,
p456-464. 9p.

Durbach, I. N, Stewart, T. J. (November, 2012). Modeling uncertainty in multi-criteria
decision analysis. European Journal of Operational Research, Vol. 223 Issue 1,
p1-14. 14p.

Fu, C.; Yang, S. (November, 2012). An evidential reasoning based consensus model for multiple attribute group decision analysis problems with interval-valued group consensus requirements. *European Journal of Operational Research.*, Vol. 223 Issue 1, p167-176. 10p.

Montibeller, G.(November / December 2012). Trends in Multiple Criteria Decision Analysis. Vol. 42 Issue 6, p600-602. 3p.

Schuwirth, N., et al. (July 2012). Methodological aspects of multi-criteria decision analysis for policy support: A case study on pharmaceutical removal from hospital wastewater. *European Journal of Operational Research*, Vol. 220 Issue 2, p472-483. 12p.

Stewart, T. J.; et al..(Aug 2013), Integrating multicriteria decision analysis and scenario planning-Review and extension. Vol. 41 Issue 4, p679-688.

The extended QUALIFLEX method for multiple criteria decision analysis based on interval type-2 fuzzy sets and applications to medical decision making.

OPAC/VAAEPS
Rev. 08/2012; 12/2012