

# APPLIED STATISTICS AND DECISION MAKING (SDGB)

## SDGB 7811. Applied Statistics Internship. (1 to 3 Credits)

This is an experiential elective within the Applied Statistics program, requiring faculty guidance for academic credit from professional training.

## SDGB 7840. Applied Regression Analysis. (3 Credits)

Focuses on preliminary data analysis, model formulation and estimation, and reliability and sensitivity analysis to understand causal links between various elements of a relationship as the foundation for effective system design and control. Multivariate regression models and techniques of experimental design provide the basis for exploring these links.

Discusses applications to all areas of business.

**Attributes:** BUAN, BUSA.

**Prerequisite:** SDGB 7844.

## SDGB 7841. Statistical Theory I. (3 Credits)

This course provides an Introduction to mathematical Statistics and a foundation for acquiring the skills to apply advanced statistical models to many important areas of decision-making in business. The course focuses on developing an understanding of random variables, their distribution functions, and sampling theory.

**Attributes:** BUAN, BUSA.

## SDGB 7842. Statistical Theory II. (3 Credits)

This course provides an Introduction to mathematical Statistics and a foundation for acquiring the skills to apply advanced statistical models to many important areas of decision-making in business. The course focuses on developing an understanding of: Hypothesis testing, Nonparametric Statistics, Bayesian Statistics, Multivariate Methods and Linear Models and their applications.

**Attributes:** BUAN, BUSA.

**Prerequisites:** DGGB 781A or SDGB 7841.

## SDGB 7843. Judgment and Decision Making. (3 Credits)

Decision-making is a central human activity, but how good are we at it? Scientific evidence suggests that our decisions are often biased and flawed, resulting in disappointing or even disastrous outcomes. This course draws upon contemporary research in economics and psychology to answer two questions: (1) how should we rationally approach decision-making, and (2) why is it that our actual decision-making is so often irrational?

**Attributes:** BUAN, BUSA.

## SDGB 7844. Stat Methods and Comp I. (3 Credits)

This course is designed to introduce statisticians to statistical programming and data analysis. Topics will include: hypothesis testing, regression models, experimental design and simulation. The statistical topics are integrated into the programming content.

**Attributes:** BUAN, BUSA.

## SDGB 7845. Sampling Theory. (3 Credits)

This course provides a foundation in sample design and data collection for decision making. We study theoretical principles and applications, starting with definition of the population characteristic of concern, the frame, sampling methods, sample size, and sampling plan. We study also sampling and non-sampling errors and biases, problems of non-response, the half-open interval, and other methods to assure validity and usefulness of our data.

## SDGB 7846. Advanced Financial Econometric. (3 Credits)

This course takes up Bayesian estimation of small-scale financial sector and macro-econometric models. Counter-factual simulations will also be used, as well as Monte-carlo methods for evaluating confidence intervals. In addition to Bayesian estimation, the course will make use of extensive data sets to investigate topics such as contagion effects across countries in financial markets, and neural networks for predictive accuracy. \*Subject to NY Approval\*

## SDGB 7847. Machine Learning for Stats. (3 Credits)

The course will give students an opportunity to implement statistical techniques in "R" to better understand how they work. Emphasis will be on implementation and intuition rather than on background theory and analytical methods. The course will offer a lab-style approach to numerical analysis and optimization methods used to fit statistical models. Topics will include gradient descent/ascent for regression and classification, newton's method, expectation maximization for mixture models, numerical maximum a-posteriori estimation via EM. Students will have the chance to implement techniques and become proficient in "R" by writing functions and classes that perform standard analyses.

**Attribute:** BUAN.

## SDGB 7848. Observational Studies. (3 Credits)

In real-world settings, analysts must draw inferences about causes and effects from observational data, such as those generated from a nonrandomized study. For example, how do we truly determine whether charter schools produce better student outcomes, or whether a marketing campaign for a product has increased consumer awareness? This course will cover select classes of statistical methods to help analysts design and analyze observational studies, for real-world decision-making. Topics will include propensity scores, predictive, modeling, and stimulation-based inference; the R statistical software will serve as the primary computational tool for this course, so a basic knowledge is required.

**Attribute:** BUAN.

## SDGB 7849. Experimental Design. (3 Credits)

This course examines the design, implementation, and analysis of empirical research methods. Topics include experimental and quasi-experimental designs; validity within designs; sampling; and data analysis.

## SDGB 7850. Statistical Risk Analysis. (3 Credits)

This course examines various aspects of risk as revealed or concealed in business, society, and personal situations by utilizing tools in probability theory, statistical analysis, decision theory, and cognitive and behavioral sciences. Students will learn basic risk metrics and models, along with methods for risk analysis and management. Through case studies mirroring Western and Chinese societies and ranging from health & safety, social inequality, finance, to sports and entertainment, students will gain deeper understanding of risk and become better decision makers. Interdisciplinary in nature, this course invites students to think unconventionally of problems that are at the frontier of the globalized and information-saturated world.

**SDGB 7851. Measurement and Data Visualization. (3 Credits)**

Businesses use metrics not only to track, evaluate, and incentivize their employees and customers but also to monitor and improve their organizations. To inform their decisions, they may, for example, look at company records, run an experiment, speak to employees and customers, or make site visits. All of these activities generate data, requiring decisions to be made on how to collect, summarize, analyze, and present these disparate pieces of information. In this course, we consider how to approach these issues, from developing appropriate metrics and heuristics, to thinking about data quality, to creating accessible visualizations.

**Attributes:** BUAN, BUSA, ISEL.

**SDGB 8999. Applied Stats & Decision. (3 Credits)**