A SAMPLE OF “O” ELECTIVES FOR THE STATISTICS MAJOR

This is a list of courses acceptable as Group O electives. It is not an exhaustive list. All Group O electives require advisor approval.

CAAM – See undergraduate statistics advisor.
MATH – See undergraduate statistics advisor.

COMPUTER SCIENCE

COMP 314/ELEC 322 APPLIED ALGORITHMS AND DATA STRUCTURES
Credits: 4
Design analysis of computer algorithms and data structures useful for applied problems. Laboratory assignments will use these techniques in conjunction with advanced programming methods.

COMP 322/ELEC 323 PRINCIPLES OF PARALLEL PROGRAMMING OR
Credits: 4
Fundamentals of parallel programming: abstract models of parallel computers, parallel algorithms and data structures, and common parallel programming patterns including task parallelism, undirected and directed synchronization, data parallelism, divide-and-conquer parallelism, and map-reduce. Laboratory assignments will explore these topics through the use of parallel extensions to the Java language.

COMP 370 / EBIO 333 EVOLUTIONARY BIOINFORMATICS
Credits: 3
Large accessible data sets have opened new frontiers in evolutionary biology, and many fields. Learn to write computer programs to test hypotheses and discover patterns in diverse data. Understand the most common strategies in evolutionary bioinformatics, including dynamic programming, hidden Markov models, and graphical algorithms. No previous programming experience required.

COMP 422 INTRODUCTION TO PARALLEL COMPUTING
Credits: 4
Fundamentals of parallel computing including abstract models for parallel computation, parallel computer architectures, parallel algorithms, and data structures, programming models and methods, mapping and scheduling computation, analyzing computations for correctness and efficiency, and applications to science and engineering. Includes an extensive programming component.
COMP 430 INTRODUCTION TO DATABASE SYSTEMS
Credits: 4
Query Introduction to relational database systems, SQL programming, Database application programming, and Database design.

COMP/ELEC 440 ARTIFICIAL INTELLIGENCE
Credits: 4
This is a foundational course in artificial intelligence, the discipline of designing intelligent agents. That course will cover the design and analysis of agents that do the right thing in the face of limited information and computational resources. The course revolves around two main questions: how agents decide what to do, and how they learn from experience. Tools from computer science, probability theory, and game theory will be used. Interesting examples of intelligent agents will be covered, including poker playing programs, bots for various games (e.g. WoW), DS1 -- the spacecraft that performed an autonomous flyby of Comet Borrely in 2001, Stanley -- the Stanford robot car that won the Darpa Grand Challenge, Google Maps and how it calculates driving directions, face and handwriting recognizers, Fedex package delivery planners, airline fare prediction sites, and fraud detectors in financial transactions.

COMP 482-DESIGN AND ANALYSIS OF ALGORITHMS
Credits: 3
Methods for designing and analyzing computer algorithms and data structures. The focus of this course will be on the theoretical and mathematical aspects of algorithms and data structures.

COMP/BIO/ELEC 485-FUNDAMENTALS OF MEDICAL IMAGING I
Credits: 3
This course will introduce basic principles of image acquisition, formation and processing of several medical imaging modalities such as X-Ray, CT, MRI, and US that are used to evaluate the human anatomy. The course also includes visits to a clinical site to gain experience with the various imaging modalities covered in class.

COMP 502-NEURAL NETWORKS AND INFORMATION THEORY I
Credits: 3
Review of major neural machine learning (Artificial Neural Network) paradigms. Analytical discussion of supervised and unsupervised neural learning algorithms and their relation to information theoretical methods. Practical applications to data analysis such as pattern recognition, clustering, classification, function approximation/regression, non-linear PCA, projection pursuit, independent component analysis, with lots of examples from image and digital processing.

ECOLOGY AND EVOLUTIONARY BIOLOGY

EBIO 333 – Evolutionary Bioinformatics
Credits: 3
Large accessible data sets have opened new frontiers in evolutionary biology, and many fields. Learn to write computer programs to test hypotheses and discover patterns in diverse data. Understand the most common strategies in evolutionary bioinformatics,
including dynamic programming, hidden Markov models, and graphical algorithms. No previous programming experience required.

**EBIO 338 - Design and Analysis of Biological Experiments**
This course addresses methods to set up biological experiments that maximize the ability to draw meaningful conclusions. Designed (factorial, nested, split plot, repeated measures) and undesigned experiments (regression, correlation) will be considered, as well as analysis and interpretation of the data. Actual data sets from several areas of biology will be used for homework, demos, and projects. The student should have some previous exposure to statistics.

**ECONOMICS**

**ECON 309-APPLIED ECONOMETRICS**
Credits: 3
Formerly ECON 446. Applied econometrics methods; focus will be on the application of econometrics to modeling, forecasting, and hypothesis testing. A computer lab 1 day a week (MWF course with computer lab on F) will focus on empirical implementation of econometric methods. STATA and/or Excel will be used in the computer labs. Some knowledge of calculus is required.

**ECON 401-MATHEMATICAL STRUCTURE OF ECONOMIC THEORY**
Credits: 3
Formerly ECON 477. There are two purposes for this course: i) to provide juniors and seniors in Economics with the essential mathematical tools; ii) to show how these tools are applied in economic theory. Accordingly, the course is divided into two parts. The first part covers mathematical topics, such as real analysis and optimization. The second part introduces some fundamental topics in economic theory, such as game theory and auction theory, to which the mathematical tools are applied. The course emphasizes logical clarity and mathematical rigor, along with the ability to follow and construct mathematical proofs.

**ECON 405-GAME THEORY AND ECONOMIC BEHAVIOR**
Credits: 3
Formerly ECON 440. The course develops a rigorous presentation of key concepts in game theory, and emphasizes their applications to economic modeling. Contents include: choice under uncertainty and Von Neumann Morgenstern utility; games in normal form: mixed strategies, Nash equilibrium (existence and stability); games in extensive form: backward induction and other equilibrium refinements; games with incomplete information: Bayesian Nash equilibrium; cooperative games: core stability and the Shapely value. Recommended prerequisite(s): Familiarity with mathematical arguments and probability theory.

**ECON 409-ECONOMETRICS**
Credits: 3
Formerly ECON 400. Survey of estimation and forecasting models. Includes multiple
regression time series analysis. A good understanding of linear algebra is highly desirable. Cross-list: STAT 400.

ECON 443-FINANCIAL ECONOMICS
Credits: 3
Economic analysis of the operation of financial markets. Covers asset pricing, risk management, portfolio theory, arbitrage theory, and market efficiency. Emphasis is put on the application of the financial concepts to decisions faced by households and firms.

SOCIOLOGY

SOCI 313-DEMOGRAPHY
Credits: 3
Introduction to the study of the dynamics of population change. Includes demographic data sources, components of population change, mortality patterns, family planning, the measurement of migration flows, and population-economic models. Graduate/Undergraduate Equivalency: SOCI 513.

SOCI 381-RESEARCH METHODS
Credits: 3
An introduction to the methods sociologists use to study human societies and their members. Hypothesis formulation and research design; qualitative studies through observation and interviews; historical and comparative approaches; sample surveys and the statistical analysis of quantitative data, political and ethical issues in social research.

SOCI 406-BASIC DEMOGRAPHIC METHODS
Credits: 3
The course provides a survey of basic demographic methods for assessing population change, fertility, mortality, and (im)migration and characteristics such with age, gender, race/ethnicity, household/family composition, marital status, economic, employment, and educational. Emphasis placed on the use of the methods in a variety of demographic and other settings. Graduate/Undergraduate Equivalency: SOCI 506.

SOCI 436-RESEARCH SEMINAR: THE HOUSTON AREA SURVEY
Credits: 3
Continuation of the series of annual surveys on how Houston residents are reacting to the ongoing economic and demographic changes. Includes sampling procedures, questionnaire construction, interviewing, data analysis, and the logic and skills of survey research. Culminates in a research report that develops empirical hypotheses and tests their validity with the survey findings. Graduate/Undergraduate Equivalency: SOCI 536.

SOCI 483-DATA ANALYSIS
Credits: 3
This graduate course introduces students to multivariate regression methods. It assumes previous coursework in elementary statistics and the use of STATA. We will cover regression analysis for continuous dependent variables and move in to intermediate and
some advance analysis for categorical dependent variables, commonly referred to as generalized linear models. Graduate/Undergraduate Equivalency: SOCI 583.

PSYCHOLOGY

PSYC 439-ADVANCED STATISTICAL METHODS FOR PSYCHOLOGY
UNDERGRADUATES
Credits: 3
This course is intended as a second course in statistics for psychology and the social sciences. It builds on PSYC 339. Advanced factorial ANOVA designs, mixed between- and within-subject designs, and multiple regression will be covered. This course is primarily for advanced psychology undergraduates contemplating enrollment in graduate school or equivalent basic statistics course.

SPORTS MANAGEMENT

SMGT 430-INTRODUCTION TO SPORT ANALYTICS
Credits: 3
The focus of this course will be to provide the basics for understanding and applying analytical techniques to professional teams both on the sports side (predicting player performance and outcomes) and the business side (establishing business models). A survey into basic statistical techniques (multiple regression, discriminant analysis, etc.) will be the foundation from which we will work.