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 330 - TOOLS & MODELS - DATA SCIENCE
Credits: 3
This course is an introduction to modern data science. Data science is the study of how to extract actionable, non-trivial knowledge from data. The proposed course will focus both on the software tools used by practitioners of modern data science, as well as the mathematical and statistical models that are employed in conjunction with such software tools. On the tools side, we will cover the basics of relational database systems, as well as modern systems for distributed computing based on MapReduce. On the models side, the course will cover standard supervised and unsupervised models for data analysis and pattern discovery.

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 382 - REASONING ABOUT ALGORITHMS
Credit Hours: 4
Writing algorithms is fun, but how are you sure that the algorithm you wrote is flawless? Are there computing tasks for which it is impossible to produce an efficient algorithm, or, for that matter, any algorithm? To answer these questions, you have to learn to perform mathematical reasoning about algorithmic problems and solutions COMP 382 is an introduction to such reasoning techniques. Topics covered would include elementary logic, analysis of the correctness and efficiency of algorithms, and formal computational models like finite automata and Turning machines. On the way, you are also going to learn some new algorithm design techniques.

COMP 422 INTRODCUTION 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 441 - LARGE-SCALE MACHINE LEARNING
Credit Hours: 3

Learning from large dataset is becoming a ubiquitous phenomena in all applications spanning robotics, medical decisions, internet, communication, biology, etc. Designed to give senior UG students a thorough grounding in the theory and algorithms needed for research and practical applications in machine learning for modern massive datasets. Topics draw from machine learning, classical statistics, algorithms and information theory.

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 MACHINE LEARNING 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. CROSS-LIST: STAT 502

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

The Economics Department introduced a new curriculum and new courses in 2015-2016. Courses prior to 2015-2016 may have changed levels (e.g., from 309 to 209). For the purposes of elective credit for the Statistics BA we will follow the course levels according to matriculation year. For example, a student who matriculated Fall 2015 or later ***will not*** get elective credit for ECON 209 Applied Econometrics, but those matriculating prior to Fall 2015 ***will*** get credit for ECON 309 Applied Econometrics since electives must be at the 300 or higher level. Elective courses from the economic departments that underwent a change in numbering as of Fall 2015 are noted below. The course descriptions given below are for the new versions.

NEW = 2015-16 and later
OLD = 2014-2015 and before

New – ECON 209 APPLIED ECONOMETRICS
Old - ECON 309 APPLIED ECONOMETRICS
Credits: 3
Applied econometric methods: econometric theory with practical emphasis on modeling, estimation, and hypothesis testing. A computer lab one day a week focuses on empirical implementation of econometric methods using STATA software. Credit may be given for only one of ECON 309 or ECON 209.

ECON 300 - GAME THEORY AND OTHER MICRO TOPICS FOR ECON MAJORS
Credit Hours: 3
Advanced level analysis of topics in microeconomics designed for students in the ECON major. Topics include the foundations and applications of game theory, the economics of choice under uncertainty, and information economics including issues of asymmetric information. Additional topics may include auction theory, mechanism design and behavioral economics. Open to all majors other than MTEC.

New - ECON 305 GAME THEORY AND OTHER MICRO TOPICS FOR MTEC MAJORS
Old - ECON 405-GAME THEORY AND ECONOMIC BEHAVIOR
Credit Hours: 3
Advanced level analysis of topics in microeconomics, focusing on mathematical modeling and designed for students in the MTEC major. Topics include the foundations and applications of game theory, general equilibrium theory and applications, the economics of choice under uncertainty, and information economics including issues of asymmetric information. Additional topics may include auction theory, mechanism design, and behavioral economics. Open to all majors.

New - ECON 308 MATHEMATICAL ECONOMICS
Old - ECON 401 MATHEMATICAL STRUCTURE OF ECONOMIC THEORY
Credits: 3
Coverage of mathematical topics used in economics, such as linear algebra, optimization, and real analysis, with applications to fundamental topics in economic theory, constrained optimization, labor market dynamics, game theory and Leontief input-output model. Emphasizes logical clarity and mathematical rigor, along with the ability to follow and construct mathematical proofs.

New - ECON 310 ECONOMETRICS
Old - ECON 409 ECONOMETRICS
Credits: 3
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 418 - ECONOMIC FORECASTING
Credit Hours: 3
Application of econometric techniques to problems in macroeconomics and financial economics. The course focuses on macroeconomic forecasting and test of economic theories using stationary and non-stationary time-series data. Methods include predictive regressions, vector autoregressions, impulse response functions, and variance decomposition. Tests and comparisons of forecast accuracy are also included. Projects will be completed in STATA.

ECON 419 - ADVANCED TOPICS IN ECONOMETRICS
Credit Hours: 3
Introduction to advanced econometrics, with an emphasis on methods used in microeconomic applications. Methods covered are used in the estimation of the demand for goods and services, production functions, and for analyzing the impact of social programs.

ECON 449 – PRINCIPLES OF FINANCIAL ENGINEERING
Credit: 3
Covers the use of financial securities and derivatives to take or hedge financial risk positions, including most commonly used instruments, from simple forwards and futures to exotic options and swaptions. Studies the pricing of derivative securities with emphasis on the mechanics and uses of financial engineering methods.

SOCIOLOGY

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.