

COMPUTATIONAL ECONOMICS

Contact Information

Economics

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The Master of Computational Economics (MCEcon) is a professional master's program, administered by the Department of [Economics](https://ga.rice.edu/programs-study/departments-programs/social-sciences/economics/#header) (<https://ga.rice.edu/programs-study/departments-programs/social-sciences/economics/#header>)...

Computational Economics does not currently offer an academic program at the undergraduate level.

Master's Program

- [Master of Computational Economics \(MCEcon\) Degree](https://ga.rice.edu/programs-study/departments-programs/social-sciences/computational-economics/computational-economics-mcecon/) (<https://ga.rice.edu/programs-study/departments-programs/social-sciences/computational-economics/computational-economics-mcecon/>)

Department Chair, Economics

George Zodrow

Program Director

Zachary Bethune

For Rice University degree-granting programs:

To view the list of official course offerings, please see [Rice's Course Catalog](https://courses.rice.edu/admweb!/SWKSCAT.cat?p_action=cata) (https://courses.rice.edu/admweb!/SWKSCAT.cat?p_action=cata).

To view the most recent semester's course schedule, please see [Rice's Course Schedule](https://courses.rice.edu/admweb!/SWKSCAT.cat) (<https://courses.rice.edu/admweb!/SWKSCAT.cat>).

Economics (ECON)

ECON 100 - PRINCIPLES OF ECONOMICS

Short Title: PRINCIPLES OF ECONOMICS

Department: Economics

Grade Mode: Standard Letter

Course Type: Lecture

Distribution Group: Distribution Group II

Credit Hours: 3

Restrictions: Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.

Course Level: Undergraduate Lower-Level

Description: Introduction to the basic concepts of microeconomics and macroeconomics. Microeconomics component includes analysis of supply and demand, consumer and producer behavior, and competitive and noncompetitive market equilibria, with applications to current policy issues. Macroeconomics component provides an overview of the determination of national output, employment, interest rates, and inflation, and analyzes monetary fiscal policies and international trade. Designed for both non-majors and majors.

ECON 101 - INTRODUCTION TO MICROECONOMICS

Short Title: INTRODUCTION TO MICROECONOMICS

Department: Economics

Grade Mode: Standard Letter

Course Type: Lecture

Distribution Group: Distribution Group II

Credit Hours: 3

Restrictions: Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.

Course Level: Undergraduate Lower-Level

Description: Introduction to microeconomic analysis at a level suitable for non-majors. Applies only for transfer credit and requires departmental approval. Approved credit counts toward total credit hours required for graduation and for distribution, but does not count toward the ECON or MTEC majors. Mutually Exclusive: Cannot register for ECON 101 if student has credit for ECON 111. Mutually Exclusive: Cannot register for ECON 101 if student has credit for ECON 111.

ECON 103 - INTRODUCTION TO MACROECONOMICS

Short Title: INTRODUCTION TO MACROECONOMICS

Department: Economics

Grade Mode: Standard Letter

Course Type: Lecture

Distribution Group: Distribution Group II

Credit Hours: 3

Restrictions: Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.

Course Level: Undergraduate Lower-Level

Description: Introduction to macroeconomic analysis at a level suitable for non-majors. Applies only for transfer credit and requires departmental approval. Approved credit counts toward total credit hours required for graduation and for distribution, but does not count toward the ECON or MTEC majors. Mutually Exclusive: Cannot register for ECON 103 if student has credit for ECON 112/ECON 113. Mutually Exclusive: Cannot register for ECON 103 if student has credit for ECON 112/ECON 113.

ECON 111 - AP/OTH CREDIT IN MICROECONOMICS**Short Title:** AP/OTH CREDIT MICROECONOMICS**Department:** Economics**Grade Mode:** Transfer Courses**Course Type:** Transfer**Credit Hours:** 1-6**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** Provides transfer credit based on student performance on approved examinations in microeconomics, such as the Advanced Placement microeconomics exam, the International Baccalaureate higher-level economics exams, or the A-Level economics exam, or for an approved introductory microeconomics course. Approved credit counts toward total credit hours required for graduation, but does not count for distribution or toward the ECON or MTEC majors. Mutually Exclusive: Cannot register for ECON 111 if student has credit for ECON 101. Mutually Exclusive: Cannot register for ECON 111 if student has credit for ECON 101.**ECON 113 - AP/OTH CREDIT IN MACROECONOMICS****Short Title:** AP/OTH CREDIT MACROECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Transfer**Credit Hours:** 1-6**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** Provides transfer credit based on student performance on approved examinations in macroeconomics, such as the Advanced Placement macroeconomics exam, the International Baccalaureate higher-level economics exams, or the A-Level economics exam, or for an approved introductory macroeconomics course. Approved credit counts toward total credit hours required for graduation, but does not count for distribution or toward the ECON or MTEC majors. Mutually Exclusive: Cannot register for ECON 113 if student has credit for ECON 103. Mutually Exclusive: Cannot register for ECON 113 if student has credit for ECON 103.**ECON 200 - MICROECONOMICS****Short Title:** MICROECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Distribution Group:** Distribution Group II**Credit Hours:** 4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Prerequisite(s):** (MATH 102 or MATH 106) and (ECON 100 or MATH 212)**Description:** Intermediate level analysis of theories of household behavior, including demand for consumer goods, labor supply, and savings/investment decisions, and producer behavior including the supply of output and demands for labor, capital and other production inputs. Emphasizes individual and interactive decision making under resource constraints and discusses equilibria in competitive markets. Mutually Exclusive: Cannot register for ECON 200 if student has credit for ECON 301.**ECON 203 - MACROECONOMICS****Short Title:** MACROECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group II**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Prerequisite(s):** ECON 100 or (ECON 111 and ECON 113)**Description:** Analyzes aggregate performance of the national economy including output, inflation, interest rates, employment, the business cycle, monetary and fiscal policy, and more generally the role of government in influencing aggregate economic performance. Introduces both the traditional aggregative only approach to Macroeconomics and the more recent New Classical and New Keynesian micro-foundations approaches. Mutually Exclusive: Cannot register for ECON 203 if student has credit for ECON 303.**ECON 205 - INTRODUCTION TO GAME THEORY****Short Title:** INTRODUCTION TO GAME THEORY**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group II**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** This course provides an introduction to game theory, a branch of mathematics that studies decision-making by agents in situations where the outcome for each depends on the actions taken by all. Students will develop a familiarity with analytical tools that have found applications in, for example, economics and other social sciences, biology, computer science, and philosophy. Designed for students who do not wish to major in ECON or MTEC and does not apply to ECON or MTEC major requirements. Mutually Exclusive: Cannot register for ECON 205 if student has credit for ECON 300.**ECON 209 - APPLIED ECONOMETRICS****Short Title:** APPLIED ECONOMETRICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Distribution Group:** Distribution Group II**Credit Hours:** 4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Prerequisite(s):** (ECON 100 or ECON 200) and (ECON 307 or STAT 310 or STAT 315 or DSCI 301)**Description:** 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 statistical software. Mutually Exclusive: Cannot register for ECON 209 if student has credit for ECON 309/ECON 446.

ECON 210 - BEHAVIORAL ECONOMICS**Short Title:** BEHAVIORAL ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group II**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Prerequisite(s):** ECON 100 or ECON 200**Description:** Examines behavioral economics, which seeks to insert more behavioral realism into economic theory by incorporating into economic models insights based on empirical observations from psychology, sociology, and neuroscience. Emphasizes attempts by behavioral economists to explain anomalies that depart from the predictions of standard economic theory. Topics include temptation and self-control, fairness and reciprocity, reference dependence, bounded rationality and choice under risk and uncertainty.**ECON 238 - SPECIAL TOPICS****Short Title:** SPECIAL TOPICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Internship/Practicum, Laboratory, Lecture, Lecture/Laboratory, Seminar, Independent Study**Credit Hours:** 1-4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Description:** Topics and credit hours vary each semester. Contact department for current semester's topic(s). Repeatable for Credit.**ECON 239 - LAW AND ECONOMICS****Short Title:** LAW AND ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group II**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Prerequisite(s):** ECON 100 or ECON 200**Description:** Exploration of the law using economic tools based on microeconomic theory. Focuses on legal issues most applicable to business. Mutually Exclusive: Cannot register for ECON 239 if student has credit for ECON 438.**ECON 275 - INTERNATIONAL MACROECONOMICS AND PUBLIC POLICY****Short Title:** INT MACRO & PUBLIC POLICY**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group II**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Prerequisite(s):** ECON 100 or ECON 200**Description:** Applies insights learned from the macroeconomic component of ECON 100 to the analysis of issues related to international public policy, stressing economic intuition rather than mathematical formulations. Designed for students who do not wish to major in ECON or MTEC, and does not apply toward ECON or MTEC major requirements.**ECON 299 - EXPERIENTIAL EDUCATION IN ECONOMICS****Short Title:** EXPERIENTIAL EDUC IN ECONOMICS**Department:** Economics**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Internship/Practicum**Credit Hour:** 1**Restrictions:** Enrollment is limited to students with a major in Economics, Managerial Econ & Org Sci or Mathematical Economic Analysis. Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Lower-Level**Prerequisite(s):** ECON 200**Description:** Provides one hour of university credit for faculty-approved internship. Students must obtain approval from a member of the department's undergraduate committee and must submit an offer letter from the internship provider as well as a letter indicating completion and satisfactory performance. Instructor Permission Required. Repeatable for Credit.**ECON 300 - GAME THEORY AND OTHER MICRO TOPICS FOR ECON MAJORS****Short Title:** GAME THEORY, MICRO TOPICS/ECON**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200 and (ECON 307 or STAT 310 or STAT 315 or DSCI 301)**Description:** Advanced applied 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 and mechanism design. Open to all majors other than MTEC. Mutually Exclusive: Cannot register for ECON 300 if student has credit for ECON 205.

ECON 305 - GAME THEORY AND OTHER MICRO TOPICS FOR MTEC MAJORS**Short Title:** GAME THEORY, MICRO TOPICS/MTEC**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (ECON 307 or STAT 310 or STAT 315 or DSCI 301) and ECON 308**Description:** Advanced theoretical analysis of topics in microeconomics, focusing on mathematical modeling. 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 and mechanism design. Open to all majors but designed for students in the MTEC major. Mutually Exclusive: Cannot register for ECON 305 if student has credit for ECON 405.**ECON 307 - PROBABILITY AND STATISTICS****Short Title:** PROBABILITY & STATISTICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group III**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** MATH 102 or MATH 106**Description:** Probability and the central concepts and methods of statistics including probability, random variables, distributions of random variables, expectation, sampling distributions, estimation, confidence intervals, and hypothesis testing. Cross-list: STAT 310. Recommended Prerequisite(s): MATH 212. Mutually Exclusive: Cannot register for ECON 307 if student has credit for DSCI 301/STAT 315.**ECON 308 - MATHEMATICAL ECONOMICS****Short Title:** MATHEMATICAL ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200 and (MATH 212 or (MATH 221 and MATH 222))**Description:** 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. Students must have either (1) made a grade of B- or higher in MATH 212 or MATH 221/MATH 222 taken at Rice, or (2) received transfer credit for MATH 212 or MATH 221/MATH 222 and received approval of the course instructor. Mutually Exclusive: Cannot register for ECON 308 if student has credit for ECON 401.**ECON 310 - ECONOMETRICS****Short Title:** ECONOMETRICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 209 and ECON 308**Description:** Survey of estimation and forecasting models. Includes multiple regression time series analysis. A good understanding of linear algebra is highly desirable. Cross-list: STAT 376. Mutually Exclusive: Cannot register for ECON 310 if student has credit for ECON 409/STAT 400.**ECON 343 - CORPORATE FINANCE****Short Title:** CORPORATE FINANCE**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group II**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (ECON 100 or ECON 200) and (STAT 280 or STAT 305 or STAT 310 or STAT 315 or ECON 307 or STAT 312 or POLI 395 or PSYC 339 or SOSOC 302) and BUSI 305**Description:** Corporate financial management including tools used to evaluate and select investment projects and the method of financing those investments. The influence of corporate control on investment decisions. The valuation of stocks, bonds and options using the time value of money, the trade-off between risk and return, and arbitrage. Mutually Exclusive: Cannot register for ECON 343 if student has credit for BUSI 343.**ECON 355 - FINANCIAL MARKETS****Short Title:** FINANCIAL MARKETS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group II**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200**Description:** Principles governing U.S. and international equity and debt markets, and the interactions between such markets and national monetary and exchange rate policies. Focuses on the role of financial markets and institutions in the allocation and transfer of credit and risk, and examines various existing and suggested regulatory frameworks.

ECON 365 - WORLD ECONOMIC HISTORY**Short Title:** WORLD ECONOMIC HISTORY**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Distribution Group:** Distribution Group I**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 100 and ECON 200 and ECON 203**Description:** Study and analysis of world economy focusing on the economic expansion of Western countries between the 14th and 21st centuries. Emphasis on contextual changes in economy, geography, history, society, culture, religion and politics in determining economic leadership of certain economies, such as Italy, Portugal, Spain, the United Kingdom, Belgium, the Netherlands, France, Germany, Sweden, the United States and Japan. Cross-list: HIST 365.**ECON 399 - INDEPENDENT RESEARCH****Short Title:** INDEPENDENT RESEARCH**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Research**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 203 and ECON 209 and (ECON 300 or ECON 305)**Description:** Independent research project under the supervision of a faculty member who must approve the topic. Consult the department website under "Independent Research" for additional details. Students must have a GPA of 3.0 or higher in the prerequisite courses and must have taken the 400-level course or courses most relevant to the research topic. Faculty advisors may require additional prerequisites. Instructor and department permission required. Not offered during the summer. Instructor Permission Required.**ECON 415 - LABOR ECONOMICS****Short Title:** LABOR ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200**Description:** Empirical evidence and theories relating to several features of labor markets. Topics covered may include fertility, health, criminal behavior, labor force participation, hours of work, education and training, geographical and inter-firm labor mobility, static and dynamic labor demand, unions, discrimination, government intervention in labor markets, and "hedonic" equilibria in labor markets. Graduate/Undergraduate Equivalency: ECON 515. Mutually Exclusive: Cannot register for ECON 415 if student has credit for ECON 515.**ECON 418 - ECONOMIC FORECASTING****Short Title:** ECONOMIC FORECASTING**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 203 and ECON 209**Description:** 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 - DATA TOOLS FOR COMPUTATIONAL ECONOMICS****Short Title:** COMPUTATIONAL ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200 and (ECON 310 or STAT 376)**Description:** 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. This course will use Python and social science datasets to answer research and business questions.**ECON 421 - QUANTITATIVE METHODS FOR POLICY EVALUATION + PRACTICAL LAB****Short Title:** QUANTITATIVE METHODS + LABS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200 or ECON 209**Description:** This course covers quantitative methods to evaluate three aspects of public policy and social programs. The first aspect is the quality of the implementation: are public policy and social programs implemented according to plan? The second aspect is impact: are interventions impacting the populations or issues for which they were designed? The third aspect is cost: do the program benefits justify the costs? The course audience are students interested in innovation in public policy and the design of social programs that aim to reduce inequality and to increase prosperity. Mutually Exclusive: Cannot register for ECON 421 if student has credit for ECON 422.

ECON 422 - INTERNATIONAL ECONOMICS AND FINANCE**Short Title:** INTERNATIONAL ECON & FINANCE**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200 and ECON 203**Description:** Studies the economic relationships among countries. Explores the sources of comparative advantage and reasons for trade policies. Examines foreign exchange and international capital markets and linkages between exchange rates, interest rates, and prices. Includes trade theory, tariffs, and other trade restrictions, an overview of historical and institutional developments, and current policy issues. Mutually Exclusive: Cannot register for ECON 422 if student has credit for ECON 420/ECON 421.**ECON 423 - ADVANCED ECONOMETRICS FOR ENERGY MARKETS****Short Title:** ADV ECON FOR ENERGY MARKETS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (ECON 209 or ECON 310) and ECON 437**Description:** This course provides an introduction to advanced econometric techniques, focusing on time series and panel data as applied to energy markets. Students will learn to handle issues such as autocorrelation and seasonality in energy data, develop ARIMA models for forecasting, and apply these techniques in Python. The course emphasizes practical applications through lab sessions and concludes with a final project that requires students to conduct demand estimation and forecasting for an energy commodity, presented in an interactive dashboard format. Graduate/Undergraduate Equivalency: ECON 623. Mutually Exclusive: Cannot register for ECON 423 if student has credit for ECON 623.**ECON 432 - POLITICAL ECONOMY****Short Title:** POLITICAL ECONOMY**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200 and (ECON 300 or ECON 305)**Description:** Analyzes income redistribution, taxation, the production of public goods, and other actions of the public sector as determined by a political process simultaneously with the economic process of exchange and production. Investigates the connection between public policies and the political forces that shape them.**ECON 433 - DYNAMIC MODELS FOR COMPUTATIONAL ECONOMICS****Short Title:** DYNAMICS IN COMPUTATIONAL ECON**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 419**Description:** This course covers models with dynamic components and procedures for decision making in the context of economics. The topics include, but are not limited to, multi-armed bandits, dynamic programming + the Bewley model, and time-series analysis (both Bayesian and frequentist). Graduate/Undergraduate Equivalency: ECON 633. Mutually Exclusive: Cannot register for ECON 433 if student has credit for ECON 633.**ECON 434 - MACHINE LEARNING AND ALGORITHMS FOR COMPUTATIONAL ECONOMICS****Short Title:** MACHINE LEARNING FOR COMP ECON**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 419 and ECON 479**Description:** This course will cover supervised learning (both regression and classification), reinforcement learning, and model selection via validation procedures. The course prepares students to apply a variety of classical and cutting-edge machine learning techniques to problems in economics. Students will be taught principled approaches that adhere to best practices and promote understanding and transparency. Graduate/Undergraduate Equivalency: ECON 634. Mutually Exclusive: Cannot register for ECON 434 if student has credit for ECON 634.**ECON 435 - INDUSTRIAL ORGANIZATION****Short Title:** INDUSTRIAL ORGANIZATION**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (ECON 300 or ECON 305) and (ECON 209 or ECON 310)**Description:** A mathematical approach to topics in industrial organization and market design, including price discrimination, oligopoly, collusion, and auctions.

ECON 437 - ENERGY ECONOMICS**Short Title:** ENERGY ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200**Description:** Discussion of key aspects in the supply and demand of energy. Topics include optimal extraction of depletable resources, transportation, storage, end-use and efficiency, and the relationship between economic activity, energy, and the environment. Cross-list: ENST 437. Graduate/Undergraduate Equivalency: ECON 601. Mutually Exclusive: Cannot register for ECON 437 if student has credit for ECON 601.**ECON 439 - ADVANCED TOPICS IN LAW AND ECONOMICS****Short Title:** ADV TOPICS IN LAW AND ECON**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200**Description:** Addresses the role of economics in understanding the legal system, in particular how the law allocates entitlements and risk in property, tort and contract law. Intended primarily for students who are considering attending law school and uses instruction methods appropriate for that goal.**ECON 441 - EMPIRICAL METHODS FOR INDUSTRIAL ORGANIZATION****Short Title:** EMPIRICAL METHODS FOR IO**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200 and ECON 209**Description:** Covers empirical methods for the analysis of markets and industries. Focuses on various topics related to incomplete information in industrial organization. Topics include markets, strategy, interactions among firms, and the pricing of products, including non-linear pricing.**ECON 443 - FINANCIAL ECONOMICS****Short Title:** FINANCIAL ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 305 and (ECON 307 or STAT 310 or STAT 315 or DSCI 301)**Description:** Economic analysis of the operation of financial markets from a mathematical and theoretical perspective. Topics include asset pricing, risk management, portfolio theory, arbitrage theory, and market efficiency. Emphasizes the application of the financial concepts to decisions faced by households and firms.**ECON 445 - MANAGERIAL ECONOMICS****Short Title:** MANAGERIAL ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200 and (ECON 310 or STAT 376)**Description:** Understanding how Risk, Hidden Action, Holdups, and Hidden information affect managerial decisions and how to quantify these costs.**ECON 449 - PRINCIPLES OF FINANCIAL ENGINEERING****Short Title:** FINANCIAL ENGINEERING**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** (ECON 308 or MATH 211) and MATH 212 and (ECON 310 or STAT 376)**Description:** 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. Mutually Exclusive: Cannot register for ECON 449 if student has credit for STAT 449.

ECON 450 - ECONOMIC DEVELOPMENT**Short Title:** ECONOMIC DEVELOPMENT**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200 and ECON 203**Description:** This course covers different dimensions of economic development, focusing on poverty, inequality, demography, and health. It provides an overview of the economies of less developed countries, the lives of the poor, and the theories for why some countries are rich and others are poor. It also describes how labor and credit markets function in poor countries, the consequences for health and education, and the role of institutions.**ECON 452 - RELIGION, ETHICS, AND ECONOMICS****Short Title:** RELIGION, ETHICS, & ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200 and (ECON 307 or STAT 310 or STAT 315 or DSCI 301)**Description:** Reviews economic models of the demand, supply, and markets for religion, including the effects of economic conditions on religious choice and vice versa. Students will write a term paper on topics of their choosing, subject to professor's approval. Recommended Prerequisite(s): ECON 209 or ECON 310 or STAT 376.**ECON 455 - MONEY AND BANKING****Short Title:** MONEY AND BANKING**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200 and ECON 203**Description:** Micro-foundations of monetary, fiscal and financial theory. Examines the unique roles of money and of banking in providing the transactions mechanism and in the functioning of financial markets. Explains the use of valued fiat, unbacked money which appears to violate basic microeconomics, in the context of Samuelson's overlapping generations model, including the implications for monetary and fiscal policy and for inflation. Discusses bank runs and financial instability.**ECON 456 - TOPICS IN BUSINESS ECONOMICS: FINANCIAL MARKET AND INVESTMENTS****Short Title:** INVESTMENTS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 100 and ECON 200 and ECON 203**Description:** The course is a rigorous, quantitative introduction to financial market structure and financial asset valuation. The main topics of the course include time value of money, discounted cashflow analysis, CAPM model, portfolio selection, equilibrium asset pricing. Recommended Prerequisite(s): Students must be comfortable with statistics, linear algebra, calculus, and microeconomics.**ECON 460 - ADVANCED TOPICS IN ECONOMIC DEVELOPMENT****Short Title:** ADV TOPICS ECON DEVELOPMENT**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200**Description:** Focuses on role of taxation, finance and international trade, foreign investment and foreign aid in economic development.**ECON 461 - URBAN ECONOMICS****Short Title:** URBAN ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200**Description:** In this course, we will develop theories of urban economics and then use these theories to analyze current policy issues. The theories cover a broad range of topics related to the emergence of cities, different forms of cities, and the problems associated with the process of urbanization. We will discuss potential solutions to these problems.**ECON 462 - ECONOMICS OF HUMAN CAPITAL****Short Title:** ECONOMICS OF HUMAN CAPITAL**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 320**Description:** This course covers theory that describes the central role of human capital in determining economic growth and inequality, uses advanced econometric techniques to test if the theory is consistent with data, and presents insights for public policy that can improve human capital formation, increase economic growth and reduce social inequality.

ECON 470 - MARKET DESIGN**Short Title:** MARKET DESIGN**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200 and (ECON 307 or STAT 310 or STAT 315 or DSCI 301)**Description:** Regulators, entrepreneurs and economists have recently been involved in the design of novel markets for radio spectrum, kidneys, on-line advertising, school choice, etc. This course utilizes game theory to provide the theoretical underpinning of such markets via real world examples, including the study of institutional details that can determine the success or failure of a market.**ECON 477 - SPECIAL TOPICS****Short Title:** SPECIAL TOPICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture, Laboratory, Internship/Practicum, Seminar**Credit Hours:** 1-4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Description:** Topics and credit hours vary each semester. Contact department for current semester's topic(s). Repeatable for Credit.**ECON 479 - MATHEMATICAL FOUNDATIONS FOR COMPUTATIONAL ECONOMICS****Short Title:** MATH FOR COMPUTATIONAL ECON**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 308**Description:** Examines the use of computational dynamic models to analyze the effects of economic policy reforms. Introduces computer programming methods to simulate household and firm behavior in partial and general equilibrium frameworks. Students will learn how to apply these concepts to a variety of economics and social science questions. Mutually Exclusive: Cannot register for ECON 479 if student has credit for ECON 631.**ECON 480 - THE ECONOMICS OF ENERGY & THE ENVIRONMENT****Short Title:** ECON OF ENERGY & ENVIRONMENT**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200**Description:** Uses economic theories of externalities and common property resources to analyze how markets, legal institutions, regulations, taxes and subsidies, and voluntary activity can affect the supply of environmental amenities, such as clean air, clean water, and wilderness areas. Also discusses methods for determining the demand for environmental amenities. Cross-list: ENST 480. Graduate/Undergraduate Equivalency: ECON 607.**ECON 481 - HEALTH ECONOMICS****Short Title:** HEALTH ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200 and (ECON 209 or ECON 310 or STAT 376)**Description:** Study of determinants of health, including behavioral, economic and social factors and access to health care. Application of economics to understand health insurance, the hospital and physician markets, pharmaceuticals, and the health care system. Effects of regulation and methods of payment. Graduate/Undergraduate Equivalency: ECON 565. Mutually Exclusive: Cannot register for ECON 481 if student has credit for ECON 565.**ECON 483 - PUBLIC ECONOMICS: TAXATION****Short Title:** PUBLIC ECONOMICS: TAXATION**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200**Description:** Provides an economic analysis of the theory and practice of tax policy, focusing on the evaluation of alternative tax systems in terms of equity, efficiency, and simplicity. Analyzes tax the effects of various taxes on individual and business behavior, including labor supply, saving, and investment. Discusses general equilibrium modeling of the economic and distributional effects of alternative tax systems and tax reforms. Special topics include the choice between income-based and consumption-based taxation, tax incidence, optimal taxation, taxation of the family, and state and local public finance.

ECON 484 - PUBLIC ECONOMICS: EXPENDITURES**Short Title:** PUBLIC ECONOMICS: EXPENDITURES**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200**Description:** Provides an economic analysis of the theory and practice of government expenditure policy, focusing on issue related to efficiency and equity. Analyzes issues related to budget deficits, government debt, and fiscal sustainability. Special topics include national public goods, state and local public goods, political economy, policies that correct for externalities including those associated with carbon emissions and pollution, education policy, income redistribution programs such as the Earned Income Tax Credit, and social insurance programs such as Social Security.**ECON 485 - THE ECONOMICS OF SUSTAINABILITY, CONSERVATION, AND PANDEMICS****Short Title:** ECON, CONSERVATION & PANDEMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200**Description:** This course will cover issues related to conservation, sustainability and pandemics from an economics point of view. Topics will include the need for conservation policies and planning, how science informs conservation strategies, incentives and the design of conservation agreements, and the role of deforestation and wildlife markets in pandemic emergence. Policies to reduce the likelihood of pandemic emergence, as well as the effects of pandemics like influenza, HIV, and COVID-19 on the global economy will also be discussed. Recommended Prerequisite(s): MATH 212**ECON 489 - ECONOMICS OF SOCIAL NETWORKS****Short Title:** ECONOMICS OF SOCIAL NETWORKS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 200 and ECON 209**Description:** This course introduces research on social networks and analyzes how these networks affect our choices: the products we buy, the careers we follow, whom we marry, how we raise our children. Students will learn about network measurement and formation and the influence of social networks on our decisions.**ECON 496 - RESEARCH IN ECONOMIC THEORY****Short Title:** RESEARCH IN ECONOMIC THEORY**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Research**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 203 and (ECON 310 or STAT 376) and ECON 305**Description:** Capstone course for MTEC majors whose primary interest is in economic theory. Review and analysis of seminal and current research in economic theory, including independent analysis by the student. Topics vary from year to year.**ECON 497 - RESEARCH IN ECONOMETRICS****Short Title:** RESEARCH IN ECONOMETRICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Research**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 203 and (ECON 310 or STAT 376) and ECON 305**Description:** Capstone course for MTEC majors whose primary interest is in econometrics. Review and analysis of seminal and current research in econometrics, including independent analysis by the student. Topics vary from year to year.**ECON 498 - HONORS PROGRAM IN ECONOMICS-I****Short Title:** HONORS PROGRAM IN ECONOMICS-I**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Research**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 203 and (ECON 209 or ECON 310) and (ECON 300 or ECON 305)**Description:** Research workshop open to ECON and MTEC majors. Students must have a GPA of at least 3.67 in all courses taken toward satisfying major requirements, and must have taken all ECON courses directly related to the topic of their research. Students develop a research idea, construct an economic model with testable hypotheses, test those hypotheses, and write and present an academic quality paper. Econometrics pre-requisite is ECON 209 for ECON majors and ECON 310 for MTEC majors.**ECON 499 - HONORS PROGRAM IN ECONOMICS-II****Short Title:** HONORS PROGRAM IN ECONOMICS-II**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Research**Credit Hours:** 3**Restrictions:** Enrollment is limited to Undergraduate, Undergraduate Professional or Visiting Undergraduate level students.**Course Level:** Undergraduate Upper-Level**Prerequisite(s):** ECON 498**Description:** Continuation of ECON 498. University credit only.

ECON 501 - MICROECONOMICS I**Short Title:** MICROECONOMICS I**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Description: Formal mathematical treatments of the classic topics in microeconomics: consumer and producer theory, choice under risk and uncertainty, revealed preference theory and general equilibrium theory. Introduces and uses mathematical tools that are the workhorses of economic theory: real analysis, constrained optimization, monotone comparative statics and fixed point theorems.

ECON 502 - MACROECONOMICS**Short Title:** MACROECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Description: Review of static general equilibrium theory; elements of functional analysis for optimization; deterministic and stochastic difference equations, local stability analysis; introduction to Markov processes; dynamic optimization techniques, including stochastic optimal control theory, dynamic programming, and robust control; applications to growth theory, search, industrial organization, and monetary economics; dynamic stochastic general equilibrium modeling.

ECON 504 - COMPUTATIONAL ECONOMICS**Short Title:** COMPUTATIONAL ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Prerequisite(s): ECON 501 and ECON 502 and ECON 505 and ECON 508 and ECON 510 and ECON 511 and MATH 321

Description: Numerical methods most commonly used in economics and their application to frontier research projects in economic modeling. Topics include optimization theory and numerical integration. Cross-list: STAT 604.

ECON 505 - FINANCIAL ECONOMICS I**Short Title:** FINANCIAL ECONOMICS I**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Prerequisite(s): ECON 501 and ECON 502

Description: Introduction to asset pricing and portfolio choice theory. Covers mathematical analysis of single-period and dynamic models, including pricing by arbitrage, mean-variance analysis, factor models, dynamic optimization, recursive utility, and an introduction to continuous-time finance. Cross-list: BUSI 521.

ECON 507 - MATHEMATICAL ECONOMICS I**Short Title:** MATHEMATICAL ECONOMICS I**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Description: The purpose of this course is to provide the first-year PhD students in Economics with the essential mathematical tools. The course covers topics in real analysis, topology, linear algebra, etc. Aside from providing the mathematical tools, a primary aim of this course is to develop the level of mathematical sophistication necessary to conduct research in modern economics. The course will therefore emphasize logical clarity and mathematical rigor, along with the ability to follow and construct mathematical proofs.

ECON 508 - MICROECONOMICS II**Short Title:** MICROECONOMICS II**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 5**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Prerequisite(s): ECON 501 and MATH 321

Description: Two modules: (1) Introduces students to the mathematical tools of game theory, and the modeling of economic settings as games. Covers normal form games, extensive form games with perfect information, Bayesian games, and extensive form games with imperfect information; (2) introduces students to information economics and the theory of social choice and mechanism design.

ECON 509 - TOPICS IN MICROECONOMICS**Short Title:** TOPICS IN MICROECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Prerequisite(s): ECON 508

Description: Discussion of selected topics in microeconomic theory. Recently, the topic has been behavioral economics, especially individual choice under risk and uncertainty, reference-dependent preferences, behavioral time discounting, temptation and self-control, other-regarding preferences, behavioral game theory, behavioral welfare economics, limited attention, mental accounting, and neuroeconomics. Repeatable for Credit.

ECON 510 - ECONOMETRICS I**Short Title:** ECONOMETRICS I**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Description: Estimation and inference in single equation regression models, multicollinearity, autocorrelated and heteroskedastic disturbances, distributed lags, asymptotic theory, and maximum likelihood techniques. Emphasis is placed on critical analysis of the literature. Cross-list: STAT 610.

ECON 511 - ECONOMETRICS II**Short Title:** ECONOMETRICS II**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** ECON 510 or STAT 610**Description:** Topics in linear and nonlinear simultaneous equations estimation, including panel data, qualitative and categorical dependent variable models, duration analysis, simulation-based estimation, treatment effects, stochastic production frontier estimation. Cross-list: STAT 611.**ECON 512 - INTERNATIONAL TRADE THEORY****Short Title:** INTERNATIONAL TRADE THEORY**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Exploration of classical, neoclassical, and modern trade theory. Includes welfare aspects of trade such as the theory of commercial policy, with emphasis on applications.**ECON 513 - ECONOMICS OF INSURANCE****Short Title:** ECONOMICS OF INSURANCE**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** ECON 501 and ECON 510**Description:** This course will cover the theory of insurance, including classic and some behavioral models of insurance demand. The course will heavily focus on estimation techniques including estimating demand for insurance, tests for moral hazard and selection, insurance design, and measures of welfare. Empirical topics will include property insurance, health insurance, annuities, life insurance, and unemployment insurance.**ECON 514 - EMPIRICAL INDUSTRIAL ORGANIZATION****Short Title:** EMPIRICAL INDUSTRIAL ORGANIZAT**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Topics include structural analysis of auction, nonlinear pricing, insurance and bargaining data. Emphasizes the use of advanced econometric methods (nonparametric and semiparametric) to estimate and test models under incomplete information.**ECON 515 - LABOR ECONOMICS****Short Title:** LABOR ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Mathematical and statistical analysis of empirical evidence and theories relating to several features of labor markets. Topics covered may include fertility, health, criminal behavior, labor force participation, hours of work, education and training, geographical and inter-firm labor mobility, static and dynamic labor demand, unions, discrimination, government intervention in labor markets, and "hedonic" equilibria in labor markets. Graduate/Undergraduate Equivalency: ECON 415. Mutually Exclusive: Cannot register for ECON 515 if student has credit for ECON 415.**ECON 516 - EMPIRICAL MICROECONOMICS****Short Title:** EMPIRICAL MICROECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** ECON 508**Description:** This course studies topics in empirical microeconomics through papers in the recent economics literature. The emphasis will be on economic models that have been brought to data, identification of the models from observable data, and empirical findings.**ECON 517 - EMPIRICAL INDUSTRIAL ORGANIZATION II****Short Title:** EMPIRICAL INDUSTRIAL ORG II**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Examines economic models of competition and industry structure. These include models of demand, supply, investment and entry. Special attention is paid to economic statistical modeling of industries and the use of price and game theory in industrial organization. Matching and market design are also covered.**ECON 518 - INTERNATIONAL MACROECONOMICS****Short Title:** INTERNATIONAL MACROECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Effects of fiscal and monetary policies on exchange rates and the current account and balance of payments. Includes exchange market efficiency, exchange rates and prices, LDC debt, and policy coordination.

ECON 519 - ECONOMIC GROWTH AND DEVELOPMENT**Short Title:** ECONOMIC GROWTH & DEVELOPMENT**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** ECON 501 and ECON 508 and ECON 510 and ECON 511**Description:** Mathematical and statistical analysis of topics in microeconomic development and introduction to some frequently used applied econometric methods. Topics covered include poverty and inequality, health, education, fertility, marriage markets, and other gender issues. Special focus is given to intra-household bargaining models and their applications.**ECON 521 - MATCHING AND MARKET DESIGN****Short Title:** MATCHING AND MARKET DESIGN**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** ECON 501 and ECON 502 and ECON 510 and ECON 505 and ECON 508 and ECON 511 and MATH 321**Description:** This course begins with an overview of different matching markets (e.g., one-to-one or many-to-one AND with or without transfers AND centralized or decentralized) and the common empirical models; it then provides a relatively in-depth discussion of market design, both theoretical and empirical, for school choice and kidney transplants.**ECON 522 - PUBLIC ECONOMICS: TAX POLICY****Short Title:** PUBLIC ECONOMICS: TAX POLICY**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Provides an economic analysis of the theory and practice of tax policy, focusing on the evaluation of alternative tax systems in terms of equity, efficiency, and simplicity. Analyzes the effects of various taxes on individual and business behavior, including labor supply, saving, and investment including the calculation of effective tax rates. Discusses general equilibrium modeling of the economic and distributional effects of alternative tax systems and tax reforms. Special topics include the choice between income-based and consumption-based taxation, tax incidence, optimal taxation, and state and local public finance.**ECON 523 - DYNAMIC OPTIMIZATION****Short Title:** DYNAMIC OPTIMIZATION**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Study of dynamic optimization in discrete and continuous time, including numerical methods and applications to macroeconomics, finance and resource and energy economics.**ECON 547 - ADVANCED TOPICS IN ENERGY ECONOMICS****Short Title:** ADV TOPICS IN ENERGY ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** (ECON 301 or ECON 370) and (ECON 309 or ECON 446 or ECON 409 or ECON 400 or STAT 400) and ECON 437**Description:** A detailed development and analysis of topics in energy modeling. Topics include optimal extraction of depletable resources, models of storable energy commodities, energy demand by end-use sector, models of non-competitive behavior, energy security and the relationship between energy and commodity prices. ECON 547 requires an additional assignment in addition to the assignments of ECON 447. Recommended Prerequisite(s): ECON 477 or ECON 401. Mutually Exclusive: Cannot register for ECON 547 if student has credit for ECON 447/ECON 604.**ECON 565 - HEALTH ECONOMICS****Short Title:** HEALTH ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Application of empirical and theoretical economic models to health and healthcare. Includes production, cost, demand and supply factors; methods of payment and effects of regulation. Topics include optimal design of health insurance markets, cost-benefit analysis of healthcare technologies, econometric evaluation of government regulations and reimbursement in the healthcare sector, and testing of hypothesis that explain rising prices and costs of healthcare. Graduate/Undergraduate Equivalency: ECON 481. Mutually Exclusive: Cannot register for ECON 565 if student has credit for ECON 481.**ECON 575 - TOPICS IN MACROECONOMICS I****Short Title:** TOPICS IN MACROECONOMICS I**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Discussion topics in macroeconomics. Repeatable for Credit. Repeatable for Credit.**ECON 576 - TOPICS IN MACROECONOMICS II****Short Title:** TOPICS IN MACROECONOMICS II**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Seminar**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** The course will cover topics on the aggregate implications of quantitative models of producer heterogeneity, with applications to firm dynamics, innovation and aggregate growth, cross-country income differences, and international trade. Repeatable for Credit.

ECON 577 - TOPICS IN ECONOMIC THEORY I**Short Title:** TOPICS IN ECONOMIC THEORY I**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Discussion of topics in advanced economic theory. Repeatable for Credit.**ECON 578 - TOPICS IN ECONOMETRICS I****Short Title:** TOPICS IN ECONOMETRICS I**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Discussion of selected topics in advanced econometrics. Repeatable for Credit.**ECON 579 - TOPICS IN ECONOMETRICS II****Short Title:** TOPICS IN ECONOMETRICS II**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** ECON 511**Description:** Discussion of selected topics in advanced econometrics that focus on the mathematical and statistical modeling of such phenomena as (1) extended panel data methods; (2) spatial econometrics; (3) bootstrapping; (4) factor models, wavelets, smoothing-splines, sieves; (5) model averaging; (6) continuous and discrete dynamic programming models; (7) econometrics of auctions; (8) BLP methods of demand estimation; (9) structural and non-structural models of producer behavior; (10) point and set identification; (11) Bayesian Econometrics/Metropolis-Hastings MCMC algorithms. Repeatable for Credit.**ECON 592 - TOPICS IN POLICY AND APPLIED ECONOMICS****Short Title:** TOP-POLICY&APPL'D ECON**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Discussion of selected topics and applied economics. Repeatable for Credit.**ECON 593 - WORKSHOP IN MICROECONOMICS****Short Title:** WORKSHOP IN ECONOMICS**Department:** Economics**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** ECON 501 and ECON 502 and ECON 510 and ECON 505 and ECON 508 and ECON 511**Description:** Seminars on advanced topics in macroeconomics, microeconomics, econometrics and applied microeconomic theory, presented through guest lectures by leading researchers. Repeatable for credit. Repeatable for Credit.**ECON 594 - WORKSHOP IN ECONOMICS II****Short Title:** WORKSHOP IN ECONOMICS II**Department:** Economics**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Seminar**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** ECON 508 and ECON 510**Description:** Seminars on advanced topics in macroeconomics, microeconomics, econometrics and applied microeconomic theory, presented through guest lectures by leading researchers. Repeatable for credit. Repeatable for Credit.**ECON 595 - WRITING WORKSHOP****Short Title:** WRITING WORKSHOP**Department:** Economics**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Lecture**Credit Hours:** 1-4**Restrictions:** Enrollment limited to students with a class of Graduate. Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Students in this course will read instructional materials on writing in the field of economics as well as generally in social science and will write both short and long pieces directly related to their research and the larger field of economics. Instructional topics will include appropriate tone, style, organizational patterns, grammar, and word choice for different genres of writing within the field.**ECON 596 - RESEARCH SEMINAR****Short Title:** RESEARCH SEMINAR**Department:** Economics**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Seminar**Credit Hours:** 0.5**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** Supervises fourth-year and fifth-year Ph.D. students in their quantitative dissertation research in preparation for graduation. Students must present their own research at least once during the semester. Repeatable for Credit.

ECON 597 - COLLOQUIUM ON RESEARCH IN ECONOMICS**Short Title:** COLLOQUIUM ON RESEARCH IN ECON**Department:** Economics**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Independent Study**Credit Hour:** 1**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Description: Workshop prepares graduate students for completing innovative and original research. All second year graduate students must attend the workshop. Each week, a faculty member will give a brief lecture about their experience with research. Possible topics include how they came up with ideas, how those ideas evolved and became papers, how these papers proceeded through the publication process, etc. Alternatively, faculty members can present a broad overview of particular research areas and discuss outstanding questions in those areas. Instructor Permission Required. Repeatable for Credit.

ECON 598 - READINGS IN ADVANCED TOPICS**Short Title:** READINGS IN ADVANCED TOPICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Independent Study**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Description: Prepares second-year Ph.D. students to conduct quantitative research. After a critical review of existing economic models, statistical analysis of data and economic evaluations, students develop their own research agenda. Repeatable for Credit.

ECON 599 - SEMINAR WORKSHOP**Short Title:** SEMINAR WORKSHOP**Department:** Economics**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Research**Credit Hours:** 0.5**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Description: Promotes graduate students' attendance and active participation in the Econ 593 and Econ 594 seminar workshops. Each student is required to attend at least fifteen ECON 593/594 seminars per semester, write a brief report on each seminar presentation they attend, prepare to present a background paper for three of the seminars they plan to attend, and participate in post seminar discussions. Repeatable for Credit.

ECON 601 - ENERGY ECONOMICS I**Short Title:** ENERGY ECONOMICS I**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate

Description: Introduces the energy sector to students, discusses key aspects of energy supply, demand and pricing, and is foundational for the MEECON degree. Topics include optimal extraction of depletable resources, investment in energy-using capital, trade of energy commodities, storage, end-use demand and energy efficiency, and the relationship between economic activity, energy and the environment. Students learn to apply dynamic optimization, linear programming and econometric techniques in addressing the course topics. Graduate/Undergraduate Equivalency: ECON 437. Mutually Exclusive: Cannot register for ECON 601 if student has credit for ECON 437.

ECON 602 - MICROECONOMICS OF THE ENERGY SECTOR**Short Title:** MICROECONOMICS - ENERGY SECTOR**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate

Description: Covers basic microeconomic concepts and applies them to contemporary issues in the energy sector. Topics covered include demand and supply analysis, market equilibrium and different market structures, international trade, investment and capacity expansion, risk and investment finance, and economic analysis of energy policy including environmental policy. This course enables students to apply quantitative microeconomic theory in order to make data-driven recommendations to case studies presented by industry partners.

ECON 603 - APPLIED ECONOMETRICS FOR ENERGY MARKETS**Short Title:** APPLIED ECONOMETRICS ENGY MKTS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate

Description: Students will be introduced to basic concepts in statistical analysis and how to use statistical tools to analyze economic data and test economic theories. The course includes a laboratory session where students practice using the tools discussed in lectures with data that is particularly relevant to the energy industry.

ECON 604 - ENERGY ECONOMICS II**Short Title:** ENERGY ECONOMICS II**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate**Description:** Explores a variety of topics in energy modeling and energy data analysis. Topics include optimal extraction of depletable resources, game theoretic approaches to OPEC behavior, national oil company behavior, models of storable energy commodities and energy demand by end-use sector, energy security and fundamental drivers of commodity prices. This course tasks students to expand on the dynamic optimization problems and econometric techniques applied to energy economics. Mutually Exclusive: Cannot register for ECON 604 if student has credit for ECON 547.**ECON 605 - TAXATION IN THE ENERGY SECTOR****Short Title:** TAXATION IN THE ENERGY SECTOR**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate**Description:** Provides an introductory economic analysis of the theory and practice of taxes and the energy sector, focusing on the evaluation of alternative tax systems in terms of equity, efficiency, and simplicity. Includes general equilibrium modeling of the economic effects of taxes, with an application to federal and state taxes on the energy sector. Topics include royalties, resource rent taxes, corporate income taxes including international tax issues such as transfer pricing and income shifting, excess profit taxes, production-sharing agreements, auctions, and environmental taxes such as carbon taxes. Students will formulate, implement, and use a computable general equilibrium model to solve problems related to private and public decision making in the context of taxes applied to the U.S. energy sector.**ECON 606 - CORPORATE FINANCE FOR THE ENERGY SECTOR****Short Title:** CORP FINANCE - ENERGY SECTOR**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate**Description:** Examines the investment decisions of corporations, the valuation of stock, bonds and options investments by individual investors. The implications of investor decisions for corporations, and specifically the manner in which they evaluate investment projects and finance investments are a core focus. Examples and case studies focus on the energy sector. Students will increase their understanding of financing and investment decision as the relate to energy companies and energy related projects using analytical and mathematical techniques to make data-driven recommendation to real-world problems.**ECON 607 - THE ECONOMICS OF ENERGY AND THE ENVIRONMENT****Short Title:** ECON OF ENERGY & ENVIRONMENT**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate**Description:** This course evaluates policies used to protect environmental resources from harmful externalities, with a focus on those arising from energy production and use. After analyzing different policy tools, the course will focus on the issue of carbon dioxide emissions and climate. Key issues discussed will include electricity system economics and the trade-offs involved in energy and climate policy. The course will conclude with a discussion of some non-emission externalities associated with mining. Graduate/Undergraduate Equivalency: ECON 480.**ECON 608 - RISK MANAGEMENT IN THE ENERGY INDUSTRY****Short Title:** RISK MANAGEMENT/ENERGYINDUSTRY**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate**Description:** This course introduces quantitative risk management techniques often employed in the energy industry. It covers topics such as real options, value at risk, conditional value at risk, and expected shortfall, as well as the use of derivatives for trading and hedging various risk exposures. The course is methodologically self-contained and provides students with hands-on experience with state-of-the-art software to measure and manage risk-adjusted returns of heterogeneous asset portfolios.**ECON 609 - ADVANCED ECONOMETRIC TOPICS FOR APPLIED ENERGY ECONOMICS****Short Title:** ADVANCED ENERGY ECONOMETRICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** ECON 603**Description:** Students will be introduced to econometric methods beyond the simple linear model under classical assumptions with application to energy economics. Coverage will be sufficient to allow informed consumption, application, and even supervision of applications using these techniques. The course includes a laboratory session to afford an opportunity to apply and observe the methods in action.

ECON 610 - ENERGY AND THE MACROECONOMY**Short Title:** ENERGY & THE MACROECONOMY**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate**Description:** Discusses connections between energy and economic activity at the regional, national, and international level, and especially the role of energy shocks in economic fluctuations, innovations in energy supply as drivers of regional economic growth, and the role of energy commodities in transportation and international trade.**ECON 611 - GEOPOLITICS OF ENERGY****Short Title:** GEOPOLITICS OF ENERGY**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate**Description:** Explores the geopolitical issues around energy security and trade by focusing on role of energy as the world's largest business and a strategic requirement of the modern nation-state, a source of power in international relations, and a major influence on national politics and institutions. This course equips students with the analytical skills to inform policy debates, advocate for the interests of principals, and advise policy makers and firms amid rapid changes in energy markets. Students learn both to produce sound empirical analysis by employing state of the art econometric techniques and to be discerning consumers of empirical research.**ECON 612 - ENERGY PROJECT DEVELOPMENT****Short Title:** ENERGY PROJECT DEVELOPMENT**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate**Description:** This course will cover the development of energy projects, especially electric power projects, from inception through to financing. It examines key issues such as: siting/permitting, including compliance with federal, state and local environmental and regulatory issues; fuel supply agreements; capital cost pricing; off-take agreements; and the various methods of project financing. Microsoft Excel is used for project financial analysis, including revenue and cost modeling, debt management, project net cash flow, project internal rate of return and net present value. The course also will cover strategies to monetize the project including development fees, carried equity, and private and public sale of equity, including initial public offerings ("IPOs").**ECON 613 - INTERNATIONAL TRADE IN ENERGY****Short Title:** INTERNATIONAL TRADE IN ENERGY**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate**Description:** This course explores the effects of international trade and the determinants of the amount of trade between countries in energy commodities, and the role of international capital flows in financing energy projects, in particular. It will also discuss the many ways that governments can alter international trade through various policies.**ECON 614 - POLITICAL ECONOMY OF ENERGY AND RESOURCES POLICY****Short Title:** POLITICAL ECONOMY OF OIL**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate**Description:** This course evaluates the political and economic determinants of energy and resources policies in developing countries and their impact on world markets, the interaction between states and extractive industries, the challenges of resource wealth management, and the causal links between resource abundance/dependency and development, institutions, and political regimes. Resource contracts, fiscal and regulatory regimes, and national resource companies are analyzed.**ECON 615 - SOCIAL STUDIES OF ENERGY****Short Title:** SOCIAL STUDIES OF ENERGY**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate**Description:** Investigate the ways in which energy production and consumption impacts social life. By studying the implementation and use of renewable and on-renewable energy infrastructures in different parts of the world, the students will develop a contextual, self-reflexive and critical lens that will help them make decisions in later stages of their careers.**ECON 620 - INDUSTRIAL ORGANIZATION AND THE ENERGY SECTOR****Short Title:** INDUSTRIAL ORG & ENERGY SECTOR**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate**Description:** The course will discuss monopoly, oligopoly, and the underlying sources of monopoly power in energy industries and how the industries can be restructured to isolate the monopoly elements from the more competitive ones. Other topics include price discrimination, vertical control, mergers and acquisitions, and strategic behavior between firms.

ECON 621 - THE ECONOMICS OF THE ELECTRICITY INDUSTRY**Short Title:** ELECTRICITY INDUSTRY ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate**Description:** Discusses the determinants of the cost of electricity, the effects of organizing the industry in different ways, the need to encourage sufficient investment in reserve capacity, and the use of information technology to allow for new ways of pricing electricity, operating the network and coordinating supply and demand. Students will learn to analyze the behavior of power markets, the effect of different policies, and draw empirical solutions to the real-world issues.**ECON 622 - TRANSPORTATION ECONOMICS****Short Title:** TRANSPORTATION ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate**Description:** Discusses transportation as a major source of energy demand in modern post-industrial economies and of future demands in emerging economies. Emphasizes that the demand for energy use in the transportation sector involves modeling household choices, economic growth and demographic transition, government decisions to support transportation infrastructure development, and the introduction of new technologies. Students will apply problem solving and analytical skills to perform calculations related to transportation energy and its environmental impact.**ECON 623 - ADVANCED ECONOMETRICS FOR ENERGY MARKETS****Short Title:** ADV ECON FOR ENERGY MARKETS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** ECON 601 and ECON 603**Description:** This course is designed for students in the Master of Energy Economics (MEECON) program, offering advanced training in econometric methods with a focus on empirical applications in energy markets. The course emphasizes time series and panel data analysis, key for understanding energy trading, demand forecasting, and policy evaluation. Students will review key econometric techniques such as Ordinary Least Squares (OLS), ARIMA models, and handling seasonality, applying them to real-world energy data through practical lab sessions using Python. This course provides the empirical tools necessary to reinforce and apply the knowledge gained throughout the MEECON program, culminating in a final project where students analyze and forecast market demand for an energy commodity using interactive dashboards. Graduate/Undergraduate Equivalency: ECON 423. Mutually Exclusive: Cannot register for ECON 623 if student has credit for ECON 423.**ECON 631 - MATHEMATICAL FOUNDATIONS FOR COMPUTATIONAL ECONOMICS****Short Title:** MATH FOR COMPUTATIONAL ECON**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** This course introduces core concepts underlying computational social science, including, optimization, probability, and statistical modeling. We learn how to apply these concepts to a variety of economics and social science questions. Mutually Exclusive: Cannot register for ECON 631 if student has credit for ECON 479.**ECON 632 - DATA TOOLS FOR COMPUTATIONAL ECONOMICS****Short Title:** COMPUTATIONAL ECONOMICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Description:** This course teaches the foundational skills necessary to do modern data analytics using the Python programming language. We assume that students have previously worked with Python. We will add to existing Python skills and teach the core scientific and data-specific libraries (numpy, scipy, matplotlib, and pandas). We will use these skills to analyze a variety of economics and social science datasets and answer research and business questions.**ECON 633 - DYNAMIC MODELS FOR COMPUTATIONAL ECONOMICS****Short Title:** DYNAMICS IN COMPUTATIONAL ECON**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** ECON 510**Description:** This course covers models with dynamic components and procedures for decision making in the context of economics. The topics include, but are not limited to, multi-armed bandits, dynamic programming + the Bewley model, and time-series analysis (both Bayesian and frequentist). Graduate/Undergraduate Equivalency: ECON 433. Mutually Exclusive: Cannot register for ECON 633 if student has credit for ECON 433.

ECON 634 - MACHINE LEARNING AND ALGORITHMS FOR COMPUTATIONAL ECONOMICS**Short Title:** MACHINE LEARNING FOR COMP ECON**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Lecture/Laboratory**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate**Prerequisite(s):** ECON 510

Description: This course will cover supervised learning (both regression and classification), reinforcement learning, and model selection via validation procedures. The course prepares students to apply a variety of classical and cutting-edge machine learning techniques to problems in economics. Students will be taught principled approaches that adhere to best practices and promote understanding and transparency. Graduate/Undergraduate Equivalency: ECON 434. Mutually Exclusive: Cannot register for ECON 634 if student has credit for ECON 434.

ECON 677 - SPECIAL TOPICS**Short Title:** SPECIAL TOPICS**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Internship/Practicum, Laboratory, Lecture, Seminar, Independent Study, Lecture/Laboratory**Credit Hours:** 1-4**Restrictions:** Enrollment is limited to Graduate or Visiting Graduate level students.**Course Level:** Graduate**Description:** Topics and credit hours vary each semester. Contact department for current semester's topic(s). Repeatable for Credit.**ECON 699 - PRACTICUM****Short Title:** PRACTICUM**Department:** Economics**Grade Mode:** Standard Letter**Course Type:** Internship/Practicum**Credit Hours:** 4**Restrictions:** Enrollment is limited to Graduate level students. Enrollment limited to students in a Master of Energy Economics degree.**Course Level:** Graduate

Description: Projects developed by an industry advisory group to be researched and presented to participating industry at completion of all course work. Internships with an approved employer may be substituted. Emphasis on skill building components may include: analyzing data for accuracy and reconciliation across different sources, quantitative analysis and risk assessment of a firm's portfolio of assets and capital investment opportunities, and briefing expert and non-expert audiences.

ECON 700 - DEPARTMENTAL SERVICE COURSE**Short Title:** DEPARTMENTAL SERVICE COURSE**Department:** Economics**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Independent Study**Credit Hours:** 3**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Description: In each semester in which students perform departmental service, they need to register in the departmental service course Econ 700. Students must meet their faculty supervisors as early as possible before the semester starts and regularly during the semester to ensure there is a mutual understanding of the job responsibilities. Repeatable for Credit.

ECON 800 - GRADUATE RESEARCH**Short Title:** GRADUATE RESEARCH**Department:** Economics**Grade Mode:** Satisfactory/Unsatisfactory**Course Type:** Research**Credit Hours:** 1-12**Restrictions:** Enrollment is limited to Graduate level students.**Course Level:** Graduate

Description: Assists students in the dissertation writing process. Students must write an independent and original piece of quantitative research that is of sufficient quality to merit publication in an academic economics journal. Towards this objective, faculty mentor evaluate and critique the research of PhD students who are either preparing research before formally selecting a dissertation topic or actively engaged in dissertation research. Repeatable for Credit.

Description and Code Legend

Note: Internally, the university uses the following descriptions, codes, and abbreviations for this academic program. The following is a quick reference:

Course Catalog/Schedule

- Course offerings/subject code: ECON

Department Description and Code

- Economics: ECON

Graduate Degree Description and Code

- Master of Computational Economics degree: MCEcon

Graduate Degree Program Description and Code

- Degree Program in Computational Economics: XXXX

CIP Code and Description¹

- XXXX Major/Program: CIP Code/Title: 45.0603 - Econometrics and Quantitative Economics

¹ Classification of Instructional Programs (CIP) 2020 Codes and Descriptions from the National Center for Education Statistics: <https://nces.ed.gov/ipeds/cipcode/>.