ECONOMICS

Director of undergraduate studies: Ebonya Washington, Rm. 36, 37 Hillhouse Ave., 432-9901, qazi.azam@yale.edu; economics.yale.edu/
undergraduate-program

FACULTY OF THE DEPARTMENT OF ECONOMICS

Professors Joseph Altonji, Donald Andrews, Dirk Bergemann, Steven Berry, Truman Bewley, Xiaohong Chen, Ray Fair, John
Geanakoplos, Pinelopi Goldberg, Timothy Guinnane, Philip Haile, Johannes Horner, Gerald Jaynes, Dean Karlan, Yuichi Kitamura,
Alvin Klevorick, Samuel Kortum, Naomi Lamoreaux, Giovanni Maggi, Konstantinos Meghir, Giuseppe Moscarini, William Nordhaus,
Peter Phillips, Benjamin Polak, Mark Rosenzweig, Larry Samuelson, Robert Shiller, Anthony Smith, Aleh Tsyvinski, Christopher Udry,
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Associate Professors Costas Arkolakis, Eduardo Faingold, Amanda Kowalski, Nancy Qian

Assistant Professors Timothy Armstrong, Jose-Antonio Espin-Sanchez, Zhen Huo, Mitsuru Igami, Daniel Keniston, Ilse Lindenlaub,
Michael Peters, Nicholas Ryan, Joseph Shapiro, Eric Weese

Senior Lecturers Cheryl Doss, Tolga Koker, Douglas McKee

Lecturers Michael Boozer, Katerina Simons

Economics concerns the wealth of nations, its origins in production and exchange, its allocation among competing uses, its distribution
among individuals, and its accumulation or decline. Economics at Yale is regarded and taught as part of a liberal education, not as a
preparation for any particular vocation. Nonetheless, economics provides an especially relevant background for a number of professions.

Requirements of the major Students majoring in Economics are required to take twelve term courses. Two of these may be introductory
economics courses, one in microeconomics and one in macroeconomics. All majors must take the following courses: one term
of intermediate microeconomics (ECON 121 or 125); one term of intermediate macroeconomics (ECON 122 or 126); one term of
econometrics (ECON 131, 132, or 136); and one Yale mathematics course, usually selected from MATH 112, 115, 118, or 120. Students
who place out of these mathematics courses must take a higher-level mathematics course at Yale and should consult the director of
undergraduate studies in Economics. All of these required courses should be completed prior to the senior year. Majors must also take
two courses numbered ECON 400–491, at least one of which must be taken in the senior year.

Subject to approval by the director of undergraduate studies, students may count toward the major one course related to economics but
taught in another field, in addition to the required course in mathematics.

Students who take a term abroad or take summer courses not at Yale may petition the director of undergraduate studies to count at most
two courses from outside Yale toward the requirements of the major. Students who take a year abroad may petition to count at most three
courses. Many economics courses taken outside Yale do not meet the requirements of the Economics major; students should consult
with the director of undergraduate studies before taking such courses. Courses taken outside Yale may not be counted toward the major
requirements in intermediate microeconomics, intermediate macroeconomics, or econometrics.

Courses taken Credit/D/Fail and residential college seminars may not be counted toward the requirements of the major.

Introductory courses Introductory courses serve students considering a major in Economics as well as others who seek an introduction
to the subject. Most students enroll in ECON 115 and 116, lecture courses with a discussion section. ECON 115 is concerned with
microeconomics and includes such topics as markets, prices, production, distribution, and the allocation of resources. ECON 116 covers
such macroeconomic issues as unemployment, inflation, growth, and international economics; it has a microeconomics prerequisite.

ECON 110 and 111 are limited-enrollment alternatives to ECON 115 and 116; they are open only to freshmen selected from those who
preregister. ECON 108 also covers microeconomics, but with a greater emphasis on quantitative methods and examples. It is intended
for, but not restricted to, freshmen with little or no experience with calculus. Enrollment is limited, and preregistration is required.
ECON 108, 110, and 115 are similar in substance, and ECON 111 and 116 are similar in substance as well. A student may receive credit for
only one course each in introductory microeconomics and introductory macroeconomics.

The department recommends that students interested in majoring in Economics take introductory economics in the freshman year. In
order to make the introductory courses available to all freshmen and to students majoring in other subjects, the introductory courses do
not have a mathematics requirement.

Placement and exemptions for introductory courses Students with a score of 5 on the Advanced Placement tests for microeconomics
and macroeconomics and a score of 5 on the Advanced Placement Calculus BC test may petition the director of undergraduate studies to
place out of introductory microeconomics and introductory macroeconomics and enroll directly in intermediate microeconomics. It is
recommended that students with a score of 5 on the Advanced Placement economics tests but without a 5 on the Calculus BC test take a
Yale mathematics course such as MATH 115 or 120 and then petition the director of undergraduate studies to place out of introductory
microeconomics and take intermediate microeconomics in the following term. Students with high scores on examinations equivalent to
Advanced Placement, such as the GCE A-level or Higher Level International Baccalaureate, may also petition to be exempted from the
introductory courses. For other placement and exemption questions, consult the departmental Web site (http://economics.yale.edu/undergraduate-program).

Mathematics Students are advised to meet the mathematics requirement for the major during their freshman year. The department also recommends that majors either complete MATH 118 or complete two term courses including MATH 120 and either 222 or 225. The latter two-term sequence is preferable for students who wish to take further mathematics courses or who plan to pursue a graduate degree in economics.

Econometrics Students are advised to take a two-term sequence of statistics and econometrics courses, especially if they are considering writing a senior essay. One option is to take ECON 131 followed by 132. Students with a stronger mathematics background or who plan to pursue a graduate degree in economics are encouraged to take either ECON 135 or STAT 241 and 242, followed by ECON 136. Prospective majors are urged to start their econometrics sequence in the fall of sophomore year.

Intermediate microeconomics and macroeconomics Along with econometrics, intermediate microeconomics and macroeconomics form the core of the major. Two options are available in both microeconomics and macroeconomics. The standard intermediate courses are ECON 121 and 122. Students with a stronger mathematics background are encouraged to take ECON 125 and 126 instead. The intermediate courses need not be taken in sequence: in particular, ECON 125 is not required for 126.

Field courses The department offers a wide selection of upper-level courses that explore in greater detail material presented in introductory courses. Advanced fields of economics include theoretical, quantitative, and mathematical economics; market organization; human resources; finance; international and development economics; public policy and the public sector; and economic history. Some advanced field courses have only introductory microeconomics as a prerequisite. Others apply intermediate-level theory or econometrics to economic problems and institutions, and for this reason list one or more of the theory or econometrics courses as prerequisites.

Advanced lecture courses Advanced lecture courses, numbered ECON 400–439, are limited-enrollment courses that cover relatively advanced material in more depth than regular field courses. Prerequisites usually include two of intermediate microeconomics, intermediate macroeconomics, and econometrics or a mathematics course such as MATH 120. Advanced lecture courses may be applied toward the senior requirement. While these courses vary in approach, they share features of other Economics courses: like field courses, they devote some time to traditional lecturing, and like seminars, they emphasize class interaction, the writing of papers, and the reading of journal articles.

Seminars Although there is diversity in approaches in the various seminars (courses numbered ECON 440–489), all have in common an emphasis on class interaction, the writing of papers, and the reading of journal articles. Seminars represent an opportunity for students to apply and extend the economics they have learned through their earlier course work.

Enrollment in seminars and advanced lecture courses is limited. Senior Economics majors who have not yet completed the senior requirement for the major are given priority for these courses and may preregister; see the departmental Web site (http://economics.yale.edu/undergraduate-program) for instructions. Students must take two of three core courses in intermediate microeconomics, intermediate macroeconomics, and econometrics before enrolling in a seminar. Underclassmen in the major and nonmajors may also enroll in Economics seminars and advanced lecture courses as space permits, but they do not preregister.

Senior requirement Majors are required to take two departmental courses numbered ECON 400–491, at least one of which must be taken in the senior year. The senior requirement must be met by Yale Economics courses; courses in other departments or taken elsewhere do not suffice.

Senior essay Only those majors who submit a senior essay are eligible for Distinction in the Major. There are three types of senior essay: (1) students may write a one-term essay in the fall of the senior year as an independent project on a topic of their own design under the close and regular supervision of a faculty adviser (ECON 491); (2) students may write a two-term essay starting in the fall of the senior year as an independent project on a topic of their own design under the close and regular supervision of a faculty adviser (ECON 491 and 492); or (3) students may write a one-term essay in an advanced departmental course (numbered 400–489) taken during the fall term of the senior year, with the option of completing the essay in the spring of the senior year as an independent project under the close and regular supervision of a faculty adviser (ECON 492); under this option the instructor of the advanced departmental course taken in the fall term typically serves as the faculty adviser.

Note that the essay must be written during the senior year and that students may submit a senior essay only if they have an approved prospectus and a senior essay adviser. Senior essays that are not submitted on time will receive a grade of Incomplete. Senior essays with grades of Incomplete without permission of the residential college dean are subject to grade penalties when submitted.

Meetings for seniors to discuss the senior essay will be held on Wednesday, August 31, 2016 at 4:30 p.m. and Thursday, September 1, 2016 at 1:30 p.m. in Room 106, 28 Hillhouse Avenue. Details regarding calculations for Distinction in the Major will be discussed in these meetings, and senior essay guidelines will be distributed. Senior essay prospectus forms are due Monday, October 3, 2016.

Distinction in the Major To be considered for Distinction, students must meet the appropriate grade standards as described in this bulletin under Honors (http://catalog.yale.edu/archive/2016–2017/ycps/yale-college/honors) and submit a senior essay to the Economics department. Students who fail to submit an essay will not be considered for Distinction in the Major. Grade computation for Distinction does not include the introductory economics courses, the required mathematics course, or courses taken outside Yale.
Graduate courses  Well-qualified students who have acquired the requisite background in undergraduate courses may, with written permission of the instructor, the director of undergraduate studies, and the director of graduate studies, be admitted to graduate courses and seminars. Descriptions of courses are available in the Economics department office.

Students who are planning graduate work in economics should take additional mathematics courses beyond the one-term course required for the major. Many graduate programs in economics require courses in multivariate calculus and linear algebra. Students are urged to discuss their plans for graduate work with the director of undergraduate studies as early in their college careers as possible.

Faculty representatives  The Economics department has faculty representatives/advisers for each residential college, typically fellows of that college. Students majoring in Economics should consult with and secure written approval of their course selection from one of their college representatives. Questions concerning the major or programs of study should also be directed to the college representative. College representatives are listed below.

Faculty representatives:

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Requirements of the Major

Prerequisites  None  
Number of courses  12 term courses (incl senior req)  
Distribution of courses  1 intro course in microeconomics, 1 in macroeconomics (or equivalents with DUS permission); 1 math course, as specified  
Specific courses required  ECON 121 or 125; ECON 122 or 126; ECON 131, 132, or 136  
Substitution permitted  1 related course in another dept, with DUS approval  
Senior requirement  2 courses numbered ECON 400–491, at least 1 in senior year  

Introductory Courses

* ECON 108a or b, Quantitative Foundations of Microeconomics  Staff  
Introductory microeconomics with a special emphasis on quantitative methods and examples. Intended for students with limited or no experience with calculus. Enrollment limited. Online preregistration is required; visit economics.yale.edu/undergraduate-program for more information. May not be taken after ECON 110 or 115.  QR, SO  

* ECON 110a or b, An Introduction to Microeconomic Analysis  Staff  
Similar to ECON 115, but taught as a lecture discussion with limited enrollment. Enrollment limited to freshmen. Online preregistration is required; visit economics.yale.edu/undergraduate-program for more information. May not be taken after ECON 108 or 115.  QR, SO  

* ECON 111a or b, An Introduction to Macroeconomic Analysis  Staff  
Similar to ECON 116, but taught as a lecture discussion with limited enrollment. Enrollment limited to freshmen. Online preregistration is required; visit economics.yale.edu/undergraduate-program for more information. May not be taken after ECON 116. Prerequisite: ECON 108, 110, or 115.  SO  

ECON 115a or b, Introductory Microeconomics  Staff  
An introduction to the basic tools of microeconomics to provide a rigorous framework for understanding how individuals, firms, markets, and governments allocate scarce resources. The design and evaluation of public policy. May not be taken after ECON 108 or 110.  QR, SO  

ECON 116a or b, Introductory Macroeconomics  Staff  
An introduction that stresses how the macroeconomy works, including the determination of output, unemployment, inflation, interest rates, and exchange rates. Economic theory is applied to current events. May not be taken after ECON 111. Prerequisite: ECON 108, 110, or 115.  SO  

Intermediate Courses

ECON 121a or b, Intermediate Microeconomics  Staff  
The theory of resource allocation and its applications. Topics include the theory of choice, consumer and firm behavior, production, price determination in different market structures, welfare, and market failure. After introductory microeconomics and completion of the mathematics requirement for the major or its equivalent. Elementary techniques from multivariate calculus are introduced and applied, but prior knowledge is not assumed. May not be taken after ECON 125.  QR, SO
ECON 122a or b, Intermediate Macroeconomics  Staff
Contemporary theories of employment, finance, money, business fluctuations, and economic growth. Their implications for monetary and fiscal policy. Emphasis on empirical studies, financial and monetary crises, and recent policies and problems. Enrollment limited in the fall term. After two terms of introductory economics and completion of the mathematics requirement for the major or its equivalent. May not be taken after ECON 126.  QR, SO

ECON 125a, Microeconomic Theory  Eduardo Faingold
Similar to ECON 121 but with a more intensive treatment of consumer and producer theory, and covering additional topics including choice under uncertainty, game theory, contracting under hidden actions or hidden information, externalities and public goods, and general equilibrium theory. Recommended for students considering graduate study in economics. After introductory economics, and MATH 118 or 120 or equivalent. May not be taken after ECON 121.  QR, SO

* ECON 126b, Macroeconomic Theory  Anthony Smith
Similar to ECON 122 but with a more intensive treatment of the mathematical foundations of macroeconomic modeling, and with rigorous study of additional topics. Recommended for students considering graduate study in economics. After two terms of introductory economics, and MATH 118 or 120 or equivalent. May not be taken after ECON 122.  QR, SO

Econometrics and Statistics Courses

ECON 131a or b, Econometrics and Data Analysis I  Staff
Basic probability theory and statistics, distribution theory, estimation and inference, bivariate regression, introduction to multivariate regression, introduction to statistical computing. After introductory microeconomics and MATH 112 or equivalent.  QR, SO

ECON 132a or b, Econometrics and Data Analysis II  Staff
Continuation of ECON 131, with a focus on multivariate regression. Topics include statistical inference, choice of functional form, heteroskedasticity, serial correlation, two-stage least squares, qualitative choice models, time series models, and forecasting. Emphasis on statistical computing and the mechanics of how to conduct and present empirical research. After two terms of introductory econometrics, completion of the mathematics requirement for the major, and ECON 131 or 135 or a course in the STAT 101–106 series.  QR, SO

ECON 135a, Introduction to Probability and Statistics  Timothy Armstrong
Foundations of mathematical statistics: probability theory, distribution theory, parameter estimation, hypothesis testing, regression, and computer programming. Recommended for students considering graduate study in economics. After introductory microeconomics and either (1) MATH 118; or (2) MATH 120 and either MATH 222 or MATH 225.  QR, SO

ECON 136b, Econometrics  Yuichi Kitamura
Continuation of ECON 135 with a focus on econometric theory and practice: problems that arise from the specification, estimation, and interpretation of models of economic behavior. Topics include classical regression and simultaneous equations models; panel data; and limited dependent variables. Recommended for students considering graduate study in economics. After ECON 135 or STAT 241 and 242.  QR, SO

Field Courses

ECON 159b, Game Theory  Barry Nalebuff
An introduction to game theory and strategic thinking. Ideas such as dominance, backward induction, Nash equilibrium, evolutionary stability, commitment, credibility, asymmetric information, adverse selection, and signaling are applied to games played in class and to examples drawn from economics, politics, the movies, and elsewhere. After introductory microeconomics. No prior knowledge of game theory assumed.  QR, SO

ECON 170a, Health Economics and Public Policy  Howard Forman
Application of economic principles to the study of the U.S. health care system. Emphasis on basic principles about the structure of the U.S. system, current problems, proposed solutions, and the context of health policy making and politics. After introductory microeconomics.  SO

ECON 171b / AFAM 469b / EDST 271b, Urban Inequalities and Educational Inequality  Gerald Jaynes
Analysis of contemporary policy problems related to academic under performance in lower income urban schools and the concomitant achievement gaps among various racial and ethnic groups in United States K-12 education. Historical review of opportunity inequalities and policy solutions proposed to ameliorate differences in achievement and job readiness. Students benefit from practical experience and interdisciplinary methods, including a lab component with time spent in a New Haven high school. Prerequisites: Any course offered by Education Studies, or one course in history or any social science, either: Anthropology, Economics, Political Science, Psychology, Sociology. EDST 110 is preferred, although not required.  SO

ECON 182b / HIST 135b, American Economic History  Matthew Jaremski
The growth of the American economy since 1790, both as a unique historical record and as an illustration of factors in the process of economic development. The American experience viewed in the context of its European background and patterns of industrialization overseas. After introductory microeconomics.  WR, SO
ECON 185a / GLBL 237a, Debates in Macroeconomics  Stephen Roach and Aleh Tsyvinski
Introduction to current theoretical and practical debates in macroeconomics. In-class debates between the instructors on topics such as economic crises, fiscal and monetary policy, inflation, debt, and financial regulations. Prerequisites: introductory microeconomics and macroeconomics.  SO

ECON 186a, European Economic History, 1700–1815  Timothy Guinnane
European economic growth and development from the late seventeenth century through the first stages of the British industrial revolution. The role of institutional development, trade and imperialism, agricultural improvements, and industrialization. Particular attention to comparisons between Britain and other parts of Europe. After ECON 115 or 121, and ECON 116 or 122.  SO

ECON 210b / EDST 210b, Economics of Education  Joseph Altonji
Application of basic economic concepts and empirical methods to the analysis of education. Topics include the economic return to secondary and postsecondary education, the quality of elementary and secondary education, the market for teachers, inequality in education attainment, and school choice. Prerequisites: ECON 108, 110, or 115. A prior course in statistics or econometrics is helpful but not required.  SO

ECON 211b / GLBL 211b / SAST 278b, Economic Performance and Challenges in India  Rakesh Mohan
India’s transition from being one of the poorest countries in the world to having one of the fastest-growing economies. Economic reform processes, trade and policy implications, and changes within the agriculture, industry, and service sectors. Prerequisites: introductory microeconomics and macroeconomics.  SO

ECON 221b, Financial Theory  John Geanakoplos
Study of the financial system as part of the global economy, rather than only the financial world. Topics include bond pricing, the capital asset pricing model, option pricing, the social security system, the mortgage market, hedge funds, collateral, default, and financial crises. Prerequisite: After introductory microeconomics.  QR, SO

ECON 222b, Financial Markets  Robert Shiller
An overview of the ideas, methods, and institutions that permit human society to manage risks and foster enterprise. Description of practices today and analysis of prospects for the future. Introduction to risk management and behavioral finance principles to understand the functioning of securities, insurance, and banking industries. After two terms of introductory economics.  SO

ECON 255a, Introduction to Corporate Finance  Jose-Antonio Espin-Sanchez
Introduction to the concepts and techniques necessary to analyze and implement optimal investment decisions. Prerequisite: introductory microeconomics and introductory macroeconomics.  SO

ECON 256b, The Economics of Strategy  Mitsuru Igami
Study of systematic thinking about competition and strategy using key concepts of microeconomics. Analysis of data, with consideration of economic theory and statistical methods using tools in Excel and Stata. Topics include logical thinking, empirical analysis, modeling, and estimation. Prerequisite: introductory microeconomics, but some familiarity with statistics and econometrics will be helpful.  SO

ECON 327b, The Economics of Poverty Alleviation  Dean Karlan
Measures that succeed and fail—and why—in the fight against poverty in developing countries. Fundamentals of behavioral economics and their application to policy and program design. When and how to use experimental methods to evaluate ideas and programs. Interventions and policies that apply to households, small firms, and communities, with particular attention to microfinance, health, and education. After introductory microeconomics and econometrics.  WR, SO

ECON 330b / EVST 340b, Economics of Natural Resources  Robert Mendelsohn
Microeconomic theory brought to bear on current issues in natural resource policy. Topics include regulation of pollution, hazardous waste management, depletion of the world’s forests and fisheries, wilderness and wildlife preservation, and energy planning. After introductory microeconomics.  QR, SO

ECON 338a / EAST 338a / GLBL 318a, The Next China  Stephen Roach
Economic development in China since the late 1970s. Emphasis on factors pushing China toward a transition from its modern export- and investment-led development model to a pro-consumption model. The possibility of a resulting identity crisis, underscored by China’s need to embrace political reform and by the West’s long-standing misperceptions of China. Prerequisite: introductory macroeconomics.  SO

ECON 339b, Advance Competition Economics and Policy  Fiona Scott Morton
Limits that antitrust laws, as applied and interpreted by agencies, courts, and competitors, place on firm behavior. Economic theories underlying antitrust enforcement. Whether legal rules restricting competitive behavior increase social welfare and how they affect managerial choices. The evidence and reasoning advanced in key antitrust cases; how outcomes may affect social welfare and firm strategies. Goals and procedures of US and EU antitrust agencies.  SO

ECON 350a, Mathematical Economics: General Equilibrium Theory  Truman Bewley
An introduction to general equilibrium theory and its extension to equilibria involving uncertainty and time. Discussion of the economic role of insurance and of intertemporal models, namely, the overlapping generations model and the optimal growth theory model. Recommended for students considering graduate study in economics. After MATH 118 or 120, and intermediate microeconomics.  QR, SO
ECON 351b, Mathematical Economics: Game Theory  Eduardo Faingold
Introduction to game theory and choice under uncertainty. Analysis of the role of information and uncertainty for individual choice behavior, as well as application to the decision theory under uncertainty. Analysis of strategic interaction among economic agents, leading to the theory of auctions and mechanism design. Recommended for students considering graduate study in economics. After MATH 118, 120, and intermediate microeconomics.  QR, SO

* ECON 360a, Capital Markets  Gary Gorton
Topics related to capital markets, with emphasis on the financial crisis of 2007–2008. The design, pricing, and trading of corporate bonds, credit derivatives, and money market instruments; bond restructuring, bond ratings, and financial crises; basic tools used to address such issues, including fixed income mathematics, binomial option pricing, and swaps. Prerequisites: intermediate microeconomics and econometrics.
Note: Econ 360a “Capital Markets” is cross-listed with SOM MGT 947a and has space for up to five undergraduates.

ECON 361a or b, Corporate Finance  Staff
Financial management from inside the corporation or operating entity. Topics include capital budgeting and valuation, optimal capital structure, initial public offerings, mergers, and corporate restructuring. Cases and problem sets provide applications. Prerequisites: intermediate microeconomics and econometrics.

ECON 375a, Monetary Policy  William English
This class will provide an introduction to modern macroeconomic models and then use the models to examine some of the key issues that have faced monetary policymakers during and after the global financial crisis of 2008-09. Intermediate level macroeconomics (Econ 122 or 126) and introductory econometrics (Econ 131 or 135).  WR, SO

Advanced Lecture Courses
Senior Economics majors may preregister for advanced lecture courses; see the departmental Web site (http://economics.yale.edu/undergraduate-program) for instructions. Other interested students may enroll with permission of the instructor during the course selection period.

* ECON 405a, Economics of Health and Health Care  Amanda Kowalski
Economic principles and empirical methods applied to issues in health economics. Discussion of policies to address market failures in health care markets. Consumer behavior in medical markets, valuing medical improvements, and evaluating health insurance reform. Prerequisites: intermediate microeconomics and econometrics.  SO

* ECON 407a / GLBL 310a, International Finance  Zhen Huo
A study of how consumers and firms are affected by the globalization of the world economy. Topics include trade costs, the current account, exchange rate pass-through, international macroeconomic co-movement, multinational production, and gains from globalization. Prerequisite: intermediate macroeconomics or equivalent.  SO

* ECON 408b / GLBL 238b, International Trade Policy  Giovanni Maggi
Analysis of issues concerning international trade policy and agreements, including recent academic research. Welfare analysis of trade policy; the political economy of trade policy; international trade agreements. Attention to both theoretical methods and empirical research. Prerequisites: intermediate microeconomics and ECON 184.  SO

ECON 409a, Firms, Markets, and Competition  Evangelia Chalioti
Analysis of imperfectly competitive markets, focusing on the interactions among firm behavior, market structure, and market outcomes. Topics include oligopoly, collusion, predation, firm entry, advertising, and price discrimination as well as public policy implications of market behavior. After intermediate microeconomics or equivalent.  QR, SO

* ECON 410b, The Economics of Innovation  Mitsuru Igami
Study of forces that drive the process of innovation. Creativity and creative destruction; the innovator’s dilemma; incentives to innovate; competitive advantage; industry evolution; intellectual property. Use of both formal theoretical models and quantitative empirical studies, as well as descriptive studies from management strategy and economic history. Prerequisites: econometrics and intermediate microeconomics.

* ECON 413b / AMTH 437b / EENG 437b, Optimization Techniques  Sekhar Tatikonda
Fundamental theory and algorithms of optimization, emphasizing convex optimization. The geometry of convex sets, basic convex analysis, the principle of optimality, duality. Numerical algorithms: steepest descent, Newton’s method, interior point methods, dynamic programming, unimodal search. Applications from engineering and the sciences. Prerequisites: MATH 120 and 222, or equivalents. May not be taken after AMTH 237.  QR

ECON 414a, Economic Models of New Technology  Evangelia Chalioti
Analysis of firms’ incentives to innovate, focusing on the effects of market power on the intensity of innovative activity. Topics include strategic investment in innovation, patent races, the diffusion of knowledge, intellectual property (IP) protection systems, IP licensing, research joint ventures, litigation, venture capital, and conflicts between IP rights and antitrust regulation. Prerequisites: intermediate microeconomics and econometrics.  SO
**ECON 416b, Labor Economics: Employment, Wages, and Skills**  Ilse Lindenlaub  
Topics in labor economics from theoretical and empirical points of view. Models of supply and demand in a competitive market economy; changes in the allocation of workers to jobs, wage distribution, and wage inequality; reasons why the labor market may not be perfectly competitive; and what determines unemployment and the reallocation of workers after job loss. Prerequisites: intermediate microeconomics and econometrics.  **SO**

**ECON 417b, Computational Methods in Economics**  Anthony Smith  
Introduction to the basic tools of numerical analysis and how to apply them to the study of economic models in a variety of subdisciplines, including macroeconomics, labor economics, industrial organization, public finance, and environmental economics. Prerequisite: intermediate microeconomics, intermediate macroeconomics, and econometrics.  **SO**

**ECON 418a, Risk Management for Financial Institutions**  Andrea Vedolin  
Study of the ways in which risks are quantified and managed by financial institutions. Examination of business and technical issues; regulatory requirements and techniques to measure and report risk across major organizations; and both qualitative and quantitative aspects of risk. Prerequisites: Econometrics, ECON 131 or equivalent and Intermediate Microeconomics, ECON 121 or equivalent.  **SO**

**ECON 419a, Financial Time Series Econometrics**  Xiaohong Chen  
Survey of methods used to analyze financial time series data. Classic linear models; autocorrelation in error variances; methods that allow for non-linearities; methods tailored to analysis of high-frequency data and modeling of value at risk; vector autoregressive models; factor models; the Kalman filter. Prerequisites: ECON 131 and 132, or ECON 135 and 136.  **SO**

**ECON 420a, Applied Microeconometrics**  Yuichi Kitamura and Timothy Armstrong  
Advanced study of econometric theory and applied econometrics, providing students opportunity and ability to conduct high-level empirical research, combining economics, econometrics, and data. Recommended for students planning to write or currently writing an empirical senior essay. Econ121 (Intermediate Micro), and either Econ 132 (Econometrics and Data Analysis II) or Econ 136 (Econometrics).  **SO**

* ECON 421a / CPSC 412a, Designing the Digital Economy  Eric Weyl  
Digitization is transforming a variety of markets from personal transportation services to advertising. This course explores the economic tools (market design, price theory, causal inference, etc.) and technical tools from computer science (machine learning, the analysis of algorithms, user interface design, etc.) students need to contribute meaningfully to this transformation. Prerequisites: elementary training in both economics and computer science and some intermediate/advanced training in at least one relevant field.  **SO**

**ECON 423a, Matching and Market Design**  Takuo Sugaya  
The economics of matching and market design through study of classic and contemporary articles in research literature and case studies. Consideration of how economists match people to other people and people to goods, as in student placement in schools; employees to employers; organ donors to patients in need. Prerequisites: Intermediate microeconomics and familiarity with mathematical proofs. Prior exposure to game theory is useful but not required.  **SO**

**ECON 424b, Central Banking**  William English  
Introduction to the different roles and responsibilities of modern central banks, including the operation of payments systems, monetary policy, supervision and regulation, and financial stability. Discussion of different ways to structure central banks to best manage their responsibilities. Prerequisites: Intermediate Microeconomics, Intermediate Macroeconomics, and Introductory Econometrics.  **SO**

### Seminars

Senior Economics majors may preregister for departmental seminars; see the departmental Web site (http://economics.yale.edu/undergraduate-program) for instructions. Other interested students may enroll with permission of the instructor during the course selection period.

* ECON 440a, Economic and Financial Networks  Alireza Tahbaz-Saleh  
An introduction to the field of economic and financial networks. Examination of the basic concepts and tools from graph theory and study of frontier research topics with applications to microeconomics, macroeconomics, and finance. Prerequisites: Intermediate microeconomics, intermediate macroeconomics, econometrics, and calculus.  **SO**

* ECON 442b, Microfoundations of Growth in China  Xiaoxue Zhao  
A comprehensive overview of the challenges China faces as it transitions from a centrally planned economy to adopting a greater reliance on market-based mechanisms. Review of microeconomic literature on China’s recent economic and institutional transformation to provide a general analytical framework for understanding the economic implications of the process. Prerequisites: intermediate microeconomics and econometrics.  **SO**

* ECON 444b, The Economics of Hedge Funds  Michael Pascutti  
The role of hedge funds in the United States financial markets and hedge fund behavior; understanding what hedge funds do, why they exist, and how they are different from other investment vehicles. Study of investment strategies that provide opportunity and risk for investors and study of academic papers analyzing (risky) arbitrage strategies. Prerequisite: intermediate microeconomics and econometrics.  **SO**
* ECON 445a, The U.S. Banking System  Michael Pascutti
The special functions of banks in the U.S. economy. The benefits but fragile nature of the banking system. Prerequisites: intermediate macroeconomics, microeconomics, and econometrics.  

* ECON 449a, The Economic Analysis of Conflict  Ana Maria Ibanez Londono
The purpose of this class is to introduce students to the microeconomic analysis of internal conflict. In particular, we will study how conflict imposes economic costs on the population and how people react to conflict. Students will work on an empirical paper throughout the semester. Intermediate micro and econometrics.  

* ECON 450a, Investment Analysis  Dean Takahashi
Examination of investment management in theory and practice. Discussion of asset allocation, investment strategy, and manager selection from the perspective of an institutional investor. Focus on the degree of market efficiency and opportunity for generating attractive returns.  

* ECON 452b / EP&E 300b / GLBL 302b, Contemporary Issues in Energy Policy  Ioannis Kessides
Overview of challenges in the global energy framework generated by concerns about energy security and climate change; public policies necessary for addressing these issues. Potential contributions and limitations of existing, improved or transitional, and advanced technologies.  

* ECON 456a, Private Equity Investing  Michael Schmertzler
A case-oriented study of principal issues and investment types found in substantial private equity portfolios. Discussion of enterprise valuation, value creation, business economics, negotiation, and legal structure, based on primary source materials and original cases. Prerequisites: intermediate microeconomics and econometrics.  

* ECON 457a / EP&E 221a, Economics, Politics, and History: Institutional Design and Institutional Change  Jose-Antonio Espin-Sanchez
The efficiency and distributive consequences of institutions' governing of human relationships. Efficiency concerns with the size of the "pie"; ways in which different institutions generate a bigger "pie" than others. Distribution concerns with who gets a bigger piece of the "pie." Why "bad" institutions persist over time; what can be done to change from bad/old institutions to good/new institutions. Prerequisites: intermediate micro- or macroeconomics, and a course in statistics and probability.  

* ECON 461b, Economics, Addiction, and Public Policy  Jody Sindelar
Smoking, alcoholism, illicit drugs, and obesity studied from economic and policy perspectives. Focus on causes of and solutions to problems. After introductory microeconomics.  

* ECON 462a / EP&E 224a / GLBL 330a, Debating Globalization  Ernesto Zedillo
Facets of contemporary economic globalization, including trade, investment, and migration. Challenges and threats of globalization: inclusion and inequality, emerging global players, global governance, climate change, and nuclear weapons proliferation. Prerequisite: background in international economics and data analysis. Preference to seniors majoring in Economics or EP&E.  

* ECON 467b / GLBL 307b, Economic Evolution of the Latin American and Caribbean Countries  Ernesto Zedillo
Economic evolution and prospects of the Latin American and Caribbean (LAC) countries. Topics include the period from independence to the 1930s; import substitution and industrialization to the early 1980s; the debt crisis and the "lost decade"; reform and disappointment in the late 1980s and the 1990s; exploration of selected episodes in particular countries; and speculations about the future. Prerequisites: intermediate microeconomics and macroeconomics.  

* ECON 470b / EP&E 232b / GLBL 233b, Strategies for Economic Development  Rakesh Mohan
How strategies for economic development have changed over time and how dominant strands in development theory and practice have evolved. Students trace the influence of the evolution in thinking on actual changes that have taken place in successful development strategies, as practiced in fast growing developing countries, and as illustrated in case studies of fast growth periods in Japan, South Korea, Brazil, China, and India. Prerequisites: introductory microeconomics and macroeconomics.  

* ECON 471b / EP&E 297b, Topics in Cooperative Game Theory  Pradeep Dubey
The theory and applications of cooperative games. Topics include matching, bargaining, cost allocation, market games, voting games, and games on networks. Prerequisite: intermediate microeconomics.  

* ECON 473b / EP&E 227b / PLSC 343b, Equality  John Roemer
Egalitarian theories of justice and their critics. Readings in philosophy are paired with analytic methods from economics. Topics include Rawlsian justice, utilitarianism, the veil of ignorance, Dworkin's resource egalitarianism, Roemer's equality of opportunity, Marxist exploitation, and Nozickian procedural justice. Some discussion of American economic inequality, Nordic social democracy, and the politics of inequality. Recommended preparation: intermediate microeconomics.  

* ECON 474b / EAST 454b / GLBL 312b, Economic and Policy Lessons from Japan  Stephen Roach
An evaluation of modern Japan's protracted economic problems and of their potential implications for other economies, including the United States, Europe, and China. Policy blunders, structural growth impediments, bubbles, the global economic crisis of 2008, and Abenomics; risks of secular stagnation and related dangers to the global economy from subpar post-crisis recoveries. Focus on policy remedies to avert similar problems in other countries. Prerequisite: an introductory course in macroeconomics.
* ECON 475b / EP&E 286b, Discrimination in Law, Theory, and Practice  Gerald Jaynes
How law and economic theory define and conceptualize economic discrimination; whether economic models adequately describe behaviors of discriminators as documented in court cases and government hearings; the extent to which economic theory and econometric techniques aid our understanding of actual marketplace discrimination. Prerequisites: introductory microeconomics and at least one additional course in Economics, African American Studies, Ethnicity, Race, and Migration, or Women’s, Gender, and Sexuality Studies.

* ECON 480b / GLBL 311b, Banking Crises and Financial Stability  Sigridur Benediktsdottir
Focus on systemic risk, banking crises, financial stability and macroprudential policies. Additional emphasis on systemic risk and prudential policies in peripheral European economies and emerging economies. Prerequisites: ECON 115 and 116, or equivalent.

* ECON 481a / EP&E 298a, Empirical Microeconomics  Jessica Reyes
Introduction to empirical microeconomics and its methodologies. Academic research in the field explored using tools from economic theory and econometrics. Topics include approaches to identification, environmental effects on health, and the economics of crime, gender, and race. Prerequisites: intermediate microeconomics and econometrics.

* ECON 488a / EP&E 404, Experimental Economics  Shyam Sunder
The use of economic experiments to investigate the behavior of economic markets and institutions. Students are actively involved in the design, execution, and analysis of experiments. Examples of experiments include auctions, information aggregation, and stock markets and public goods provision. After intermediate microeconomics or equivalent.

Senior Essay and Directed Reading Courses

* ECON 491a or b and ECON 492b, The Senior Essay  Staff
Students deciding to write one-term senior essays by enrolling in ECON 491, or two-term senior essays by enrolling in ECON 491 and 492, must choose their topics and advisers by Monday, October 3, 2016. One-term senior essays are due at the end of the last week of classes in the fall term. Two-term senior essays are due by 4:30 p.m. on Monday, April 3, 2017. Students writing senior essays who would like to be considered for Distinction in the Major must submit three copies of their essay to the Economics department office by 4:30 p.m. on Monday, April 3, 2017. Advisers are chosen with the assistance of the director of undergraduate studies. The format and character of the departmental senior essay may vary to suit the interest of the student and the demands of the topic, but it is expected that the tools and concepts of economic analysis will be employed and that the essay will contain original research. Paper lengths may vary; the normal expectation is thirty pages. Students may receive up to two credits for the senior essay, though it counts as only one departmental seminar whether one or two terms are taken. Meetings for seniors to discuss the senior essay will be held on Wednesday, August 31, at 4:30 p.m. and Thursday, September 1, at 1:30 p.m. in Room 106, 28 Hillhouse Avenue. Seniors planning to write either a one-term or a two-term senior essay should attend one of these meetings. Details regarding calculation of Distinction will be discussed and senior essay guidelines will be distributed.

* ECON 498a and ECON 499b, Directed Reading  Ebonya Washington
Students desiring a directed reading course in special topics in economics not covered in other graduate or undergraduate courses may elect this course, usually not more than once, with written permission of the director of undergraduate studies and of the instructor. The instructor meets with the student regularly, typically for an hour a week, and the student writes a paper or a series of short essays. Does not meet the requirement for a departmental seminar.