

# Economics

The Department of Economics offers programs designed to improve the understanding of important economic problems and to provide the tools needed for the critical analysis of these problems and for dealing with them in practice.

On the undergraduate level, the department provides both for those who want to become professional economists and for those interested in a specialty related to economics, such as business, law, government, history, health care management, or environmental engineering. Still other students are simply interested in improving their understanding of society or making informed assessments of economic policies as citizens or making wise decisions about personal finances.

On the graduate level, the department provides advanced training for students preparing for careers as professional economists. The program encompasses such fields as macroeconomics, microeconomic theory, econometrics, labor economics, international economics, industrial organization, economic development, and public finance, with an emphasis on the application of economic theory and quantitative methods. Because of the small number of graduate students admitted, they can work closely with faculty in graduate courses and seminars, and have easy and informal access to faculty members. The entire faculty and student body participate in a regular general seminar.

## The Faculty

**Laurence M. Ball**, Professor: macroeconomics.

**Christopher Carroll**, Professor: macroeconomics.

**Carl F. Christ**, Professor Emeritus:  
macroeconomics, money, econometrics,  
economic policy.

**Mark Gersovitz**, Professor: development economics,  
public finance.

**Bruce W. Hamilton**, Professor Emeritus: urban  
economics, public finance, labor economics,  
microeconomic theory.

**Joseph Harrington**, Professor: industrial  
organization, game theory, formal political  
theory.

**Edi Karni**, Professor: economics of uncertainty and  
information, microeconomic theory, decision  
theory.

**M. Ali Khan**, Abram G. Hutzler Professor:  
mathematical economics, microeconomic theory,  
intellectual history.

**Thomas A. Lubik**, Assistant Professor: international  
macroeconomics.

**Louis J. Maccini**, Professor (Chair):  
macroeconomics, econometrics.

**Robert A. Moffitt**, Krieger-Eisenhower Professor:  
labor economics, econometrics, public finance,  
population economics.

**Matthew Shou-Chung Shum**, Associate Professor:  
industrial organization, applied econometrics.

**Tiemen Woutersen**, Assistant Professor:  
econometrics, labor, finance.

**H. Peyton Young**, Scott and Barbara Black  
Professor: game theory, evolutionary economics,  
microeconomic theory.

## Joint Appointments

**Burton Barnow**, Adjunct Professor (Institute for  
Policy Studies): labor economics, public finance.

**Caroline Fohlin**, Associate Research Professor:  
financial and economic history, financial  
intermediation, industrial organization.

**Kevin Frick**, Associate Professor (Bloomberg School  
of Public Health): health economics.

**Steve H. Hanke**, Professor (Geography and  
Environmental Engineering): applied micro- and  
macroeconomics and finance.

**Pravin Krishna**, Professor (S.A.I.S.), international  
trade. political economy, development.

## Undergraduate Programs

The introductory course 180.101-102 Elements of Economics is open to all students. Courses at the 200 level have Elements of Economics (180.101 and 180.102) as pre-requisites.

The Microeconomic and Macroeconomic Theory (180.301 and 180.302) courses have 180.101 and 180.102 as well as Differential Calculus (110.106 or equivalent) as prerequisites. All 300 level courses above 301 and 302 have Microeconomic and/or Macroeconomic Theory (180.301, 180.302) as pre-requisites, as well as Elements of Economics and Calculus. Independent study is available, subject to the consent of the department and of the faculty member with whom the student wants to work.

Subject to the consent of the instructor, graduate courses at the 600-level are open to qualified undergraduates. They receive 1.5 undergraduate credits per class hour. The 600-level courses for which advanced undergraduates are most likely to be qualified are 180.601 and 603, Microeconomic and Macroeconomic Theory.

## Requirements for the B.A. Degree

(See also General Requirements for Departmental Majors, page 46.)

To receive the B.A. degree with a major in economics, the student must do satisfactory work in the following courses, or work judged at least equivalent by the department.

- Economics Core (5 courses):
- 180.101-102 Elements of Macro- and Micro-economics
- 180.301-302 Micro- and Macroeconomic Theory
- 180.334 Econometrics
- Economics Electives (5 courses):
- The five electives must be regular courses, not internships nor (with the exception of the senior thesis) independent study courses. At least two of the five electives must be at the 300 level. A minimum grade of C- is required for any course to be applied to meeting requirements for the major, including courses taken first semester freshman year. Except for 180.301-302 and 180.392, the department does not necessarily offer all 300-level courses every year. Students should plan their programs accordingly, in consultation with faculty.
- Mathematics:
- At least one term of differential calculus
- Statistics:
- 550.111 Statistical Analysis or the equivalent

*Note: The above courses in mathematics and statistics may be used for part of the general requirements for the B.A. degree with a departmental major.*

*Note: Statistical Analysis is a prerequisite for Econometrics.*

## Course Scheduling

Students who may want to major in economics should take 180.101-102 Elements of Economics, 110.106 Differential Calculus, and 550.111 Statistical Analysis during their freshman or sophomore year. Those who try to take them later are likely to run into serious schedule conflicts in the junior and senior years because of the need to fulfill the prerequisites for advanced courses.

Economics students interested in an accelerated program for the B.A. or in early admission to graduate study, or both, will find it helpful to take 180.101-102 and 110.106 in their freshman year. They should consult with faculty at an early stage.

Students planning graduate study in economics will find it useful to take 110.201 Linear Algebra,

110.202 Advanced Calculus, 550.311-312 Probability and Statistics, and related work in other social sciences, history, mathematics, operations research, and computer programming.

## Honors Program in Economics

Departmental honors are awarded to those students who satisfy the following requirements:

- All economics courses applied to the major have been taken in the department.
- 180.392 Economics Senior Thesis. The thesis may be counted as one of the five economics electives.
- A grade point average of at least 3.5 for all economics courses.
- A grade point average of at least 3.5 for 180.301-302 and the senior thesis.

## Minor in Economics

Students with a major in another department may be awarded a minor in economics with satisfactory work in the following courses:

- Elements of Economics (2 courses): 180.101-102 Elements of Macro- and Microeconomics.
- Economics Electives (4 courses): The four courses must be regular courses at the 200 or 300 level, not internships nor independent study courses. No substitution of courses in other departments for economics electives may be made. A minimum grade of C- is required for an economics course to be applied to meeting the requirements of the minor.

## Graduate Programs

### Requirements for Admission

The department's admission requirements are flexible. The admission of each applicant is by the department as a whole and rests upon his/her academic record, recommendations of instructors, and other pertinent information.

To apply for admission, an applicant must submit an official transcript of all academic work beyond secondary school and at least two letters of recommendation from previous instructors. Prospective applicants in the U.S. must submit scores from the Graduate Record Examination, and those outside the U.S. should do so if at all possible. Foreign applicants must also satisfy the department that they are fluent in English by a TOEFL score of at least 600.

Students should have a broad background in the arts and sciences and, in particular, a knowledge of economic theory and institutions, statistical inference, and mathematics through at least differen-

tial calculus. A knowledge of integral calculus and linear algebra would also be helpful.

### Requirements for the M.A. Degree

The department does not admit students from outside Johns Hopkins University who intend to work only for an M.A. However, it does offer this degree as an intermediate step toward the Ph.D. or as a final degree to some of those who do not complete their doctoral work.

Beyond the general University requirements, the department requires for the masters degree either two years of satisfactory graduate course work or one year of satisfactory graduate course work and an acceptable masters essay.

### Requirements for the Ph.D. Degree

The departmental requirements for the doctor's degree include the following:

- Basic course work in economic theory, mathematical methods of economics, and econometrics, and additional work in specialized branches of economics depending on his/her previous training and special interests. Candidates may take relevant work in related departments, such as history, mathematics, mathematical sciences, political science, sociology, anthropology, and public health.
- The comprehensive examination. Administered by the department, this consists of two written examinations designed to test the candidate's grasp of micro- and macroeconomics, and a research paper. The written examinations are usually taken at the beginning of the third term, and the research paper is submitted during the fourth term.
- A dissertation. This should be an original investigation worthy of publication, prepared under the supervision of one or more members of the faculty. The candidate must submit the dissertation in final typed form at least three weeks before the date of the Graduate Board Oral Examination.

The committee that administers the examination includes a majority of faculty from outside the department.

### Financial Aid

The department offers a variety of forms of financial support to graduate students enrolled in the Ph.D. program. Students may receive full or partial tuition fellowships, which may be accompanied by cash stipends or teaching assistantships. In the 2005-2006 academic year, full stipends or assistantships will carry an award of approximately \$12,500 per year. The T. Rowe Price Fellowship, established by the T. Rowe Price Associates Foundation to honor the memory of Mr. Price, is awarded to an entering graduate student each year. It covers tuition and in 2005-2006 will pay an annual stipend of \$14,500 for three years and a teaching assistantship thereafter. At the same time, it is possible that the department will be able to offer one or more of the University's Owen Fellowships to its outstanding graduate applicants. This fellowship consists of a stipend of \$17,500 the students first three years. Although aid is provided on a yearly basis subject to the availability of financial support from the University, it is the department's policy to continue aid for at least four and usually five years, provided the student is making satisfactory progress.

Finally, several summer dissertation fellowships are awarded on a competitive basis to students who have successfully completed their second year of study.

### Carl Christ Fellowship

In the academic year 1989-90, the department established the Carl Christ Fellowship fund to honor one of its faculty members for his distinguished service and achievements. The proceeds of the fund are used to support outstanding graduate students at the dissertation stage of their research.

For further information about graduate study in economics, contact the director of graduate admissions, Department of Economics.

## Undergraduate Courses

*The department plans to offer every course in this list at least once during the academic years 2005–2006 and 2006–2007. However, the indicated instructor(s) of a scheduled course may be changed without notice, and a scheduled course may be canceled if the enrollment is too small, or for other reasons.*

### 180.101 (S) Elements of Macroeconomics

An introduction to the economic system and economic analysis, with emphasis on total national income and output, employment, the price level and inflation, money, the government budget, the national debt, and interest rates. The role of public policy. Applications of economic analysis to government and personal decisions. Prerequisite: basic facility with graphs and algebra.

Ball 3 credits fall

### 180.102 (S) Elements of Microeconomics

An introduction to the economic system and economic analysis, with emphasis on demand and supply, relative prices, the allocation of resources, and the distribution of goods and services; theory of consumer behavior, theory of the firm, and competition and monopoly, including the application of microeconomic analysis to contemporary problems. Prerequisite: basic facility with graphs and algebra.

Hamilton 3 credits spring

### 180.215 (S) Game Theory and the Social Sciences

Game theory is one of the few mathematical tools developed for the purpose of understanding social phenomena. This course provides an introduction to game theory with an emphasis on applications. Applications in economics, political science, business, military science, history, biology, theology, and recreation are covered. No prior knowledge of game theory is presumed and the required mathematical background is minimal (high school algebra and one term of calculus are sufficient). Prerequisite: 180.102.

Young 3 credits

### 108.218 (S) Economics in/of the 18th Century

This seminar traces the extent to which theory, particularly as it pertains to exchange and trade and to economic development, is grounded in and responds to 18th-century texts. The interdisciplinary nature of the writing and its implications for epistemological questions in economics are emphasized. Students in the humanities and social sciences are welcome. Prerequisites: 180.101-102 or permission of instructor.

Khan 3 credits

### 180.227-228 (S) Economic Development

A review of the historical experience in presently developed economies, models of development, planning techniques, and development policies. The course is aimed at identifying major economic questions relevant to less developed economies and to showing how economic analysis can be used further to understand the obstacles

to development and to formulate appropriate policies. Prerequisites: 180.101-102.

Gersovitz 3 credits

### 180.231 (S) Comparative Economic Systems

An examination of the important features of different economic systems, including the nature of pre-modern economies, the evolution of laissez-faire economy, planned economies, and several variants of advanced market economies existing today. Prerequisite: 180.101-102.

Morgan 3 credits

### 180.241 (S) International Trade

Theory of comparative advantage and the international division of labor: the determinants and pattern of trade, factor price equalization, factor mobility, gains from trade and distribution of income, and theory and practice of tariffs and other trade restrictions. Prerequisites: 180.101-102.

Staff 3 credits

### 180.242 (S) International Monetary Economics

Balance of payments, foreign exchange markets, adjustments in the balance of payments, the international monetary system, plans for reform, fixed and flexible exchange rates. Prerequisites: 180.101-102.

Staff 3 credits

### 180.252 (S) Economics of Discrimination

Economic differences between various demographic groups are often attributed to discrimination. This course will provide an introduction to economic thinking about discrimination with applications to current and historical American dilemmas. Prerequisite: 180.102.

Staff 3 credits

### 180.253 (S) Poverty, Welfare, and Race

This course is designed to be an introduction to U.S. social welfare policy, with an emphasis on race and class. Prerequisites: 180.101.

Turner 3 credits

### 180.261 (S) Monetary Analysis

Analysis of money, banking, and government debt, with emphasis on coherent models with microeconomic foundations. Topics include barter and commodity money, monetary institutions in historical perspective, international monetary systems; portfolio theory, liquidity, financial intermediation, bank risk, central banking; debts and deficits, savings and investment, the temptation of inflation. The course aims at providing students with the means to analyze monetary questions and institutions. Prerequisites: 180.101-102, Differential Calculus 110.106.

Staff 3 credits

### 180.273 (S) Economics of Science

Science and technology are central to theories of economic growth. This course explores the role of scientific discovery in promoting technological advance and the resulting distribution of economic benefits.

Staff 3 credits

**180.280 (S) Population Economics**

This course includes the historical background of demographic trends and their economic manifestations; their relationship to the labor force, consumption, productivity and technical change, and to the demand for health, education, and housing; the accumulation of human capital; living standards and the quality of life; population planning. Prerequisites: 180.101-102.

Staff 3 credits

**180.289 (S) Economics of Health**

Application of economic concepts and analysis to the health services system. Review of empirical studies of demand for health services, behavior of providers, and relationship of health services to population health levels. Discussion of current policy issues relating to financing and resource allocation. Prerequisite: 180.102.

Staff 3 credits

**180.301 (S) Microeconomic Theory**

An introduction to the modern theory of allocation of resources, starting with the theories of the individual consumer and producer, and proceeding to analysis of systems of interacting individuals, first in the theory of exchange, then to systems which include production as well. Prerequisites: 180.101-102 and Differential Calculus 110.106, or permission of instructor.

Staff 4.5 credits

**180.302 (S) Macroeconomic Theory**

The course provides a treatment of macroeconomic theory including a static analysis of the determination of output, employment, the price level, the rate of interest, and a dynamic analysis of growth, inflation, and business cycles. In addition, the use and effectiveness of monetary and fiscal policy to bring about full employment, price stability, and steady economic growth will be discussed. Prerequisites: 180.101-102 and Differential Calculus 110.106, or permission of instructor.

Ball, Maccini 4.5 credits

**180.305 (S) Topics in Macroeconomics**

This course covers selected issues such as inflation, monetary policy, government debt, and economic growth. There is a mix of theoretical and applied topics. Prerequisites: 180.301-302 or permission of instructor.

Ball 3 credits

**180.310 (S) Economics of Antitrust**

This course explores the economic rationale for, and consequences of, antitrust laws. In addition to economic analysis, we will study landmark antitrust cases. Prerequisite: 180.301.

Hamilton, Levy 3 credits

**180.311-312 (S) Introduction to Economics of Uncertainty and Information**

In this course, we study economic phenomena that may be attributed to the existence of risk and imperfect information in the economy. Starting from the theory of individual decision making under uncertainty, we examine the role of insurance and financial markets in the allocation of risk,

and the consequences of the failure of such markets in the presence of adverse selection and moral hazard. Market responses to the existence of asymmetric information are illustrated and analyzed. Prerequisite: 180.301.

Karni 3 credits

**180.314 (S,Q) Mathematical Economics**

This course traces the extent to which modern economic theory, particularly as it pertains to the allocation of resources over time in multi-agent societies, is grounded in the language of mathematics. This course will explore how notions of existence, cardinality, stability, and optimality of equilibria are formalized through the use of basic conceptual vocabulary of calculus, analysis and point-set, and differential topology. Special attention will be paid to the formal mathematical expression of economic ideas and the ability to give a loose economic intuition a coherent logical meaning. In terms of specific topics within economics, the course will revolve around the canonical model of normal form games associated with Cournot-Nash-Harsanyi, the Arrow-Debreau-McKenzie model of general economic equilibrium, the von-Neumann growth model, and Allais-Samuelson overlapping generations model and the basic recursive model of dynamic economics associated with Lucas-Prescott. Prerequisite: 180.301.

Khan 3 credits

**180.334 (S,Q) Econometrics**

Introduction to the methods of estimation in economic research. The first part of the course develops the primary method employed in economic research, the method of least squares. This is followed by an investigation of the performance of the method in a variety of important situations. The development of a way to handle many of the situations in which ordinary least squares is not useful, the method of instrumental variables, concludes the course. Prerequisite: Statistical Analysis 550.111, or permission of instructor. Pre- or corequisite: 180.301-302.

Staff 3 credits

**180.351 (S) Labor Economics**

The economics of the determination of earnings and the allocation of labor. The theory of labor supply and labor demand will be developed and then applied to questions of income distribution, unions, government intervention in the labor market, and discrimination. If time allows, the relation between unemployment and inflation will be discussed. Prerequisite: 180.301 or permission of instructor.

Barrow 3 credits

**180.362 (S) Financial Intermediation**

Explores theoretical foundations of the existence, structure, and regulation of financial intermediaries. Topics include information asymmetry, transaction costs, maturity and liquidity transformation, credit rationing, systemic risk, and deposit insurance. Prerequisite: 180.101-102.

Fohlin 3 credits

**180.365 (S) Public Finance**

Examines competing views of the appropriate role of government in the economy and its actual role, including

analysis of the principal taxes and expenditure programs, with a particular emphasis on Social Security and other social insurance programs. Prerequisite: 180.301.

Carroll 3 credits

### **180.367 (S) Investments and Portfolio Management**

Investment securities and their markets, especially the stock market. The relation between expected return and risk. The determination of security prices. Financial portfolio selection. The assessment of the performance of managed portfolios. Prerequisites: 180.301 and Statistical Analysis 550.111.

Christ 3 credits

### **180.371 (S) Economics of Industry**

Investigation of firm behavior in markets characterized by imperfect competition. Imperfect competition lies in between monopoly and perfect competition and characterizes most major industries in modern capitalist economies. Central issues to be covered in the course include what determines the intensity of competition? what determines the extent of entry and exit? how is it that some firms consistently dominate their industries? Prerequisite: 180.301 or permission of instructor.

Harrington 3 credits

### **180.375 (S) Economics of Electronic Commerce**

This course examines how online markets function with a focus on competition, market dynamics, and the role of technology. The format will be a blend of lecture and general discussion. Open to economics majors ONLY. Prerequisites: 180.301 and 180.315.

Harrington 3 credits

### **180.392 (S) Economics Senior Thesis**

The senior thesis is a two-semester project required for those who wish to be considered for departmental honors and optional otherwise. Each student is supervised by an individual thesis adviser.

Staff 5 credits

### **180.599 Independent Study in Economics**

Independent work on selected topics may be arranged by agreement between a student, a faculty member, and the department.

Staff up to 3 credits

## **Cross-Listed**

### **360.328-329 Applied Economics Internship**

Course given in conjunction with private business and financial institutions, governmental entities, and economic research institutes in the Baltimore-Washington metropolitan area. Requirements include 120 hours of internship time and a research paper on an applied economics topic. Permission of instructor required. Satisfactory/Unsatisfactory.

Hanke 3 credits

## **Graduate Courses**

### **180.601-602 Microeconomic Theory**

First term: a systematic presentation of microeconomic theory in both its partial equilibrium and general equilibrium aspects. Topics covered include preferences and utility, exchange, production, theory of the firm, capital and interest, competition and monopoly, stability of equilibrium, and welfare economics. Second term: a more intensive discussion of selected topics, emphasizing recent contributions. Prerequisites: 180.301-302 or equivalent and Differential Calculus 110.106 or permission of instructor.

Hamilton, Khan 3 hours (601), 2 hours (602)

### **180.603-604 Macroeconomic Theory**

First term: a comprehensive treatment of macroeconomic theory, including static analysis of aggregate output employment, the rate of interest, and the price level; aggregative theory of investment, consumption, demand and supply of money; empirical work on aggregative relationships. Second term: the macrodynamic theory of growth, cycles, unemployment and inflation, and selected subjects. Prerequisites: 180.301-302 or permission of instructor.

Maccini, Carroll 3 hours

### **180.605-606 Advanced Macroeconomics**

Topics of recent research in macroeconomics. Content will vary from year to year. Likely topics include implicit contract theory, search theory and unemployment, disequilibrium macroeconomic models, monetary policy and the control of inflation, contract-based rational expectations models, imperfect competition in macrodynamic models, business cycle models, empirical tests of rational expectations models, theories of investment behavior, and debt neutrality. Prerequisites: 180.603-604.

Ball, Maccini, Carroll 2 hours

### **180.611-612 Economics of Uncertainty**

A review of the theory of decision making under uncertainty and its applications to problems of optimal insurance, portfolio selection, savings decisions and optimal search. Alternative approaches to decision making under uncertainty will be surveyed. Attitudes toward risk will be characterized and the issues of measurement and comparability of these attitudes discussed, both in the univariate and multivariate cases; applications are given. The theory of optimal search is developed with emphasis on its usefulness for the study of labor markets and unemployment. Prerequisites: 180.601 and 180.603 or permission of instructor.

Karni 2 hours

### **180.614 Mathematical Economics**

The mathematical theory of general static equilibrium. The course will emphasize the formal mathematical expression of economic ideas and the ability to give a loose economic intuition a coherent logical meaning. Different mathematical structures in general equilibrium theory are isolated and discussed. Prerequisites: 180.601-602 or permission of instructor.

Khan 2 hours

**180.615 Mathematical Methods in Economics**

A course in mathematics for economists not planning to work in quantitative areas, or for those whose mathematics background is weak. The emphasis is on optimization theory; also included are topics in advanced calculus and linear algebra. Prerequisites: 180.301-302 or permission of instructor.

Karni 2 hours

**180.616 Mathematical Methods in Economics**

This is a continuation of 180.615 and is a course in dynamic aspects of optimization models. Techniques of dynamic programming and the calculus of variations are also developed. Prerequisite: 180.615 or permission of instructor.

Staff 2 hours

**180.617 Topics in Mathematical Economics**

The subject matter of this course will vary from year to year, according to the interests of the instructor. Such topics as convex analysis, functional equations, and non-convex global optimization may be studied. Prerequisite: permission of instructor.

Khan, Karni 2 hours

**180.618 Game Theory and Economic Behavior**

This course is an introduction to cooperative and non-cooperative games. Its focus is noncooperative game theory with applications in economics. Topics include foundations of solution concepts, refinements of Nash equilibrium, repeated games, games with incomplete information, differential games, and experimental testing of hypotheses. Prerequisite: 180.601.

Staff 2 hours

**180.619 Evolutionary Economics**

Neoclassical economics stresses the rationality of economic agents and the equilibrium that results when rational agents pursue their self-interest. Evolutionary economics, by contrast, stresses the complex, organic, and somewhat unpredictable nature of economic change. Instead of relying on mechanical paradigms like equilibrium, it borrows its metaphors from biology: growth, mutation, and adaptation are the central focus of attention. This course focuses on four topics: the emergence of social norms, evolutionary models of industrial competition, the adoption of industry standards, and models of learning. The course will cover the necessary concepts in stochastic dynamical systems theory. Prerequisite: graduate-level knowledge of game theory and mathematical methods.

Young 2 hours

**180.622 Political Economy**

This course will discuss topics in Political Economy.

Staff 2 hours

**180.627 Economic Development**

A review of experience in less-developed countries (LDCs) since 1945, theories of development, economic planning in the LDC context, and models of the development process. Corequisites: 180.601, 180.603.

Khan 2 hours

**180.628 Development Policies and Project Evaluation**

Trade relations between developed and developing countries, trade policies in developed countries, policies by developing countries, project evaluation and foreign investment. Corequisites: 180.601, 180.603.

Staff 3 hours

**180.633-634 Econometrics**

Mathematical models of economic behavior and the use of statistical methods for testing economic theories and estimating economic parameters. Subject matter will vary from year to year; statistical methods, such as linear regression, multivariate analysis, and identification, estimation and testing in simultaneous equation models, are stressed. Prerequisites: 180.301-302, statistical inference, and differential calculus (including partial derivatives and matrix algebra), or permission of instructor.

Staff 2 hours

**180.635 Advanced Econometrics**

Estimation and inference within the context of a system of nonlinear parametric simultaneous equations. The large sample properties of many useful econometric estimators are investigated within the framework of a general theory of estimation. Prerequisite: 180.634 or permission of instructor.

Staff 2 hours

**180.636 Statistical Inference**

Theory and applications of statistical inference. Topics include probability and sampling, distribution theory, estimation, hypothesis testing and simple regression analysis. Statistical applications will be drawn from economics. Prerequisites: differential calculus and linear algebra. Limited to graduate students in economics except by permission of the chair.

Staff 2 hours

**180.641 International Trade**

The pure theory of trade. Theories of comparative advantage, factor price equalization, trade and welfare, tariffs, trade and factor movements. Corequisites: 180.601, 180.603.

Staff 2 hours

**180.642 International Monetary Economics**

A link between the balance of payments and asset accumulation/decumulation, microeconomics of international finance and open-economy macroeconomics. The section on open-economy macroeconomics covers approaches to balance-of-payments adjustments, theories of exchange rate determination and monetary, fiscal, and exchange-market policies under fixed and flexible rate regimes. Corequisites: 180.601, 180.603.

Staff 2 hours

**180.651-652 Labor Economics**

First term: theories of the allocation of time and supply of labor, human capital, demand for labor, market equilibrium, and income distribution. As time allows, other topics, such as unemployment, unions, and compensating differences are discussed. Second term: current topics in labor economics. The content will vary from year to year.

Likely areas include nature vs. nurture in the determination of earnings, the function(s) of unions, the question of the existence of dual labor markets, and internal markets with specific human capital. Prerequisite: 180.601. Corequisite for 652: 180.633-634.

Moffitt 2 hours

#### **180.661 Monetary Analysis**

Study of various recent models of money and its interaction with the government budget constraint and real economic variables. Topics include overlapping generations models (with applications to hyperinflations, open-market operations, commodity money); turnpike models of spatial separation; cash-in-advance constraint; liquidity constraint; search-theoretic view of money. Prerequisites: 180.601, 180.604, 180.615-616.

Staff 2 hours

#### **180.665-666 Public Finance**

First term: A theoretical and empirical analysis of the economics of the public sector. Particular topics include criteria for an optimal tax base, consequences of existing tax structures, public-expenditure criteria, an introduction to the theory of public goods, problems of fiscal federalism. Attention is also given to specific current policy issues. Second term: A seminar on research topics in public finance. Prerequisites: 180.601 and 180.603 or permission of instructor.

Staff 2 hours

#### **180.671-672 Industrial Organization**

First term: An investigation of firm behavior in imperfectly competitive industries from a game-theoretic perspective. Firm decision making with respect to price and quantity, entry and exit, and investment are explored. Both static and dynamic theories are presented to address questions related to the intensity of competition and the creation and maintenance of market dominance. The course is largely, though not exclusively, theoretical in content. Though no background in game theory is required, students are encouraged to take 180.618 or some other game theory course concurrently. Second term: The emphasis in this course is on empirical analysis of firm behavior. The first part of the course focuses on models of the internal organization of the firm. The second part considers empirical

analysis of firm behavior in markets, with an emphasis on the new industrial economics. Prerequisite: 180.601.

Harrington 2 hours

#### **180.694 Applied Microeconomics Seminar**

Staff 2 hours

#### **180.695 Microeconomics Workshop**

Staff 2 hours

#### **180.696 Macroeconomics Workshop**

Staff 2 hours

#### **180.697 Trade and Development Workshop**

Staff 2 hours

#### **180.698 Research and Teaching Practicum**

The purpose of the Ph.D program in Economics is to train students to teach and to do research in Economics. This course is for graduate students in the Ph.D. program in Economics to obtain graduate credit for work off campus that provides training and the development of skills in teaching and/or research. Before the practicum is begun, the graduate student must identify a sponsoring faculty member or seek permission from the student's faculty adviser. The faculty member or adviser must sign a form that certifies that graduate credit will be granted, verifies the nature of the work to be performed by the student, and explains how the practicum helps to fulfill a degree requirement. Once completed, the sponsoring faculty member or adviser submits a grade of pass or fail for the student. The course may be used for Curricular Practical Training.