Economics

The Economics program explores the problems of a modern economy and introduces the methodological tools that economists use. It emphasizes the development of analytical models and their application to important economic, social and political issues, such as inflation, unemployment, taxation, inequality, poverty, pollution, government decision-making and regulation. Our faculty, which is made up of leading teacher-scholars, includes specialists in game theory, microeconomics, macroeconomics, industrial organization, monetary economics, financial economics, and public finance.

The study of economics contributes to a broad liberal arts education and helps students develop superior problem-solving skills. It is an excellent course of study to pursue, whether students plan to enter the workforce after graduation or are considering graduate work in law, engineering or the social sciences. Economics also provides exceptional preparation for careers in business, either immediately after graduation or after completing master’s-level graduate work in business (e.g., MBA, MS Finance). In addition to the introductory and intermediate economic theory courses, courses that have particular relevance for business include Econ 3311, Econ 335, Econ 413, Econ 4151, Econ 451, Econ 452, Econ 467, and Econ 477. Economics students with business interests typically complete at least one internship to obtain practical business experience, and it is possible to obtain academic credit for that internship. Students should discuss with their advisors the possibility of taking courses, such as accounting, in the Olin Business School.

In addition to the Economics major, there are two interdisciplinary majors: Economics & Computer Science and Math & Economics. In each major, students complete the core courses in the respective fields along with a set of electives that are complementary to both fields. Further information is available in the Majors section (p. 3) of this page. As noted previously, students are strongly encouraged to complete at least one internship and to complement their studies with appropriate course work from the Olin Business School.

Contact: Dorothy Petersen, Academic Coordinator
Phone: 314-935-5644
Email: dottie@wustl.edu
Website: http://economics.wustl.edu

Faculty

Chair

George-Levi Gayle (https://economics.wustl.edu/people/george-levi-gayle/)
John H. Biggs Distinguished Professorship in Economics
PhD, University of Pittsburgh
Econometric theory; contract theory; labor economics; personnel economics; corporate governance

Associate Chair

Francisco (Paco) Buera (https://economics.wustl.edu/people/francisco-buera/)
Sam B. Cook Professor of Economics
PhD, University of Chicago
Macroeconomics; macroeconomic development

Endowed Professors

Costas Azariadis (https://economics.wustl.edu/people/costas-azariadis/)
Edward Mallinckrodt Distinguished Professor in Arts & Sciences
Weidenbaum Center Research Fellow
PhD, Carnegie Mellon University
Macroeconomic dynamics; economic development; monetary and fiscal policy

Michele Boldrin (https://economics.wustl.edu/people/michele-boldrin/)
Joseph Gibson Hoyt Distinguished Professor in Arts & Sciences
PhD, University of Rochester
Economic theory; economic growth; macroeconomics

Steven Fazzari (https://economics.wustl.edu/people/steven-fazzari/)
Bert A. and Jeanette L. Lynch Distinguished Professor of Economics
PhD, Stanford University
Macroeconomics; Keynesian economics; investment and finance

Limor Golan (https://economics.wustl.edu/people/limor-golan/)
Laurence H. Meyer Professor of Economics
PhD, University of Wisconsin–Madison
Labor economics; applied microeconomics; applied econometrics

Rodolfo Manuelli (https://economics.wustl.edu/people/rodolfo-manuelli/)
James S. McDonnell Distinguished University Professor
Graduate Admissions Officer
PhD, University of Minnesota
Economic growth and development economics; macro and monetary economics

Werner Ploberger (https://economics.wustl.edu/people/werner-ploberger/)
Thomas H. Eliot Distinguished Professor in Arts & Sciences
PhD, Vienna University of Technology
Statistics; econometric methodology; time-series econometrics

Robert Pollak (https://economics.wustl.edu/people/robert-pollak/)
Henneich Distinguished Professor of Economics
PhD, Massachusetts Institute of Technology
Environmental economics; microeconomics/industrial organization; business and government; political economy
Yongseok Shin (https://economics.wustl.edu/people/yongseok-shin/)
Douglass C. North Distinguished Professor of Economics
PhD, Stanford University
Macroeconomics; economic growth

Ping Wang (https://economics.wustl.edu/people/ping-wang/)
Seigle Family Professor
NBER Research Associate
PhD, University of Rochester
Growth/development; money/macro; economic theory; spatial/health economics

Professors

Gaetano Antinolfi (https://economics.wustl.edu/people/gaetano-antinolfi/)
Weidenbaum Center Research Fellow
PhD, Cornell University
Macroeconomics; monetary and international economics

Marcus Berliant (https://economics.wustl.edu/people/marcus-berliant/)
PhD, University of California, Berkeley
Public finance; mathematical economics; urban economics

Ismael Mourifié (https://economics.wustl.edu/people/ismael-mourifie%C3%A9/)
PhD, University of Montréal
Microeconomics (theory and applications)

John Nachbar (https://economics.wustl.edu/people/john-nachbar/)
PhD, Harvard University
Economic theory

Brian Rogers (https://economics.wustl.edu/people/brian-rogers/)
PhD, California Institute of Technology
Microeconomic theory, in particular, the fields of network formation, social learning, and applied game theory

Jonathan Weinstein (https://economics.wustl.edu/people/jonathan-weinstein/)
Director of Graduate Studies
PhD, Massachusetts Institute of Technology
Microeconomic theory, game theory

M. Bumin Yenmez (https://economics.wustl.edu/people/m-bumin-yenmez/)
PhD, Stanford Graduate School of Business
Microeconomic theory, mechanism and market design, choice theory

Associate Professors

Gaurab Aryal (https://economics.wustl.edu/people/gaurab-aryal/)
PhD, Pennsylvania State University
Industrial organization; empirical industrial organization

Ana Babus (https://economics.wustl.edu/people/ana-babus/)
PhD, Erasmus University Rotterdam
Microeconomic theory; finance

Sukkoo Kim (https://economics.wustl.edu/people/sukkoo-kim/)
PhD, University of California, Los Angeles
Economic history; urban and regional economics; trade and development

SangMok Lee (https://economics.wustl.edu/people/sangmok-lee/)
PhD, California Institute of Technology
Microeconomics

Assistant Professors

Ian Fillmore (https://economics.wustl.edu/people/ian-fillmore/)
PhD, University of Chicago
Intersection of industrial organization, labor economics, and econometrics; economics of education and education markets

Sanghmitra Gautam (https://economics.wustl.edu/people/sanghmitra-gautam/)
PhD, University College London
Development economics; applied microeconometrics; public economics

Andrew Jordan (https://sites.google.com/view/andrewjordanecon/home/)
PhD, University of Chicago
Labor markets, discrimination, and criminal justice

Teaching Professor

Sudeshna Bandyopadhyay (http://economics.wustl.edu/people/sudeshna-bandyopadhyay/)
PhD, University of Maryland

Senior Lecturer

Maria Canon (https://economics.wustl.edu/people/maria-canon/)
PhD, University of Rochester

Lecturer

Grace J. Yan Johnson (http://economics.wustl.edu/people/grace-junhui-yan-johnson/)
Director of Master’s Program
PhD, Oklahoma State University

Affiliated Faculty

Mariagiovanna Baccara (https://olin.wustl.edu/EN-US/Faculty-Research/Faculty/Pages/FacultyDetail.aspx?username=mbaccara)
PhD, Princeton University
Scott A. Baker (http://law.wustl.edu/faculty_profiles/profiles.aspx?id=7283)
JD, University of Chicago
PhD, University of North Carolina at Chapel Hill

Serdar Birinci (https://economics.wustl.edu/people/serdar-birinci/)
PhD, University of Minnesota

James Bullard (https://economics.wustl.edu/people/james-bullard/)
PhD, Indiana University

John Drobak (https://law.wustl.edu/faculty-staff-directory/profile/john-n-drobak/)
JD, Stanford University

Maximiliano Dvorkin (https://economics.wustl.edu/people/maximiliano-dvorkin/)
PhD, Yale University

Philip H. Dybvig (http://www.olin.wustl.edu/EN-US/Faculty-Research/Faculty/Pages/FacultyDetail.aspx?username=Dybvig)
PhD, Yale University

Miguel Faria-e-Castro (https://economics.wustl.edu/people/miguel-faria-e-castro/)
PhD, New York University

Leonard Green (http://economics.wustl.edu/people/leonard-green/)
PhD, State University of New York

Barton Hamilton (https://olin.wustl.edu/EN-US/Faculty-Research/Faculty/Pages/FacultyDetail.aspx?username=hamiltonb)
PhD, Stanford University

Julian Kozlowski (https://economics.wustl.edu/people/julian-kozlowski/)
PhD, New York University

Oksana Leukhina (https://sites.google.com/view/oksana-leukhina/)
PhD, University of Minnesota

Glenn MacDonald (https://olin.wustl.edu/EN-US/Faculty-Research/Faculty/Pages/FacultyDetail.aspx?username=macdonald)
PhD, University of Rochester

Fernando Martin (https://research.stlouisfed.org/econ/martin/sel/)
PhD, University of Pennsylvania

Serdar Ozkan (https://economics.wustl.edu/people/serdar-ozkan/)
PhD, University of Pennsylvania

Camillo Padoa-Schioppa (https://neuroscience.wustl.edu/people/camillo-padoa-schioppa-phd/)
PhD, Massachusetts Institute of Technology

Paulia Restrepo-Echavarria (https://research.stlouisfed.org/econ/restrepo-echavarria/sel/)
PhD, University of California, Los Angeles

Juan Sanchez (https://economics.wustl.edu/people/juan-sanchez/)
PhD, University of Rochester

Guillaume Vandenbroucke (https://research.stlouisfed.org/econ/vandenbroucke/sel/)
PhD, University of Rochester

Michael Zdinak (https://economics.wustl.edu/people/michael-zdinak/)
PhD, Washington University in St. Louis

**Professors Emeriti**

Lee K. Benham (https://economics.wustl.edu/people/lee-benham/)
PhD, Stanford University

David Levine (http://www.dklevine.com/)
John H. Biggs Distinguished Professor Emeritus
PhD, Massachusetts Institute of Technology

Wilhelm Neuefeind (https://economics.wustl.edu/people/wilhelm-neuefeind/)
PhD, Universität Bonn

Robert Parks (https://artsci.wustl.edu/faculty-staff/robert-parks/)
PhD, Purdue University

Bruce C. Petersen (https://economics.wustl.edu/people/bruce-petersen/)
Bert and Jeanette Lynch Distinguished Professor Emeritus
PhD, Harvard University

**Majors**

**The Major in Economics**

**Total units required:** 37 to 39

**Required courses:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 131</td>
<td>Calculus I</td>
<td>3</td>
</tr>
<tr>
<td>Math 132</td>
<td>Calculus II</td>
<td>3</td>
</tr>
<tr>
<td>Math 2200</td>
<td>Elementary Probability and Statistics</td>
<td>3</td>
</tr>
<tr>
<td>or Math 3200</td>
<td>Elementary to Intermediate Statistics and Data Analysis</td>
<td></td>
</tr>
<tr>
<td>or Math 3211</td>
<td>Statistics for Data Science I</td>
<td></td>
</tr>
<tr>
<td>or ESE 326</td>
<td>Probability and Statistics for Engineering</td>
<td></td>
</tr>
<tr>
<td>or DAT 120 &amp; DAT 121</td>
<td>Managerial Statistics I and Managerial Statistics II</td>
<td></td>
</tr>
<tr>
<td>Econ 1011</td>
<td>Introduction to Microeconomics</td>
<td>3</td>
</tr>
</tbody>
</table>
The Major in Economics and Computer Science

The College of Arts & Sciences and the McKelvey School of Engineering have developed a major that allows students interested in both economics and computer science to combine these two complementary disciplines efficiently, without having to pursue them as two separate majors.

Engineering students who declare this major must fulfill the distribution requirements and all other requirements for the BS in Applied Science degree (http://bulletin.wustl.edu/undergrad/engineering/requirements/) in the McKelvey School of Engineering. Arts & Sciences students who declare this major must fulfill the distribution requirements and all other requirements for an AB degree (http://bulletin.wustl.edu/undergrad/artsci/requirements/) in addition to the specific requirements listed below. It is possible to earn the Certificate in Financial Economics in conjunction with this major (prime or second), and interested students should consult with Academic Coordinator Dorothy Petersen (dottie@wustl.edu) in the Department of Economics.

**Total units required:** 54

**Required courses:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Econ 1011</td>
<td>Introduction to Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>Econ 1021</td>
<td>Introduction to Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>Econ 4011</td>
<td>Intermediate Microeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>Econ 4021</td>
<td>Intermediate Macroeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>Econ 413</td>
<td>Introduction to Econometrics</td>
<td>3</td>
</tr>
<tr>
<td>or Econ 413W</td>
<td>Introduction to Econometrics with Writing</td>
<td>3</td>
</tr>
<tr>
<td>Math 131</td>
<td>Calculus I (AP credit may satisfy this requirement)</td>
<td>3</td>
</tr>
<tr>
<td>Math 132</td>
<td>Calculus II (AP credit may satisfy this requirement)</td>
<td>3</td>
</tr>
<tr>
<td>Math 233</td>
<td>Calculus III</td>
<td>3</td>
</tr>
<tr>
<td>Math 3200</td>
<td>Elementary to Intermediate Statistics and Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>or Math 3211</td>
<td>Statistics for Data Science I</td>
<td>3</td>
</tr>
<tr>
<td>or ESE 326</td>
<td>Probability and Statistics for Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CSE 131</td>
<td>Introduction to Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>CSE 240</td>
<td>Logic and Discrete Mathematics</td>
<td>3</td>
</tr>
</tbody>
</table>

**Elective courses:**

Four advanced economics electives (12 units), at least two of which must have an Econ 4011 or Econ 4021 prerequisite.

**The College of Arts & Sciences and the McKelvey School of Engineering have developed a major that allows students interested in both economics and computer science to combine these two complementary disciplines efficiently, without having to pursue them as two separate majors.**

Engineering students who declare this major must fulfill the distribution requirements and all other requirements for the BS in Applied Science degree (http://bulletin.wustl.edu/undergrad/engineering/requirements/) in the McKelvey School of Engineering. Arts & Sciences students who declare this major must fulfill the distribution requirements and all other requirements for an AB degree (http://bulletin.wustl.edu/undergrad/artsci/requirements/) in addition to the specific requirements listed below. It is possible to earn the Certificate in Financial Economics in conjunction with this major (prime or second), and interested students should consult with Academic Coordinator Dorothy Petersen (dottie@wustl.edu) in the Department of Economics.

**Total units required:** 54

**Required courses:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Econ 1011</td>
<td>Introduction to Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>Econ 1021</td>
<td>Introduction to Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>Econ 4011</td>
<td>Intermediate Microeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>Econ 4021</td>
<td>Intermediate Macroeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>Econ 413</td>
<td>Introduction to Econometrics</td>
<td>3</td>
</tr>
<tr>
<td>or Econ 413W</td>
<td>Introduction to Econometrics with Writing</td>
<td>3</td>
</tr>
<tr>
<td>Math 131</td>
<td>Calculus I (AP credit may satisfy this requirement)</td>
<td>3</td>
</tr>
<tr>
<td>Math 132</td>
<td>Calculus II (AP credit may satisfy this requirement)</td>
<td>3</td>
</tr>
<tr>
<td>Math 233</td>
<td>Calculus III</td>
<td>3</td>
</tr>
<tr>
<td>Math 3200</td>
<td>Elementary to Intermediate Statistics and Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>or Math 3211</td>
<td>Statistics for Data Science I</td>
<td>3</td>
</tr>
<tr>
<td>or ESE 326</td>
<td>Probability and Statistics for Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CSE 131</td>
<td>Introduction to Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>CSE 240</td>
<td>Logic and Discrete Mathematics</td>
<td>3</td>
</tr>
</tbody>
</table>

**Elective courses:**

1. Three 3-unit economics electives drawn from any Econ 4011 prerequisite course, including Econ 4021
   a. Economics electives of particular relevance include (but are not limited to) Econ 407 Market Design, Econ 4151 Applied Econometrics, Econ 452 Industrial Organization, Econ 4567 Auction Theory and Practice, Econ 467 Game Theory and Econ 484 Computational Macroeconomics.

2. Three 3-unit computer science electives drawn from the list below:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 217A</td>
<td>Introduction to Data Science</td>
<td>3</td>
</tr>
<tr>
<td>CSE 311A</td>
<td>Introduction to Intelligent Agents Using Science Fiction</td>
<td>3</td>
</tr>
<tr>
<td>CSE 314A</td>
<td>Data Manipulation and Management</td>
<td>3</td>
</tr>
<tr>
<td>CSE 330S</td>
<td>Rapid Prototype Development and Creative Programming</td>
<td>3</td>
</tr>
<tr>
<td>CSE 332S</td>
<td>Object-Oriented Software Development Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>CSE 341T</td>
<td>Parallel and Sequential Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CSE 400E</td>
<td>Independent Study</td>
<td>varies; max. 3</td>
</tr>
<tr>
<td>CSE 411A</td>
<td>AI and Society</td>
<td>3</td>
</tr>
<tr>
<td>CSE 412A</td>
<td>Introduction to Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>CSE 416A</td>
<td>Analysis of Network Data</td>
<td>3</td>
</tr>
<tr>
<td>CSE 417T</td>
<td>Introduction to Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>or ESE 417</td>
<td>Introduction to Machine Learning and Pattern Classification</td>
<td>3</td>
</tr>
<tr>
<td>CSE 425S</td>
<td>Programming Systems and Languages</td>
<td>3</td>
</tr>
<tr>
<td>CSE 427S</td>
<td>Cloud Computing with Big Data Applications</td>
<td>3</td>
</tr>
<tr>
<td>CSE 435S</td>
<td>Database Management Systems</td>
<td>3</td>
</tr>
<tr>
<td>CSE 457A</td>
<td>Introduction to Visualization</td>
<td>3</td>
</tr>
<tr>
<td>CSE 514A</td>
<td>Data Mining</td>
<td>3</td>
</tr>
<tr>
<td>CSE 517A</td>
<td>Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>CSE 518A</td>
<td>Human-in-the-Loop Computation</td>
<td>3</td>
</tr>
<tr>
<td>CSE 543T</td>
<td>Algorithms for Nonlinear Optimization</td>
<td>3</td>
</tr>
<tr>
<td>CSE 557A</td>
<td>Advanced Visualization</td>
<td>3</td>
</tr>
</tbody>
</table>

* Of these options, Math 3200 is the preferred course.
Students planning to complete CSE 517A Machine Learning should try to complete CSE 417T Introduction to Machine Learning as the prerequisite course. Non-engineering students may substitute Math 3200 Elementary to Intermediate Statistics and Data Analysis or Math 3211 Statistics for Data Science I for the ESE 326 Probability and Statistics for Engineering prerequisite for ESE 417 Introduction to Machine Learning and Pattern Classification.

The Major in Mathematics and Economics

Total units required: 57

Required courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 131</td>
<td>Introduction to Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>Econ 1011</td>
<td>Introduction to Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>Econ 1021</td>
<td>Introduction to Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>Econ 4011</td>
<td>Intermediate Microeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>Econ 4021</td>
<td>Intermediate Macroeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>Econ 413</td>
<td>Introduction to Econometrics</td>
<td>3</td>
</tr>
<tr>
<td>or Econ 413W</td>
<td>Introduction to Econometrics with Writing</td>
<td></td>
</tr>
<tr>
<td>Math 131</td>
<td>Calculus I</td>
<td>3</td>
</tr>
<tr>
<td>Math 132</td>
<td>Calculus II</td>
<td>3</td>
</tr>
<tr>
<td>Math 233</td>
<td>Calculus III</td>
<td>3</td>
</tr>
<tr>
<td>Math 309</td>
<td>Matrix Algebra</td>
<td>3</td>
</tr>
<tr>
<td>Math 310</td>
<td>Foundations for Higher Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>or Math 310W</td>
<td>Foundations for Higher Mathematics with Writing</td>
<td></td>
</tr>
<tr>
<td>Math 3200</td>
<td>Elementary to Intermediate Statistics and Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>or Math 3211</td>
<td>Statistics for Data Science I</td>
<td></td>
</tr>
<tr>
<td>or Math 493</td>
<td>Probability</td>
<td></td>
</tr>
</tbody>
</table>

Elective courses:

Majors must complete seven electives, with three in each discipline and one from either department.

In Economics:

One of the three electives can be any Economics course with Econ 4011 or Econ 4021 as a prerequisite, including from an approved study abroad program. The other two economics electives must come from the following list:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Econ 404</td>
<td>Behavioral Economics and Experimental Economics</td>
<td>3</td>
</tr>
<tr>
<td>Econ 407</td>
<td>Market Design</td>
<td>3</td>
</tr>
<tr>
<td>Econ 410</td>
<td>Macroeconomics of Inequality</td>
<td>3</td>
</tr>
<tr>
<td>Econ 4151</td>
<td>Applied Econometrics</td>
<td>3</td>
</tr>
<tr>
<td>Econ 435</td>
<td>Open Economy Macroeconomics</td>
<td>3</td>
</tr>
</tbody>
</table>

In Mathematics:

For Mathematics, the electives can come from the following list:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 410</td>
<td>Introduction to Fourier Series and Integrals</td>
<td>3</td>
</tr>
<tr>
<td>Math 4111</td>
<td>Introduction to Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Math 4121</td>
<td>Introduction to Lebesgue Integration</td>
<td>3</td>
</tr>
<tr>
<td>Math 415</td>
<td>Partial Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>Math 416</td>
<td>Complex Variables</td>
<td>3</td>
</tr>
<tr>
<td>Math 420</td>
<td>Experimental Design</td>
<td>3</td>
</tr>
<tr>
<td>Math 429</td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>Math 439</td>
<td>Linear Statistical Models</td>
<td>3</td>
</tr>
<tr>
<td>Math 4392</td>
<td>Advanced Linear Statistical Models</td>
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<tr>
<td>Math 449</td>
<td>Numerical Applied Mathematics</td>
<td>3</td>
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<tr>
<td>Math 450</td>
<td>Topics in Applied Mathematics</td>
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<td>Math 456</td>
<td>Topics in Financial Mathematics</td>
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<td>Math 459</td>
<td>Bayesian Statistics</td>
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<td>Math 460</td>
<td>Multivariate Statistical Analysis</td>
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<td>Math 461</td>
<td>Time Series Analysis</td>
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<tr>
<td>Math 462</td>
<td>Mathematical Foundations of Big Data</td>
<td>3</td>
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<tr>
<td>Math 475</td>
<td>Statistical Computation</td>
<td>3</td>
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<td>Math 493</td>
<td>Probability</td>
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<td>Math 494</td>
<td>Mathematical Statistics</td>
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<tr>
<td>Math 495</td>
<td>Stochastic Processes</td>
<td>3</td>
</tr>
</tbody>
</table>

Advising, Questions, and Further Considerations:

- Students may declare a prime or a second major in Math + Economics via L24 (Math) or L11 (Econ), which will determine their major advisor.
- It is possible to earn the Certificate in Financial Economics in conjunction with this major (prime or second).
• It is possible to graduate with Latin Honors or with “English” honors. Students should refer to the departments’ websites or consult with either Professor Blake Thornton (bthornton@wustl.edu) in the Department of Mathematics and Statistics or Academic Coordinator Dorothy Petersen (dottie@wustl.edu) in the Department of Economics for more information.

• Substitutions for Mathematics courses and study abroad approval for Mathematics courses will be determined by the Department of Mathematics and Statistics.

• Substitutions for Economics courses and study abroad approval will be determined by Academic Coordinator Dorothy Petersen in the Department of Economics.

• Substitutions for CSE 131 are subject to approval by the McKelvey School of Engineering.

The Certificate in Financial Economics

By completing a specialized set of electives, majors (prime or second, including the joint majors) can earn the Certificate in Financial Economics (https://economics.wustl.edu/certificate-financial-economics-0/). More information about the Certificate in Financial Economics can be found on the department website.

Additional Information

Majors must complete Econ 4011, Econ 4021, and the Econ 4011/Econ 4021 prerequisite electives in residence during the fall or spring semesters.

Prerequisites: The prerequisite courses for Econ 4011 are Econ 1011 and Math 132. In addition, Econ 493 or Math 233 must be taken prior to, or concurrently with, enrollment in Econ 4011. The prerequisite courses for Econ 4021 are Econ 1021 and Econ 4011.

The upper-level units (300- and 400-level courses) required for the major must be independent of other majors or minors in Arts & Sciences. Upper-level course work required for a major may not be double-counted for another major or minor in Arts & Sciences.

Senior Honors: Students are invited, during the second semester of their junior year, to participate in the honors program during their senior year if they meet certain academic requirements.

More information about the majors, the minors, the course offerings, and the honors program can be found in the Economics Undergraduate Guide (http://economics.wustl.edu/undergraduate/), available on the department website and from the department. Students are also encouraged to contact Academic Coordinator Dorothy Petersen (dottie@wustl.edu) with any questions.

Minors

The Minor in General Economics

Economics units required: 15

Required courses:

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>Econ 1011</td>
<td>Introduction to Microeconomics</td>
<td>3</td>
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<tr>
<td>Econ 1021</td>
<td>Introduction to Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>Econ 4011</td>
<td>Intermediate Microeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>Econ 4021</td>
<td>Intermediate Macroeconomic Theory</td>
<td>3</td>
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</tbody>
</table>

Total Units: 12

Elective course: One economics elective having at least Econ 1011 and/or Econ 1021 as a prerequisite course

Prerequisites: The prerequisite courses for Econ 4011 are Econ 1011 and Math 132. In addition, Econ 493 or Math 233 must be taken prior to, or concurrently with, enrollment in Econ 4011. The prerequisite courses for Econ 4021 are Econ 1021 and Econ 4011.

The Minor in Applied Microeconomics

Economics units required: 15

Required courses:

<table>
<thead>
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</tr>
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<td>3</td>
</tr>
<tr>
<td>Econ 4011</td>
<td>Intermediate Microeconomic Theory</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Units: 9

Elective courses:

• One Economics elective having Econ 4011 as a prerequisite course

• One Economics elective having at least Econ 1011 and/or Econ 1021 as a prerequisite course

Prerequisites: The prerequisite courses for Econ 4011 are Econ 1011 and Math 132. In addition, Econ 493 or Math 233 must be taken prior to, or concurrently with, enrollment in Econ 4011.

Courses

Visit online course listings to view semester offerings for


L11 Econ 1011 Introduction to Microeconomics

Determination of prices; distribution of national income; theory of production. For a thorough introduction to economics, Econ 1021 also should be taken.
Credit variable, maximum 3 units. Prerequisite: instructor permission.

L11 Econ 105 The Endgame of Entrepreneurship: Leveraging Capitalism for Good
Historically, profit has been a key driver of human behavior. In this course, students will learn to take advantage of the profit-seeking motive of capitalism while also learning from the mistakes and unintended consequences capitalism has caused throughout history. Students will apply these learnings toward profit-seeking solutions for the United Nations’ Sustainable Development Goals, which are global challenges that call us to work together with boldness and urgency. We will explore how skills from entrepreneurship and venture creation can be used to improve water, climate, education and gender equality globally and here in St. Louis. In interdisciplinary teams, students will learn how to define a problem; listen to customers, competitors and collaborators; create value; measure impact; and communicate their vision. Bold entrepreneurial spirit and skills learned in this course will guide students in their further studies at Washington University and beyond. This course does not count for Economics major/minor elective credit. This course is for first-year (non-transfer) students only. Same as I60 BEYOND 105
Credit 3 units. A&S IQ: SSC Arch; SSC Art; SSC BU: BA; ETH EN: S

L11 Econ 2391 Economies as Cultural Systems
Many contemporary approaches to economics downplay or bracket the importance of culture in the workings of economic systems. In this class we will focus on approaches to distribution and exchange in which culture and social institutions figure prominently, if not pre-eminently. We will sample a diverse array of economies, from gift exchange to the ceremonial destruction of wealth, from Melanesia to Wall Street, in order to evaluate some of the assumptions that undergird market capitalism. These assumptions include the perception of market actors exclusively as calculative, maximizing individuals. Topics to be covered include the Industrial Revolution; utilitarianism; economic anthropology; the formal vs. substantivist debates; ethnography of finance, and Marxist sociology. Same as L48 Anthro 3391
Credit 3 units. A&S IQ: LCD, SSC Arch; SSC Art; SSC BU: ETH EN: S

L11 Econ 296 Undergraduate TA
In this course, an advanced undergraduate can assist a faculty member in the teaching of an undergraduate Economics class. Students can enroll after their selection by a supervising faculty member, which occurs after an application (on the department website) is submitted and reviewed, perhaps in conjunction with an interview with the supervising faculty member. Students can enroll in only one section per semester. Students will be expected, at a minimum, to attend lectures and hold office hours. Specific grading duties will be determined by the supervising faculty member, in accord with Arts & Sciences policies. The typical number of units earned is 2, with the possibility of a maximum of 3, per semester. This course can be repeated for F/P credit. Prerequisite: instructor permission.
Credit variable, maximum 3 units.

L11 Econ 326 American Economic History
Basic theoretical concepts applied to analyze the changing structure and performance of the American economy from colonial times to the present. Prerequisites: Econ 1011 and 1021.
Credit 3 units. A&S IQ: SSC Arch; SSC Art; SSC BU: BA EN: S
Credit 3 units. A&S IQ: SSC, Arch: SSC, Art: SSC, BU: BA EN: S

L11 Econ 380 Labor and the Economy
Economic analysis of labor markets. Theory and policy applications of labor supply and labor demand; explanations of wage and income differentials, migration and immigration; discrimination; labor unions; unemployment. Prerequisite: Econ 1011.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L11 Econ 382 Socio-Economic Perspectives on Inequality
This course examines the definition and impact of social and economic inequality. Beginning with a review social, economic, and philosophical perspectives of inequality, the course considers the measurement of inequality, international comparisons of inequality, and policies designed to eliminate inequality. Students should be comfortable with methods of quantitative social science. Prerequisite: Econ 1011 is recommended.
Credit 3 units. A&S IQ: SSC

L11 Econ 4011 Intermediate Microeconomic Theory
Analytic theory of consumer and producer behavior under perfect and imperfect competition. Coverage of demand theory (indifference curves and utility functions) and preferences under uncertainty, including expected utility and risk aversion. Development of general equilibrium under pure exchange, including the concepts of competitive equilibrium and Pareto efficiency. Discussion of the role of time as it pertains to interest rates, discounting and net present value. Analysis of standard monopoly and simple oligopoly problems. Development of noncooperative game theory, including strategic and extensive-form equilibria and Nash and sub-game perfect equilibria. Thorough training in intermediate theory requires both Econ 4011 and Econ 4021. Prerequisites: Econ 1011, Math 132 and concurrent enrollment in, or prior completion of, either Math 233 or Econ 493 (Mathematical Economics).
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L11 Econ 4021 Intermediate Macroeconomic Theory
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L11 Econ 404 Behavioral Economics and Experimental Economics
Behavioral economics is an effort to incorporate ideas from psychology into economic models of behavior. We will focus on popular experimental anomalies, including the Allais and Rabin paradoxes, ultimatum bargaining, the centipede and public goods contribution games. We will examine the extent to which these are consistent with standard economic theory and how they may contradict it. The primary focus will be a critical examination of psychological theories of nonstandard preferences including loss aversion, probability weighting, reciprocity, fairness and present bias. Theories of incorrect beliefs and systematic biases such as money illusion and procrastination will be covered. Applications to the current economic crisis will also be discussed. The class will include an introduction to experimental methods in economics, including hands-on experience in the MISSEL laboratory. A sound grounding in economic theory is essential to the course. You must have successfully completed Econ 4011, and should be acquainted with basic optimization theory, expected utility theory, risk aversion, discounting and basic game theory including dominance, Nash equilibrium and subgame perfection.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L11 Econ 407 Market Design
The objective of this course is to study how to design mechanisms to allocate scarce resources and how to create successful marketplaces. We will primarily consider two topics: (1) two-sided matching markets, such as the National Resident Matching Program and the Kidney Exchange for transplants, and (2) auctions used by Google, Facebook, etc. Time permitting, a third topic will be the problem of designing and regulating market “platforms,” such as the e-commerce markets run by eBay, Amazon, and Craigslist, and applications marketplaces run by Apple, Google, etc., as well as the electronic financial trading platforms run by the NYSE. Prerequisite: Econ 4011.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L11 Econ 410 Macroeconomics of Inequality
In this course, we study the driving forces of inequality across countries, across time, and across individuals within a country. We will define and measure inequality using standard measures of economic well-being, such as income, wealth, and consumption of market goods, and we will also consider broader measures such as health outcomes. Historical cross-country data, microdata, and specific case studies will be used to evaluate theories of the sources of inequality. Key variables to be evaluated include physical capital investment, education and human capital investment, technological progress, robotization, international trade, and financial markets, among others. Prerequisites: Econ 4011 and Econ 4021.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L11 Econ 413 Introduction to Econometrics
Course provides a basic working knowledge of econometrics. Topics include: translation of economic theory into statistical models, statistical foundations of econometrics, preregression analysis bivariate and multiple regression techniques, hypothesis testing, multicollinearity, specification error, autocorrelation, errors in variables, identification, and simultaneous estimation.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L11 Econ 413W Introduction to Econometrics with Writing
Econometrics is the development and application of statistical techniques for the measurement of economic phenomena. This course is your initial study of econometric theory and practice. Topics include: translation of economic theory into statistical models, statistical foundations of econometrics, preregression analysis bivariate and multiple regression techniques, hypothesis testing, multicollinearity, specification error, autocorrelation, errors in variables, identification, and simultaneous estimation. The three writing assignments and the final paper will provide you an opportunity to formulate an economic model, estimate the model with appropriate data, and interpret the results. This experience will help you understand how econometrics relates to other upper-level economics courses which focus on theoretical models for how the world operates. Econometrics provides a method of testing the validity of these economic models, and the term paper will improve your writing skills, giving you a chance to write clearly and concisely about technical material. Prerequisites: Econ 4011 and Math 2200 or equivalent.
Credit 3 units. A&S IQ: SSC, WI Arch: SSC Art: SSC EN: S
Introduction to econometrics as it is applied in microeconomics. Emphasis is on hands-on implementation of the models covered in the course. Topics related to the analysis of microeconomic data include cross-section and panel data linear models and robust inference; instrumental variables estimation; simultaneous equation models; models for discrete choice; and truncation, censoring and sample selection models.

Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L11 Econ 4301 Understanding the Financial Crisis
The global financial crisis of 2007-2009 was the most severe since the Great Depression. The goal of the course is to provide tools to analyze key elements of this crisis. We will move from a corporate finance perspective — to understand the behavior of firms and financial institutions — to a macroeconomic perspective — to make this behavior in aggregate outcomes and policy responses. Topics covered include: the U.S. crisis in historical and international perspective; corporate finance of firms and banks in closed and open economy; monetary and fiscal policy intervention; the open economy dimension of the financial crisis; the European Sovereign Debt crisis.

Credit 3 units. A&S IQ: SSC Arch: SSC Art: FAAM, SSC EN: S

L11 Econ 432 Economics of Public Policy
This course will cover the logic underlying the economics and politics of public policies concerning issues such as international trade, monetary policy, fiscal policy, market reforms, pollution control, economic inequality and the welfare state more generally. The general question we will address, using specific cases, is that of the role of markets and government in an economy. The course relies heavily on the concepts and methods of microeconomics and macroeconomics. There are many theories of how economic policies work and considerable debate as to what can be done and what should be done. We will examine the facts (past and present) and then examine the theories and their explanatory power. We will also organize the class into research groups that will address specific economic policies issues. Prerequisite: Econ 4011.

Credit 3 units. A&S IQ: SSC EN: S

L11 Econ 435 Open Economy Macroeconomics
This course begins with a review of international trade theory, of the balance of payment accounts, and their relationship to international borrowing and lending. We then study the asset approach to exchange rates determination, exchange rate behavior in the short and in the long run, and the relationship of exchange rates with prices and output. The course also explores monetary and fiscal policy under both fixed and floating exchange rates, macroeconomic policy coordination and optimum currency areas, international debt problems of developing countries, and their relation to stabilization program. Prerequisite: Econ 4021.

Credit 3 units. A&S IQ: SSC BU: IS EN: S

L11 Econ 437 The Economics of Financial Intermediation
The structure and the role of banks have changed tremendously. The historically-traditional activity of granting loans and collecting deposits has evolved into a much richer and more complex set of financial contracts. The separation between financial asset trading activity and traditional commercial bank activity that was typical of the financial system in the period after the World War II also disappeared. Coincident with the evolution of financial institutions was the development of the asymmetric information model. The role of banks in the economy can be explained with the tools developed in these models of the economics of information, as a microeconomic theory of banking does not exist when information is symmetric and markets are complete. The economics of information literature is also used to explain the evolution of financial institutions and markets, and to understand the consequences of that evolution for economic outcomes (such as economic development and financial crises) and for monetary policy choices (such as central bank interventions, regulations and changes in the payments system). Prerequisite: Econ 4011; Econ 4021 recommended, but not required. Credit 3 units. A&S IQ: SSC EN: S

L11 Econ 444 Innovation and Intellectual Property: Theory and Practice
Innovation — figuring out better and cheaper ways of satisfying human desires — is the key to improving our well-being. It is not patient saving and accumulation that makes us so much better off than we used to be: capital accumulation is only the conduit through which the innovation juices flow. The question is: What drives it? How come some societies are apparently much more innovative than others? How come we have the impression that most useful inventions took place in the past three centuries? Are there policies that help fostering innovation and others that hurt? The course tries to address these questions. Economists have many theories of innovation, some better than others. We look at the theories, we examine the facts (past and present), then we go back to the theories and reconsider their explanatory power. With this background, we approach the debate about intellectual property, what it is and what it is not good for, whose interests it serves, and whose well-being it thwarts. Prerequisite: Econ 4011.

Credit 3 units. A&S IQ: SSC Art: SSC EN: S

L11 Econ 445 Public Finance
The study of fundamental forms of market failure that provide the economic rationale for government action. The first third of the class examines market failure when an economy contains externalities and public goods and the general nature of public policies that address these issues. The second third addresses particular public policies, with a focus on their intended and unintended consequences and their costs. The final third addresses taxation. Topics include the measurement and evaluation of tax burdens, the federal personal income tax, tax evasion and proposals for fundamental tax reform. Prerequisite: Econ 4011.

Credit 3 units. A&S IQ: SSC Art: SSC EN: S

L11 Econ 448 Money & Monetary Policy
We will explore several classic questions in the theory of money. What is money? What forms does money take? Why is money necessary? Why is there a demand for money? What determines the supply of money? What is the debate on central versus free banking? Should banking be regulated, and, if so, why and how? What determines inflation? Should nations enter into fixed exchange rate regimes, or should they let the value of their monies be market-determined? What are the tensions that arise in fixed exchange rate regimes and common currency areas? How should policymakers view cryptocurrencies? Is a central bank digital currency desirable? These, and other questions, are explored within the context of theories that model the microfoundations of monetary exchange explicitly. Prerequisites: Econ 4011 and Econ 4021.

Credit 3 units. A&S IQ: SSC EN: S

L11 Econ 448W Current Macroeconomic Issues
Review and extension of macroeconomic models from Econ 4021 from a comparative perspective and use of these models to analyze current macroeconomic and policy issues. Topics include recession and recovery; long-term growth; saving and social security; investment; and monetary policy. Multiple writing assignments that emphasize critical analysis of theoretical perspectives and readings applied to current macroeconomic topics. Assignments are revised to improve logical structure, clarity and style. Enrollment limited to 15 students with priority given to senior economics majors. Prerequisite: Econ 4021. Please note: Requests for online registration are wait-listed.

Credit 3 units. A&S IQ: SSC, WI Arch: SSC Art: SSC EN: S
L11 Econ 451 Environmental Policy
Course examines the relationship between environmental economics and environmental policy. The course focuses on air pollution, water pollution and hazardous wastes, with some attention given to biodiversity and global climate change. The course examines critically two prescriptions that economics usually endorses: (1) “balancing” of benefits against costs (e.g., benefit-cost analysis) and the use of risk analysis in evaluating policy alternatives; and (2) use of market incentives (e.g., prices, taxes or charges) or “property rights” instead of traditional command-and-control regulations to implement environmental policy. Prerequisite: Econ 4011.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC BU: BA, ETH EN: S

L11 Econ 452 Industrial Organization
Theoretical and empirical analysis of the presence and value of competitive forces in the United States economy. Theories of industrial organization and development of criteria for performance of noncompetitive industries. Prerequisite: Econ 4011.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L11 Econ 4567 Auction Theory and Practice
This course will use the theoretical and empirical tools of economics to study auctions, which are one way of buying and selling goods (or services). The course begins with a consideration of optimal bidding in different types of auctions. We will explore how to design auction rules that maximize the seller’s revenue, or minimize the buyer’s cost (such as in the case of government procurement). We will also study how to design auction rules that improve efficiency by reducing collusion by bidders. The course will conclude by using econometrics to analyze “real-world” auction data to estimate preferences and cost distributions; to determine optimal reserve prices; and to answer some questions related to auction design. Familiarity with computer programming/estimation, such as with MATLAB, R, or Julia, will be helpful. Prerequisites: Econ 4011 and Econ 413 or Econ 413W.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC

L11 Econ 460 Urban Economics
Economic function of the city and the role of the city in a national economy. Local decision making; financing of local government expenditures. An analysis of selected urban problems, such as causes and effects of housing market segregation; decay and abandonment, landlord-tenant relations, crime, and urban transport systems. Prerequisite: Econ 4011.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L11 Econ 467 Game Theory
This course covers advanced applications of Game Theory in economics. Topics include expected utility, strategic-form and extensive-form games with perfect information, Bayesian games, infinitely repeated games, dominance, Nash equilibrium and its refinements. We apply these tools to study strategic situations in industrial organization, auctions, bargaining, voting, and signaling games. Prerequisites: Econ 4011 and Math 2200.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L11 Econ 471 Development Economics
This course investigates issues related to the development of the economics of third-world countries. Topics include economic growth, poverty, corruption, and human capital accumulation, with an emphasis on education and health-related policies. The course provides an in-depth understanding of the role of the state and the impact of specific public policies designed to encourage development. Empirical examples are drawn from Asia, Latin America, and the African subcontinent. Prerequisites: Econ 4011 and Econ 413 or Econ 413W.

L11 Econ 472 Topics in Growth and Development
This course highlights important empirical facts concerning growth and development in various countries at different development stages. Fundamental growth theory is then provided for explaining these facts systematically and for evaluating the consequences of commonly adopted development policies. Topics vary, but may include population; human capital and labor market development; R&D and innovation; finance and growth; modernization and industrial transformation; world income disparities and poverty problems; institutions and political economy issues; environmental and social factors; and international trade and economic integration. Prerequisites: Econ 4011 and Econ 4021.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L11 Econ 4721 Advanced Topics in Modern Economic Growth
This course studies economic theories that explain the observed patterns of economic development across time and space. What explains the growth of the world economy since the Industrial Revolution? Why are the level and the growth rate of per-capita income so different across countries? What explains the decline of manufacturing, and its growth in the early stages of development? What are the determinants of inequality and risk faced by individuals in different countries? Theories featuring the role of investment in physical and human capital, technology, coordination, financial markets, and environmental variables will be presented. Theories will be evaluated using historical data and detailed case studies. This course is designed to complement Econ 472. Prerequisites: Econ 4011.
Credit 3 units. A&S IQ: SSC EN: S

L11 Econ 477 Topics in Financial Economics
The objective of the course is to develop the basic economic models that can be used to study the valuation of different financial assets and to discuss how to confront the theory with the evidence from financial markets. The course will develop the basic model of investment under uncertainty and discuss portfolio choices in static and dynamic settings as well as market equilibria and the impact of news on the forecast-ability of excess returns. The course will describe valuation in incomplete asset markets (e.g., arbitrage pricing theory) and the extension to the valuation of firms and real estate assets. Prerequisites: Econ 4011, Econ 4021, and Econ 413.
Credit 3 units.

L11 Econ 480 Labor Economics
Economic analysis of labor markets. Theory and evidence on supply of and demand for labor, explanation of wage and income differentials; impact of education on human skills and productivity. Prerequisites: Econ 401 and 413.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L11 Econ 483 Economics of Education
The course involves analysis of the economic and social determinants and consequences of education. Because each person’s education is an investment in human capital that allows the individual to contribute to society in a productive way, education becomes a crucial determinant of an economy’s ability to achieve high growth with high wages, low unemployment and strong social cohesion. This course addresses three essential topics from the wide-ranging field of the economics of education. The first is demand-side oriented and includes: (1) the measurement of the returns to education in the labor market (human capital theory; the central idea of education as human capital investment); and (2) a characterization of the education production function, which relates the various inputs affecting a student’s learning (schools, families, peers, neighborhoods, etc.) to measure outputs.
including labor market success, graduation rates and standardized test scores. The second important topic involves political economy and the supply side: the financing and provision of education. The third part of the course is devoted to the links between education and economic development, including cross-country differences in schooling, returns to schooling and per-capita income. Prerequisites: Econ 4011, Econ 4021 and Econ 413.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

**L11 Econ 484 Computational Macroeconomics**
This course provides a more in depth look into quantitative methods used in contemporary macroeconomic analysis. We will cover numerical methods used in dynamic optimization. In practice, we will apply these methods to solve two major models used in macroeconomic analysis, using both Excel and Matlab. The Neoclassical Growth Model and its variants are used to study aggregate trends and aggregate effects of government policy. The lifecycle model is used to examine questions involving decision-making over the lifecycle. We will learn how to use empirical observations for the purpose of calibrating model parameters and how to conduct policy evaluation in the context of calibrated models. Our policy evaluation will focus on fiscal policy (taxes) and social security issues. Prerequisites: 4011 and 4021.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

**L11 Econ 490 Independent Work**
Prerequisites: senior standing and permission of the supervising faculty member. Consult Academic Coordinator for further details. Note: This course does not count toward the major or minor in economics.
Credit variable, maximum 6 units.

**L11 Econ 493 Mathematical Economics**
The objective of this course is to develop the mathematical tools necessary for the study of intermediate micro- and macro-economic theory and the advanced electives in economics. The principal focus will be the calculus of multivariate functions (including total and partial differentiation), unconstrained and constrained optimization of multivariate functions, and implicit and inverse function rules. Time permitting, additional topics will be introduced. Economics majors and minors must take this course (or Math 233) prior to, or concurrently with, Econ 4011. Students who have taken, or are taking, Math 233 are encouraged to take this course as well. Prerequisites: Econ 1011, Econ 1021, and Math 132.
Credit 1 unit. A&S IQ: SSC Arch: SSC Art: SSC EN: S

**L11 Econ 494 Introduction to Stata**
This short course introduces students to the data analysis and statistical software tools used in upper-level econometrics and applied economics courses. The course is designed to serve as a bridge between introductory econometrics and practical work with real-world databases. The course will be held in the computer classroom so that students can obtain hands-on experience with data preparation, workflow, and modeling using the Stata statistical software package. Emphasis throughout the course is placed on examples of applications in economics. PLEASE NOTE: 1. This course must be taken for a letter grade; the P/F and audit grade options are not available. 2. Students cannot use WebStac to add or drop this course after the first session -- contact dottie@wustl.edu for scheduling issues. 3. The final exam will occur on the last day of class, per the course syllabus. Prerequisites: prior completion of, or concurrent enrollment in, Econ 413.
Credit 1.5 units.

**L11 Econ 4941 Economic Analysis with Excel**
This mini course offers students the opportunity to master the advance functionality of Microsoft Excel, and to apply those skills to common economic, statistical, and financial problems. Even those familiar with the basic functioning of Excel may be surprised to learn how little of its full capability most users access. Though basic functions will be covered, our focus will be on leveraging Excel's more advanced functions, analytical tools, reporting templates, and linking features to manage multiple workbooks, manipulate data across files, automate tasks, and produce publication quality charts, tables, and graphs. In addition to providing hands-on experience using Excel's advanced capabilities, the course is designed to serve as a bridge between introductory econometrics and practical work with real-world datasets. The course will be held in the computer classroom so that students can obtain practical experience preparing data, managing workflow, and presenting results. Added emphasis throughout the course will be placed on examples with applications in economics. Prerequisites: prior completion of, or concurrent enrollment in, Econ 413 (or equivalent), Credit 1.5 units.

**L11 Econ 497 Research in Economics**
Opportunity to work as part of a research project under faculty supervision. Note: This course does not count toward the major or minor in economics. May be repeated for credit. Credit variable, maximum 3 units. A&S IQ: SSC Art: SSC EN: S

**L11 Econ 498 Honors Seminar**
Advanced application of economic theory to policy problems. This is the first part of the two-course sequence for seniors writing an honors thesis, and it is taken in the fall semester of the senior year. This course may not be used to satisfy major requirements. Prerequisite: invitation into the "Honors in Economics with Thesis" track of the department's Honors Program.
Credit 3 units. A&S IQ: SSC EN: S

**L11 Econ 499 Study for Honors**
Independent reading and research under faculty direction leading to a Senior Honors Thesis. This is the second part of the two-course sequence for seniors writing an honors thesis, and it is taken in the spring semester of the senior year. This course may not be used to satisfy major requirements. Prerequisite: invitation into the "Honors in Economics with Thesis" track of the department's Honors Program.
Credit 3 units.