

ECONOMICS

THE SCHOOL OF SOCIAL SCIENCES

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DEGREES OFFERED: BA, MA, PHD

Undergraduates may major in either economics or mathematical economic analysis. The latter is recommended for students who intend to continue on to graduate work in economics or pursue a business or governmental job in which analytical and quantitative skills are required.

The 8 major fields available for graduate study are econometrics, economic development, economic theory, industrial organization and regulation, international trade and finance, labor, macroeconomics and/or monetary theory, and public finance.

REQUIREMENTS FOR MAJORING IN ECONOMICS

1. All economics majors must complete a minimum of 10 courses with a grade point average of at least 2.0. When students repeat courses or complete more than the minimally required number of courses, the departmental GPA will be based on the set of courses that (i) satisfies all requirements for the degree and (ii) results in the highest GPA for the student. Major requirements are not reduced for multiple majors, although some courses can satisfy the requirements for more than 1 major. (Please note that students may not pursue a double major in economics and mathematical economic analysis.)
2. The following courses are required for all economics majors:

ECON 211 *Principles of Economics I*

ECON 370 *Microeconomic Theory*

ECON 375 *Macroeconomic Theory*

STAT 280 *Elementary Applied Statistics* (or STAT 310/ECON 382)

ECON 446 *Applied Econometrics* (or ECON 400).

Please note that ECON 370 requires MATH 101 (or both MATH 111 and 112) as prerequisites. We suggest that economics majors take ECON 211, ECON 370, MATH 101, STAT 280 (or STAT 310/ECON 382), and ECON 446 (or ECON 400) as early as possible. Please note that failure to take prerequisite courses in earlier years may cause scheduling problems in later years.

- Given that item 2 has been satisfied, the 5 remaining required economics courses must be selected from the following:

ECON 250 *Foundations of Public Sector Economics*

ECON 340 *Introduction to Game Theory*

ECON 348 *Organization Design*

ECON 355 *Financial Markets*

ECON 400 *Econometrics*

ECON 403/404 *Senior Independent Research*

ECON 415 *Labor Economics*

ECON 420 *International Trade*

ECON 421 *International Finance*

ECON 435 *Industrial Organization*

ECON 436 *Regulation*

ECON 437 *Energy Economics*

ECON 438 *Business, Law, and Economics*

ECON 439 *Torts, Property, and Contracts*

ECON 440 *Advanced Game Theory*

ECON 445 *Managerial Economics*

ECON 448 *Corporate Finance*

ECON 449 *Basics/Financial Engineering*

ECON 450 *World Economy and Social Development*

ECON 451 *Economy of Latin America*

ECON 452 *Religion, Ethics, and Economics*

ECON 455 *Money and Financial Markets*

ECON 461 *Urban Economics*

ECON 475 *Integer and Combinatorial Optimization*

ECON 477 *Mathematical Economics*

ECON 479 *Applied General Equilibrium Modeling*

ECON 480 *Environmental Economics*

ECON 481 *Health Economics*

ECON 482 *Distributive Justice*

ECON 483 *Public Finance Tax Policy*

ECON 484 *Public Finance Expenditure*

ECON 485/486 *Contemporary Economic Issues*

ECON 495/496 *Senior Seminar*

- No more than 3 of the 10 economics courses may be transferred from other schools. Additional transfer credits in economics may count toward meeting university graduation requirements but not toward fulfillment of the departmental major requirements. AP credits do not count against the 3 allowed transfer credits. In order to transfer ECON 211, the student must pass a qualifying examination. Students wishing to take the ECON 211 qualifying examination must apply to the economics department office in Baker Hall 266A. For additional information on transfer credits, consult "Procedures for Transfer Credit," available in the economics department office.
- Students may graduate with honors in economics by achieving a B+ (3.33) average in all economics courses and completing 2 semesters of independent research (for details, consult Economics 403/404—*Senior Independent Research*, available in the economics department office).
- For additional course information, consult Economics Course Descriptions, compiled by the Rice chapter of the Omicron Delta Epsilon National Economics Honor Society.
- Please note that it is primarily the responsibility of the student to satisfy all degree requirements, including the University Credit Requirements and University Distribution Requirements specified in the General Announcements. Students are advised that the relevant departmental requirements are those in effect on the day that the student declares economics as their major. Consult with the appropriate departmental advisor, who must sign all registration forms for each major.

8. Students who are considering either graduate work in economics or a business or governmental job in which analytical and quantitative skills are required should seriously consider obtaining the alternative major in mathematical economic analysis.

REQUIREMENTS FOR MAJORING IN MATHEMATICAL ECONOMIC ANALYSIS

1. The major in mathematical economic analysis (MTEC) is designed for students who are interested in either graduate work in economics or a business or governmental job in which analytical and quantitative skills are required.
2. Students must choose between the 2 majors offered by the economics department; that is, students may not double major in economics and mathematical economic analysis. Major requirements are not reduced for students with multiple majors.
3. All MTEC majors must complete a minimum of 16 courses in 6 areas with a grade point average of at least 2.00. These courses must include:

(a) 5 courses in mathematics and statistics

MATH 101 *Single Variable Calculus I*
 MATH 102 *Single Variable Calculus II, and*
 MATH 211 *Ordinary Differential Equations, or*
 MATH 355 *Linear Algebra, or*
 CAAM 335 *Matrix Analysis, and*
 MATH 212 *Multivariable Calculus, or*
 MATH 221 *Honors Calculus III, and*
 ECON 382/STAT 310 *Probability and Statistics, or*
 STAT 410 *Introduction into Regression and*
Statistical Computing, or
 STAT 431 *Overview of Mathematical Statistics*

(b) 1 courses in econometrics:

ECON 400 *Econometrics*

(c) 4 courses in economic theory:

ECON 211 *Principles of Economics I*
 ECON 340 *Introduction to Game Theory*
 ECON 370 *Microeconomic Theory*
 ECON 375 *Macroeconomic Theory*
 ECON 477 *Mathematical Structure of Economic Theory*

(d) 4 courses in applied economics, selected from:

ECON 301 *History of Economic Analysis*
 ECON 348 *Organizational Design*
 ECON 355 *Financial Markets*
 ECON 415 *Labor Economics*
 ECON 420 *International Trade*

ECON 421 *International Finance*
 ECON 435 *Industrial Organization*
 ECON 436 *Regulation*
 ECON 437 *Energy Economics*
 ECON 438 *Business, Law, and Economics*
 ECON 439 *Torts, Property, and Contracts*
 ECON 440 *Advanced Game Theory*
 ECON 445 *Managerial Economics*
 ECON 446 *Applied Econometrics*
 ECON 448 *Corporate Finance*
 ECON 449 *Basics of Financial Engineering*
 ECON 450 *World Economic and Social Development*
 ECON 451 *The Political Economy of Latin America*
 ECON 452 *Religion, Ethics, and Economics*
 ECON 455 *Money and Financial Markets*
 ECON 461 *Urban Economics*
 ECON 475 *Integer and Combinatorial Optimization*
 ECON 480 *Environmental and Energy Economics*
 ECON 481 *Health Economics*
 ECON 482 *Distributive Justice: A Microeconomic Approach*
 ECON 483 *Public Finance: Tax Policy*
 ECON 484 *Public Expenditure Theory and Social Insurance*
 ECON 485 *Contemporary Economic Issues*

ECON 486 *Contemporary Economic Issues*

(e) 1 semester of ECON 403 or Senior Independent Research

(f) 1 additional 400-level course in applied economics as listed in (d) or 1 additional semester of Senior Independent Research (ECON 404) or a course in advanced analysis, selected from:

CAAM 452 *Numerical Methods for Partial Differential Equations*

CAAM 453 *Numerical Analysis I*

CAAM 454 *Numerical Analysis II*

CAAM 460 *Optimization Theory*

CAAM 475 *Integer and Combinational Optimization*

4. No more than 3 of the required economics courses and 2 of the required mathematics (or computational and applied mathematics or statistics) courses may be transferred from other schools, if those courses are taken after matriculation at Rice. Additional transfer credits in economics, mathematics, computational and applied mathematics, or statistics may count toward meeting university graduation requirements but not toward fulfillment of the departmental major requirements. AP credits and credits awarded to transfer students for courses taken prior to matriculation at Rice are not counted against the limit on transfer courses, but all students must complete more than half of their upper-level major work at Rice. In order to transfer ECON 211, the student must pass a qualifying examination. Students wishing to take the ECON 211 qualifying examination must apply to the economics department office in Baker Hall 259. For additional information on transfer credits, consult "Procedures for Transfer Credit," also available in the economics department office.
5. Students may graduate with "Honors in Mathematical Economic Analysis" by achieving a B+ (3.33) average in the 16 courses required for the major. When students repeat courses or complete more than the minimally required number of courses, the departmental GPA will be based on the set of courses that (i) satisfies all requirements for the degree and (ii) results in the highest GPA for the student. However, when a course is taken both at Rice and at another institution, the Rice grade will be used for departmental GPA calculations.
6. For additional course information, consult "Economics Course Descriptions," compiled by the Rice chapter of the Omicron Delta Epsilon National Economics Honor Society.
7. Please note that it is the responsibility of the student to satisfy all degree requirements, including the university credit requirements and university distribution requirements specified in *General Announcements*. Students are advised that the relevant departmental requirements are those in effect on the day that the student declares mathematical economic analysis as their major. Consult with the appropriate departmental advisor, who must sign all registration forms for each major.

CONCENTRATION IN BUSINESS ECONOMICS

Students who complete the requirement for a major in economics or a major in mathematical economic analysis also may request a certification from the department that they have completed the requirements for a concentration in business economics if they complete the following courses with minimum grade point average of at least 2.0:

1. ACCO 305 *Introduction to Accounting*
2. The following electives for the economics or mathematical economic analysis major:

ECON 355 *Financial Markets*

ECON 438 *Business, Law, and Economics*

ECON 445 *Managerial Economics*

ECON 448 *Corporate Finance*

Note that to complete their major requirements, economic majors will need to choose 1 additional 400-level elective beyond those chosen to satisfy requirement 2.

Substituting Economics Graduate Courses for Undergraduate Courses—Undergraduate majors satisfying the course prerequisites may, subject to the approval of the instructor and of the departmental undergraduate committee chair, substitute certain graduate courses for undergraduate courses. Only highly motivated students with excellent aptitudes for economics and a strong background in mathematics should consider making such substitutions. Typically, but not necessarily, such students will be majors in mathematical economic analysis. Permitted substitutions are as follows:

- ECON 501 for ECON 370 (if student has completed ECON 211 at Rice)
- ECON 502 for ECON 375
- ECON 504 for ECON 382
- ECON 510 for ECON 400
- Furthermore, ECON 505 and ECON 508 also may be taken by undergraduates and may be used toward satisfying MTEC requirements. Specifically, ECON 505 could be used as 1 of the courses in the applied economics category or in the advanced analysis category, while ECON 508 could be used only in the advanced analysis category.

Note that this set of substitutable graduate courses includes 6 of the 7 courses required during the 1st year of the PhD program at Rice. Accordingly, such advanced course work would be excellent preparation for graduate study in economics or in some related field such as finance. Taking such graduate courses also should open more opportunities for the student who will be seeking employment immediately after graduation.

THE 5-YEAR MA PROGRAM

Advanced undergraduate students can, subject to the approval of the departmental 5-year MA advisor, enter our 5-year MA program. In this program, a student who has taken advantage of the full menu of graduate course substitutions available could, with an additional year of study at Rice, earn an MA in economics.

To obtain the MA degree, students must satisfy all of the requirements for PhD candidacy. In particular, students must pass general examinations in microeconomic theory and in macroeconomic theory and econometrics, must pass an examination in a specialized field of study in economics, and must complete an original research project (a dissertation prospectus) that could be developed into a PhD dissertation under the supervision of a faculty member. This work could be an extension of a paper written as a senior independent research project (ECON 403/404). In some cases, at the discretion of the independent research advisor, the paper produced in ECON 403/404 may fulfill this requirement. Finally, the 1st-year graduate requirement to take ECON 507 Mathematical Economics would be waived with the approval of the departmental 5-year MA advisor.

Note that any student who subsequently decides to enter the economics PhD program at Rice would be given graduate credit for all 500-level economics courses completed while an undergraduate. The completion of the PhD

dissertation typically requires at least 1 additional year of research (but no additional courses) beyond the MA degree.

Students who opt for the 5-year MA degree program will have different backgrounds and interests on entering Rice and will choose to pursue this option at different stages in their academic careers. The following illustrates 2 (of many) possible paths to satisfying the MTEC major requirements, while at the same time completing all of the requirements for the MA degree over a 5-year period.

COURSES: SAMPLE PATH ONE

The student enters with AP credit for ECON 211 and MATH 101/102 and has an early interest in the 5-year MA program.

Freshman Year

ECON 370, 375, 477, and MATH 211/212

Sophomore Year

ECON 501; 1 course from Applied Economics category; and MATH 355 or CAAM 310

Junior Year

ECON 502, 504, 505, 510, and 1 course from Applied Economics category

Senior Year

ECON 403/404 and ECON 508

5th Year

Complete all remaining graduate courses and pass all remaining examinations required to achieve PhD candidacy.

(Note that with AP credit for MATH 101/102, but not for ECON 211, the student could substitute ECON 370 for ECON 211 in the freshman year.)

COURSES: SAMPLE PATH TWO

The student has no relevant AP credit and/or decides to enter the 5-year MA program only near the end of the sophomore year.

Freshman Year

ECON 211 and MATH 101/102

Sophomore Year

ECON 370, 375, 477, and 1 course from applied economics category; MATH 211/212

Junior Year

ECON 501, 502, 505, 508; MATH 355 or CAAM 310

Senior Year

ECON 504, 510, 403/404, and 1 course from applied economics category

5th Year

Complete all remaining graduate courses and pass all remaining examinations required to achieve PhD candidacy.

DEGREE REQUIREMENTS FOR PHD IN ECONOMICS

Preparation for PhD Program. Applicants to the PhD program should have had at least 2 semesters in calculus and 1 in linear algebra. Students who have not met these requirements may complete these prerequisites as Class III students (pages 81–82) before being admitted to the graduate program. All applicants are required to take the Graduate Record Exam.

Requirements. For general university requirements, see Graduate Degrees (pages 61–62). Candidates for the PhD degree usually spend from 2 to 2 and 1-half years in full-time course work and at least 1 year writing the dissertation;

4 to 5 years is a reasonable goal for completing the program. For the PhD, students must:

- Complete an approved program of at least 14 courses, not including ECON 593/594 *Workshop in Economics I* and ECON 595/596 *Workshop in Economics II*
- Complete an approved program of at least 4 sections of ECON 593/594 *Workshop in Economics I* and ECON 595/596 *Workshop in Economics II*
- Perform satisfactorily on written general examinations in economic theory and econometrics
- Demonstrate proficiency in a major field by taking the relevant courses in that field and performing satisfactorily on a written examination
- Complete and defend orally a doctoral dissertation setting forth in publishable form the results of original research

See ECON in the Courses of Instruction section.