Economics, Ph.D.

COLLEGE OF LIBERAL ARTS (https://liberalarts.temple.edu)

About the Program
The Ph.D. in Economics is designed to prepare the student for university teaching and research as well as for positions as economists in business, government, and industry. The program emphasizes the development of advanced research and scholarship skills in applied economics areas, including applied econometrics, economic development, financial economics, industrial organization, international economics, and labor economics. The program has a strong track record of placing its graduates in desirable positions.

Time Limit for Degree Completion: 7 years

Campus Location: Main

Full-Time/Part-Time Status: Students complete the degree program through classes offered after 5:30 p.m. The degree program can be completed on a full- or part-time basis.

Interdisciplinary Study: Interdisciplinary tracks may be established with other departments.

Areas of Specialization: The Economics faculty focus their research in the major areas of applied econometrics, development economics, financial economics, industrial organization, international economics, and labor economics.

Job Prospects: The program is dedicated to producing well-trained researchers to work in academic positions and research-oriented jobs in companies, think tanks, government, and other institutions.

Non-Matriculated Student Policy: Non-matriculated students are permitted to take doctoral courses when granted an exception. Students may enroll in up to 9 credits with the permission of the Economics Graduate Director. Minimum undergraduate GPA requirements apply.

Financing Opportunities: The Economics Department has a limited number of Ph.D. assistantships that are awarded to exceptionally good candidates on a competitive basis. The assistantship requires 20 hours of service per week, which can include teaching and/or supervised research. An assistantship provides a stipend, tuition remission, and health insurance.

Admission Requirements and Deadlines

Application Deadline:

Fall: January 15
Spring: November 15

Applications received after the January 15 deadline will be considered, but will not receive priority for financial assistance. Spring admission is restricted to those students who have taken classes at Temple University in the Fall or who can pass the waiver exams. All other prospective students are advised to apply for Fall admission.

APPLY ONLINE to this graduate program to begin the application process and receive your TUid number.

Next, visit http://cla.temple.edu/interfolio/economics-phd to create or log in to your Interfolio account. Complete the supplemental program application and upload scanned copies of all supporting documents to your account, with these exceptions:

- Scores for the GRE and TOEFL, if applicable, must be reported directly by ETS to institution code 2906.
- Official electronic transcripts must be sent to econgrad@temple.edu (linda.wyatt@temple.edu) or the originals mailed to:

  Linda Wyatt, Graduate Coordinator
  Temple University College of Liberal Arts
  Dept. of Economics
  1301 Cecil B. Moore Avenue, 822 Ritter Hall Annex (004-00)
  Philadelphia, PA 19122-6091

Letters of Reference:
Number Required: 3

From Whom: Letters of recommendation should be obtained from college/university faculty members familiar with the applicant's academic competence.

Coursework Required for Admission Consideration: Details on appropriate background are available from the department upon request.
Master’s Degree in the Discipline/Related Discipline: A master’s degree is not required.

Bachelor’s Degree in the Discipline/Related Discipline: A baccalaureate degree is required. Details on appropriate disciplines are available from the department.

Statement of Goals: Approximately 500 to 1,000 words include your specific interest in Temple's program, your research goals, your future career goals, and your academic and research achievements.

Standardized Test Scores:
GRE: Required. Scores are typically in the 65th to 99th percentile on the quantitative section and in the 50th to 99th percentile on the verbal section.
TOEFL: 79 iBT or 550 PBT minimum

Transfer Credit: A grade of "B" or better must have been earned in a peer graduate program course in order for the credit to transfer. The maximum number of credits a student may transfer is 9.

Program Requirements

General Program Requirements:
Number of Credits Required to Earn the Degree: 42

Required Courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Core Courses</strong></td>
<td></td>
</tr>
<tr>
<td>ECON 8001</td>
<td>Microeconomic Analysis¹</td>
<td>3</td>
</tr>
<tr>
<td>ECON 8002</td>
<td>Macroeconomic Analysis¹</td>
<td>3</td>
</tr>
<tr>
<td>ECON 8003</td>
<td>Mathematics for Economics I¹</td>
<td>3</td>
</tr>
<tr>
<td>ECON 8005</td>
<td>Microeconomic Theory I</td>
<td>3</td>
</tr>
<tr>
<td>ECON 8007</td>
<td>Macroeconomic Theory I</td>
<td>3</td>
</tr>
<tr>
<td>ECON 8009</td>
<td>Econometrics I</td>
<td>3</td>
</tr>
<tr>
<td>ECON 8108</td>
<td>Macroeconomic Theory II</td>
<td>3</td>
</tr>
<tr>
<td>ECON 8119</td>
<td>Econometrics II</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Specialization or Elective Courses</strong></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td><strong>Dissertation Research</strong></td>
<td>6</td>
</tr>
<tr>
<td>ECON 9994</td>
<td>Field Examination/Dissertation Proposal Research³</td>
<td>3</td>
</tr>
<tr>
<td>ECON 9998</td>
<td>Dissertation Proposal Research⁴</td>
<td></td>
</tr>
<tr>
<td>ECON 9999</td>
<td>Doctoral Thesis Research⁵</td>
<td></td>
</tr>
</tbody>
</table>

Total Credit Hours: 42

¹ These courses can be waived upon passing the departmental waiver exams.
² Upon finishing coursework, the student enters the research stage, which involves studying Economic literature and models, preparing a dissertation proposal, and writing a dissertation. This process is structured and monitored by the use of ECON 9994 Field Examination/Dissertation Proposal Research, ECON 9998 Dissertation Proposal Research, and ECON 9999 Doctoral Thesis Research.
³ ECON 9994 is designed for students who have finished all coursework and passed the theory prelims. Along with preparing for the field exams, they must choose a topic and start researching their dissertation proposal.
⁴ ECON 9998 is designed for students who have passed all theory and field qualifying exams. The students are expected to complete their dissertation proposal and submit it to the Graduate Affairs Committee for consideration.
⁵ ECON 9999 is designed for students who have an accepted dissertation proposal. Their research should be divided into several stages, each leading to a successful dissertation defense.

Culminating Events:

Preliminary Examinations:
The purpose of the preliminary examinations is to demonstrate critical and interpretive knowledge of current research. There are two theory exams, one each in microeconomics and in macroeconomics, and two field exams. The theory exams must be passed by the end of the second year, while the field exams must be completed within three terms of passing the last theory exam.

The subject areas of the field exams are chosen by the student, in consultation with the Graduate Director. To prepare for a field exam, the student must take one or two courses in the subject area. The number of required courses is specified by the Field Examination Committee. If a required course is not
offered, it can be substituted by ECON 9183 Directed Study. Students who are preparing to write their preliminary examinations should confirm a time and date with their departmental advisor.

Members of the Economics Department write the questions for the preliminary examinations. The student must answer every question on the examination in order to be evaluated. The Department Committee evaluates the examination. The evaluators look for a breadth and depth of understanding of specific research areas; a critical application of that knowledge to specific phenomena; and an ability to write technical prose. Each member votes to pass or fail the student. In order to pass, a majority of the committee members must agree that the exam has been satisfactorily completed.

Dissertation Proposal:
The dissertation proposal demonstrates the student's knowledge of and ability to conduct the proposed research. The proposal should consist of the following:

1. the context and background surrounding a particular research problem,
2. an exhaustive survey and review of literature related to the problem, and
3. a detailed methodological plan for investigating the problem.

The proposal should be completed and approved no more than one year after passing the last field exam. Upon approval, a timeline for completing the investigation and the writing process is established.

Dissertation:
The doctoral dissertation is an original empirical study that makes a significant contribution to the field. It should expand the existing knowledge and demonstrate the student's knowledge of both research methods and a mastery of her/his primary area of interest. Dissertations should be rigorously investigated; uphold the ethics and standard of the field; demonstrate an understanding of the relationship between the primary area of interest and the broader discipline of Economics; and be prepared for publication in an academic journal.

The Doctoral Advisory Committee is formed to oversee the student's doctoral research and is comprised of at least three Graduate Faculty members. Two members, including the Chair, must be from the department. The Chair is responsible for overseeing and guiding the student's progress, coordinating the responses of the committee members, and informing the student of her/his academic progress.

If any member of the Doctoral Advisory Committee decides to withdraw from the committee, the student shall notify the Chair of the committee and the Director of the Ph.D. program. The student is responsible for finding a replacement, in consultation with the Chair. Inability to find a replacement shall constitute evidence that the student is unable to complete the dissertation. In such a case, the student may petition the Director of the Ph.D. program for a review. Once a review of the facts and circumstances is completed, the Director rules on the student's progress. If the Director rules that the student is incapable of completing the dissertation, s/he is dismissed from the program. This decision may be appealed to the Associate Dean of the College of Liberal Arts and, if necessary, to the Graduate School.

The Dissertation Examining Committee evaluates the student's dissertation and oral defense. This committee is comprised of the Doctoral Advisory Committee and at least one additional faculty member from outside the department. It examines the student's ability to express verbally her/his research topic, methodological approach, primary findings, and implications. The committee votes to pass or fail the dissertation and the defense at the conclusion of the public presentation.

Students preparing to defend their dissertation should confirm a time and date with their Dissertation Examining Committee and register with the Graduate Secretary at least 15 days before the defense is to be scheduled. The Graduate Secretary arranges the time, date, and room within two working days, and forwards the appropriate forms to the student. The student then sends a completed "Announcement of Dissertation Defense" form, found in TUportal under the Tools tab within "University Forms," at least 10 working days before the defense to the Graduate School. The Economics Department posts an announcement of the defense.

Contacts

Program Web Address:
http://www.cla.temple.edu/economics/graduate/

Department Information:
Dept. of Economics
822 Ritter Hall Annex
1301 Cecil B. Moore Avenue
Philadelphia, PA 19122-6091
econgrad@temple.edu
215-204-8880
Submission Address for Application Materials:
http://cla.temple.edu/interfolio/economics-phd

Submission Address for Official Electronic Transcripts:
econgrad@temple.edu

Submission Address for Official Paper Transcripts:
Linda Wyatt, Graduate Coordinator
Temple University Dept. of Economics
1301 Cecil B. Moore Avenue, 822 Ritter Hall Annex (004-00)
Philadelphia, PA 19122-6091

Department Contacts:
Admissions:
Linda Wyatt
Graduate Coordinator
linda.wyatt@temple.edu
215-204-6638

Graduate Director:
Dr. Douglas Webber
douglas.webber@temple.edu
215-204-5025

Chairperson:
Dr. Michael Leeds
mleeds@temple.edu
215-204-8030

Courses
ECON 5001. Managerial Economics. 3 Credit Hours.
This course examines the applications of economic theory to problems confronting managers, including pricing under different market structures, cost and technology, strategic decision making, theory of demand, and the economics of less than perfect information.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

ECON 5102. Econ. Decision/Planning. 3 Credit Hours.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

ECON 5182. Independent Study. 1 to 6 Credit Hour.
Supervised individual reading and research projects for master's and Ph.D. students. Depending on the type of project, work experience or curricular practical training may be required. No more than six semester hours of independent study may be counted toward degree requirements.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may be repeated for additional credit.

ECON 5190. Special Topics in Economics. 3 Credit Hours.
A one-semester course on a topic in a particular field of economics.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may be repeated for additional credit.

ECON 5501. Survey of Internatl Econ. 3 Credit Hours.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.
ECON 5801. The Economic Environment. 3 Credit Hours.
The student's proficiency and confidence in solving real-world business problems increase as a deeper understanding of micro- and macroeconomic
issues is developed. This course examines foundations of the economic behavior of enterprises and consumers in different market environments, such
as open market, monopoly, and oligopoly. Also analyzed is the impact of government fiscal, monetary, and trade policies on business decisions and on
economic measures such as GNP, employment, interest rates, and exchange rates.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

ECON 8001. Microeconomic Analysis. 3 Credit Hours.
Microeconomic theory for graduate students with little preparation in economics. This course offers detailed analysis of the behavior of households and
firms in a variety of market settings.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

ECON 8002. Macroeconomic Analysis. 3 Credit Hours.
Macroeconomic theory for graduate students with little preparation in economics. This course is a survey of theories and evidence bearing on growth
and cycles in output, employment, interest rates, and prices. The course includes sector details and considers the scope for control of cycles.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

ECON 8003. Mathematics for Economics I. 3 Credit Hours.
An overview of elementary calculus, linear algebra, and the theory of Lagrange multipliers for graduate students in economics and related fields.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

ECON 8004. Microeconomic Theory I. 3 Credit Hours.
This course covers demand analysis; the theory of the firm; the theory of markets; and theories of wages, rent, interest, and profits.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ECON 8001|Minimum Grade of B-|May not be taken concurrently
AND ECON 8003|Minimum Grade of B-|May not be taken concurrently)

ECON 8005. Macroeconomic Theory I. 3 Credit Hours.
This course covers macroeconomic concepts relating to the determination of output, employment, and price level.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ECON 8001|Minimum Grade of B-|May not be taken concurrently
AND ECON 8002|Minimum Grade of B-|May not be taken concurrently
AND ECON 8003|Minimum Grade of B-|May not be taken concurrently)

ECON 8007. Macroeconomic Theory II. 3 Credit Hours.
This course is the first in a two-semester sequence. The materials begin with the classical linear regression model, including hypothesis testing. Such
traditional topics as multicollinearity, heteroscedasticity, and autocorrelation are included. Problems of pooled data and simultaneous equations are also
considered.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.
ECON 8104. Labor Economics. 3 Credit Hours.
This course provides a theoretical framework for analyzing the operation of the labor market. The role of the labor market in the determination of employment, wages, prices, and production is central to this analysis. Labor supply, labor demand, human capital, labor unions, migration, and discrimination are among the topics discussed. Particular attention is paid to the role of public policy and to the design of theoretical and empirical models.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
ECON 5001|Minimum Grade of B-|May not be taken concurrently.

ECON 8105. Regulations and Antitrust Policy. 3 Credit Hours.
The focus is on analysis of the impact of regulatory processes, including antitrust, upon industry. Special emphasis is given to public policy toward monopoly, resource utilization, and pricing processes.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
ECON 5001|Minimum Grade of B-|May not be taken concurrently.

ECON 8106. Microeconomic Theory II. 3 Credit Hours.
Topics covered include general equilibrium analysis, game theory, introduction to public choice and welfare economics, and imperfect information analysis.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ECON 8005|Minimum Grade of B-|May not be taken concurrently
AND ECON 9101|Minimum Grade of B-|May not be taken concurrently)

ECON 8108. Macroeconomic Theory II. 3 Credit Hours.
This course presents advanced topics in macroeconomics and empirical testing of national income components, mainly in a dynamic setting.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ECON 8007|Minimum Grade of B-|May not be taken concurrently
AND ECON 8009|Minimum Grade of B-|May not be taken concurrently
AND ECON 9101|Minimum Grade of B-|May not be taken concurrently)

ECON 8109. Theory of Economic Development. 3 Credit Hours.
The major part is an introduction to applied theory of economic growth. The roles of human capital, investment, and natural resources are analyzed. Issues of sectoral development, policies of the public sector, finance, and international trade are discussed. Practical projections of economic growth and ease studies are stressed.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ECON 8007|Minimum Grade of B-|May not be taken concurrently
AND ECON 8009|Minimum Grade of B-|May not be taken concurrently)
ECON 8114. Advanced Labor Economics. 3 Credit Hours.
This course examines the microeconomic foundations of macroeconomic phenomena in the labor market. Questions surrounding the nature of employment and its causes are explored. This course includes economic models of unions, contracting and agency models, efficiency wages, insider/outsider models, implicit contracts, and job searches. Specific articles in these areas form the basis of the material covered. Particular attention is paid to the mathematics behind many of the theoretical models covered in the course.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ECON 8005|Minimum Grade of B-|May not be taken concurrently
AND ECON 8009|Minimum Grade of B-|May not be taken concurrently
AND ECON 8104|Minimum Grade of B-|May not be taken concurrently)

ECON 8115. Theory of Industrial Organizations. 3 Credit Hours.
The course offers a microeconomic analysis of the relationship between the structure of industry markets and the conduct and performance of business enterprise. Emphasis is on the modern theory of oligopoly, including dynamic pricing, contestable markets, and game theory. Specific dimensions of firm conduct include pricing, product differentiation, mergers, and research and development.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
ECON 8005|Minimum Grade of B-|May not be taken concurrently.

ECON 8116. Mathematical Economics. 3 Credit Hours.
This course covers mathematical techniques and theorems of current importance in economic theory, with applications. Topics include game theory, social choice, general equilibrium analysis, and dynamic economics. The course concentrates on one of these topics, as warranted by developments in contemporary economic theory.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ECON 8005|Minimum Grade of B-|May not be taken concurrently
AND ECON 8007|Minimum Grade of B-|May not be taken concurrently
AND ECON 9101|Minimum Grade of B-|May not be taken concurrently)

ECON 8119. Econometrics II. 3 Credit Hours.
This is the second in a two-semester sequence of courses. The topics include nonlinear regression, the analysis of economic time series, and models with discrete or limited dependent variables.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
ECON 8009|Minimum Grade of B-|May not be taken concurrently.

ECON 8121. Development of Less Developed Economies. 3 Credit Hours.
Examination of development efforts of less developed economies is undertaken. Selected domestic and international issues, policies, institutions, and reform are targeted.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

ECON 8122. Economics of the Public Sector. 3 Credit Hours.
Analysis of the economics of the public sector is covered. Topics include theories of public goods and optimal taxation, revenues, public expenditures, and incidence problems.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.
ECON 8123. Economics of Sports. 3 Credit Hours.
This course covers the application to professional and amateur sports of theory of industrial organization; anti-trust issues; public finance involving the relationship between cities and franchises; and labor issues of reward systems, unions, and discrimination.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ECON 8009|Minimum Grade of B-|May not be taken concurrently
AND ECON 8114|Minimum Grade of B-|May not be taken concurrently)

ECON 8124. International Trade: Theory and Policy. 3 Credit Hours.
This course offers an intensive study of pure theory of international trade, welfare impacts of international trade, the theory and practice of commercial policy, and international factor movements. Special topics include the transfer problem; trade under uncertainty; and the relations between trade, growth, and development.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ECON 8009|Minimum Grade of B-|May not be taken concurrently
AND ECON 8106|Minimum Grade of B-|May not be taken concurrently
AND ECON 9101|Minimum Grade of B-|May not be taken concurrently)

ECON 8125. Theory of Public Finance. 3 Credit Hours.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

ECON 8129. Time Series Econometrics. 3 Credit Hours.
This course is designed to teach students advanced econometric techniques necessary to conduct original empirical research in macroeconomics. The course focuses on techniques appropriate for the analysis of time-series data. Students will learn the theoretical underpinnings of such topics as stationarity, ARMA processes, and vector autoregression (VAR) models and how to apply this theory to economic data.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ECON 8009|Minimum Grade of B-|May not be taken concurrently)
AND (ECON 8119|Minimum Grade of B-|May not be taken concurrently)

ECON 8134. Intern Monetary Econ. 3 Credit Hours.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

ECON 8139. Panel Data Econometrics. 3 Credit Hours.
This course is designed to teach students advanced econometric techniques necessary to conduct original empirical research using micro-level data. The course focuses on techniques appropriate for the analysis of cross-section and panel data. Students will learn the theoretical underpinnings of such topics as instrumental variables, selection bias, and regression discontinuity, and quantile regression. We will pay particular attention to how to apply these techniques to economic data.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ECON 8009|Minimum Grade of B-|May not be taken concurrently)
AND (ECON 8119|Minimum Grade of B-|May not be taken concurrently)

ECON 8190. Special Topics. 3 Credit Hours.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may be repeated for additional credit.
ECON 8204. Health Economics. 3 Credit Hours.
This course is designed to teach students advanced econometric techniques necessary to conduct original empirical research using micro-level data. The course focuses on techniques appropriate for the analysis of cross-section and panel data. Students will learn the theoretical underpinnings of such topics as instrumental variables, selection bias, and regression discontinuity, and quantile regression. We will pay particular attention to how to apply these techniques to economic data.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
(ECON 8009|Minimum Grade of B-|May not be taken concurrently)
AND (ECON 8119|Minimum Grade of B-|May not be taken concurrently)

ECON 9001. Foundations in Managerial Economics. 3 Credit Hours.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

ECON 9101. Mathematics for Economists II. 3 Credit Hours.
Mathematical techniques and theorems are presented and used in economic applications. Proofs are presented in formal mathematical language to introduce the students to the vernacular of current economics research papers. Topics covered include advanced topics in linear algebra; the implicit function theorem in multivariate calculus and its application to comparative statistics; the Karush-Kuhn-Tucker theorem and applications to linear and nonlinear optimization theory; and differential and difference equations with elements of stability analysis.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:
ECON 8003|Minimum Grade of B-|May not be taken concurrently.

ECON 9183. Directed Study. 1 to 6 Credit Hour.
This course is designed for doctoral students who need specialization in topics related to their dissertation work.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may be repeated for additional credit.

ECON 9994. Field Examination/Dissertation Proposal Research. 1 to 6 Credit Hour.
This course is designed for students who have finished required coursework and are preparing a master's thesis or for preliminary and qualifying examinations.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may be repeated for additional credit.

ECON 9996. Master of Arts Thesis. 1 to 6 Credit Hour.
Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may be repeated for additional credit.

ECON 9998. Dissertation Proposal Research. 1 to 6 Credit Hour.
This course is designed for students who have passed the theory preliminary and qualifying examinations but do not have an accepted proposal. The course may be taken for up to 3 semester hours.

Level Registration Restrictions: Must be enrolled in one of the following Levels: Graduate.

Repeatability: This course may be repeated for additional credit.
ECON 9999. Doctoral Thesis Research. 1 to 6 Credit Hour.
This course is designed for students who have an accepted proposal and are in the research/writing stage of the thesis. Students living in the Philadelphia metropolitan area are required to attend the seminar and fulfill its requirements. Those living outside the area are required to fulfill its written requirements each semester and to make at least one presentation of their doctoral research in the seminar or elsewhere during the period they are working on their dissertation.

**Level Registration Restrictions:** Must be enrolled in one of the following Levels: Graduate.

**Student Attribute Restrictions:** Must be enrolled in one of the following Student Attributes: Dissertation Writing Student.

**Repeatability:** This course may be repeated for additional credit.