



**EMORY**  
**COLLEGE**  
OF ARTS AND  
SCIENCES

**Department  
of Economics**

**Department of Economics**

**Economics 4+1 Program Handbook**

2024-2025

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## **Introduction**

The 4+1 BA/MS program in economics is designed to equip the students with highly sought-after quantitative skills and analysis-based knowledge of economics. The goal of the program is to train gifted undergraduates in (i) critical thinking, (ii) quantitative skills relevant for economics, and (iii) a deep understanding of important economic issues and the corresponding policy solutions. These in-demand skills equip the students with a good grasp of techniques to examine contemporary social, business, and policy issues.

Economists have been advancing the frontiers of statistical analytics, econometrics analysis, and quantitative modeling of all sorts of social phenomenon. This long-held empirical tradition has persuaded many data-driven high-tech companies to hire large numbers of economists to tackle their big-data issues. The convergence of large data and the statistical/econometric skills that economists bring to the table allows exploration of important policy questions with a fundamentally analytical approach. Our program will train students to understand such work and to implement its tools to examine other important policy issues.

This handbook serves as the official guide to the economics 4+1 BA/MS program at Emory University. It complements the Emory College of Arts and Sciences rules and policies and the Laney Graduate School (LGS) Handbook, which contains graduate degree requirements and graduate school policies. The handbooks are modified occasionally to account for policy changes. Before consulting this manual, students should be certain that they have the latest version (dated by academic year). If unsure about some policy or rule, students should consult with the 4+1 Program Coordinator or the 4+1 Program Director.

## Admission Requirements

Applicants to the 4+1 Economics program must be current Emory juniors. It is recommended that applicants have a minimum cumulative grade point average of 3.5 at the time of the application submission. By the end of the applicant's junior year\*, the applicant should have completed the following foundational courses:

- **Math 111** Calculus I
- **Econ 101** Principles of Microeconomics or **Fin 201** (Business Economics)
- **Econ 112** Principles of Macroeconomics
- **Econ 201** Intermediate Microeconomics
- **Econ 212** Intermediate Macroeconomics
- **Econ 220** Probability & Statistics for Economists or **Math 361** Mathematical Statistics I
- **Econ 320** Econometrics
- One of the following electives: **Econ 333** Financial Economics, **Econ 371** Health Economics, **Econ 372** Healthcare Markets, **Econ 315** Economics & Psychology, **Econ 415** Behavioral Economics & Finance, **Econ 405** Industrial Organization, or **Econ 487** Game Theory & Economic Activity. Other elective courses may satisfy this requirement with approval from the 4+1 program director.

*\*Courses should be finished by end of junior year, but course completion by end of fall of senior year will be considered. Please talk to the program director for details.*

Emory students who have transferred from Oxford College are eligible for the program provided they have met the above admissions criteria.

Emory students in majors other than economics are eligible for the program provided they have met the above admissions criteria.

Qualified students will be able to apply to the program in their junior year and include grades from their junior year fall semester and a list of course in-progress for spring. The application materials will consist of a resume, personal statement, Emory transcript, and 2 letters of recommendation. Applications will be reviewed by the Department and admissions decisions will be communicated to students prior to the enrollment deadlines for the subsequent Fall semester.

## Curriculum

All required and elective courses that satisfy the requirements of the 4+1 program must be taken for a letter grade.

### 1. Foundation courses to be taken in senior year:

- Econ 526 (3 credits): Quantitative Methods I
- Econ 725 (3 credits): Computer Programming & Data Management in Economics
- Econ 520 (3 credits): Data Sciences for Economics

### 2. Required courses to be taken in the +1 year:

- Econ 521 (4 credits): Econometrics of Policy-Analysis & Causal Inference
- Econ 522 (4 credits): Forecasting and Macroeconomic Analytics
- Econ 524 (4 credits): Big Data Econometrics

### 3. Elective track to be taken in the +1 year:

Students choose one of the elective tracks to follow.

#### a) No specialization:

Required: Econ 540 (3 credits): Empirical Writing and Communication

Required: Choose 2 electives among the following courses:

- Econ 541 (3 credits): Pricing and Revenue Management
- Econ 542 (3 credits): Transfer Pricing
- Econ 543 (3 credits): Cost-Benefit Analysis
- Econ 544 (3 credits): Internet Economics
- Econ 570 (3 credits): Health Economics I
- Econ 571 (3 credits): Health Economics II

#### b) Cost, Benefit, and Pricing Analytics specialization:

Required: Econ 540 (3 credits): Empirical Writing and Communication

Required: Choose 2 electives among the following courses:

- Econ 541 (3 credits): Pricing and Revenue Management
- Econ 542 (3 credits): Transfer Pricing
- Econ 543 (3 credits): Cost-Benefit Analysis
- Econ 544 (3 credits): Internet Economics

#### c) Health Econ Analytics and Policy specialization:

Required: Econ 540 (3 credits): Empirical Writing and Communication

Required: Two health economics related courses:

- Econ 570 (3 credits): Health Economics I
- Econ 571 (3 credits): Health Economics II

#### d) Research specialization:

Required: Choose any 1 elective from among Econ 540, 541, 542, 543, 544, 570 or 571.  
Econ 540 strongly recommended.

Required: Econ 599 (6 credits) Thesis Research

**Thesis research:** The master's thesis must be a research project aimed at examining an important economic question, using empirical methods learned in the curriculum. The thesis will be conducted under the supervision of the student's advisory committee. This committee requires two members of the LGS graduate faculty. The completed thesis must be presented and successfully defended before a group of selected faculty members chosen by the advisory committee in consultation with the 4+1 program director. The defense date in the Spring semester of the +1 year and the selected faculty will be arranged between the student and that advisory committee. A master's thesis must contain original work and cannot be submitted as a paper in other courses. A senior honors thesis may not be used as the master's thesis. The master's thesis can be related to the senior honors thesis, but it must be a distinctly different paper.

***For students considering obtaining a PhD in economics in the future:*** We recommend doing the research specialization track along with the following undergraduate math classes:

*Math 211 Multivariable calculus*

*Math 212 Differential Equations*

*Math 221 Linear Algebra*

*Math 250 Foundations of Mathematics*

*Math 411 Real Analysis*

## Summary of program pathway

<p><b>Spring of Junior Year:</b></p> <p>Students apply to the program</p> <p>Admitted students sign up for the senior year courses</p>	
<p><b>Fall of Senior Year (Year 4):</b></p> <p>Students take two foundation courses:</p> <p>Econ 526 Quantitative Methods I</p> <p>Econ 725 Computer Programming &amp; Data Management in Economics</p>	<p>3 credits</p> <p>3 credits</p>
<p><b>Spring of Senior Year (Year 4):</b></p> <p>Students take one foundation course:</p> <p>Econ 520 Data Sciences for Economics</p>	<p>3 credits</p>
<p><b>Fall of Graduate Year (Year +1):</b></p> <p>Students take three of the four required courses:</p> <p>Econ 521 Econometrics of Policy-Analysis &amp; Causal Inference</p> <p>Econ 522 Forecasting and Macroeconomic Analytics</p> <p>Econ 524 Big Data Econometrics</p> <p>Econ 540 Empirical Writing &amp; Communication (recommended but not required for thesis option)</p>	<p>4 credits</p> <p>4 credits</p> <p>4 credits</p> <p>3 credits</p>
<p><b>Spring of Graduate Year (Year +1):</b></p> <p>Students take remaining required course plus 2 electives:</p> <p>Students with <i>No Specialization</i> take two courses among 541, 542, 543, 544, 570, &amp; 571</p> <p>Students in the <i>Health Econ &amp; Policy Analytics specialization</i> take</p> <p>Health Economics I (Econ 570)</p> <p>Health Economics II (Econ 571)</p> <p>Students in the <i>Cost, Benefit, &amp; Price Analytics specialization</i> take two courses among</p> <p>Pricing and Revenue Management (Econ 541)</p> <p>Transfer Pricing (Econ 542)</p> <p>Cost-Benefit Analysis (Econ 543)</p> <p>Internet Economics (Econ 544)</p> <p>Students in the <i>Research specialization</i> take 6 credit hours of thesis research plus one 3 hour elective among 540, 541, 542, 543, 544, 570, &amp; 571</p>	<p>3-4 credits</p> <p>6 credits</p> <p>3 credits</p> <p>3 credits</p> <p>3 credits</p> <p>3 credits</p> <p>3 credits</p> <p>3 credits</p> <p>3 credits</p> <p>9 hours</p>

## Advising and Supervision

Each student in the 4+1 program will be assigned a faculty advisor from the Economics Department. Non-thesis students will be assigned to the 4+1 Program Director, while students undertaking a master’s thesis, will be assigned their thesis advisor. This advisor will be assigned during the Spring semester of the senior year, after successful completion of their Fall graduate courses. In consultation with the advisor, students in the program will prepare a plan for the +1 year and submit this to the 4+1 Program Director.

## Academic Progress, Conduct, Honor Code, Grievance

**4<sup>th</sup> year students:** Emory College of Arts and Sciences (ECAS) sets the standards for students in their 4<sup>th</sup> year of undergraduate studies. ECAS policies are in effect until the student graduates from ECAS at the end of their 4<sup>th</sup> year. However, Laney Graduate School (LGS) policies regarding graduate coursework are in effect within the graduate classes taken while enrolled in ECAS.

**+1 year students:** The LGS sets standards for academic progress for all students in graduate programs at Emory, as outlined in the LGS handbook at <https://www.gs.emory.edu/academics/policies-progress/index.html>.

### Summary of policies by year:

	4 <sup>th</sup> year	+ 1 year
Full time status	ECAS: 12 credit hours (fewer than 12 allowed with permission in final semester of study)	LGS: 9 credit hours
Minimum GPA to meet satisfactory academic progress standards	See “Continuation Requirements” of Emory College course catalog: “Senior: a student must make satisfactory progress toward fulfilling requirements for a degree.”	2.7 each semester and 2.7 cumulative in LGS coursework
Enrollment in undergraduate / graduate classes	Graduate classes allowed with permission	Undergraduate classes allowed with permission
Honor code	LGS classes follow LGS honor code and process; If a serious violation is deemed to have occurred, the LGS Honor Council consults with ECAS  ECAS classes follow ECAS code and process	LGS honor code



Conduct code	ECAS conduct code	LGS conduct code
Exam policies	LGS classes follow LGS exam policy  ECAS classes follow ECAS exam policy	LGS exam policy
Grievance Procedure	Grievances related to LGS coursework are reported to LGS. Other grievances are reported to ECAS	LGS grievance policy
Grading scale	ECAS classes: A, A-, B+, B, B-, C+, C, C-, D+, D, or F.  LGS classes: A, A-, B+, B, B-, C or F.	A, A-, B+, B, B-, C, or F

**Summer in between 4<sup>th</sup> year and +1 year**

Students are encouraged to seek summer internships. Students in the summer between their 4th and +1 years may seek internships and funding through the ECAS Pathways Center. International students should discuss work requirements and restrictions with ISSS.

**Voluntarily exiting the program**

Students in their 4th year may voluntarily exit the 4+1 program and remain enrolled in ECAS to finish the requirements for a Bachelor’s degree.

If a student in the +1 year exits the program, they will no longer be enrolled at Emory. LGS policies regarding exiting apply.

## Course descriptions

**Econ 526 Quantitative Methods I:** The objective of the course is to cover the mathematical methods and tools that are used in modern economic analyses. These include the methods used in static as well as dynamic analyses. The materials covered include multivariate and integral calculus, matrix algebra, and difference and differential equations, with applications. Pre-requisite(s): Permission of the 4+1 Program Director.

**Econ 725 Computer Programming & Data Management in Economics:** This is a programming and data management course with a central focus on data manipulation for economic analysis. In this course students will learn how to access and manipulate data from IPUMS and the World Bank. Previous knowledge of Python is used to conduct basic data manipulations, exploratory data analysis, and formal statistical inference. These tasks will be performed using more advanced tools and then replicated in other widely used data analysis software: Python and STATA. Students will also learn the basics of SQL and Tableau for data manipulation and visualization. As part of this course, students will have a data analysis challenge manipulating and analyzing data using at least two of the software programs used in the course. The final work is presented to class. Pre-requisite(s): Permission of the 4+1 Program Director.

**Econ 520 Data Sciences for Economics:** The first part of the course focuses on the necessary background material such as statistics, probability, linear algebra and some calculus to understand machine learning. This part is not a traditional 'paper-and-pencil' type of introductory statistics courses you can take elsewhere that covers theoretical concepts and techniques, but fails to include much programming and data analysis, which are at the heart of data science. Therefore, the emphasis of this course will be placed on combining programming techniques (such as parallelization) and statistical concepts simultaneously through the analysis of real-life data sets taken from various sources. The second part of the course uses knowledge of the first part to explain the two major approaches of machine learning techniques; generative methods and discriminative methods. Pre-requisite(s): Econ 526 and Econ 725.

**Econ 521 Econometrics of Policy-Analysis & Causal-Inference:** This is an applied microeconometrics course with a central focus on causal inference and empirical analysis of policy impact. As part of this course, the students will complete an empirical research project using raw data and employ econometric methods to analyze a research question relevant to contemporary microeconomic policies and present the results in class. The content of the course is split into two general areas: 1) acquisition, compilation, and management of real-world panel data; and 2) empirical methods in program evaluation and causal inference. Each area of the course will be covered by way of posing a research question. At the end, the students will be able to organize project files, clean and manage real-world datasets in Python, implement selected methods for causal inference using real-world data, explain research results with a written report and presentation. Pre-requisite(s): Econ 520, 526, and 725 or permission of the 4+1 Program Director.

**Econ 522 Forecasting and Macroeconomic Analytics:** The course is intended to fulfill two needs: (1) introduce students to the tools to analyze time series data in an univariate and multivariate framework (2) to provide students with applied interests with the most sophisticated and up to date techniques used in empirical time series analysis and forecasting. The empirical relevance of every model will be emphasized while also maintaining a theoretical rigor. Computer exercises will help in keeping the class relevant. The importance of forecasting in macroeconomics research conducted at private and public sectors will be discussed. Pre-requisite(s): Econ 520, 526, and 725 or permission of the 4+1 Program Director.

**Econ 524 Big Data Econometrics:** This course is intended for students who have completed Econ 520 or approved equivalent. It aims to provide modern skills in analyzing data and discover potential relations and associations. Modern methods of data sciences and computing techniques are introduced. Data analysis is placed on a sound basis with understanding of the algorithms and their meaning. This course will cover the key concepts of machine learning, including classification, regression analysis, clustering, and dimensionality reduction. These topics are intended to provide the students with modern skills for robust model discovery and latest advances in prediction with examples from economics, predictive text searches, market research, algorithmic financial decision making, and health sciences. Pre-requisite(s): Econ 520, 526, and 725 or permission of the 4+1 Program Director.

**Econ 540 Empirical Writing and Communication:** This course is designed to teach students methods for effective communication of empirical results. Students will become proficient in interpreting, organizing, displaying, and writing results of quantitative research. Students will learn techniques for writing an academic paper. Students will also learn how to summarize and present empirical results for different audiences. We will explore methods for communication to academics, policy makers, industry leaders, and the mass media. As part of this course, students will also learn some professionalization skills including resume writing and interview skills. Pre-requisite(s): Permission of the 4+1 Program Director.

**Econ 541 Pricing and Revenue Management:** This course covers many pricing tools as well as techniques for selling goods and services under capacity constraints with advance booking, refunds, and overbooking. Applications will be drawn from a variety of industries, including soft drink manufacturing, grocery stores, Internet content providers, cable TV operators, airlines, hotels, phone operators, concert halls, movie theaters, and electricity and gas companies. A part of the assessment will be based on case study analyses. The main objective of the course is to equip students with the knowledge in pricing and revenue management strategy necessary for working as a business or academic economist, operations researcher, marketing scientist, pricing manager, or an economic consultant. Pre-requisite(s): Econ 521, 522, and 724 or permission of the 4+1 Program Director.

**Econ 542 Transfer Pricing:** This course will introduce students to the economics of transfer pricing. Transfer pricing involves finding reliable intercompany pricing in situations where free markets do not exist and accounts for over half of all international trade. Given the extent of globalization in the current business environment, multinational enterprises must address

transfer pricing issues on a day-to-day basis. Taxing authorities throughout the world have instituted transfer pricing legislation to claim their “fair share” of profits from the multinational enterprises’ global income. As a result, this field has attracted significant attention from policy makers and businesses. Pre-requisite(s): Econ 521, 522, and 724 or permission of the 4+1 Program Director.

**Econ 543 Cost-Benefit Analysis:** The objective of this course is to introduce students to how economic theory can be used to make cost-benefit analysis for business planning by firms, for decision making by consumers, for regulatory practices by agencies, and for policy formulation by the legislature. Such analyses serve as decision rule for selecting policies for maximizing economic efficiency or assessing economic efficiency when it is used as only one of the goals relevant to policy choice. The richness of the methodology for both public and private sector decision making is demonstrated with many examples and case studies, emphasizing practical applications and correct use of analytical tools. Pre-requisite(s): Econ 521, 522, and 724 or permission of the 4+1 Program Director.

**Econ 544 Internet Economics:** There is no doubt that the Internet will play an increasingly bigger role in society and the economy. This course introduces various fundamental ideas and theories in economics that can help us understand online businesses better and more deeply. We will mainly cover several foundational theories, including search, two-sided markets, matching, and auctions. We will also discuss some contemporaneous topics, such as recommendation and ratings systems, net neutrality, and cryptocurrencies. Pre-requisite(s): Econ 521, 522, and 724 or permission of the 4+1 Program Director.

**Econ 570 Health Economics I: (The Economics of Health Behaviors and Policy)** This course is designed to introduce master’s level students in economics to the field of Health Economics. The provision of health care and the production of health have different institutional properties and incentives than other consumer goods, making health-related markets unique topics for study. This course will focus on the demand-side of health, emphasizing the difference between health as an outcome and medical care as one of many inputs into the production of health. Health economics concepts will be linked to current policy debates at the state and federal levels. Students will apply empirical techniques to research questions in health economics, with a focus on policy analysis. Discussion of the relevance and limits of the economics approach to analyzing public health issues will be encouraged. Pre-requisite(s): Econ 521, 522, and 724 or permission of the 4+1 Program Director.

**Econ 571 Health Economics II: (The Economics of Health Care Markets)** This course explores the industrial organization of health care markets in the U.S. We will focus on the following areas: hospital production and competition, information asymmetries, vertical integration between physicians and hospitals, insurance markets (including adverse selection and managed competition), and finally issues of insurer and hospital bargaining. The class is effectively designed as an empirical IO course with applications to health care. As such, we will also examine several econometric tools used in the literature, including production function

estimation and demand estimation, as well as common empirical methods of causal inference.  
Pre-requisite(s): Econ 521, 522, and 724 or permission of the 4+1 Program Director.