EMORY COLLEGE OF ARTS AND SCIENCES | Department of Economics

4+1 BA/MS in Economics Program Handbook

Department of Economics, Emory University, and
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Emory University

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General Program Information

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.

Program Leadership and Contact Information

Faculty Program Director:	Sara Markowitz, PhD. Winship Distinguished Research Professor Email: sara.markowitz@emory.edu Phone: 404-712-8167
Staff Program Coordinator:	Natalie Jones Email: Natalie.jones3@emory.edu Phone: 404-727-2490

Program Learning Goals

Our curriculum combines economic theory, quantitative methods, econometrics, and data analytics. We call it “Econolytics.” Your education will prepare you for jobs that combine economic reasoning with cutting-edge empirical methods and data analytics.

CIP Classification

45.0603: Econometrics and Quantitative Economics: A program that focuses on the systematic study of mathematical and statistical analysis of economic phenomena and problems. Includes instruction in economic statistics, optimization theory, cost/benefit analysis, price theory, economic modeling, and economic forecasting and evaluation.

Admissions

Requirements

Applicants to the 4+1 Economics program must be current Emory juniors or seniors. 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 fall semester of the applicant's senior 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.

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.

Application Process

The application materials consist of a resume, personal statement, Emory transcript, and 2 letters of recommendation from Emory faculty. Applications will be reviewed by the Department and admissions decisions will be communicated to students prior to the course enrollment deadlines for the subsequent semester.

Application Deadlines

Application deadline	Who is eligible to apply	Enrollment term
Mid-March	Juniors	Fall of senior year
August 1	Rising seniors	Fall of senior year
December 1	Seniors	Spring of senior year

Curriculum

Degree Requirements:

Students must complete 30 credits of graduate coursework. 2 graduate courses (ECON 520, ECON 526, or ECON 725) may be double counted and used to satisfy 400- level electives requirement for the BA degree. All required and elective courses that satisfy the requirements of the 4+1 program must be taken for a letter grade.

Required courses:

- Econ 526 (3 credits): Quantitative Methods I
- Econ 525 (3 credits): Data Management & Visualization in Economics
- Econ 520 (3 credits): Data Sciences for Economics
- 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
- Econ 540 (3 credits): Communicating and Writing Economic Analyses

Elective courses. Choose 6 credits of 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 599 (6 credits): Thesis

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 pathways

Application deadline	**Who is eligible to apply**	**Enrollment Term**	**Pathway**
Mid-March	3rd year (Juniors)	Fall of 4th year	1 or 2
August 1	Rising 4th year (rising Seniors)	Fall of 4th year	1 or 2
December 1	4th year (Seniors)	Spring of 4th year	3

Pathway 1: For ECAS students applying in spring of junior year Coursework over 4 semesters (Fall-Spring-Fall-Spring)	
Year 1	***Year 2***
ECAS Fall: Econ 526	LGS Fall: 3 required courses (521, 524, 540)
ECAS Fall or Spring: Econ 725	LGS Spring: 1 required (522) + 2 electives
ECAS Spring: Econ 520	

Pathway 2: For ECAS students graduating from ECAS in fall of senior year Coursework over 3 semesters (Fall-Spring-Fall)	
Year 1	***Year 2***
ECAS Fall: Econ 526, 725*, 520	LGS Fall: 3 required courses (521, 524, 540)
LGS Spring: 1 required (522) + 2 electives	
*Note: 725 can be taken in any semester	

Pathway 3: For ECAS students applying in fall of senior year Coursework over 3 semesters (Spring-Fall-Spring)	
Year 1	***Year 2***
ECAS Spring: Econ 725, Econ 520	LGS Fall: Econ 526 + 3 required courses (521, 524, 540)
	LGS Spring: 1 required (522) + 2 electives

Academic Progress, Conduct, Honor Code, Grievance

4th year students: Emory College of Arts and Sciences (ECAS) sets the standards for students in their 4th year of undergraduate studies. ECAS policies are in effect until the student graduates from ECAS at the end of their 4th 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:

	4th 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.	LGS grievance policy

	Other grievances are reported to ECAS	
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 4th 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 (3 hours), Quantitative Methods I: Assuming that students are familiar with differential calculus and integration of a single variable, this course, as a first sequence of quantitative methods, covers matrix algebra, functions of several variables, unconstrained and constrained optimization of multiple variables, and economic dynamics in discrete and/or continuous time – first-order difference and/or differential equations. This course aims to help students build solid quantitative foundations for upper-level applied courses in the master's program. During each class, theoretical concepts and methods are presented, accompanied by examples in economics.

Econ 525 (3 hours), Data Management & Visualization in Economics: This course equips students with essential programming and computational data science skills tailored for economic analysis. Students will learn to use tools like Python, Git, Docker, and Cloud Computing to create reproducible workflows, analyze data, and present results through dashboards and visualizations. The course also covers machine learning techniques and practical methods for deploying models in real-world scenarios. Additionally, students will develop proficiency in SQL and Tableau for data manipulation and visualization. A key component of the course is its hands-on practice with data analysis challenges, where students apply the tools and techniques learned to manipulate and analyze datasets effectively.

Econ 520 (3 hours), 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 econometrics at a more advanced level. The second part of the course emphasizes the construction and application of econometric models such as linear regression models, difference-in-difference models, instrumental variables, as well as randomized control trials. The goal of the course is to prepare students with a fundamental understanding of how causal inference can be established, which students can then utilize to develop more complex models in later courses. Research papers directly relevant to the theory will be discussed weekly, and students will complete a research project using real-world data at the end of the semester.

Econ 521 (4 hours), Econometrics of Policy Analysis & Causal Inference: This is an applied microeconometrics course with a central focus on causal inference and the empirical evaluation of policies and programs. As part of this course, the students will learn and employ econometric methods to questions of causal inference, and analyze research questions relevant to contemporary microeconomic policies. The content of the course is split into two general areas: 1) establishing and understanding the theoretical foundations for asking and answering questions of causal inference, and 2) learning and applying a set of the most common empirical methods for program evaluation and causal inference. Students will replicate the results of existing studies as well as undertake a final project answering a novel research question. The

course seeks to build the background and technical capacity to apply methods of causal inference using real-world data, and explain research results in written and presentation-based formats.

Econ 522 (4 hours), 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 with leaders in the field that will come as guests during the semester.

Econ 524 (4 hours), Big Data Econometrics: This course provides an introduction to machine learning and its applications to causal inference with big data in economics. It covers both linear machine learning methods, such as LASSO, logistic regression and support vector classifier, and nonlinear machine learning methods, such as decisions trees, random forests, boosted trees, neural networks (deep learning) and support vector machines. These methods serve as building blocks for the introduction of debiased machine learning, which is crucial for delivering reliable statistical results when conducting causal inference with big data. Computation and empirical applications are important components of this course. In the Lab sessions, students learn implementations of the algorithms introduced in class using Python.

Econ 540 (3 hours), Communicating and Writing Economics Analyses: This course aims to provide opportunities to develop professional writing and communication skills through the experiences of doing actual real-world economic/management consulting. Students will practice how to properly report data analysis outcomes and effectively communicate the information with "clients." Economic/management consulting requires abilities to: 1) clearly define the right questions to solve the problem; 2) find relevant data and properly extract information; 3) clearly communicate and present the information and findings in non-technical language 4) provide a clear solution to the problem in a timely manner and in an implementable format. By the end of this course, students will be able to produce graphs and tables that summarize and interpret raw/complex quantitative and qualitative data; effectively communicate data, technical, professional information to audiences with diverse backgrounds and varying levels of expertise; produce written reports that interpret, analyze, and evaluate data and professional documents; understand, conduct, and execute research and projects that require effective writing and communication skills.

Econ 541 (3 hours), 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.

Econ 542 (3 hours), 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.

Econ 543 (3 hours), Cost-Benefit Analysis: The objective of this course is to introduce students to how the combination of economic theory and data 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 are a foundational tool for selecting policies that maximize economic efficiency or for assessing economic efficiency when it is 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.