

Undergraduate Economics

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At its most fundamental level, economics is the study of how scarce resources are allocated. What will be produced and consumed, how much, and by whom? These questions are central to the well-being of people throughout the world. Economists identify, model, and analyze problems with the objective of developing practical and efficient solutions to challenges confronting society. Economists are also active participants in the processes and institutions through which economic policies are implemented. In the public arena sphere, economists contribute to the design of programs and incentive systems to foster efficient implementation of policies. In the private sector, economists use modeling and data-analytic skills, both in identifying ways to enhance productive efficiency within the firm and in developing strategies to enhance effectiveness of the firm as it competes in the global marketplace.

Upon major declaration, students pursuing the Bachelor of Arts in Economics or Bachelor of Science in Economics are affiliated with the Tepper School of Business. This means that students complete the Tepper general education requirements and are subject to all Tepper School policies and procedures. Students interested in the Bachelor of Science in Economics+Mathematics first declare the Bachelor of Science in Economics degree and are then able to apply for Economics+Mathematics major. The academic college affiliation for students pursuing majors in Economics +Politics and Economics+Statistics is the Dietrich College of Humanities and Social Sciences.

EDUCATIONAL OBJECTIVES

The Economics majors are designed to develop strong analytical skills and a solid foundation in the discipline of economics. More specifically, measurable objectives for our economics curriculum are the following:

- Students should be able to identify, explain, and use economic concepts, theories, models, and data-analytic techniques.
- Students should acquire and use knowledge of economics, mathematics, statistics, and computing flexibly in a variety of contexts, providing the foundation for success in graduate studies and careers in the public and private sectors.
- Students should be able to apply their economic tools to formulate positions on a wide range of social and economic problems and engage effectively in policy debates.
- Students should use the investigative skills necessary for conducting original economic research and participating effectively in project teams.
- Students should be able to deliver effective presentations in which they combine visual communication design with oral arguments and/or the written word.

Degree Options

In order to accommodate students' wide variety of goals, three primary degree majors are available in the Tepper School of Business:

- Bachelor of Arts in Economics
- Bachelor of Science in Economics
- Bachelor of Science in Economics and Mathematical Sciences (jointly administered with the Department of Mathematics)

The Dietrich College of Humanities and Social Sciences administers two interdisciplinary Economics majors:

- Bachelor of Science in Economics and Politics
- Bachelor of Science in Economics and Statistics

Additional majors in Economics, Economics and Politics, and Economics and Statistics, and a minor degree program in Economics are available for Carnegie Mellon students.

First Year Academic Advising

First-year students interested in Economics begin in Dietrich College and are assigned a Dietrich College Advisor (<https://www.cmu.edu/dietrich/students/undergraduate/student-success/>). While the College Advisor is the advisor of record until students formally declare their majors, students who are considering majoring in Economics are encouraged to speak with the Tepper School Economics advisors so that they will have access to program resources, advising, and the community of faculty, staff, and students.

B.A. in Economics

To receive the B.A. degree in Economics, students must complete at least 360 units, consisting of the requirements for Mathematics, Quantitative Analysis, Economic Core, Economic Electives, Senior Requirement, University Core, and a Minor.

Mathematics Prerequisites

Courses		Units
21-120	Differential and Integral Calculus	10-20
or 21-111 & 21-112	Differential Calculus and Integral Calculus	
21-256	Multivariate Analysis	9-10
or 21-259	Calculus in Three Dimensions	

Economic Theory Requirements

		Units
73-102	Principles of Microeconomics	9
or 73-104	Principles of Microeconomics Accelerated	
73-103	Principles of Macroeconomics	9
73-230	Intermediate Microeconomics	9
73-240	Intermediate Macroeconomics	9
70-340	Business Communications	9
70-345	Business Presentations	9

Quantitative Analysis Requirements

		Units
70-207	Probability and Statistics for Business Applications	9
or 36-200	Reasoning with Data	
73-265	Economics and Data Science	9
73-274	Econometrics I	9

Economics Electives (36 Units)

Students must take four economics elective courses. Economics elective courses are those numbered 73-300 or higher.

Special Electives (18 Units)

Students must take two special elective courses. Students should consult the degree audit system for courses that satisfy the special electives requirement and have the ability to petition a course not included on the sample list for consideration as a special elective.

Course List

Sample List of Special Elective Courses	Units
19-403 Policies of Wireless Systems	12
19-411 Science and Innovation Leadership for the 21st Century: Firms, Nations, and Tech	9
66-221 Topics of Law: Introduction to Intellectual Property Law	9
79-245 Capitalism and Individualism in American Culture	9
79-262 Modern China: From the Birth of Mao ... to Now	9
79-266 Russian History and Revolutionary Socialism	9
79-280 Coffee and Capitalism	9
79-283 Hungry World: Food and Famine in Global Perspective	9

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79-288	Bananas, Baseball, and Borders: Latin America and the United States	9
79-300	Controversial Topics in the History of American Public Policy	9
79-315	The Politics of Water in Global Perspective	9
79-320	Women, Politics, and Protest	9
79-343	Education, Democracy, and Civil Rights	9
79-383	The History of Capitalism	9
80-136	Social Structure, Public Policy & Ethics	9
80-249	AI, Society, and Humanity	9
80-305	Game Theory	9
80-324	Philosophy of Economics	9
80-335	Social and Political Philosophy	9
80-348	Health, Human Rights, and International Development	9
84-310	Policy in a Global Economy 1: International Trade and Trade Policy	6
84-318	Politics of Developing Nations	9
84-362	Diplomacy and Statecraft	9
84-387	Remote Systems and the Cyber Domain in Conflict	9
88-411	Rise of the Asian Economies	9

Senior Work

		Units
73-497	Senior Project	12
or 73-500 & 73-501	Tepper College Honors Thesis I and Tepper College Honors Thesis II	

Note: Students in the BA in Economics who complete an Honors Thesis in economics may use 73-497 (Senior Project) as an economics elective.

Minor

In order to obtain the degree, students must complete a minor from another academic discipline. For students electing to complete an additional major or dual degree, the minor is waived.

University Core

Students are required to complete University Core which is the general education program in the Tepper School.

Core @ Carnegie Mellon

All undergraduate students are required to take 99-101 (<http://coursecatalog.web.cmu.edu/search/?P=99-101>) Core @ Carnegie Mellon to graduate (completed during the first year).

B.S. in Economics

To receive the B.S. degree in Economics, students must complete at least 360 units, consisting of the requirements for Mathematics, Quantitative Analysis, Economic Core, Economic Electives, Senior Requirement, University Core, and a Minor.

Mathematics Requirement

		Units
21-120	Differential and Integral Calculus	10-20
or 21-111 & 21-112	Differential Calculus and Integral Calculus	
21-256	Multivariate Analysis	9
or 21-259	Calculus in Three Dimensions	
21-240	Matrix Algebra with Applications	10
or 21-241	Matrices and Linear Transformations	

Quantitative Analysis Requirements

		Units
73-265	Economics and Data Science	9
73-274	Econometrics I	9
73-374	Econometrics II	9
or 73-423	Forecasting for Economics and Business	
or 70-467	Machine Learning for Business Analytics	

Economic Core Requirements

		Units
73-102	Principles of Microeconomics	9
or 73-104	Principles of Microeconomics Accelerated	
73-103	Principles of Macroeconomics	9
73-230	Intermediate Microeconomics	9
73-240	Intermediate Macroeconomics	9
70-340	Business Communications	9
70-345	Business Presentations	9

Economics Electives (54 Units)

Students must take six economics elective courses. Economics elective courses are those numbered 73-300 or higher.

Senior Requirement

		Units
73-497	Senior Project	12
or 73-500 & 73-501	Tepper College Honors Thesis I and Tepper College Honors Thesis II	

Note: Students in the BS in Economics who complete an Honors Thesis in economics may use 73-497 (Senior Project) as an economics elective.

Minor

In order to obtain the degree, students must complete a minor from another academic discipline. For students electing to complete an additional major or dual degree, the minor requirement is waived.

University Core

Students are required to complete University Core which is the general education program in the Tepper School.

Core @ Carnegie Mellon

All undergraduate students are required to take 99-101 (<http://coursecatalog.web.cmu.edu/search/?P=99-101>) Core @ Carnegie Mellon to graduate (completed during the first year).

B.S. in Economics and Mathematical Sciences

The B.S. in Economics and Mathematical Sciences is an interdisciplinary major that provides students with courses that complement and develop depth of understanding of economic theory, applied economics, and applied mathematics. The major equips students with the mathematical tools that are essential for success in Ph.D. programs in economics, mathematics, and key functional areas of business including finance, accounting, marketing, and information systems. Students must be enrolled in the B.S. in Economics major to apply for the Economics and Mathematics major. Acceptance into the major is based on meeting the following requirements:

- Cumulative QPA of at least 3.5
- Earned a "B" or better in 21-127 Concepts of Mathematics or 21-128 Mathematical Concepts and Proofs
- Earned a "B" or better in 21-241 Matrices and Linear Transformations
- Completed Principles of Microeconomics waiver, 73-102 Principles of Microeconomics or 73-104 Principles of Microeconomics Accelerated

- Earned a "B" or better in 73-103 Principles of Macroeconomics
- Earned a "B" or better in either 73-230 Intermediate Microeconomics or 73-240 Intermediate Macroeconomics
- Personal statement

Economic Theory Requirements

	Units
73-102 Principles of Microeconomics *	9
or 73-104 Principles of Microeconomics Accelerated	
73-103 Principles of Macroeconomics	9
73-230 Intermediate Microeconomics	9
73-240 Intermediate Macroeconomics	9

Quantitative Analysis Requirements

	Units
70-207 Probability and Statistics for Business Applications	9
or 36-200 Reasoning with Data	
36-225 Introduction to Probability Theory	9
or 36-235 Probability and Statistical Inference I	
or 21-325 Probability	
73-265 Economics and Data Science	9
73-274 Econometrics I	9
73-374 Econometrics II	9

Mathematical Sciences Requirements

	Units
21-120 Differential and Integral Calculus	10-20
or 21-111 Differential Calculus and Integral Calculus	
& 21-112	
21-122 Integration and Approximation	10
21-127 Concepts of Mathematics	12
21-228 Discrete Mathematics	9-12
or 15-251 Great Ideas in Theoretical Computer Science	
21-241 Matrices and Linear Transformations	11
21-259 Calculus in Three Dimensions	9-12
or 21-256 Multivariate Analysis	
or 21-268 Multidimensional Calculus	
or 21-269 Vector Analysis	
21-260 Differential Equations	9
21-355 Principles of Real Analysis I	9
21-356 Principles of Real Analysis II	9

Programming Requirement (10 Units)

	Units
15-110 Principles of Computing	10

Writing Requirement

	Units
70-340 Business Communications	9

Economic Electives (27 Units)

Students must take three economics elective courses. Economics elective courses are those courses numbered 73-300 or higher, (excluding 73-374 Econometrics II). Students are encouraged to work with their advisors to structure a set of courses which meet these requirements based on their particular interests, subject to course availability.

Recommended Economics electives include: 73-315 Market Design, 73-347 Game Theory Applications for Economics and Business, 73-365 Firms, Market Structures, and Strategy, and 73-421 Emerging Markets.

Mathematical Science Depth Electives (27 Units)

Students must take three advanced mathematics depth courses. Students are encouraged to work with their advisors to structure a set of courses which meet these requirements based on their particular interests, subject to course availability.

Recommended Mathematical Science Depth Electives:

21-270	Introduction to Mathematical Finance	9
21-292	Operations Research I	9
21-301	Combinatorics	9
21-341	Linear Algebra	9
21-369	Numerical Methods	12
21-370	Discrete Time Finance	9
21-371	Functions of a Complex Variable	9
21-393	Operations Research II	9
21-420	Continuous-Time Finance	9
21-484	Graph Theory	9

Note: Only one of the following courses may count towards the required Mathematical Sciences Depth Electives: 21-366 Topics in Applied Mathematics.

Senior Work

73-497	Senior Project	12
or 73-500 & 73-501	Tepper College Honors Thesis I and Tepper College Honors Thesis II	

Note: Students in the BS in Economics and Math who complete an Honors Thesis in economics may use 73-497 (Senior Project) as an economics elective.

Double-Counting Restriction

The 3 economics electives and 3 math electives cannot double count with another major or minor.

University Core

Students are required to complete University Core which is the general education program in the Tepper School.

Core @ Carnegie Mellon

All undergraduate students are required to take 99-101 (<http://coursecatalog.web.cmu.edu/search/?P=99-101>) Computing @ Carnegie Mellon to graduate (completed during the first year).

Additional Major in Economics

Students are eligible to apply for the Additional Major in Economics after completion of the Minor in Economics.

Mathematics Requirement

21-120	Differential and Integral Calculus	10
or 21-111 & 21-112	Differential Calculus and Integral Calculus	
21-256	Multivariate Analysis	9
or 21-254	Linear Algebra and Vector Calculus for Engineers	
or 21-259	Calculus in Three Dimensions	
or 21-266	Vector Calculus for Computer Scientists	
21-240	Matrix Algebra with Applications	10
or 21-241	Matrices and Linear Transformations	

Quantitative analysis requirement

73-265	Economics and Data Science	9
73-274	Econometrics I	9
73-374	Econometrics II	9
or 73-423	Forecasting for Economics and Business	
or 70-467	Machine Learning for Business Analytics	

Economic Core Requirement

73-102	Principles of Microeconomics *	9
or 73-104	Principles of Microeconomics Accelerated	
73-103	Principles of Macroeconomics	9
73-230	Intermediate Microeconomics	9
73-240	Intermediate Macroeconomics	9

70-340	Business Communications	9
70-345	Business Presentations	9

If a student is pursuing the additional major and receives a prerequisite waiver for 73102, 9 additional units of elective course work (73-3xx or higher) is required.

Economics Electives Requirement (54 units)

Students must take six economics elective courses. Economics elective courses are those numbered 73-300 or higher.

73-497	Senior Project *	12
or 73-500 & 73-501	Tepper College Honors Thesis I and Tepper College Honors Thesis II	

Note: Students who complete an Honors Thesis in economics may use 73-497 (Senior Project) as an economics elective.

Double count restriction

Students pursuing the additional major may double-count two economics electives with any other major or minor requirements. There are no double counting restrictions between the additional major and a student's home college general education requirements.

Minor in Economics

Students are eligible to apply for a minor upon completion of two courses for the minor wherein they earn a 2.0 QPA or higher in the coursework.

While there are no double counting restrictions between the minor and the student's home college general education requirements, 73-265 Economics and Data Science and the 3 economics electives must be unique for the minor and cannot double count with any other major or minor.

Mathematics Requirements

		Units
21-120	Differential and Integral Calculus	10-20
or 21-111 & 21-112	Differential Calculus and Integral Calculus	
21-256	Multivariate Analysis	9
or 21-254	Linear Algebra and Vector Calculus for Engineers	
or 21-259	Calculus in Three Dimensions	
or 21-266	Vector Calculus for Computer Scientists	
or 21-268	Multidimensional Calculus	
or 21-269	Vector Analysis	

Economic Theory Requirements (27 Units)

		Units
73-102	Principles of Microeconomics *	9
or 73-104	Principles of Microeconomics Accelerated	
73-103	Principles of Macroeconomics	9
73-230	Intermediate Microeconomics	9
or 73-240	Intermediate Macroeconomics	

If a student is pursuing an economics minor and receives a prerequisite waiver for 73102, 9 additional units of elective course work (73-3xx or higher) is required to ensure 54+ units are met in the minor curriculum.

Quantitative Analysis Requirements (18 Units)

Students who have taken coursework in intermediate-level regression analysis and data visualization may petition to substitute 73-274 Econometrics I or 73-423 Forecasting for Economics and Business for 73-265 Economics and Data Science.

		Units
70-207	Probability and Statistics for Business Applications	9
or 36-200	Reasoning with Data	
or 15-259	Probability and Computing	
or 21-325	Probability	
or 36-218	Probability Theory for Computer Scientists	
or 36-219	Probability Theory and Random Processes	
or 36-220	Engineering Statistics and Quality Control	

or 36-225	Introduction to Probability Theory	
73-265	Economics and Data Science	9

Economics Electives (27 Units)

Students must take three economics elective courses. Economics elective courses are those numbered 73-3xx through 73-49x. Students are encouraged to work with their economics advisor to structure a set of courses to meet these requirements based on their particular interests, subject to course availability.