

Economics and Mathematical Sciences, B.S.

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.
- 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

Curriculum

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	
or 21-425	Probability and Martingales	
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 & 21-112	Differential Calculus and Integral Calculus	
21-122	Integration and Approximation	10
21-127	Concepts of Mathematics	12
or 21-128	Mathematical Concepts and Proofs	
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 21-266	Vector Calculus using Matrix Algebra	
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
15-104	Introduction to Computing for Creative Practice	10
or 15-110	Principles of Computing	
or 15-112	Fundamentals of Programming and Computer Science	

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

As part of all Tepper School undergraduate degrees, students must complete general education coursework in the liberal arts and sciences. These courses connect students to the vast array of academic

disciplines offered at CMU and offer an opportunity for students to explore intellectual interests in new ways to meet their academic goals.

The University Core offers deliberative choice in selecting courses to meet the general education that aligns with university competencies. Students select courses from particular CMU departments and two courses as free electives. External transfer courses can be used to fulfill University Core Requirements 2-5.

University Core Requirement 1: CMU First Year Writing (9 units)

Semester Long Writing Course:

- 76-101 Interpretation and Argument
- 76-102 Advanced First Year Writing: Special Topics

OR Select 2 Mini Writing Courses:

- 76-106 Writing about Literature, Art and Culture
- 76-107 Writing about Data
- 76-108 Writing about Public Problems

University Core Requirement 2: Scientific Reasoning (9+ units)

- Any Biological Sciences course 03-100 or higher
- Any Chemistry course 09-100 or higher
- Any Computational Biology course 02-100 or higher
- Any Computer Sciences course 15-100 or higher
- Any Physics course 33-100 or higher
- Any Psychology course 85-102 or higher
- Any Robotics course 16-100 or higher

University Core Requirement 3: Information Literacy (9+ units)

- Any Philosophy course 80-100 or higher
- Any Information Systems course 67-100 or higher
- Any Social and Decision Science course 88-100 or higher

University Core Requirement 4: Global, Cultural, and Diverse Perspectives (18+ units)

- Any History course 79-100 or higher
- Any English course 76-200 or higher
- Any Institute for Strategy and Technology course 84-001 or higher
- Any Languages, Cultures, and Applied Linguistics course 82-100 or higher

Please note that this requirement requires at least 18 units (two or more classes) to complete.

University Core Requirement 5: Free Electives (18+ units)

Any Carnegie Mellon academic course excluding Business (70-xxx), Economics (73-xxx), Physical Education (69-xxx), StuCo [Student-Led] (98-xxx), 21-270 Introduction to Mathematical Finance, or any other course within the primary major's curriculum requirements.

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).