

# DUAL DEGREE IN ECONOMICS (M.A.) AND DATA SCIENCE (M.S.)

## Overview

The dual degree in economics (M.A.) and data science (M.S.) enables students to gain a deeper understanding of economic theory and computational methods while having the time and expertise to engage in research projects that link data science and economics. The dual degree requires 15 courses (45 credits), which can be taken sequentially or concurrently.

## Admissions

The dual degree in economics (M.A.) and data science (M.S.) has the same admissions requirements as the M.A. in economics and the M.S. in data science.

These requirements are:

- completed online application
- three letters of recommendation for non-Fordham students; two for Fordham students
- official transcripts from all prior undergraduate and/or graduate institutions
- statement of intent
- official GRE test scores
- official TOEFL or IELTS scores for non-native English speakers.

Students will initially be admitted to either the M.A. in economics or the M.S. in data science and then apply for the dual degree (the other M.A./M.S.) once they are approximately 18 credits into their graduate study (i.e., completed four courses and are currently registered for at least two more).

Application to the second degree will only require an application form, a short statement of intent, and transcripts, with no fee for the application.

## Economics Prerequisites

An undergraduate degree in a field emphasizing economics and/or quantitative skills is expected, such as a degree in economics or international political economy, or a degree in math, finance, psychology, computer science, or business with a minor in economics. The following courses or equivalent should be taken prior to beginning the M.A. in economics program:

- Intermediate-level Macroeconomics and Microeconomics
- Math for Economists OR Calculus I and Linear Algebra
- Statistics I and Statistics II (Statistical Decision Making)

If these classes were not completed with a previous degree, then the required classes will be added to a student's admission. These classes must be taken in the first semester or prior to beginning the program (e.g., during the summer or the previous semester).

## Data Science Prerequisites

- Applicants with undergraduate degrees in non-computer science areas are welcome.
- An undergraduate degree in a field emphasizing quantitative skills is expected, such as a degree in computer science, information science, engineering, math, physical science, health science, business, economics, psychology, social science, or urban and city planning.
- Knowledge of discrete math, probability, and statistics, including permutations, combinations, descriptive statistics, and basic probability concepts.
- Basic programming knowledge and familiarity with Python programming are expected. This knowledge can be acquired via completion of CISC 5380 Programming with Python.

Admitted students **who seek to bypass** CISC 5380 Programming with Python **must take** a placement examination, which is administered by the department prior to the beginning of each entry term. The exam covers the fundamentals of Python programming language. Students who earn a grade lower than a B are required to enroll in CISC 5380 Programming with Python in their first semester of study. This bridge course can be taken concurrently with courses that fulfill degree requirements.

## Requirements

The requirements for the Dual Degree in Economics (M.A.) and Data Science (M.S.) are as follows:

Course	Title	Credits
<b>Economics Courses</b>		
<i>Core Courses</i>		
ECON 6010	Microeconomic Theory I	3
ECON 6020	Macroeconomic Theory I	3
ECON 6910	Applied Econometrics	3
	or ECON 6950 Financial Econometrics	
<i>Economics Electives</i> <sup>1</sup>		9
Three courses from any of the following areas:		
Applied Microeconomics		
Finance		
Specialized Topics		
<b>Data Science Courses</b>		
<i>Core Courses</i>		
CISC 5790	Data Mining	3
CISC 5800	Machine Learning	3
CISC 5950	Big Data Computing	3
<i>Data Science Electives</i> <sup>1</sup>		6
<i>One of the following options:</i> <sup>2</sup>		3
CISC 6080	Capstone Project in Data Science	
CISC 6085	Master's Thesis in Data Science I	
& CISC 6086	and Master's Thesis in Data Science II	
CISC 6081	Data Science Practicum (internship)	
<b>Math Core</b>		
ECON 5710	Mathematical Analysis in Economics	3
	or CISC 5450 Mathematics for Data Science	
<b>Free Electives</b> <sup>3</sup>		6
<b>Total Credits</b>		<b>45</b>

<sup>1</sup> See below lists for courses that may fulfill this requirement. For students who did not complete an undergraduate major in economics and are pursuing this dual-degree program, ECON 5012 Foundations of Economics may also count as an economics elective.

<sup>2</sup> Students completing two semesters of data science thesis (6 credits) may complete one fewer 3-credit data science elective.

<sup>3</sup> Any course that counts as an economics or data science elective may fulfill this requirement.

CISC 6525	Artificial Intelligence	3
CISC 6735	Wireless Networks	3
CISC 6745	Data Visualization	3

## Applied Microeconomics elective courses

*Courses in this group have the EDAM attribute.*

Course	Title	Credits
ECON 5260	Epidemics and Development Policy	3
ECON 5280	Urban Economics	3
ECON 5590	Health Economics	3
ECON 6440	Development Economics	3
ECON 6480	Environmental and Resource Economics	3
ECON 6970	Applied Microeconometrics	3

## Finance elective courses

*Courses in this group have the EDFI attribute.*

Course	Title	Credits
ECON 6240	Financial Economics	3
ECON 6340	Financial Theory	3

## Specialized Topics elective courses

*Courses in this group have the EDST attribute.*

Course	Title	Credits
ECON 5450	Crises, Adjustment and Poverty	3
ECON 5750	Game Theory	3
ECON 5760	Computational Macroeconomics/Finance	3
ECON 6310	Monetary Policy	3
ECON 6320	Monetary Theory	3
ECON 6470	Growth and Development	3
ECON 6510	International Trade	3
ECON 6530	International Economics of Growth and Development	3
ECON 6560	International Finance	3
ECON 6990	Topics in Econometric Theory	3

## Data Science elective courses

*Courses in this group have the EDDS attribute.*

Course	Title	Credits
CISC 5500	Data Analytics Tools and Scripting	3
CISC 5550	Cloud Computing	3
CISC 5640	Nosql Database Systems	3
CISC 5835	Algorithms for Data Science	3
CISC 5900	Information Fusion	3
CISC 6000	Deep Learning	3
CISC 6210	Natural Language Processing	3