Degree Requirements for Dual Degree in Economics (BA) and Mathematics (BS)

A solid training in the mathematical and statistical sciences is fundamental to optimally prepare economics students for graduate school. A dual degree in economics and mathematics will substantially increase program quality and career prospects for our students as well as enhancing the reputation of the economics program at UCD. Similarly, a solid training in quantitative and qualitative economic principles offers significant benefits to mathematics majors who seek industrial and/or consulting positions.

Program Requirements Required Economics

Courses

- ECON 2012 -- Principles of Economics: Macroeconomics \textbf{gtPATHWAYS: GT-SS1}
- ECON 2022 -- Principles of Economics: Microeconomics \textbf{gtPATHWAYS: GT-SS1}
- ECON 4071 -- Intermediate Microeconomic Theory \textbf{gtPATHWAYS:}
- ECON 4081 -- Intermediate Macroeconomic Theory \textbf{gtPATHWAYS:}
- ECON 4091 -- History of Economic Thought \textbf{gtPATHWAYS:}
- ECON 4811 -- Introduction to Econometrics \textbf{gtPATHWAYS:}

\textbf{Total: 18 Hours}

Economics Electives

Any five, 3-semester-hour courses taken in economics may satisfy this requirement, other than internships and independent studies which require the approval of the department chair. 

\textbf{Note:} Econ3801 and Econ3811 cannot be counted as electives.

One of the following Mathematics courses can be counted as one Economics elective (it may also be counted as one Mathematics required course or one Mathematics elective):

- MATH 3301 Operations Research I
- MATH 3302 Operations Research II
- MATH 4101 Applied Statistics Using SAS and SPSS I
- MATH 4387 Regression Analysis, Modeling and Time Series
- MATH 4390 Game Theory
- MATH 4450 Complex Variables
- MATH 4733 Partial Differential Equations
- MATH 4830 Applied Statistics
- MATH 5350 Mathematical Theory of Interest

\textbf{Total: 15 Hours} (four Economics courses + one Mathematics course or five Economics courses)

Senior Exercise
Graduating seniors must submit the three best papers that the student wrote in any three separate courses taken in the Department of Economics for the outcomes assessment of the economics program. The three papers should be handed in at one time in a folder to the economics office, before the first day of the month in which the student plans to graduate.

**Required Core Courses for All Mathematics Majors**

**Lower-Division Courses**

- MATH 1401 Calculus I gtPATHWAYS: GT--MA1
- MATH 2411 Calculus II gtPATHWAYS: GT--MA1
  - MATH 2421 Calculus III gtPATHWAYS: GT--MA1

**Upper-Division Courses**

- MATH 3000 Introduction to Abstract Mathematics
- MATH 3191 Applied Linear Algebra
- MATH 4310 Introduction to Real Analysis I

**Total: 21 Hours.**

**Required Courses for the Dual--Degree**

- MATH 3200 Elementary Differential Equations
- MATH 4650 Numerical Analysis I
- MATH 4779 Math Clinic
- MATH 4810 Probability
- MATH 4820 or 3382 Statistics

Applied/Modeling Elective: one course chosen from

- MATH 3301 Introduction to Operations Research I - Deterministic Systems
- MATH 3302 Operations Research II
- MATH 4387 Regression Analysis, Modeling and Time Series
- MATH 4409 Applied Combinatorics
- MATH 4733 Partial Differential Equations
- MATH 4791 Continuous Modeling
- MATH 4792 Probabilistic Modeling
- MATH 4793 Discrete Math Modeling
- MATH 4794 Optimization Modeling

**Depth in Proof-Writing Elective**

One course chosen from:

- MATH 4110 Theory of Numbers
- MATH 4140 Introduction to Modern Algebra
• MATH 4201 Topology
• MATH 4220 Higher Geometry II
• MATH 4320 Introduction to Real Analysis II (highly recommended)
• MATH 4408 Applied Graph Theory

The students must choose two approved mathematics electives (at least 3 semester hours) above 3000, excluding MATH 4012, 4013, 4014 and 4015.

Note: MATH 3511 and 3040 cannot be counted as electives.

One of the following Economics courses can be counted as one Mathematics elective (it can also be counted as one Economics elective):

• ECON 4030 Data Analysis with SAS
• ECON 4110 Money and Banking
• ECON 4150 Economic Forecasting
• ECON 4320 Financial Economics
• ECON 4430 Economics Growth
• ECON 4550 Game Theory and Economic Applications
• ECON 4610 Labor Economics
• ECON 4740 Industrial Organization

**Total: 27 Hours** (eight Mathematics courses + one Economics course, or nine Mathematics courses).

**Portfolio, Interview, Survey**

In the semester of graduation, students must

• submit a portfolio consisting of two papers, typically written for previous courses, that demonstrate mathematical and writing proficiency;
• participate in an exit interview, which may be scheduled by the department administrative assistant;
• complete a senior survey, available from the department administrative assistant.

**Residence Requirements**

In addition to the CLAS residence requirements, the Economics Department requires that

• At least six of the major courses (18 semester hours), including at least three courses out of 4071, 4081, 4091 and 4811, must be taken from economics faculty at CU Denver.

• Once a student has enrolled at CU Denver, no courses in the major may be taken outside the economics department without permission from the undergraduate advisor.

And the Mathematics Department requires that

At least 15 upper-division mathematics credits must be taken at CU Denver.