MATHEMATICAL ANALYTICS & OPERATIONS RESEARCH, BACHELOR OF SCIENCE

College of Letters & Science

The Major Programs
Mathematics is the study of abstract structures, space, change, and the interrelations of these concepts. It also is the language of the exact sciences.

The Program
After completing basic introductory courses such as calculus and linear algebra, students plan an upper division program in consultation with a faculty advisor. Upper division courses include real analysis, probability, modern algebra, as well as a variety of other courses that allow students to further mathematical knowledge and skills that feature their research or career interests. This individualized program can lead to graduate study in pure or applied mathematics, elementary or secondary level teaching, or to other professional goals. It can also reflect a special interest such as computational and applied mathematics, computer science, or statistics, or may be combined with a major in some other field.

Career Alternatives
A degree in mathematics provides entry to many careers in industry in addition to teaching. For instance, operations research, data analysis, systems analysis, computing, actuarial work, insurance, and financial services are only a few such careers. Mathematics is also a sound basis for graduate work in a variety of fields, such as law, engineering, and economics.

Major Advisors
For a current list of faculty and staff advisors, see Math Department Advising (https://www.math.ucdavis.edu/undergrad/advising/advisers/) or contact Student Services (studentservices@math.ucdavis.edu).

Mathematics Placement Requirement
Students who wish to enroll in MAT 012, MAT 016A, MAT 017A, MAT 021A, MAT 021AH, and MAT 021M must satisfy the mathematics placement requirement by taking an online exam. Students who do not satisfy the requirement will be administratively dropped from these courses. For more information, including preparation tips and how to access the online exam, please see Math Placement Requirement (MPR) (http://www.math.ucdavis.edu/undergrad/math_placement/), well in advance of enrolling.

Department Honors
Students who meet the minimum GPA requirement for honors at graduation for the College of Letters & Science and who complete a senior project as part of MAT 194 or MAT 199 units in consultation with their faculty advisor may also be recommended by the department for graduation with High Honors or Highest Honors. Recommendations will be based on evaluations of students’ academic achievements in their major and the quality of their senior project. For complete details, see Honors & Awards (https://www.math.ucdavis.edu/research/honors/).

Graduate Study
The Department offers programs of study and research leading to M.A. and Ph.D. degrees in Mathematics. Information regarding graduate study may be obtained by consulting our website or contacting Student Services (studentservices@math.ucdavis.edu).

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>MAT 021A</td>
<td>Calculus</td>
<td>4</td>
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<tr>
<td>MAT 021B</td>
<td>Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MAT 021C</td>
<td>Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MAT 021D</td>
<td>Vector Analysis</td>
<td>4</td>
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Choose one option: 4-8

(a)

MAT 022A Linear Algebra
MAT 108 Introduction to Abstract Mathematics
or

MAT/BIS 027A Linear Algebra with Applications to Biology
MAT 108 Introduction to Abstract Mathematics
or

(b)

MAT 067 Modern Linear Algebra
MATLAB 0-1
MAT 022AL Linear Algebra Computer Laboratory
Equivalent MATLAB knowledge.

Differential Equations 3-4

MAT/BIS 027B Differential Equations with Applications to Biology
or

MAT 022B Differential Equations

Programming

ECS 032A Introduction to Programming 4
or
EN 006 Engineering Problem Solving

Economics

ECN 001A Principles of Microeconomics 4
or
ECN 001AV Principles of Microeconomics
or
ECN 001AY Principles of Microeconomics

ECN 001B Principles of Macroeconomics 4
or
ECN 001BV Principles of Macroeconomics

Statistics

STA 032 Gateway to Statistical Data Science 4
or
STA 100 Applied Statistics for Biological Sciences

Preparatory Subject Matter Subtotal 39-45

Depth Subject Matter

A. Core Courses

MAT 127A Real Analysis 4
MAT 127B Real Analysis 4
MAT 127C Real Analysis 4
MAT 135A Probability 4
MAT 135B Stochastic Processes 4
MAT 150A Modern Algebra 4
MAT 168 Optimization 4
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>MAT 170</td>
<td>Mathematics for Data Analytics &amp; Decision Making</td>
<td>4</td>
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<td><strong>Choose one:</strong></td>
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<tr>
<td>MAT 128A</td>
<td>Numerical Analysis</td>
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<tr>
<td>MAT 128B</td>
<td>Numerical Analysis in Solution of Equations</td>
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<tr>
<td>MAT 128C</td>
<td>Numerical Analysis in Differential Equations</td>
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**B. Enrichment Courses**

1. **Enrichment A**
   - **Choose two:**
     - MAT 111-MAT 185B
     - STA 131B: Introduction to Mathematical Statistics
     - STA 131C: Introduction to Mathematical Statistics
     - STA 137: Applied Time Series Analysis
     - STA 141A: Fundamentals of Statistical Data Science
     - STA 141B: Data & Web Technologies for Data Analysis
     - STA 141C: Big Data & High Performance Statistical Computing

2. **Enrichment B**
   - **Choose two:**
     - ECN 100A: Intermediate Micro Theory: Consumer & Producer Theory
     - or ARE 100A: Intermediate Microeconomics: Theory of Production & Consumption
     - ECN 100B: Intermediate Micro Theory: Imperfect Competition & Market Failure
     - or ARE 100B: Intermediate Microeconomics: Imperfect Competition, Markets & Welfare Economics
     - ECN 121A: Industrial Organization
     - ECN 121B: Industrial Organization
     - ECN 122: Theory of Games & Strategic Behavior
     - ECN 134: Financial Economics
     - ARE 155: Operations Research & Management Science
     - ARE 156: Introduction to Mathematical Economics
     - ARE 157: Analysis for Operations & Production Management

**C. Capstone Course**

- **Choose one:**
  - MAT 115B: Number Theory
  - MAT 118B: Partial Differential Equations: Eigenfunction Expansions
  - MAT 119B: Ordinary Differential Equations
  - MAT 135B: Stochastic Processes
  - MAT 146: Algebraic Combinatorics
  - MAT 150B: Modern Algebra
  - MAT 150C: Modern Algebra
  - MAT 180: Special Topics
  - MAT 185B: Complex Analysis
  - MAT 189: Advanced Problem Solving
  - MAT 192: Internship in Applied Mathematics (Must take 3 units.)
  - MAT 194: Undergraduate Thesis

**Depth Subject Matter Subtotal**: 55-56

**Total Units**: 94-101

1. **Note**: Basic knowledge of MATLAB is required for both MAT 022A and MAT 067. Students can learn it on their own, enroll in ENG 006, EME 005, or in the 1 unit course MAT 022AL (can be taken concurrently).

2. **Please note that MAT 170 has a prerequisite of MAT 167, or MAT 128B, or ECS 130. MAT 167 or MAT 128B can be used to satisfy one of the two required Enrichment A courses.**

3. **Excluding MAT 180, core courses, and courses being used as a capstone.**