Progress Toward Completion of the Mathematics Major

Applied Mathematics Concentration

Arts and Sciences students may be admitted to the math major after successfully completing a semester of multivariable calculus, a semester of linear algebra, and a 3- or 4-credit computer programming course. Applications are available in 310A Malott Hall.

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<tr>
<th>Student's Name</th>
<th>Net ID</th>
<th>Faculty Advisor</th>
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<th>Courses needed to complete the major</th>
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Math majors must complete **9 courses** for the major, as described in items 1–3 below, with a **minimum grade of C–**. MATH courses numbered 5000–5999 do not count. No course may be used to satisfy more than one requirement.

1. **Two Courses in Algebra.** (___ transfer credit applied, see reverse)

   - MATH 3320  Introduction to Number Theory
   - MATH 3340* Abstract Algebra
   - MATH 3360* Applicable Algebra
   - MATH 4310* Linear Algebra
   - MATH 4330* Honors Linear Algebra
   - MATH 4340* Honors Introduction to Algebra
   - MATH 4370  Computational Algebra
   - MATH 4500  Matrix Groups
   - MATH 4560  Geometry of Discrete Groups

2. **Two Courses in Analysis.** (___ transfer credit applied, see reverse)

   - MATH 3110* Introduction to Analysis
   - MATH 3210  Manifolds & Differential Forms
   - MATH 3230* Introduction to Differential Equations
   - MATH 4130* Honors Intro Analysis I
   - MATH 4140  Honors Intro Analysis II
   - MATH 4180* Complex Analysis
   - MATH 4200* Differential Equations and Dynamical Systems
   - MATH 4210* Nonlinear Dynamics and Chaos [also MAE 5790]
   - MATH 4220* Applied Complex Analysis
   - MATH 4250  Numerical Analysis and Differential Equations [also CS 4210]
   - MATH 4260  Numerical Analysis: Linear & Nonlinear Equations [also CS 4220; co-meets w/CS 5223]
   - MATH 4280* Introduction to Partial Differential Equations

*Forbidden Overlaps:* Due to an overlap in content, students will receive credit for only one course in each group:
1. (1) MATH 3110, 4130; (2) MATH 3230, 4280; (3) MATH 3340, 3360; (4) MATH 3340, 4340; (5) MATH 4180, 4220; (6) MATH 4200, 4210;
2. (7) MATH 4310, 4315, 4330; (8) MATH 4710, ECON 3130, BTRY 3080; (9) MATH 4720, ECON 3130, BTRY 4090; (10) MATH 4810, 4860.
Of the 9 courses used to fulfill requirements (1), (2), (3 iii), and (3 iv) of the math major, at least one course must be taken from three of the four Groups A, B, C, and D described on the next page. Non-MATH courses in these groups may be used toward the math modeling requirement (3 iv).

3. **Concentration in Applied Mathematics.**  (___ transfer credit applied, see below)

Five additional courses from (iii) and (iv) below.

(iii) At least three MATH courses numbered 3000 or above:

___ _________________________________________________________________________________
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(iv) At least one course dealing with mathematical models. Any course from outside mathematics with serious mathematical content and dealing with scientific matters may be used. Serious mathematical content includes, but is not limited to, extensive use of calculus or linear algebra. Any course from another department that would satisfy one of the other concentrations may be used.

___ _________________________________________________________________________________
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_or one of the following:

___ CS 2110 Object-Oriented Programming and Data Structures [also ENGRD 2110]
___ MATH 3610 Mathematical Modeling
___ PHYS 1116 Physics I: Mechanics and Special Relativity
___ PHYS 2208 Fundamentals of Physics II
___ PHYS 2213 Physics II: Electromagnetism
___ PHYS 2217 Physics II: Electricity and Magnetism [also AEP 2170]

Other 1000-level physics courses and PHYS 2207 may not be used. AP credit may not be used.

___ ____________________________________________________________________________________ (approved by faculty advisor)

**Transfer Credit / Study Abroad Courses Applied to the Major**

<table>
<thead>
<tr>
<th>Course Number &amp; Title</th>
<th>Institution</th>
<th>Requirement</th>
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(1) MATH 3110, 4130; (2) MATH 3230, 4280; (3) MATH 3340, 3360; (4) MATH 3340, 4340; (5) MATH 4180, 4220; (6) MATH 4200, 4210; (7) MATH 4310, 4315, 4330; (8) MATH 4710, ECON 3130, BTRY 3080; (9) MATH 4720, ECON 3130, BTRY 4090; (10) MATH 4810, 4860.
# Applied Mathematics Concentration

Of the 9 courses used to fulfill requirements (1), (2), (3 iii), and (3 iv) of the math major, at least one course must be taken from three of the four Groups A, B, C, and D below.

## Group A. Differential equations
- MATH 3230* Introduction to Differential Equations
- MATH 4200* Differential Equations and Dynamical Systems
- MATH 4210* Nonlinear Dynamics and Chaos [also MAE 5790]
- MATH 4280* Introduction to Partial Differential Equations

## Group B. Discrete mathematics and combinatorics
- MATH 3360 Applicable Algebra
- MATH 4370 Computational Algebra
- MATH 4410 Introduction to Combinatorics I
- MATH 4420 Introduction to Combinatorics II
- CS 4820 Introduction to Analysis of Algorithms
- ORIE 3300 Optimization I
- ORIE 4330 Discrete Models
- ORIE 4350 Introduction to Game Theory

## Group C. Numerical and computational methods
- MATH 4250 Numerical Analysis and Differential Equations [also CS 4210]
- MATH 4260 Numerical Analysis: Linear and Nonlinear Problems [also CS 4220; co-meets w/CS 5223]
- CEE 5290 Heuristic Methods for Optimization [also CS 5722, ORIE 5340]
- CS 4620 Introduction to Computer Graphics [co-meets with CS 5620]
- CS 4670 Introduction to Computer Vision [co-meets with CS 5670]
- CS 5643 Physically Based Animation for Computer Graphics [also CS 5722, ORIE 5340]
- MAE 4700 Finite Element Analysis for Mechanical and Aerospace Design [co-meets w/MAE 4701]
- ORIE 4320 Nonlinear Optimization

## Group D. Probability and statistics
- MATH 4710* Basic Probability
- MATH 4720* Statistics
- ECON 3130* Statistics and Probability (formerly ECON 3190)
- ORIE 3500 Engineering Probability and Statistics II
- STSCI 3080* Probability Models and Inference [also BTRY 3080, ILRST 3080]
- STSCI 3100 Statistical Sampling [also BTRY 3100, ILRST 3100]
- STSCI 4030 Linear Models with Matrices [also BTRY 4030]
- STSCI 4100 Multivariate Analysis [also BTRY 4100, ILRST 4100]

*Forbidden Overlaps:* Due to an overlap in content, students will receive credit for only one course in each group:
(1) MATH 3110, 4130; (2) MATH 3230, 4280; (3) MATH 3340, 3360; (4) MATH 3340, 4340; (5) MATH 4180, 4220; (6) MATH 4200, 4210; (7) MATH 4310, 4315, 4330; (8) MATH 4710, ECON 3130, BTRY 3080; (9) MATH 4720, ECON 3130, BTRY 4090; (10) MATH 4810, 4860.