### Progress Toward Completion of the Mathematics Major

#### Computer Science 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. Visit math.cornell.edu/major for more information.

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<tr>
<th>Student’s Name</th>
<th>Net ID</th>
<th>Faculty Advisor</th>
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#### Courses needed to complete the major

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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.

- At least two of the MATH courses taken must be at the 4000 level (or above).

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) 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.
3. Concentration in Computer Science. ( ___ transfer credit applied, see below)

Five courses from (v) and (vi) below.

(v) At least one MATH course numbered 3000 or above:

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(vi) At least three CS courses with significant mathematical content.

_____ CS 3220 Computational Mathematics for Computer Science
_____ CS 4110 Programming Languages and Logics [co-meets with CS 5110]
_____ CS 4160 Formal Verification
_____ CS 4210 Numerical Analysis and Differential Equations [also MATH 4250]
_____ CS 4220 Numerical Analysis: Linear and Nonlinear Problems [also MATH 4260; co-meets w/CS 5223]
_____ CS 4620 Introduction to Computer Graphics [co-meets with CS 5620]
_____ CS 4670 Introduction to Computer Vision [co-meets with CS 5670]
_____ CS 4700 Foundations of Artificial Intelligence
_____ CS 4740 Natural Language Processing [also COGST 4740, LING 4474; co-meets with CS 5740]
_____ CS 4744 Computational Linguistics [also COGST 4240, LING 4424]
_____ CS 4758 Robot Learning [also ECE 4758, MAE 4758; co-meets with CS 6758]
_____ CS 4775 Computational Genetics and Genomics [also BTRY 4840; co-meets with BTRY 6840]
_____ CS 4780 Machine Learning for Intelligent Systems [co-meets with CS 5780]
_____ CS 4786 Machine Learning for Data Science [co-meets with CS 5786]
_____ CS 4787 Principles of Large Scale Machine Learning Systems
_____ CS 4810 Introduction to Theory of Computing
_____ CS 4812 Quantum Information Processing [also PHYS 4481; co-meets with PHYS 7681]
_____ CS 4814 Introduction to Computational Complexity
_____ CS 4820 Introduction to Analysis of Algorithms
_____ CS 4830 Introduction to Cryptography [co-meets with CS 5830]
_____ CS 4850 Mathematical Foundations for the Information Age
_____ CS 4852 Networks II: Market Design [also ECON 3825, INFO 4220; co-meets with INFO 6220]
_____ CS 4860 Applied Logic [also MATH 4860]

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(approved by faculty advisor)

Note: There are also many CS graduate courses with significant mathematical content that may be used. Interested students should discuss these options with their math faculty advisor (after being admitted to the math major.)

Transfer Credit / Study Abroad Courses Applied to the Major

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<th>Course Number &amp;Title</th>
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