

# College of Arts and Sciences

## Mathematics and Statistics

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### **B.S. in Applied Mathematics**

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#### **Admission to the Program**

Formal admission to the major requires a cumulative grade point average of 2.00 (on a 4.00 scale) and departmental approval.

#### **University Requirements**

- A total of 120 credit hours
- 6 credit hours of college writing
- 3 credit hours of college mathematics or the equivalent by examination

#### **General Education Requirements**

- A total of ten courses, consisting of one foundation course and one second-level course in an approved sequence from each of the five curricular areas
- No more than 6 credit hours may be taken in the same discipline

#### **Major Requirements**

- 57 credit hours with grades of C or better

#### **Course Requirements**

- CSC-280 Introduction to Computer Science I (4)
- CSC-281 Introduction to Computer Science II (3)
- MATH-221 Calculus I (4)
- MATH-222 Calculus II (4)
- MATH-313 Calculus III (4)
- MATH-310 Linear Algebra (3)
- MATH-321 Differential Equations (3)
- MATH-501 Probability (3)
- MATH-550 Complex Analysis (3)
- MATH-551 Partial Differential Equations (3)
- MATH-560 Numerical Analysis: Basic Problems (3)
- STAT-502 Introduction to Mathematical Statistics (3)
- Three additional mathematics electives, to be selected in consultation with the student's advisor

#### **Related Courses**

- PHYS-110 University Physics I 5:1 (4)
- PHYS-210 University Physics II 5:2 (4)  
or alternative science courses approved by advisor

#### **University Honors Program**

All University Honors students must complete at least 12 credit hours of advanced-level (300-level and above) Honors courses including a 3 to 6 credit hour Honors Senior Capstone Project. Students may graduate with University Honors in the major if they complete at least 12 advanced-level Honors

courses including the Senior Capstone Project in the department. Each department has three levels of University Honors requirements: Level I Options (100-200-level Honors classes); Level II Options (300-level and above Honors classes); and Level III Options (Honors Senior Capstone). The department Honors coordinator advises students in the University Honors Program regarding departmental options. For more information, go to [www.american.edu/academic.depts/honors/](http://www.american.edu/academic.depts/honors/).

### **B.S. in Mathematics**

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#### **Admission to the Program**

Formal admission to the major requires a cumulative grade point average of 2.00 (on a 4.00 scale) and departmental approval.

Students who wish to obtain credentials for teaching grade 7–12 mathematics may take a 36-credit hour second major. Students must have a 3.00 grade point average to be admitted to the second major in secondary education. For information on admission and program requirements, see the School of Education, Teaching and Health secondary education programs.

#### **University Requirements**

- A total of 120 credit hours
- 6 credit hours of college writing
- 3 credit hours of college mathematics or the equivalent by examination

#### **General Education Requirements**

- A total of ten courses, consisting of one foundation course and one second-level course in an approved sequence from each of the five curricular areas
- No more than 6 credit hours may be taken in the same discipline

#### **Major Requirements**

- 52 credit hours with grades of C or better
- Students who elect a second major in secondary school mathematics teaching take a total of 53 credit hours for the mathematics major (see course requirements below)

#### **Course Requirements**

- CSC-280 Introduction to Computer Science I (4)
- MATH-221 Calculus I (4)
- MATH-222 Calculus II (4)
- MATH-313 Calculus III (4)
- MATH-310 Linear Algebra (3)
- MATH-500 Advanced Calculus of Several Variables (3)
- MATH-512 Introduction to Modern Algebra (3)
- MATH-513 Rings and Fields (3)

- MATH-520 Introduction to Analysis (3)
- MATH-521 Measure Theory and Integration (3)
- Three courses selected from the following:
  - MATH-321 Differential Equations (3)
  - MATH-501 Probability (3)
  - MATH-503 Foundations of Mathematics (3)
  - MATH-505 Mathematical Logic (3)
  - MATH-508 Automata, Languages and Computability (3)
  - MATH-510 Geometry (3)
  - MATH-515 Number Theory (3)
  - MATH-540 Topology (3)
  - MATH-550 Complex Analysis (3)
  - MATH-551 Partial Differential Equations (3)
  - MATH-560 Numerical Analysis: Basic Problems (3)
  - MATH-570 History of Mathematics (3)
  - MATH-601 Harmonic Analysis (3)
  - STAT-502 Introduction to Mathematical Statistics (3)
- Three courses in a field of application, to be selected in consultation with the advisor. This requirement may be waived for students with more than one major in this department.

**Mathematics Majors with a Second Major in Secondary Education**

**Course Requirements**

- CSC-280 Introduction to Computer Science I (4)
- MATH-221 Calculus I (4)
- MATH-222 Calculus II (4)
- MATH-313 Calculus III (4)
- MATH-310 Linear Algebra (3)
- MATH-500 Advanced Calculus of Several Variables (3)
- MATH-501 Probability (3)
- MATH-510 Geometry (3)
- MATH-512 Introduction to Modern Algebra (3)
- MATH-585 Mathematics Education (3)
- STAT-202 Basic Statistics (4)
- STAT-502 Introduction to Mathematical Statistics (3)
- Two courses selected from the following:
  - MATH-321 Differential Equations (3)
  - MATH-503 Foundations of Mathematics (3)
  - MATH-505 Mathematical Logic (3)
  - MATH-515 Number Theory (3)
  - MATH-540 Topology (3)
  - MATH-550 Complex Analysis (3)
  - MATH-551 Partial Differential Equations (3)
  - MATH-560 Numerical Analysis: Basic Problems (3)
  - MATH-570 History of Mathematics (3)
  - MATH-601 Harmonic Analysis (3)
- Two courses in a field of application, to be selected in consultation with the advisor. This requirement may be waived for students with more than one major in this department.

**University Honors Program**

All University Honors students must complete at least 12 credit hours of advanced-level (300-level and above) Honors courses including a 3 to 6 credit hour Honors Senior Capstone Project. Students may graduate with University Honors in the major if they complete at least 12 advanced-level Honors courses including the Senior Capstone Project in the department. Each department has three levels of University Honors requirements: Level I Options (100-200-level Honors classes); Level II Options (300-level and above Honors classes); and Level III Options (Honors Senior Capstone). The department Honors coordinator advises students in the University Honors Program regarding departmental options. For more information, go to [www.american.edu/academic.depts/honors/](http://www.american.edu/academic.depts/honors/).

**B.S. in Statistics**

**Admission to the Program**

Formal admission to the major requires a cumulative grade point average of 2.00 (on a 4.00 scale) and departmental approval.

**Tracks**

Mathematical Statistics and Applied Statistics

**University Requirements**

- A total of 120 credit hours
- 6 credit hours of college writing
- 3 credit hours of college mathematics or the equivalent by examination

**General Education Requirements**

- A total of ten courses, consisting of one foundation course and one second-level course in an approved sequence from each of the five curricular areas
- No more than 6 credit hours may be taken in the same discipline

**Major Requirements**

- Mathematical Statistics: 47 credit hours with grades of C or better
- Applied Statistics: 54–55 credit hours with grades of C or better

**Course Requirements**

**Mathematical Statistics**

- CSC-280 Introduction to Computer Science I (4)
- MATH-221 Calculus I (4)
- MATH-222 Calculus II (4)
- MATH-313 Calculus III (4)
- MATH-310 Linear Algebra (3)
- MATH-501 Probability (3)
- STAT-202 Basic Statistics (4)
- STAT-502 Introduction to Mathematical Statistics (3)
- STAT-515 Regression (3)
- STAT-516 Design of Experiments (3)

- Four additional courses at or above 300 in the department, of which two must have the prefix STAT- (STAT-514 cannot be used and STAT-300 and STAT-302 cannot both be used) as approved by an advisor. CSC-281 may substitute for a course with a prefix of MATH-.

#### **Applied Statistics**

- CSC-280 Introduction to Computer Science I (4)
- MATH-211 Applied Calculus I (4) *and*  
MATH-212 Applied Calculus II (3)  
*or*  
MATH-221 Calculus I (4) *and*  
MATH-222 Calculus II (4)
- MATH-310 Linear Algebra (3)
- MATH-501 Probability (3)
- STAT-202 Basic Statistics (4)
- STAT-300 Business and Economic Statistics (3)  
*or*  
STAT-302 Intermediate Statistics (3)
- STAT-502 Introduction to Mathematical Statistics (3)
- STAT-515 Regression (3)

- STAT-516 Design of Experiments (3)
- Two additional courses selected from the department as approved by a student's advisor
- At least five additional courses in a related field, as approved by an advisor. The courses may be selected from more than one teaching unit, but must have a common theme or subject area in which statistics are applied.

#### **University Honors Program**

All University Honors students must complete at least 12 credit hours of advanced-level (300-level and above) Honors courses including a 3 to 6 credit hour Honors Senior Capstone Project. Students may graduate with University Honors in the major if they complete at least 12 advanced-level Honors courses including the Senior Capstone Project in the department. Each department has three levels of University Honors requirements: Level I Options (100-200-level Honors classes); Level II Options (300-level and above Honors classes); and Level III Options (Honors Senior Capstone). The department Honors coordinator advises students in the University Honors Program regarding departmental options. For more information, go to [www.american.edu/academic.depts/honors/](http://www.american.edu/academic.depts/honors/).

### **Minor in Mathematics**

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- 19 credit hours with grades of C or better and at least 12 credit hours unique to the minor

#### **Course Requirements**

- MATH-310 Linear Algebra (3)
- MATH-221 Calculus I (4) *and*  
MATH-222 Calculus II (4)  
*or*  
MATH-211 Applied Calculus I (4) *and*  
MATH-212 Applied Calculus II (3)
- Three additional courses numbered MATH-313 or above or STAT-202 or above, with at least two courses at the 300 level or above

### **Minor in Quantitative Methods**

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- 20 credit hours with grades of C or better and with at least 12 credit hours unique to the minor

#### **Course Requirements**

- CSC-280 Introduction to Computer Science I (4)
- MATH-310 Linear Algebra (3)
- MATH-221 Calculus I (4) *and*  
MATH-222 Calculus II (4)  
*or*  
MATH-211 Applied Calculus I (4) *and*  
MATH-212 Applied Calculus II (3)
- Two courses in statistics numbered STAT-3xx or above: Students may select only one of STAT-300 Business and Economic Statistics, STAT-302 Intermediate Statistics, or STAT-514 Statistical Methods for credit toward the minor.

### **Minor in Statistics**

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- 20 credit hours with grades of C or better and at least 12 credit hours unique to the minor

#### **Course Requirements**

- MATH-221 Calculus I (4) *or*  
MATH-211 Applied Calculus I (4)
- STAT-202 Basic Statistics (4)
- Four courses in statistics (STAT-xxx) at the 300 level or above (MATH-501 Probability may also be used as one of the four) Students may select only one of STAT-300 Business and Economic Statistics, STAT-302 Intermediate Statistics, or STAT-514 Statistical Methods for credit toward the minor.

### **Undergraduate Certificate in Applied Statistics**

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#### **Admission to the Program**

Open to undergraduate degree and nondegree students.

#### **Certificate Requirements**

- 18 credit hours of approved course work with at least 9 credit hours at the 300-level or above, with grades of C or better. Grades of C- or D in certificate program courses are not accepted toward the fulfillment of certificate requirements, although these grades will be included in the calculation of the GPA. Students must have at least a 3.0 GPA in certificate courses in order to be awarded a certificate. Students in certificate programs must take a minimum of 6 credit hours during each 12-month period and complete the certificate in four years. International students must enroll in 12 credit hours each semester (except for summer). A maximum of 3 credit hours earned at an accredited college or university may be applied toward the certificate as transfer credit.

#### **Course Requirements**

- CSC-280 Introduction to Computer Science (4)
- MATH-211 Applied Calculus I (4)
- MATH-212 Applied Calculus II (3)
- STAT-202 Basic Statistics (4)
- STAT-300 Business and Economic Statistics (3)  
*or*  
STAT-302 Intermediate Statistics (3)  
*or*  
STAT-514 Statistical Methods (3)

## **Combined B.S. in Applied Mathematics and M.A. in Mathematics**

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This program enables students to earn both a B.S. in Applied Mathematics and an M.A. in Mathematics.

### **Requirements**

- All requirements for the B.S. in Applied Mathematics  
Undergraduate students may apply 6 credit hours of approved 500-level course work to satisfy the requirements of both degrees.
- All requirements for the M.A. in Mathematics, including a minimum of 24 credit hours completed in residence in graduate status after the undergraduate degree has been awarded.

## **Combined B.S. in Mathematics and M.A. in Mathematics**

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This program enables students to earn both a B.S. in Mathematics and an M.A. in Mathematics.

### **Admission to Program**

Undergraduate students should apply by the end of the junior year. Students should have a minimum grade point average of 3.20 in major courses and have completed one of the following sequences:

MATH-512 Introduction to Modern Algebra *and*  
MATH-513 Rings and Fields

*or*

MATH-520 Introduction to Analysis I *and*  
MATH-521 Measure Theory and Integration

### **Requirements**

- All requirements for the B.S. in Mathematics  
Undergraduate students may apply up to 9 credit hours of approved graduate-level course work to satisfy the requirements of both degrees.
- All requirements for the M.A. in Mathematics, including a minimum of 18 credit hours completed in residence in graduate status after the undergraduate degree has been awarded.

## **Combined B.S. in Mathematics or Statistics and M.S. in Statistics**

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Students receive both a B.S. in Mathematics or Statistics and an M.S. in Statistics.

### **Admission to the Program**

Interested students should apply by the end of their junior year. Applicants should have a minimum grade point average of 3.20 in major courses and complete MATH-501 Probability and STAT-502 Introduction to Mathematical Statistics by the end of the junior year.

### **Requirements**

- All requirements for the B.S. in Mathematics or Statistics (mathematical statistics track)  
Undergraduate students may apply up to 9 credit hours of approved graduate-level course work to satisfy the requirements of both degrees.
- All requirements for the M.S. in Mathematics, including a minimum of 18 credit hours completed in residence in graduate status after the undergraduate degree has been awarded.

## **Combined B.S. in Mathematics and M.S. in Computer Science**

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### **Admission to the Program**

Admission is open to undergraduate mathematics majors with a minimum grade point average of 3.20. Applicants must have completed the following by the end of the junior year:

CSC-280 Introduction to Computer Science I  
CSC-281 Introduction to Computer Science II  
CSC-520 Algorithms and Data Structures

### **Requirements**

- All requirements for the B.S. in Mathematics  
Undergraduate students may apply up to 9 credit hours of approved graduate-level course work to satisfy the requirements of both degrees.
- All requirements for the M.S. in Computer Science, including a minimum of 18 credit hours completed in residence in graduate status after the undergraduate degree has been awarded.

## **M.A. in Mathematics**

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### **Admission to the Program**

In addition to meeting the minimum university requirements for admission, applicants must have an undergraduate degree in mathematics or a related field. Graduate Record Examination (GRE) scores are required. Students entering the M.A. program without the appropriate background will be expected to take certain undergraduate courses as prerequisite work.

### **Degree Requirements**

- 30 credit hours of approved graduate course work including thesis or nonthesis option requirements
- Tool of research: proficiency in Russian, German, French, or an approved computer language
- Written comprehensive examination in mathematics
- Research requirement:  
Thesis option: MATH-797 Master's Thesis Seminar in Mathematics (6) and an oral defense of the thesis  
Nonthesis option: MATH-690 Independent Study Project in Mathematics (3) (topic to be chosen in consultation with a faculty member) requiring an oral and written presentation of the research work and 3 credit hours in approved graduate-level independent research, seminar, or research course.

All course work for the thesis or nonthesis option must be completed with grades of B or better.

## **M.S. in Statistics**

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### **Admission to the Program**

In addition to meeting the minimum university requirements for graduate study, applicants will be expected to have an adequate background in the mathematical sciences. Graduate Record Examination (GRE) scores are required. Students entering the M.S. program without the appropriate background will be expected to take certain undergraduate courses as prerequisite work.

### **Degree Requirements**

- 30–33 credit hours of approved graduate work
- Tool of research: proficiency in French, German, Russian, an approved computer language, or an approved analytical skill such as numerical, complex, or real analysis
- Written comprehensive examination  
Thesis option: Mathematical Statistics  
Nonthesis option: Applied Statistics: Statistical Theory and Applications
- Research requirement:  
Thesis option: STAT-797 Master's Thesis Seminar in Statistics (3–6) requiring a formal written thesis with an oral defense  
Nonthesis option: STAT-691 Internship (3) and STAT-798 Statistical Research and Consulting (3) with required oral and written presentation of the research work  
All course work for the thesis or nonthesis option must be completed with grades of B or better.

### **Course Requirements**

- STAT-515 Regression (3)
- STAT-524 Data Analysis (3)
- STAT-525 Statistical Software (3)
- STAT-530 Mathematical Statistics I (3)
- STAT-531 Mathematical Statistics II (3)
- STAT-616 Generalized Linear Models (3)
- STAT-691 Internship in Statistics (3)

#### **Thesis option**

- STAT-797 Master's Thesis Seminar (3-6)
- Two additional graduate courses in mathematics or statistical theory

#### **Nonthesis option**

- STAT-510 Survey Sampling (3)
- STAT-798 Statistical Research and Consulting (1) (taken at least three times)
- Two additional graduate courses in statistical theory, methods, and applications, including approved related courses offered by other departments

## **Graduate Certificate in Applied Statistics**

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### **Admission to the Program**

Open to students with a bachelor's degree from an accredited institution.

### **Certificate Requirements**

- 15 credit hours of approved course work with grades of C or better

Grades of C- or D in certificate program courses are not accepted toward the fulfillment of certificate requirements, although these grades will be included in the calculation of the GPA. Students must have at least a 3.0 GPA in certificate courses in order to be awarded a certificate. Students in certificate programs must take a minimum of 6 credit hours during each 12-month period and complete the certificate in

four years. International students must enroll in 9 credit hours each semester (except for summer). A maximum of 3 credit hours earned at an accredited college or university may be applied toward the certificate as transfer credit.

### **Course Requirements**

- STAT-530 Mathematical Statistics I (3)
- STAT-531 Mathematical Statistics II (3)
- Three of the following:
  - STAT-510 Theory of Sampling I (3)
  - STAT-515 Regression (3)
  - STAT-516 Design of Experiments (3)
  - STAT-517 Special Topics in Statistical Methodology (3)*or*
  - STAT-519 Nonparametric Statistics (3)