



## Program of Study

### Degree Requirements (120 hours)

#### 1. Carolina Core (34-46 hours)

- a. **CMW** (6 hours): any approved CC-CMW course –*must be passed with a grade of C or higher*
- b. **ARP** (8 hours) –*must be passed with a grade of C or higher*
  - i. MATH 141 - Calculus I
  - ii. MATH 142 - Calculus II
- c. **SCI** (8 hours): Two 4-credit hours laboratory science courses
- d. **GFL** (0-6 hours): Demonstration of proficiency in one foreign language equivalent to the minimal passing grade on the exit examination in the 122 course is required for all baccalaureate degrees. Students can demonstrate this proficiency by successfully completing Phase II of the Proficiency Test or by successfully completing the 122 course, including the exit exam administered as part of that course.  
*It is strongly recommended that students continuing the study of a foreign language begin college-level study of that language in their first semester and continue in that language until their particular foreign language requirement is completed.*
- e. **GHS** (3 hours): any approved CC-GHS course
- f. **GSS** (3 hours): any approved CC-GSS course
- g. **AIU** (3 hours): any approved CC-AIU course

#### **Carolina Core Stand Alone or Overlay Eligible Requirements:**

Up to two of these requirements may be met in overlay courses. At least one of these requirements must be satisfied by a course not applied elsewhere in general education. (3-9 Hours)

- h. **CMS** (3 hours): any approved overlay or stand-alone CC-CMS course
- i. **INF** (0-3 hours): any approved overlay or stand-alone CC-INF course
- j. **VSR** (0-3 hours): any approved overlay or stand-alone CC-VSR course

#### 2. College Requirements (15-18 hours)

- a. **Foreign language course** (0-3 hours) –*only if needed to meet 122-level proficiency*
- b. **Analytical Reasoning** (6 hours) –*must be passed with a grade of C or higher*
  - i. CSCE 145 - Algorithmic Design I *or* CSCE 206 - Scientific Applications Programming
  - ii. STAT 509 - Statistics for Engineers, STAT 512 - Mathematical Statistics *or* STAT 515 - Statistical Methods I
- c. **History** (3 hours): The College of Arts and Sciences requires one U.S. History and one non-U.S. History course, both of which must be chosen from the approved Carolina Core GHS courses. Whichever is not fulfilled through the Carolina Core GHS requirement must be fulfilled through this college requirement.
- d. **Social Science** (3 hours): choose any from the list of CC-GSS approved courses
- e. **Fine Arts or Humanities** (3 hours)

#### 3. Program Requirements (32-47 hours)

- a. **Cognate or Minor** (12-18 hours):

##### **Cognate**

The cognate is intended to support the course work in the major. The cognate must consist of twelve (12) hours of courses at the advanced level, outside of but related to the major. The cognate may be taken in one or more departments or programs, depending on the interests of the student and the judgment of the advisor.

Courses offered by departments and programs that are acceptable for cognate credit are outlined in the section titled Courses Acceptable for Cognate Credit in Degree Programs in the College of Arts and Sciences.

For cognate course offerings in other colleges, consult the appropriate sections of this bulletin. Some major programs have specific cognate requirements.

It should be emphasized that the cognate is not a second set of elective courses to be chosen at random by the student. The cognate must be approved by the major advisor as being related to the major field of study. Students are urged to consult their major advisors for specific requirements in their major.

Courses applied toward general education requirements cannot be counted toward the cognate.

For Bachelor of Science degrees, grades of **D** are acceptable for completion of the cognate requirement, except where restricted by the major program.

### **Minor**

In place of the cognate a student in the College of Arts and Sciences may choose a minor consisting of at least 18 credit hours of prescribed courses. (Some minors in the sciences require a minimum of 16 hours.) The subject area of the minor may be related to the major. Students pursuing interdisciplinary minors who wish to use courses in their major department for minor credit must petition the College Committee on Scholastic Standards and Petitions for permission to do so.

The minor is intended to develop a coherent basic preparation in a second area of study. It differs from the cognate inasmuch as the courses must be concentrated in one area and must follow a structured sequence. Interdisciplinary minors can be designed with the approval of the assistant dean for academic affairs and advising.

Courses applied toward general education requirements cannot be counted toward the minor. No course may satisfy both major and minor requirements. **All minor courses must be passed with a grade of C or higher.** At least half of the courses in the minor must be completed in residence at the University.

A list of minor programs of study can be found at Programs A-Z.

- b. **Supporting Courses** (6 hours) –*must be passed with a grade of C or higher*
- i. MATH 241 - Vector Calculus
  - ii. MATH 300 - Transition to Advanced Mathematics

- c. **Electives** (8-29 hours): No courses of a remedial, developmental, skill-acquiring, or vocational nature may apply as credit toward degrees in the College of Arts and Sciences. The College of Arts and Sciences allows the use of the Pass-Fail option on elective courses. Further clarification on inapplicable courses can be obtained from the College of Arts and Sciences.

Note: 0-14 hours of electives will be needed to reach hours to graduate and Program Requirements will range from 17-32 hours, if completing the B.S. with Distinction in Mathematics.

4. **Major Requirements (24 hours)** –*a minimum grade of C is required in all major courses*

- a. **Major Courses** (12 hours)
- i. MATH 544 - Linear Algebra
  - ii. MATH 546 - Algebraic Structures I
  - iii. One course (3 hours) from the following:
    1. MATH 511 - Probability
    2. MATH 520 - Ordinary Differential Equations
    3. MATH 534 - Elements of General Topology
    4. MATH 550 - Vector Analysis
    5. MATH 552 - Applied Complex Variables
  - iv. MATH 554 - Analysis I
- b. **Major Electives** (12 hours)
- i. At least 12 hours of MATH electives numbered 500-599. The choice of the four MATH electives should be made to support the student's educational goals and career objectives. The courses listed below are available for MATH elective credit. (As MATH 544, 546, and 554 are required of all majors, these are not listed.) Undergraduate students interested in taking 700-level MATH courses as elective credit should consult the Graduate Bulletin.
    1. **Algebra**
      - MATH 540 - Modern Applied Algebra
      - MATH 541 - Algebraic Coding Theory
      - MATH 547 - Algebraic Structures II
    2. **Analysis**
      - MATH 511 - Probability

- MATH 550 - Vector Analysis
  - MATH 551 - Introduction to Differential Geometry
  - MATH 552 - Applied Complex Variables
  - MATH 555 - Analysis II
3. **Differential Equations and Modeling**
    - MATH 520 - Ordinary Differential Equations
    - MATH 521 - Boundary Value Problems and Partial Differential Equations
    - MATH 522 - Wavelets
    - MATH 523 - Mathematical Modeling of Population Biology
  4. **Discrete Mathematics**
    - MATH 541 - Algebraic Coding Theory
    - MATH 570 - Discrete Optimization
    - MATH 574 - Discrete Mathematics I
    - MATH 575 - Discrete Mathematics II
    - MATH 576 - Combinatorial Game Theory
    - MATH 587 - Introduction to Cryptography
  5. **Financial Mathematics and Probability**
    - MATH 511 - Probability
    - MATH 514 - Financial Mathematics I
    - MATH 515 - Financial Mathematics II
    - MATH 525 - Mathematical Game Theory
  6. **Geometry**
    - MATH 531 - Foundations of Geometry
    - MATH 532 - Modern Geometry
    - MATH 533 - Elementary Geometric Topology
    - MATH 534 - Elements of General Topology
    - MATH 551 - Introduction to Differential Geometry
  7. **Mathematic Logic**
    - MATH 561 - Introduction to Mathematical Logic
    - MATH 562 - Theory of Computation
  8. **Number Theory**
    - MATH 580 - Elementary Number Theory
    - MATH 587 - Introduction to Cryptography
  9. **Optimization and Computation**
    - MATH 524 - Nonlinear Optimization
    - MATH 527 - Numerical Analysis
    - MATH 570 - Discrete Optimization
  10. **Special Topics**
    - MATH 599 - Topics in Mathematics

### **B.S. with Distinction in Mathematics (39 hours)**

#### a. **Prerequisite**

A minimum GPA of 3.60 in upper division (500 and above) major courses, and 3.30 cumulative when the student applies to enter the B.S. with Distinction in Mathematics.

#### b. **Requirements**

The student should apply to enter the B.S. with Distinction in Mathematics track and choose the members of the thesis committee as early as possible, but in all cases at least one year before completion of the degree. The committee will consist of a thesis advisor, who must be a tenure-track faculty member in Mathematics, and one or two other tenure-track or research faculty members in Mathematics or any other department, as approved by the Undergraduate Advisory Council. The senior thesis consists of either significant original work or a synthesis of known material beyond the scope of ordinary undergraduate coursework. The student

may use their senior thesis to simultaneously fulfill other requirements as well (e.g., Magellan Scholarship, Honors College Thesis, etc.), at the discretion of the thesis advisor.

By the end of the semester in which the student is admitted into the B.S. with Distinction in Mathematics track, a brief research plan must be agreed upon by the thesis committee and the student, and filed in the Department of Mathematics and College of Arts and Sciences. Before submitting and defending the thesis, the student must have completed three credit hours of MATH 499 (Undergraduate Research) under the supervision of the thesis advisor, and at least 12 hours of upper-level (500 and above) MATH credit approved by the Undergraduate Director beyond the 24 credit hours of 500-level MATH courses required for the B.S. in Mathematics.

By the end of the student's last semester, the student must present and defend the senior thesis before the thesis committee. The defense must be announced at least one week in advance and be open to the general public. A certificate attesting to a successful defense, signed by the committee, must be placed on file with both the Department of Mathematics and the College of Arts and Sciences. In addition, prior to graduation the student must have either (a) presented the research at a meeting of a professional society, at Discovery Day at USC, or at a comparable venue; or (b) submitted the work for publication in an undergraduate or professional journal.

### **Retention and Other Details**

1. A grade of C or better is required in each MATH course.
2. A student may enroll in each MATH course a maximum of two times. (Enrolled in a course is interpreted to mean that a grade, including W or WF, has been recorded.)
3. A student may repeat a maximum of three MATH courses. (Receiving a grade of W is not to be considered a repeat.)