The Department of Biology has a strong commitment to teaching at both the undergraduate and graduate levels. Recipients of undergraduate biology degrees find employment in a wide range of fields and are well-prepared for further study in graduate school and in health-related professions such as medicine, dentistry, and veterinary medicine. Writing- and speaking-intensive courses and laboratory classes help develop communication and research skills.

The department’s tradition of excellence in education is complemented by a faculty actively engaged in research in areas ranging from molecular biology and biochemistry to ecology and evolution. Students are encouraged to gain research experience through independent study with a faculty mentor.

**Transfer Credit**

Credit for courses above the 100 level is transferred as Biology elective credit only. To establish transfer credit for specific Biology courses above the 100 level, students should contact the Director of Undergraduate Studies or Associate Head. Transfer students are reminded that at least 12 semester hours in the major must be completed at UNCG.

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**BIOLOGY Major (BIOL)—B.A. OR B.S.**

**Degree:** Bachelor of Arts or Bachelor of Science

Required: 122 semester hours, to include at least 36 hours at or above the 300 course level

Available Concentrations and AOS Codes:

- Biology—B.A., U117
- Comprehensive Science High School Teaching Licensure—B.A., U119
- Biology—B.S., U116
- Biotechnology—B.S., U214
- Comprehensive Science High School Teaching Licensure—B.S., U218
- Environmental Biology—B.S., U118
- Human Biology—B.S., U863

**Biology Major: Biology Concentration (BIOL)—B.A.**

**Degree:** Bachelor of Arts

Required: 122 semester hours, to include at least 36 hours at or above the 300 course level

AOS Code: U117

The Department offers a full range of courses leading to the B.A. degree. The degree may lead to further study in graduate school, medicine, dentistry, veterinary medicine, medical technology, biotechnology, and environmental biology. See also Preprofessional Programs. Both study and laboratory facilities are available to advanced undergraduates.

**I General Education Core Requirements (GEC)**

See complete GEC requirements under General Education Program in the University Requirements section. See the GEC Course Summary Table for approved courses.

- **GLT—Literature** (6 s.h.)
  - Student selects 6 s.h. from GLT list.
- **GFA—Fine Arts** (3 s.h.)
  - Student selects 3 s.h. from GFA list.
- **GPR—Philosophical, Religious, Ethical Principles** (3 s.h.)
  - Student selects 3 s.h. from GPR list.
- **GHP—Historical Perspectives** (3 s.h.)
  - Student selects 3 s.h. from GHP list.
- **GNS—Natural Sciences** (7 s.h.)
  - BIO 111 Principles of Biology I
  - CHE 111 General Chemistry I
  - GMT—Mathematics (3 s.h.)
    - MAT 151 Precalculus II
    - or
    - MAT 191 Calculus I
GRD—Reasoning and Discourse (6 s.h.)
  ENG 101 College Writing I
  or
  FMS 115 Freshman Seminar in Reasoning and Discourse I
  or
  RCO 101 College Writing I

Student selects additional 3 s.h. from the GRD list.

GSB—Social and Behavioral Sciences (6 s.h.)
Student selects 6 s.h. from GSB list.

II General Education Marker Requirements
See complete GEC requirements under General Education Program in the University Requirements section. See the GEC Course Summary Table for approved courses.

GL/GN—Global/Global Non-Western Perspectives
Four courses carrying GL/GN markers, at least one of which must carry the GN marker.

One SI (Speaking Intensive) Course
In addition to this SI Marker requirement, students must also complete a second SI course within the major. All programs have identified at least one course among their major requirements that is taught as Speaking Intensive.

One WI (Writing Intensive) Course
In addition to this WI Marker requirement, students must also complete a second WI course within the major. All programs have identified at least one course among their major requirements that is taught as Writing Intensive.

III College of Arts and Sciences Additional Requirements (CAR)
See CAR requirements in the Academic Units section. See the GEC Course Summary Table for approved CAR courses.

GMO/GPM—Historical Perspectives (3 s.h.)
Student selects 3 s.h. from GMO or GPM list, depending on category used to satisfy GHP requirement.

GLS/GPS—Natural Sciences (3–4 s.h.)
Required:
  BIO 112 Principles of Biology II

One SI (Speaking Intensive) Course
In addition to this SI Marker requirement, students must also complete a second SI course within the major. All programs have identified at least one course among their major requirements that is taught as Speaking Intensive.

One WI (Writing Intensive) Course
In addition to this WI Marker requirement, students must also complete a second WI course within the major. All programs have identified at least one course among their major requirements that is taught as Writing Intensive.

IV Major Requirements
Program Qualifications
BIO 111 Principles of Biology I
BIO 112 Principles of Biology II

Additional Qualifications
- A minimum of 30 semester hours of Biology courses above the 100 level.
- A maximum of 4 s.h. at the 200 level may be counted toward the major.
- Students must have a grade point average of at least 2.0 in Biology courses completed at UNCG.

Core Courses
In meeting the requirement for hours above the 100 level, all B.A. in Biology majors must complete the following core courses; completion of at least four of these requirements is strongly recommended prior to enrollment in courses numbered 400 and higher.
  1. Ecology
     BIO 301 Principles of Ecology
  2. Cell Biology
     BIO 355 Cell Biology
  3. Genetics
     BIO 392 Genetics
  4. Evolution
     BIO 330 Evolution
  5. Two laboratory courses
     BIO 315 Ecology and Evolution Laboratory
     BIO 375 Cell Biology and Genetics Laboratory

V Related Area Requirements
1. Required
   CHE 111 General Chemistry I
   CHE 112 General Chemistry I Laboratory
   CHE 114 General Chemistry II
   CHE 115 General Chemistry II Laboratory

2. Required
   MAT 151 Precalculus II
   or
   MAT 191 Calculus I

Recommended
The department highly recommends the courses listed below in addition to the required courses listed above.
  1. Required
     CHE 351 Organic Chemistry I
     CHE 352 Organic Chemistry II
     CHE 354 Organic Chemistry Laboratory
  2. Required
     MAT 191 Calculus I
     MAT 292 Calculus II
  3. STA 271 Fundamental Concepts of Statistics
  4. PHY 211 General Physics I
     PHY 212 General Physics II

VI Electives
Electives sufficient to complete the 122 semester hours required for the degree.
Biology Major: Comprehensive Science High School Teaching Licensure (BIOL)—B.A.
Degree: Bachelor of Arts
Required: 122 semester hours, to include at least 36 hours at or above the 300 course level; note that licensure programs may require hours beyond the minimum listed.
AOS Code: U119

The Comprehensive Science High School Licensure (BIOL) program provides a strong background in biology as well as licensure for high school biology teaching. In addition, successful completion of this program qualifies candidates to teach other high school science subjects as well.

The Department offers a full range of courses leading to the B.A. degree. The degree may lead to further study in graduate school, medicine, dentistry, veterinary medicine, medical technology, biotechnology, and environmental biology. See also Preprofessional Programs. Both study and laboratory facilities are available to advanced undergraduates.

Students seeking admission to the UNCG Teacher Education Program with a major in Biology must meet the following minimum requirements of the Department of Biology:

1. Completion of a minimum of 9 s.h. in biology courses, with at least six of those hours from courses taken at UNCG
2. A grade point average of at least 2.50 for biology courses completed at UNCG

Students already admitted to the UNCG Teacher Education Program with a major in Biology who are seeking admission to Student Teaching must meet the following requirements of the Department of Biology:

1. Completion of a minimum of 18 s.h. of biology courses, with at least 15 of those hours from courses taken at UNCG
2. A grade point average of at least 2.50 for biology courses completed at UNCG

I General Education Core Requirements (GEC)

See complete GEC requirements under General Education Program in the University Requirements section. See the GEC Course Summary Table for approved courses.

GLT—Literature (6 s.h.)
Student selects 6 s.h. from GLT list.
GFA—Fine Arts (3 s.h.)
Student selects 3 s.h. from GFA list.
GPR—Philosophical, Religious, Ethical Principles (3 s.h.)
Student selects 3 s.h. from GPR list.
GHP—Historical Perspectives (3 s.h.)
Student selects 3 s.h. from GHP list.
GNS—Natural Sciences (7 s.h.)
BIO 111 Principles of Biology I
CHE 111 General Chemistry I

GMT—Mathematics (3 s.h.)
MAT 151 Precalculus II
or
MAT 191 Calculus I
GRD—Reasoning and Discourse (6 s.h.)
ENG 101 College Writing I
or
FMS 115 Freshman Seminar in Reasoning and Discourse I
or
RCO 101 College Writing I

Student selects additional 3 s.h. from the GRD list.
GSB—Social and Behavioral Sciences (6 s.h.)
Student selects 6 s.h. from GSB list.

II General Education Marker Requirements

See complete GEC requirements under General Education Program in the University Requirements section. See the GEC Course Summary Table for approved courses.

GL/GN—Global/Global Non-Western Perspectives
Four courses carrying GL/GN markers, at least one of which must carry the GN marker.

One SI (Speaking Intensive) Course
In addition to this SI Marker requirement, students must also complete a second SI course within the major. All programs have identified at least one course among their major requirements that is taught as Speaking Intensive.

One WI (Writing Intensive) Course
In addition to this WI Marker requirement, students must also complete a second WI course within the major. All programs have identified at least one course among their major requirements that is taught as Writing Intensive.

III College of Arts and Sciences Additional Requirements (CAR)

See CAR requirements in the Academic Units section. See the GEC Course Summary Table for approved CAR courses.

GMO/GPM—Historical Perspectives (3 s.h.)
Student selects 3 s.h. from GMO or GPM list, depending on category used to satisfy GHP requirement.
GLS/GPS—Natural Sciences (3–4 s.h.)
Required:
BIO 112 Principles of Biology II
GSB—Social and Behavioral Sciences (3 s.h.)
Student selects 3 s.h. from GSB list.
GFL—Foreign Language (0–12 s.h.)
Intermediate-level proficiency in one language, demonstrated by placement test, or completion of course work through course number 204.
WI—Writing Intensive Courses
A total of four WI courses.
IV Major Requirements

Program Qualifications
BIO 111 Principles of Biology I
BIO 112 Principles of Biology II

Additional Qualifications
- A minimum of 30 semester hours of Biology courses above the 100 level.
- A maximum of 4 s.h. at the 200 level may be counted toward the major.
- Students must have a grade point average of at least 2.0 in Biology courses completed at UNCG.

Core Courses
In meeting the requirement for hours above the 100 level, all B.A. in Biology majors must complete the following core courses; completion of at least four of these requirements is strongly recommended prior to enrollment in courses numbered 400 and higher.
1. Ecology
   BIO 301 Principles of Ecology
2. Cell Biology
   BIO 355 Cell Biology
3. Genetics
   BIO 392 Genetics
4. Evolution
   BIO 330 Evolution
5. Two laboratory courses
   BIO 315 Ecology and Evolution Laboratory
   BIO 375 Cell Biology and Genetics Laboratory

V Related Area Requirements
1. Required
   CHE 111 General Chemistry I
   CHE 111 General Chemistry I Laboratory
   CHE 114 General Chemistry II
   CHE 115 General Chemistry II Laboratory
2. Required
   MAT 151 Precalculus II
   or
   MAT 191 Calculus I

Recommended
The department highly recommends the courses listed below in addition to the required courses listed above.
1. Required
   CHE 351 Organic Chemistry I
   CHE 352 Organic Chemistry II
   CHE 354 Organic Chemistry Laboratory
2. Required
   MAT 191 Calculus I
   MAT 292 Calculus II
3. STA 271 Fundamental Concepts of Statistics
4. PHY 211 General Physics I
   PHY 212 General Physics II

VI Additional Requirements for Teacher Licensure
The Teaching Licensure program in Biology includes a diverse science curriculum in order to align with licensure requirements of the North Carolina Department of Public Instruction.

a. 1. Required
   GEO 103 Introduction to Earth Science
2. One or more of the courses listed below.
   GEO 111 Physical Geology
   GEO 205 Environmental Change: Its Nature and Impact
   GEO 311 Weather and Climate
   GEO 314 Physical Geography: Landscape Processes

b. The following courses must be taken in a specified sequence terminating in student teaching in the spring semester of the senior year. See the online Secondary Education Handbook for more information.
1. Required
   TED 535 Literacy in the Content Area
2. Required
   ERM 401 Assessment I: Accountability in Our Nation’s Schools
   ERM 402 Assessment II: Standardized Tests
   ERM 403 Assessment III: Classroom Assessment
3. Required
   TED 401 Child and Adolescent Development and Learning
   SES 401 Understanding and Teaching Students with Disabilities in Inclusive Settings
   TED 403 Teaching English Learners with Diverse Abilities
4. Required
   TED 445 Human Diversity, Teaching, and Learning
5. Required
   TED 559 Teaching Practices and Curriculum in Science
6. The course provided below for 12 s.h.
   TED 465 Student Teaching and Seminar: Secondary School
7. Strongly recommended
   LIS 120/TED 120 Introduction to Instructional Technology for Educational Settings

VII Electives
Electives sufficient to complete the 122 semester hours required for the degree.
Biology Major: Biology Concentration (BIOL)—B.S.
Degree: Bachelor of Science
Required: 122 semester hours, to include at least 36 hours at or above the 300 course level
AOS Code: Biology, U116

The Bachelor of Science degree is offered for those students aspiring to a professional career in biology, and for those students with particularly strong interests in the discipline. See also Preprofessional Programs. A student pursuing the Bachelor of Science is expected to develop a stronger background in mathematics and related sciences and to attain a greater understanding of biology than will a student pursuing a Bachelor of Arts degree. Bachelor of Science students will also be strongly encouraged to undertake an individual research project with a faculty member during their junior and/or senior year.

I General Education Core Requirements (GEC)
See complete GEC requirements under General Education Program in the University Requirements section. See the GEC Course Summary Table for approved courses.

GLT—Literature (6 s.h.)
Student selects 6 s.h. from GLT list.

GFA—Fine Arts (3 s.h.)
Student selects 3 s.h. from GFA list.

GPR—Philosophical, Religious, Ethical Principles (3 s.h.)
Student selects 3 s.h. from GPR list.

GHP—Historical Perspectives on Western Culture (3 s.h.)
Student selects 3 s.h. from GHP list.

GNS—Natural Sciences (7 s.h.)
BIO 111 Principles of Biology I
CHE 111 General Chemistry I

GMT—Mathematics (3 s.h.)
MAT 191 Calculus I

GRD—Reasoning and Discourse (6 s.h.)
ENG 101 College Writing I
or
FMS 115 Freshman Seminar in Reasoning and Discourse I
or
RCO 101 College Writing I

Student selects additional 3 s.h. from the GRD list.

GSB—Social and Behavioral Sciences (6 s.h.)
Student selects 6 s.h. from GSB list.

II General Education Marker Requirements
See complete GEC requirements under General Education Program in the University Requirements section. See the GEC Course Summary Table for approved courses.

GL/GN—Global/Global Non-Western Perspectives
Four courses carrying GL/GN markers, at least one of which must carry the GN marker.

One SI (Speaking Intensive) Course
In addition to this SI Marker requirement, students must also complete a second SI course within the major. All programs have identified at least one course among their major requirements that is taught as Speaking Intensive.

One WI (Writing Intensive) Course
In addition to this WI Marker requirement, students must also complete a second WI course within the major. All programs have identified at least one course among their major requirements that is taught as Writing Intensive.

III College of Arts and Sciences Additional Requirements (CAR)
See CAR requirements in the Academic Units section. See the GEC Course Summary Table for approved CAR courses.

GMO/GPM—Historical Perspectives (3 s.h.)
Student selects 3 s.h. from GMO or GPM list, depending on category used to satisfy GHP requirement.

GLS/GPS—Natural Sciences (3–4 s.h.)
Required:
BIO 112 Principles of Biology II

GSB—Social and Behavioral Sciences (3 s.h.)
Student selects 3 s.h. from GSB list.

GFL—Foreign Language (0–12 s.h.)
Intermediate-level proficiency in one language, demonstrated by placement test, or completion of course work through course number 204.

WI—Writing Intensive Courses
A total of four WI courses.

IV Major Requirements

Program Qualifications
BIO 111 Principles of Biology I
BIO 112 Principles of Biology II

Additional Qualifications
- A minimum of 30 semester hours of Biology courses above the 100 level.
- A maximum of 4 s.h. at the 200 level may be counted toward the major.
- Students must have a grade point average of at least 2.0 in Biology courses completed at UNCG.

B.S. in Biology Core Courses
In meeting the requirement for hours above the 100 level, all B.A. in Biology majors must complete the following core courses; completion of at least four of these requirements is strongly recommended prior to enrollment in courses numbered 400 and higher.

1. Ecology
   BIO 301 Principles of Ecology

2. Cell Biology
   BIO 355 Cell Biology

3. Genetics
   BIO 392 Genetics

4. Evolution
   BIO 330 Evolution
Two laboratory courses
BIO 315 Ecology and Evolution Laboratory
BIO 375 Cell Biology and Genetics Laboratory

One additional course at the 500 level

Strongly Recommended
BIO 499 Undergraduate Research
BIO 493 Honors Work

V Related Area Requirements
1. Required
   CHE 111 General Chemistry I
   CHE 112 General Chemistry I Laboratory
   CHE 114 General Chemistry II
   CHE 115 General Chemistry II Laboratory
   CHE 351 Organic Chemistry I
   CHE 352 Organic Chemistry II
   CHE 354 Organic Chemistry Laboratory
2. Required
   MAT 191 Calculus I
   MAT 292 Calculus II
   or
   STA 271 Fundamental Concepts of Statistics
3. Required
   PHY 211 General Physics I
   and
   PHY 212 General Physics II
   or
   PHY 291 General Physics I with Calculus
   and
   PHY 292 General Physics II with Calculus

VI Electives
Electives sufficient to complete the 122 semester hours required for the degree.

Biology Major: Biotechnology Concentration (BIOL)—B.S.
Degree: Bachelor of Arts
Required: 122 semester hours, to include at least 36 hours at or above the 300 course level
AOS Code: U214

The concentration in biotechnology is designed for students with a strong interest in molecular biology and genetics. Courses will prepare students in both conceptual aspects of molecular biology and their practical application in biotechnology and genetic engineering.

I General Education Core Requirements (GEC)
See complete GEC requirements under General Education Program in the University Requirements section. See the GEC Course Summary Table for approved courses.

GLT—Literature (6 s.h.)
   Student selects 6 s.h. from GLT list.
GFA—Fine Arts (3 s.h.)
   Student selects 3 s.h. from GFA list.
GPR—Philosophical, Religious, Ethical Principles (3 s.h.)
   Student selects 3 s.h. from GPR list.
GHP—Historical Perspectives on Western Culture (3 s.h.)
   Student selects 3 s.h. from GHP list.
GNS—Natural Sciences (7 s.h.)
   BIO 111 Principles of Biology I
   CHE 111 General Chemistry I
GMT—Mathematics (3 s.h.)
   MAT 191 Calculus I
GRD—Reasoning and Discourse (6 s.h.)
   ENG 101 College Writing I
   or
   FMS 115 Freshman Seminar in Reasoning and Discourse I
   or
   RCO 101 College Writing I

   Student selects additional 3 s.h. from the GRD list.
GSB—Social and Behavioral Sciences (6 s.h.)
   Student selects 6 s.h. from GSB list.

II General Education Marker Requirements
See complete GEC requirements under General Education Program in the University Requirements section. See the GEC Course Summary Table for approved courses.

GL/GN—Global/Global Non-Western Perspectives
   Four courses carrying GL/GN markers, at least one of which must carry the GN marker.

One SI (Speaking Intensive) Course
In addition to this SI Marker requirement, students must also complete a second SI course within the major. All programs have identified at least one course among their major requirements that is taught as Speaking Intensive.

One WI (Writing Intensive) Course
In addition to this WI Marker requirement, students must also complete a second WI course within the major. All programs have identified at least one course among their major requirements that is taught as Writing Intensive.

III College of Arts and Sciences Additional Requirements (CAR)
See CAR requirements in the Academic Units section. See the GEC Course Summary Table for approved CAR courses.

GMO/GPM—Historical Perspectives (3 s.h.)
   Student selects 3 s.h. from GMO or GPM list, depending on category used to satisfy GHP requirement.
GLS/GPS—Natural Sciences (3–4 s.h.)
   Required:
   BIO 112 Principles of Biology II
   GSB—Social and Behavioral Sciences (3 s.h.)
   Student selects 3 s.h. from GSB list.
Biology

GFL—Foreign Language (0–12 s.h.)
Intermediate-level proficiency in one language, demonstrated by placement test, or completion of course work through course number 204.

WI—Writing Intensive Courses
A total of four WI courses.

IV Major Requirements
Program Qualifications
BIO 111 Principles of Biology I
BIO 112 Principles of Biology II

Additional Qualifications
• A minimum of 30 semester hours of Biology courses above the 100 level.
• A maximum of 4 s.h. at the 200 level may be counted toward the major.
• Students must have a grade point average of at least 2.0 in Biology courses completed at UNCG.

B.S. in Biology Core Courses
In meeting the requirement for hours above the 100 level, all B.A. in Biology majors must complete the following core courses; completion of at least four of these requirements is strongly recommended prior to enrollment in courses numbered 400 and higher.
1. Ecology
   BIO 301 Principles of Ecology
2. Cell Biology
   BIO 355 Cell Biology
3. Genetics
   BIO 392 Genetics
4. Evolution
   BIO 330 Evolution
5. Two laboratory courses
   BIO 315 Ecology and Evolution Laboratory
   BIO 375 Cell Biology and Genetics Laboratory
6. One additional course at the 500 level

Strongly Recommended
BIO 499 Undergraduate Research
BIO 493 Honors Work

Biotechnology Concentration
1. Required
   BIO 481 General Microbiology
   BIO 494 Introduction to Biotechnology
   BIO 535 Biochemistry: Metabolic Regulation in Health and Disease
   The course listed below for at least 1 s.h.
   BIO 596 Molecular Biological Approaches in Research
2. At least one course chosen from the courses listed below.
   BIO 479 Neurobiology
   BIO 497 Internship in Biology
   BIO 499 Undergraduate Research
   BIO 528 Microbial Ecology
   BIO 538 Human Evolutionary Genetics

BIO 540 Genes and Signals
BIO 573 Drugs and the Brain
BIO 578 Hormones in Action
BIO 583 Virology
BIO 584 Immunology
BIO 586 Cell Cycle and Cancer
BIO 587 Epigenetics
BIO 590/MAT 590 Introduction to Mathematical Models in Biology
BIO 595 Advanced Genetics

V Related Area Requirements
1. Required
   CHE 111 General Chemistry I
   CHE 112 General Chemistry I Laboratory
   CHE 114 General Chemistry II
   CHE 115 General Chemistry II Laboratory
   CHE 351 Organic Chemistry I
   CHE 352 Organic Chemistry II
   CHE 354 Organic Chemistry Laboratory

2. Required
   MAT 191 Calculus I
   MAT 292 Calculus II
   or
   STA 271 Fundamental Concepts of Statistics

3. Required
   PHY 211 General Physics I
   and
   PHY 212 General Physics II
   or
   PHY 291 General Physics I with Calculus
   and
   PHY 292 General Physics II with Calculus

VI Electives
Electives sufficient to complete the 122 semester hours required for the degree.

Biology Major: Comprehensive Science High School Teaching Licensure (BIOL)—B.S.
Degree: Bachelor of Science
Required: 122 semester hours, to include at least 36 hours at or above the 300 course level; note that licensure programs may require hours beyond the minimum listed.

AOS Code: U218

The Comprehensive Science High School Licensure (BIOL) program provides a strong background in biology as well as licensure for high school biology teaching. In addition, successful completion of this program qualifies candidates to teach other high school science subjects as well.
The Bachelor of Science degree is offered for those students aspiring to a professional career in biology, and for those students with particularly strong interests in the discipline. See also Preprofessional Programs. A student pursuing the Bachelor of Science is expected to develop a stronger background in mathematics and related sciences and to attain a greater understanding of biology than will a student pursuing a Bachelor of Arts degree. Bachelor of Science students will also be strongly encouraged to undertake an individual research project with a faculty member during their junior and/or senior year.

Students seeking admission to the UNCG Teacher Education Program with a major in Biology must meet the following minimum requirements of the Department of Biology:

1. Completion of a minimum of 9 s.h. in biology courses, with at least six of those hours from courses taken at UNCG
2. A grade point average of at least 2.50 for biology courses completed at UNCG

Students already admitted to the UNCG Teacher Education Program with a major in Biology who are seeking admission to Student Teaching must meet the following requirements of the Department of Biology:

1. Completion of a minimum of 18 s.h. of biology courses, with at least 15 of those hours from courses taken at UNCG
2. A grade point average of at least 2.50 for biology courses completed at UNCG

II General Education Marker Requirements
See complete GEC requirements under General Education Program in the University Requirements section. See the GEC Course Summary Table for approved courses.

GL/GN—Global/Global Non-Western Perspectives
Four courses carrying GL/GN markers, at least one of which must carry the GN marker.

One SI (Speaking Intensive) Course
In addition to this SI Marker requirement, students must also complete a second SI course within the major. All programs have identified at least one course among their major requirements that is taught as Speaking Intensive.

One WI (Writing Intensive) Course
In addition to this WI Marker requirement, students must also complete a second WI course within the major. All programs have identified at least one course among their major requirements that is taught as Writing Intensive.

III College of Arts and Sciences Additional Requirements (CAR)
See CAR requirements in the Academic Units section. See the GEC Course Summary Table for approved CAR courses.

GMO/GPM—Historical Perspectives (3 s.h.)
Student selects 3 s.h. from GMO or GPM list, depending on category used to satisfy GHP requirement.

GLS/GPS—Natural Sciences (3–4 s.h.)
Required:
BIO 112 Principles of Biology II

GSB—Social and Behavioral Sciences (3 s.h.)
Student selects 3 s.h. from GSB list.

GFL—Foreign Language (0–12 s.h.)
Intermediate-level proficiency in one language, demonstrated by placement test, or completion of course work through course number 204.

WI—Writing Intensive Courses
A total of four WI courses.

IV Major Requirements
Program Qualifications
BIO 111 Principles of Biology I
BIO 112 Principles of Biology II

Additional Qualifications
• A minimum of 30 semester hours of Biology courses above the 100 level.
• A maximum of 4 s.h. at the 200 level may be counted toward the major.
• Students must have a grade point average of at least 2.0 in Biology courses completed at UNCG.

B.S. in Biology Core Courses
In meeting the requirement for hours above the 100 level, all B.A. in Biology majors must complete the following core courses; completion of at least four of these requirements is strongly recommended prior to enrollment in courses numbered 400 and higher.
Biology

1. Ecology  
   BIO 301 Principles of Ecology
2. Cell Biology  
   BIO 355 Cell Biology
3. Genetics  
   BIO 392 Genetics
4. Evolution  
   BIO 330 Evolution
5. Two laboratory courses  
   BIO 315 Ecology and Evolution Laboratory  
   BIO 375 Cell Biology and Genetics Laboratory
6. One additional course at the 500 level  
   Strongly recommended  
   BIO 499 Undergraduate Research  
   BIO 493 Honors Work

V Related Area Requirements
1. Required  
   CHE 111 General Chemistry I  
   CHE 112 General Chemistry I Laboratory  
   CHE 114 General Chemistry II  
   CHE 115 General Chemistry II Laboratory  
   CHE 351 Organic Chemistry I  
   CHE 352 Organic Chemistry II  
   CHE 354 Organic Chemistry Laboratory
2. Required  
   MAT 191 Calculus I
   MAT 292 Calculus II  
   or  
   STA 271 Fundamental Concepts of Statistics
3. Required  
   PHY 211 General Physics I  
   PHY 212 General Physics II  
   or  
   PHY 291 General Physics I with Calculus  
   PHY 292 General Physics II with Calculus

VI Additional Requirements for Teacher Licensure
The Teaching Licensure program in Biology includes a diverse science curriculum in order to align with licensure requirements of the North Carolina Department of Public Instruction.

a. Required  
   1. Required  
      GEO 103 Introduction to Earth Science  
   2. One or more of the following:  
      GEO 111 Physical Geology  
      GEO 205 Environmental Change: Its Nature and Impact  
      GEO 311 Weather and Climate  
      GEO 314 Physical Geography: Landscape Processes
b. The following courses must be taken in a specified sequence terminating in student teaching in the spring semester of the senior year. See the online Secondary Education Handbook for more information.
   1. Required  
      TED 535 Literacy in the Content Area
   2. Required  
      ERM 401 Assessment I: Accountability in Our Nation’s Schools  
      ERM 402 Assessment II: Standardized Tests  
      ERM 403 Assessment III: Classroom Assessment
   3. Required  
      TED 401 Child and Adolescent Development and Learning  
      SES 401 Understanding and Teaching Students with Disabilities in Inclusive Settings  
      TED 403 Teaching English Learners with Diverse Abilities
4. Required  
   TED 445 Human Diversity, Teaching, and Learning
5. Required  
   TED 559 Teaching Practices and Curriculum in Science
6. The course listed below for 12 s.h.  
   TED 465 Student Teaching and Seminar: Secondary School
7. Strongly recommended  
   LIS 120/TED 120 Introduction to Instructional Technology for Educational Settings

VII Electives
Electives sufficient to complete the 122 semester hours required for the degree.

Biology Major: Environmental Biology Concentration (BIOL)—B.S.
Degree: Bachelor of Arts
Required: 122 semester hours, to include at least 36 hours at or above the 300 course level
AOS Code: U118

This concentration is designed for students with a strong interest in environmental biology. The concentration provides students with a breadth and depth of environmental awareness, rigorously prepares them for advanced studies in environmental biology and trains them for environmentally-oriented professions.

I General Education Core Requirements (GEC)
See complete GEC requirements under General Education Program in the University Requirements section. See the GEC Course Summary Table for approved courses.

GLT—Literature (6 s.h.)  
Student selects 6 s.h. from GLT list.
GFA—Fine Arts (3 s.h.)  
Student selects 3 s.h. from GFA list.
GPR—Philosophical, Religious, Ethical Principles (3 s.h.)
Student selects 3 s.h. from GPR list.
GHP—Historical Perspectives on Western Culture (3 s.h.)
Student selects 3 s.h. from GHP list.
GNS—Natural Sciences (7 s.h.)
   BIO 111 Principles of Biology I
   CHE 111 General Chemistry I
GMT—Mathematics (3 s.h.)
   MAT 191 Calculus I
GRD—Reasoning and Discourse (6 s.h.)
   ENG 101 College Writing I
   or
   FMS 115 Freshman Seminar in Reasoning and Discourse I
   or
   RCO 101 College Writing I
Student selects additional 3 s.h. from the GRD list.
GSB—Social and Behavioral Sciences (6 s.h.)
Student selects 6 s.h. from GSB list.

II General Education Marker Requirements
See complete GEC requirements under General Education Program in the University Requirements section. See the GEC Course Summary Table for approved courses.

GL/GN—Global/Global Non-Western Perspectives
Four courses carrying GL/GN markers, at least one of which must carry the GN marker.
One SI (Speaking Intensive) Course
In addition to this SI Marker requirement, students must also complete a second SI course within the major. All programs have identified at least one course among their major requirements that is taught as Speaking Intensive.
One WI (Writing Intensive) Course
In addition to this WI Marker requirement, students must also complete a second WI course within the major. All programs have identified at least one course among their major requirements that is taught as Writing Intensive.

III College of Arts and Sciences Additional Requirements (CAR)
See CAR requirements in the Academic Units section. See the GEC Course Summary Table for approved CAR courses.

GMO/GPM—Historical Perspectives (3 s.h.)
   Student selects 3 s.h. from GMO or GPM list, depending on category used to satisfy GHP requirement.
GLS/GPS—Natural Sciences (3–4 s.h.)
   Required:
   BIO 112 Principles of Biology II
GSB—Social and Behavioral Sciences (3 s.h.)
   Student selects 3 s.h. from GSB list.
GFL—Foreign Language (0–12 s.h.)
   Intermediate-level proficiency in one language, demonstrated by placement test, or completion of course work through course number 204.

WI—Writing Intensive Courses
A total of four WI courses.

IV Major Requirements
Program Qualifications
BIO 111 Principles of Biology I
BIO 112 Principles of Biology II

Additional Qualifications
- A minimum of 30 semester hours of Biology courses above the 100 level.
- A maximum of 4 s.h. at the 200 level may be counted toward the major.
- Students must have a grade point average of at least 2.0 in Biology courses completed at UNCG.

B.S. in Biology Core
In meeting the requirement for hours above the 100 level, all B.A. in Biology majors must complete the following core courses; completion of at least four of these requirements is strongly recommended prior to enrollment in courses numbered 400 and higher.
1. Ecology
   BIO 301 Principles of Ecology
2. Cell Biology
   BIO 355 Cell Biology
3. Genetics
   BIO 392 Genetics
4. Evolution
   BIO 330 Evolution
5. Two laboratory courses
   BIO 315 Ecology and Evolution Laboratory
   BIO 375 Cell Biology and Genetics Laboratory
6. One additional course at the 500 level

Strongly Recommended
BIO 499 Undergraduate Research
BIO 493 Honors Work

Environmental Biology Concentration
1. Required
   BIO 431 The Biosphere
2. One course chosen from the advanced Biology courses listed below.
   BIO 361 Biology and Conservation of Sea Turtles
   BIO 422 Plant Diversity
   BIO 441 Invertebrate Zoology
   BIO 470 Vertebrate Zoology
   BIO 554 Vascular Plant Systematics
3. At least one additional course chosen from the advanced Biology courses listed below.
   BIO 420 Marine Biology
   BIO 438/PSY 438 Animal Behavior
   BIO 501 Advanced Topics in Animal Ecology
   BIO 505 Advanced Topics in Ecological Physiology
   BIO 510 Advanced Topics in Plant Ecology
   BIO 520 Ecosystem Ecology and Biogeochemistry
   BIO 522 Landscape Ecology
Biology

BIO 526 Conservation Biology
BIO 528 Microbial Ecology
BIO 529 Aquatic Ecology
BIO 538 Human Evolutionary Genetics
BIO 541 Entomology
BIO 552 Metamorphosis
BIO 560 Symbiosis
BIO 579 Environmental Physiology

VI Electives
Electives sufficient to complete the 122 semester hours required for the degree.

Biology Major: Human Biology Concentration (BIOL)—B.S.
Degree: Bachelor of Arts
Required: 122 semester hours, to include at least 36 hours at or above the 300 course level
AOS Code: U863

This concentration is designed for biology majors who want to develop the ability to integrate biological knowledge as it relates to human beings. The study of human biology requires fundamental knowledge of basic life science, since humans and other animals share a large number of structural, chemical, and control mechanisms. Moreover, human behavior occurs within a specific evolutionary and ecological setting, just as it does in other animals. Full appreciation of human biology, including our complex brains, our communication and conceptual abilities, and our social structures, requires an understanding drawn not only from biology but also from basic courses in anthropology and psychology, and from additional academic disciplines in the humanities and sciences.

I General Education Core Requirements (GEC)
See complete GEC requirements under General Education Program in the University Requirements section. See the GEC Course Summary Table for approved courses.

GLT—Literature (6 s.h.)
Student selects 6 s.h. from GLT list.
GFA—Fine Arts (3 s.h.)
Student selects 3 s.h. from GFA list.
GPR—Philosophical, Religious, Ethical Principles (3 s.h.)
Student selects 3 s.h. from GPR list.
GHP—Historical Perspectives on Western Culture (3 s.h.)
Student selects 3 s.h. from GHP list.
GNS—Natural Sciences (7 s.h.)
BIO 112 Principles of Biology II
CHE 111 General Chemistry I
GMT—Mathematics (3 s.h.)
MAT 191 Calculus I
GRD—Reasoning and Discourse (6 s.h.)
ENG 101 College Writing I
or
FMS 115 Freshman Seminar in Reasoning and Discourse I

II General Education Marker Requirements
See complete GEC requirements under General Education Program in the University Requirements section. See the GEC Course Summary Table for approved courses.

GL/GN—Global/Global Non-Western Perspectives
Four courses carrying GL/GN markers, at least one of which must carry the GN marker.

One SI (Speaking Intensive) Course
In addition to this SI Marker requirement, students must also complete a second SI course within the major. All programs have identified at least one course among their major requirements that is taught as Speaking Intensive.

One WI (Writing Intensive) Course
In addition to this WI Marker requirement, students must also complete a second WI course within the major. All programs have identified at least one course among their major requirements that is taught as Writing Intensive.

III College of Arts and Sciences Additional Requirements (CAR)
See CAR requirements in the Academic Units section. See the GEC Course Summary Table for approved CAR courses.

GMO/GPM—Historical Perspectives (3 s.h.)
Student selects 3 s.h. from GMO or GPM list, depending on category used to satisfy GHP requirement.

GLS/GPS—Natural Sciences (3–4 s.h.)
Required
BIO 112 Principles of Biology II

GSB—Social and Behavioral Sciences (3 s.h.)
Student selects 3 s.h. from GSB list.

GFL—Foreign Language (0–12 s.h.)
Intermediate-level proficiency in one language, demonstrated by placement test, or completion of course work through course number 204.

WI—Writing Intensive Courses
A total of four WI courses.

IV Major Requirements
Program Qualifications
BIO 111 Principles of Biology I
BIO 112 Principles of Biology II

Additional Qualifications
- A minimum of 30 semester hours of Biology courses above the 100 level.
- A maximum of 4 s.h. at the 200 level may be counted toward the major.
- Students must have a grade point average of at least 2.0 in Biology courses completed at UNCG.

or
RCO 101 College Writing I

Student selects additional 3 s.h. from the GRD list.

GSB—Social and Behavioral Sciences (6 s.h.)
Student selects 6 s.h. from GSB list.

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B.S. in Biology Core

In meeting the requirement for hours above the 100 level, all B.A. in Biology majors must complete the following core courses; completion of at least four of these requirements is strongly recommended prior to enrollment in courses numbered 400 and higher.
1. Ecology
   BIO 301 Principles of Ecology
2. Cell Biology
   BIO 355 Cell Biology
3. Genetics
   BIO 392 Genetics
4. Evolution
   BIO 330 Evolution
5. Two laboratory courses
   BIO 315 Ecology and Evolution Laboratory
   BIO 375 Cell Biology and Genetics Laboratory
6. One additional course at the 500 level

Strongly Recommended
BIO 499 Undergraduate Research
BIO 493 Honors Work

Human Biology Concentration
1. Required
   BIO 277 Human Physiology
   or
   BIO 271 Human Anatomy
2. At least three courses chosen from the following:
   BIO 425 Biological Clocks
   BIO 438/PSY 438 Animal Behavior
   BIO 453 Vertebrate Morphogenesis
   BIO 464 Developmental Biology
   BIO 472 Histology
   BIO 479 Neurobiology
   BIO 481 General Microbiology
   BIO 535 Biochemistry: Metabolic Regulation in Health and Disease
   BIO 536 Biology of Aging
   BIO 538 Human Evolutionary Genetics
   BIO 555 Vertebrate Reproduction
   BIO 573 Drugs and the Brain
   BIO 578 Hormones in Action
   BIO 583 Virology
   BIO 584 Immunology
   BIO 586 Cell Cycle and Cancer
   BIO 587 Epigenetics
   BIO 593 Genetics of Complex Traits
   BIO 595 Advanced Genetics

V Related Area Requirements

B.S. in Biology Base
1. Required
   CHE 111 General Chemistry I
   CHE 112 General Chemistry I Laboratory
   CHE 114 General Chemistry II
   CHE 115 General Chemistry II Laboratory
   CHE 351 Organic Chemistry I
   CHE 352 Organic Chemistry II
   CHE 354 Organic Chemistry Laboratory

2. Required
   MAT 191 Calculus I
   MAT 292 Calculus II
   or
   STA 271 Fundamental Concepts of Statistics

Strongly Recommended
   STA 271 Fundamental Concepts of Statistics

3. Required
   PHY 211 General Physics I
   and
   PHY 212 General Physics II
   or
   PHY 291 General Physics I with Calculus
   and
   PHY 292 General Physics II with Calculus

Human Biology Concentration
1. Required
   ATY 253 Introduction to Biological Anthropology
2. Required
   PSY 230 Biological Psychology
3. Two courses in two different departments selected from the courses listed below.
   ATY 331 Race and Human Diversity
   ATY 357 Monkeys, Apes, and Humans
   ATY 453 Human Osteology
   ATY 455 Human Evolution
   ATY 465 Medical Anthropology
   ATY 557 Primate Behavior
   ATY 559 Disease and Nutrition in Ancient Populations
   CHE 420 Chemical Principles of Biochemistry
   CHE 556 Biochemistry I
   GRO 501 Seminar: Critical Issues of Aging
   HDF 211 Human Development Across the Life Span
   HDF 212 Families and Close Relationships
   HEA 201 Personal Health
   HEA 207 International Health
   HEA 260 Human Sexuality
   HEA 314 Public Health Diseases
   HEA 315 Epidemiology
   HEA 316 Environmental Health
   HIS 311 Darwin and the Theory of Evolution
   HIS 359 Sexuality in Historical Perspective
   KIN 375 Physiology of Sport and Physical Activity
   KIN 376 Biomechanics of Sport and Physical Activity
   NTR 213 Introductory Nutrition
   PHI 220 Medical Ethics
Biology

PHI 520 Advanced Topics in Biomedical Ethics  
PSY 346 The Psychology of Gender  
PSY 435 Brain and Psychological Processes  
PSY 436 Sensory and Perceptual Processes  
PSY 457 Developmental Psychobiology  
SOC 201 Social Problems  
SOC 327 Race and Ethnic Relations  
SOC 361 Health and Society  
SOC 370 Environmental Sociology

VI  Electives

Electives sufficient to complete the 122 semester hours required for the degree.

Biology as a Second Major

Students who wish to declare a second major in Biology must complete all requirements listed above under the degree selected.

Biology as a Second Academic Concentration

Required: minimum of 18 semester hours

The second academic concentration in Biology is designed specifically for Elementary Education students.

Requirements

1. Introductory Biology
   - BIO 111 Principles of Biology I
   - BIO 112 Principles of Biology II

2. Any three of the following four core biology courses:
   - Ecology
     - BIO 301 Principles of Ecology
   - Cell Biology
     - BIO 355 Cell Biology
   - Genetics
     - BIO 392 Genetics
   - Evolution
     - BIO 330 Evolution

3. Required
   - Completion of the courses listed below may also count toward completion of the 18 s.h. requirement.
     - BIO 271 Human Anatomy
     - BIO 277 Human Physiology

Biology Minor

Required: minimum of 17 semester hours

AOS Code: U117

A minimum of 17 semester hours in biology is required for a minor in biology. A student must have at least a 2.0 GPA in Biology courses completed at UNCG to receive a minor in Biology.

Requirements

1. Required
   - BIO 111 Principles of Biology I

Biology Standard Professional I License Only

Students who have already completed an undergraduate degree and who are now seeking the Standard Professional I License in Biology must complete the requirements for a B.A. or B.S. in Biology at UNCG with a biology grade point average of 2.50 or better. Course selection must be completed in consultation with the Head of the Department of Biology.

Students who have already taken biology courses as part of their undergraduate program should contact the Head of the Department of Biology to determine if any of those courses can be accepted as meeting some of the requirements for the Standard Professional I License in Biology at UNCG.

Direct questions about these requirements to the Head of the Department of Biology.

Biology Disciplinary Honors

Requirements

Eighteen semester hours to consist of the courses listed below.

- 3 s.h. of HSS 490 Senior Honors Project
- 3–6 s.h. of BIO 493 Honors Work (only 6 hours may be counted toward the 30 s.h. minimum in the Biology major)
- One hour credit in any of the Department’s journal clubs
- Two 500-level Biology courses (for 6–8 s.h. credit)
- A third 500-level course in Biology or a Contract course in Biology at the 300 or 400 level.
- Oral presentation of Honors Thesis to a committee of three Biology Faculty or public presentation of research at a local, regional, or national meeting is required.

Qualifications

- A grade of B or higher in all course work used to satisfy the Honors requirements in Biology
- A declared Biology Major
- At least a 3.30 overall GPA at graduation

Recognition

The designation “Completed Disciplinary Honors in Biology” and the title of the Senior Honors Project will be printed on the student’s official transcript.

Honors Advisor

See Dr. John Lepri, Honors Liaison, for further information and guidance about Honors in Biology.
BIOLOGY COURSES (BIO)
Prerequisite for 300, 400, and 500 levels: minimum grade of C- or better in BIO 112, unless otherwise specified.

BIO 100 Orientation to the Biology Major (1:1)
Introduction to the Biology major at UNCG. What it means to be a Biology major at UNCG, in our community, and as a career.

Notes: Offered as an experimental course Fall 2015.

BIO 105 Major Concepts of Biology (3:3)
Introduction to major concepts in biology. Topic sections emphasize specific areas including conservation biology, biotechnology, and current issues. Survey sections emphasize basic aspects of biology, including genetics, physiology and ecology.

Offered: Fall and Spring
Distribution: GE Core: GNS, CAR: GLS
Notes: For students not planning to take additional biology courses. Students who have prior credit for BIO 111, BIO 112 may not take BIO 105 for credit.

BIO 105L Major Concepts of Biology Laboratory (1:0:2)
Designed to acquaint non-science majors with the principles of scientific inquiry and major ideas in biology, including function of cells, the human body, mechanisms of heredity, ecology, and evolution.

Prerequisite: Pr. or Coreq.: concurrent enrollment in BIO 105 or previous credit for BIO 105

Offered: Fall and Spring
Distribution: GE Core: GNS, CAR: GLS
Notes: For students not planning to take additional biology courses. Students who have prior credit for BIO 111, BIO 112 may not take BIO 105L for credit. Online sections must have previously passed or be concurrently enrolled in online lecture.

BIO 110 Introduction to Biology (3:3)
An introduction to the principles of biology, including the molecular and cellular basis of life, genetics, and biotechnology.

Prerequisite: Pre-Nursing or Nursing major or permission of instructor

Offered: Fall and Spring
Notes: Students may not receive credit for both BIO 110 and BIO 111.

BIO 111 Principles of Biology I (4:3:3)
Prerequisite for most other biology courses and includes laboratory. Lecture covers the fundamental principles of biology including the molecular and cellular basis of life, genetics, and biotechnology.

Corequisite: BIO 111L

Offered: Fall and Spring
Distribution: GE Core: GNS, CAR: GLS
Notes: May not be taken more than twice.

BIO 111L Principles of Biology I Lab (0:0:3)
Laboratory supporting BIO 111.

Corequisite: BIO 111
Notes: No grade is awarded with this course number. Grades are awarded with the lecture course.

BIO 112 Principles of Biology II (4:3:3)
Prerequisite for 300-level courses and above. This course includes laboratory. Fundamental principles of biology including botany, zoology, evolution, and ecology.

Corequisite: BIO 112L

Offered: Fall and Spring
Distribution: GE Core: GNS, CAR: GLS
Notes: A passing grade in lecture must be achieved for successful completion of this course. May not be taken more than twice.

BIO 112L Principles of Biology II Lab (0:0:3)
Laboratory supporting BIO 112.

Corequisite: BIO 112
Notes: No grade is awarded with this course number. Grades are awarded with the lecture course.

BIO 113 Principles of Biology Laboratory (1:0:3)
Basic laboratory practices and fundamental principles of biology including molecular and cellular basis of life, genetics, and biotechnology.

Prerequisite: BIO 110

Offered: Fall and Spring

BIO 271 Human Anatomy (4:3:3)
Human anatomy with study of skeletons, models, and anatomical preparations. Includes dissection of cat.

Prerequisite: A grade of C- or better in BIO 110 or BIO 111
Notes: May not be taken more than twice.

BIO 277 Human Physiology (4:3:3)
Human physiology with emphasis on homeostatic mechanisms.

Prerequisite: A grade of C- or better in BIO 110 or BIO 111 and high school chemistry with grade of C or better

Notes: May not be taken more than twice.

BIO 280 Fundamentals of Microbiology (4:3:4)
General survey of microscopic life and its impact on medicine, public health, and the environment. Includes laboratory work with bacteria, emphasizing aseptic technique.

Prerequisite: A grade of C- or better in BIO 110 or BIO 111, and successful completion of either BIO 271 or BIO 277

Notes: Students cannot receive credit for both this course and BIO 481. May not be taken more than twice.

BIO 301 Principles of Ecology (3:3)
Introduction to fundamentals of ecology. Principles relating to populations, communities and ecosystems. Particular emphasis placed on the many dimensions of interdependence within ecosystems.

Prerequisite: Minimum grade of C- in both BIO 111 and BIO 112

Offered: Fall and Spring
Notes: May not be taken more than twice.

BIO 315 Ecology and Evolution Laboratory (2:1:3)
This course is designed to help students understand, via hands-on activities, how species and populations evolve and how species and individuals interact with one another and with their environment.

Prerequisite: Either BIO 301 or BIO 330
Corequisite: If not completed as a prerequisite, either BIO 301 or BIO 330

BIO 330 Evolution (3:3)
Fundamental principles of evolutionary biology, including processes and patterns of biological evolution and an overview of the historical and contemporary biodiversity resulting from evolution.

Prerequisite: Minimum grade of C- in both BIO 111 and BIO 112
BIO 305 Cell Biology (3:3)
Study of cellular organization and function. Fundamental biochemical properties, including cellular components, enzyme function, energetics, and metabolism studied in relation to cellular structure, membrane function, cell movement, and cytoplasmic compartments.
Prerequisite: Minimum grade of C- in both BIO 111 and BIO 112; CHE 114 (or equivalent)
Offered: Fall and Spring
Notes: May not be taken more than twice.

BIO 361 Biology and Conservation of Sea Turtles (3:1:6)
Students spend 2 weeks in July/August in Tortuguerio, Costa Rica assisting with tagging and collecting data on nesting turtles. Seminar and N.C. field trip in spring.
Prerequisite: Minimum grade of C- in both BIO 111 and BIO 112 and permission of instructor
Offered: Odd Years
Notes: May not be taken more than twice. Travel fees involved; see instructor for details.

BIO 375 Cell Biology and Genetics Laboratory (2:1:3)
Laboratory and online course that integrates modern genetic, cellular, and molecular techniques and methods to understand the concept of the gene to phenotype in biology and human health.
Prerequisite: Either BIO 355 or BIO 392
Corequisite: If not completed as a prerequisite, either BIO 355 or BIO 392

BIO 392 Genetics (3:3)
Mendelism and modern trends in genetics.
Prerequisite: Minimum grade of C- in both BIO 111 and BIO 112
Offered: Fall and Spring
Notes: May not be taken more than twice.

BIO 402 Marine Biology (3:3)
An introduction to marine organisms and their habitats; special attention given to adaptations necessary for marine life, physical oceanography, and basic ecological principles; one weekend coastal field trip is required.
Prerequisite: One of BIO 301, BIO 330, BIO 355, or BIO 392
Offered: Spring

BIO 422 Plant Diversity (4:3:3)
Introduction to plant, fungi, and protista kingdoms. Emphasis is on structure, reproduction, and life cycles of the organisms.
Prerequisite: BIO 330 or BIO 301 or BIO 392
Offered: Fall
Notes: Passing grade in lecture must be achieved for successful completion of this course. May not be taken more than twice.
Formerly BIO 322.

BIO 424 Plant Physiology and Biotechnology (3:2:3)
Physiological processes involved in plant growth spanning effects from the molecular to the environmental level. Laboratories will utilize biotechnological manipulations of the model plant Arabidopsis.
Prerequisite: BIO 355
Offered: Spring

BIO 425 Biological Clocks (3:3)
Descriptive survey of behavioral and physiological rhythms in humans and other animals, including circadian, tidal, lunar, seasonal and circannual cycles, with ecological considerations and implications for human health.
Prerequisite: One of BIO 301, BIO 330, BIO 355, BIO 392
Offered: Fall

BIO 431 The Biosphere (3:3)
A study of environmental issues in biology, specifically ecosystems, population dynamics, biodiversity and extinction.
Prerequisite: BIO 301

BIO 438 Animal Behavior (3:3)
Application of theory of evolution to the explanation of animal behavior. Surveys a variety of species, addressing several behavioral categories as well as issues in sociobiology and human evolution.
Prerequisite: PSY 121 and PSY 230; or minimum grade of C- in both BIO 111 and BIO 112
Notes: Students cannot receive credit for both this course and BIO 439 or PSY 438 or PSY 438L.
Cross Listed: Same as PSY 438.

BIO 439 Animal Behavior with Laboratory (4:3:3)
Application of theory of evolution to animal behavior. Includes laboratory and field techniques for assessing behavioral adaptations. Surveys several behavioral categories in a variety of species.
Prerequisite: PSY 230 and PSY 311; or minimum grade of C- in both BIO 111 and BIO 112
Offered: Alt Spring
Notes: Students cannot receive credit for both this course and BIO 439 or PSY 438 or PSY 438L.
Cross Listed: Same as PSY 438L.

BIO 441 Invertebrate Zoology (4:3:3)
Major invertebrate groups with emphasis on their phylogenetic relationships, ecology, physiology, evolution, and structural adaptations of representative types. Weekend coastal field trip may be required.
Prerequisite: BIO 330
Offered: Occ Spring
Notes: Includes a laboratory component. May not be taken more than twice. Students cannot receive credit for both BIO 341 and BIO 441. Formerly BIO 341.

BIO 453 Vertebrate Morphogenesis (4:3:3)
Vertebrate development focused on cellular and molecular mechanisms of induction, differentiation, and morphogenetic processes that give rise to the adult body plan. Laboratory includes study of vertebrate embryos and adult specimens.
Prerequisite: BIO 355
Offered: Fall

BIO 554 Vascular Plant Systematics (4:3:3)
Principles, methods, and the history of systematic biology are covered in the context of vascular plant classification and evolution.
Prerequisite: BIO 330 or BIO 301 or BIO 392
Offered: Spring
Notes: Passing grade in lecture must be achieved for successful completion of this course. May not be taken more than twice.
Formerly BIO 454; formerly BIO 354.
BIO 464 Developmental Biology (4:3:3)
A survey of developmental processes in plants and animals. Topics will include fertilization, achievement of multicellularity, cell determination and differentiation, pattern development, and the genetic regulation of such processes.
Prerequisite: C (2.0) or better in BIO 355 and BIO 392
Offered: Spring

BIO 470 Vertebrate Zoology (4:3:3)
Evolution of major vertebrate groups with emphasis on morphology, ecology, and behavior. Comparisons of vertebrates in the laboratory through dissections and field work.
Prerequisite: BIO 330
Offered: Fall
Notes: May not be taken more than twice. Students cannot receive credit for both BIO 370 and BIO 470. Formerly BIO 370.

BIO 472 Histology (4:3:4)
Microscopic anatomy of vertebrate tissues. Emphasis on correlation of cell and tissue functions with structures visible under the light and electron microscopes.
Prerequisite: BIO 355
Offered: Odd Spring

BIO 473 Animal Physiology (3:3)
Physiology of invertebrates and vertebrates including metabolism, temperature regulation, respiration, blood, circulation, water and ion balance, excretion, and the nervous, sensory, endocrine, and muscular systems.
Prerequisite: BIO 355 and one of BIO 277, BIO 470, or BIO 441
Offered: Even Fall

BIO 479 Neurobiology (3:3)
Survey of major integrative mechanisms used by nervous systems from invertebrates to humans. Synaptic transmission, sensory processing and activity of neural circuitry controlling behavior will be analyzed.
Prerequisite: BIO 355
Offered: Odd Fall
Notes: PHY 212 or PHY 292 recommended.

BIO 47L Neurobiology Laboratory (1:0:2)
Computer-based laboratory exercises to complement BIO 479 lecture material, including intracellular and extracellular recording simulations.
Prerequisite: Pr. or Coreq.: BIO 479
Offered: Alt Fall
Notes: PHY 212 or PHY 292 recommended

BIO 481 General Microbiology (4:3:4)
Introductory survey of microbiology, emphasizing the role of microorganisms in everyday life.
Prerequisite: BIO 301, BIO 355, and BIO 392; or permission of instructor
Offered: Fall

BIO 488 Essentials of Toxicology (3:3)
This course is designed to introduce undergraduate students to the fundamentals of toxicology and serve as the key introductory course for students who require a background in toxicology.
Prerequisite: Grade of C- or better in BIO 111 and BIO 112 and completion of BIO 301 and BIO 355; or permission of instructor

BIO 493 Honors Work (3–6)
Prerequisite: Permission of instructor; 3.30 GPA in the major, 12 s.h. in the major
Notes: May be repeated for credit if the topic of study changes. A maximum of 6 s.h. of any combination of BIO 493, BIO 496, BIO 497, and/or BIO 499 allowed.

BIO 494 Introduction to Biotechnology (4:3:4)
Introduction to the principles and techniques of biotechnology. Includes molecular cloning, DNA sequencing, and gene expression. Explores topics such as gene amplification, gene therapy, and DNA fingerprinting.
Prerequisite: BIO 392 and BIO 375
Offered: Spring

BIO 496 Science Pedagogy for Learning Assistants (1:1:3)
Students learn about current research in science pedagogy in a weekly seminar and apply their knowledge to support active learning and inquiry as in-class learning assistants in a biology course.
Prerequisite: Permission of instructor
Notes: PHY 212 or PHY 292 recommended.

BIO 497 Internship in Biology (1–3:0:3–9)
Students work at site outside university for a minimum of 45–135 hours under direction of faculty and on-site supervisor. Times vary. Prior approval required.
Prerequisite: Minimum overall GPA of 2.80; two of BIO 301, BIO 330, BIO 355, and BIO 392 with a grade of C or better; and permission of instructor
Notes: May be repeated for up to 6 s.h. credit with departmental permission. A maximum of 6 s.h. of any combination of BIO 493, BIO 496, BIO 497, and/or BIO 499 allowed.

BIO 498 Biology Seminar (1:1)
Oral reports and discussions of topics from current literature of biology by students, faculty and guest lecturers.

BIO 499 Undergraduate Research (1–3)
Biology research under the direction of a faculty member, culminating in a written report. Research will include laboratory and/or field work and/or directed readings of the literature. Times by arrangement.
Prerequisite: Two from BIO 301, BIO 330, BIO 355, and BIO 392 with a grade of C or better; and permission of instructor
Notes: May be repeated for up to 6 s.h. credit with departmental permission. A maximum of 6 s.h. of any combination of BIO 493, BIO 496, BIO 497, and/or BIO 499 allowed.
BIO 504 Advanced Topics in Cell Biology (3:3)
Advanced treatment of cell biology covering selected topics such as gene regulation, protein sorting, cell cycle control, apoptosis. The course will consist of lectures and discussion of research articles.
Prerequisite: Permission of instructor

BIO 505 Advanced Topics in Ecological Physiology (3:3)
Study of a major topic in ecological physiology of animals, including mechanisms by which physiological processes change in response to environmental alterations and the ecological significance of those changes.
Prerequisite: Permission of instructor

BIO 506 Advanced Topics in Genetics (3:3)
Basic mechanisms of gene action in microbes, animals, and plants.
Prerequisite: Permission of instructor

BIO 507 Advanced Topics in Neurobiology (3:3)
Directed readings on fundamental physiological principles of nervous system functioning. Topics may include motor pattern generation, sensory transduction, sensorimotor integration, neurohormonal modulation of behavior.
Prerequisite: Permission of instructor

BIO 509 Advanced Topics in Microbiology (3:3)
Critical review of current research covering a wide range of topics including infectious diseases, bacterial physiology, marine microbiology, and immunology. Focus on students’ interests or needs.
Prerequisite: Permission of instructor

BIO 510 Advanced Topics in Plant Ecology (3:3)
Studies of special terrestrial communities or plant groups.
Prerequisite: Permission of instructor

BIO 511 Advanced Topics in Plant Physiology (3:3)
The physiology of growth and development in vascular plants treated in terms of phytohormones, nutrition, theories of transport, and environmental factors.
Prerequisite: Permission of instructor

BIO 512 Advanced Topics in Plant Structure and Evolution (3:3)
Study of current topics in plant structure, development, and evolution. A term paper is normally required.
Prerequisite: Permission of instructor

BIO 513 Advanced Topics in Reproductive Biology (3:3)
Directed readings and original research on reproductive biology, with emphasis on structural, regulatory, behavioral, and evolutionary aspects.
Prerequisite: Permission of instructor

BIO 515 Advanced Topics in Vertebrate History (3:3)
Directed/independent study of classification and phylogeny of particular vertebrate groups that results in a term paper.
Prerequisite: Permission of instructor

BIO 519 Introduction to Nanotechnology (3:3)
This course introduces students to the emerging field of nanotechnology and exposes them to current research and topics that are being influenced by nanomaterials including biology, healthcare, and the environment.
Prerequisite: BIO 392; BIO 355; CHE 342; CHE 351; or permission of instructor

BIO 520 Ecosystem Ecology and Biogeochemistry (3:3)
Introduction to ecosystem function, structure, and dynamics; basic ecosystem theories; discussions of key processes governing energy flow and nutrient cycling; comparison of ecosystems; selected original literature.
Prerequisite: BIO 301; or permission of instructor
Offered: Alt Spring

BIO 522 Landscape Ecology (3:3)
Prerequisite: BIO 301; STA 271 recommended
Corequisite: BIO 523
Offered: Fall

BIO 523 Landscape Ecology Laboratory (1:0:4)
Field labs to observe different landscape structures and conduct course projects for comprehending principles of landscape ecology. Students will use computer labs for GIS basics, landscape analyses.
Prerequisite: BIO 301
Corequisite: BIO 522
Offered: Fall

BIO 526 Conservation Biology (3:3)
Introduction to habitat and species conservation; topics include genetic diversity, demographic patterns of rare species, habitat fragmentation, design and management of nature reserves, ecological restoration.
Prerequisite: BIO 301 and BIO 392; STA 271 recommended
Offered: Even Fall

BIO 528 Microbial Ecology (3:3)
Emphasis on current areas of active research with reference to applied problems.
Prerequisite: BIO 280 or BIO 481, or permission of instructor
Offered: Even Spring

BIO 529 Aquatic Ecology (3:3)
The study of the geology, physics, chemistry, and ecology of lakes, including reservoirs and streams with comparisons to the ocean.
Prerequisite: BIO 301 and CHE 114, or permission of instructor
Offered: Fall

BIO 530 Aquatic Ecology Laboratory (1:0:4)
Practical study of water chemistry methods, lake and stream morphometry, identification of freshwater zooplankton, benthic invertebrates and fish, and field trips to area reservoirs and streams.
Prerequisite: BIO 301
Corequisite: BIO 529
Offered: Fall

BIO 535 Biochemistry: Metabolic Regulation in Health and Disease (3:3)
Chemical properties of major cellular compounds; biosynthesis, degradation, and function of carbohydrates, lipids, proteins, nucleic acids, vitamins, and hormones; energy metabolism; enzymatic catalysis.
Prerequisite: BIO 355 and BIO 392; or permission of instructor
Offered: Spring
BIO 536 Biology of Aging (3:3)
An integrative look at biological theory and mechanisms to explain the diversity of the aging process, including human implications.
Prerequisite: BIO 301, BIO 355, BIO 392, or permission of instructor
Offered: Alt Fall

BIO 538 Human Evolutionary Genetics (3:3)
Study of primary literature testing hypotheses about human ancestry and evolution using molecular genetic methods.
Prerequisite: BIO 330 and BIO 392; or permission of instructor

BIO 540 Genes and Signals (3:3)
Investigates the regulation of gene expression in bacteria, yeast, and higher eukaryotes, and explores how such regulatory systems have evolved.
Prerequisite: BIO 355 and BIO 392
Offered: Alt Fall

BIO 541 Entomology (3:2:3)
A theoretical and practical overview of the insect orders, selected topics of insect behavior, ecology, and evolution, and an introduction to human-insect interactions.
Prerequisite: BIO 301 and BIO 330; or permission of instructor.
BIO 392 and BIO 441 recommended.
Offered: Alt Fall

BIO 543 Biophysics (3:3)
Introduction to cellular biophysics, with emphasis on the physical properties of membranes, including membrane transport mechanisms and electrical properties of membranes.
Prerequisite: BIO 355, CHE 114, MAT 191, and either PHY 211 with PHY 212 or PHY 291 with PHY 292; or permission of instructor.
Offered: Alt Fall
Cross Listed: Same as PHY 543.

BIO 545 General Biochemistry Laboratory (1:0:3)
Experimental work designed to complement lecture material of BIO 535.
Prerequisite: Pr. or Coreq.: BIO 535
Offered: Fall

BIO 549 Current Topics in Biology (1–3)
Advanced topics courses in the biological sciences. Topics vary with instructor.
Prerequisite: Minimum grade of C- in both BIO 111 and BIO 112 and permission of instructor

BIO 552 Metamorphosis (3:3)
Readings, discussions, and oral presentations of current literature on metamorphosis in animals. Mechanisms controlling metamorphosis, evolution of complex life cycles, and adaptations to differing habitats.
Prerequisite: Three courses selected from BIO 301, BIO 322, BIO 341, BIO 355, BIO 370, BIO 392, BIO 554; or permission of instructor

BIO 555 Vertebrate Reproduction (3:3)
An advanced treatment of the diversity of vertebrate reproductive biology, with emphasis on structural, regulatory, behavioral, and evolutionary aspects.
Prerequisite: One of BIO 277, BIO 425, BIO 453, BIO 464, BIO 470, or BIO 477

BIO 560 Symbiosis (3:3)
Symbiotic interactions of living organisms from an evolutionary perspective. Metabolic, genetic, behavioral, and ecological adaptations which allow symbioses to be formed and maintained will be discussed.
Prerequisite: Three courses selected from BIO 301, BIO 330, BIO 355, BIO 392, BIO 554; or permission of instructor

BIO 563 Cell Cycle and Cancer (3:3)
Molecular basis of cell division and cancer examined through lectures and discussions of primary literature. Topics include cell cycle control, genomic stability, carcinogenesis, and cancer genetics.
Prerequisite: BIO 355 and BIO 392, or permission of instructor
Offered: All Spring

BIO 564 Immunology (3:3)
Principles of immunology and serology covering both humoral and cellular aspects of immunobiology. Selected topics include: T and B cell, immunoglobulins, tolerance, hypersensitivity.
Prerequisite: BIO 481 or permission of instructor
Offered: Odd Spring

BIO 567 Drugs and the Brain (3:3)
Pharmacology of major neurotransmitter systems in the brain and nervous system. Actions of clinically relevant drugs on these systems will be analyzed along with major drugs of abuse.
Prerequisite: BIO 355, and one of the following: BIO 277, BIO 477, BIO 479, PSY 230; or permission of instructor.
Offered: Alt Fall
Notes: CHE 351 recommended.

BIO 568 Virology (3:3)
Selected topics in virology. Emphasis upon new trends in the study of animal, plant, and bacterial viruses at both molecular and cellular levels.
Prerequisite: BIO 355 and BIO 392
Offered: Fall
Biology

BIO 587 Epigenetics (3:3)
Study of epigenetic mechanisms involved in chromatin structure, DNA and histone modifications, gene expression, dosage compensation, imprinting, heterochromatin structure, stem cell differentiation, development, human disease, and environmental-gene interactions.
Prerequisite: BIO 355 and BIO 392
Offered: Alt Fall

BIO 589 Experimental Course
This number reserved for experimental courses. Refer to the Course Schedule for current offerings.

BIO 590 Introduction to Mathematical Models in Biology (3:3)
Exploration of research and methodology at the interface of mathematics and biology, with an overview of relevant fields and in-depth case studies. Focus will be on mathematical models in biology.
Prerequisite: Minimum grade of C- in BIO 111 and minimum grade of B- in BIO 112 and either MAT 191 or STA 271; or permission of instructor
Notes: Formerly BIO 491.
Cross Listed: Same as MAT 590.

BIO 591 Population Genetics and Molecular Evolution (3:3)
Application of population genetic and molecular evolutionary theory to the study of natural history, natural selection, genome variation and organization, human evolution, conservation biology, and forensics.
Prerequisite: BIO 330 and BIO 392; or permission of instructor
Offered: Alt Spring

BIO 593 Genetics of Complex Traits (3:3)
Theory, experimental methods, and analysis related to the genetic basis for variation in complex traits, including quantitative and threshold traits in animals and plants, and complex human diseases.
Prerequisite: BIO 392 or permission of the instructor
Offered: Alt Spring

BIO 595 Advanced Genetics (3:3)
Selected topics in genetics at an advanced level. Emphasis placed on comparative view of molecular mechanisms underlying animal and plant development.
Prerequisite: BIO 392
Offered: Even Spring

BIO 596 Molecular Biological Approaches in Research (1:1)
Use of novel molecular approaches to address current questions in the life sciences will be explored by analyzing recent research reports and learning the principles underlying these approaches.
Prerequisite: BIO 392
Notes: May be repeated for a total of 3 s.h. credit.

BIO 597 Workshops in Biotechnology (1:0:3)
Individual, intensive four-week workshops focused on specific techniques in biotechnology. Provides hands-on experience designing and implementing a focused project utilizing current methods and bioinformatics.
Prerequisite: BIO 494 or permission of instructor
Notes: May be repeated for credit as long as letter suffix of course differs; workshops of a given letter may be taken only once.