

## Biology

Our mission is to graduate majors who combine a breadth of knowledge in all fields of biology and a specialization of their interest. To meet this goal, we teach our majors a core curriculum in biology that covers the diversity of life and the fundamentals that maintain it. In these central courses, our majors also learn about levels of biological organization from biomolecules and cells through organisms and populations. Upon graduation, we expect our majors to be prepared to start a career, enter a professional program or pursue a postgraduate degree.

### Learning Outcomes: Biology

At the time of graduation, our biology majors are expected to:

1. Demonstrate proficiency in biological science commensurate with national undergraduate standards
2. Have the ability to research, write, and present orally a paper on a selected topic in biology.
3. Understand scientific methodology and be able to employ it in a practical setting: Conducting experiments or making observations in the laboratory or field; analyzing data; and formulating hypotheses and drawing conclusions.
4. Demonstrate the ability to solve problems and think critically about scientific topics.
5. Be able to discuss scientific topics orally and in writing, with clarity of thought and expression.

### Honors in Biology

A biology major may a B.A. or B.S. degree in Biology with the designation “Honors in Biology” if he/she:

1. Makes application for this designation [Application must be completed and approved by the regular date for advanced registration for the first regular semester of the student’s senior year].
2. Has the project [see below] approved by the Biology faculty.
3. Receives certification from the Dean of the College and
4. Completes the following requirements:
  - a) Maintains a 3.3 GPA in courses required for the major and a 3.0 cumulative GPA.
  - b) Takes a minimum of 8 credits and not more than 12 credits in independent study (designated as Bio 497 or 499), during at least two regular semesters and earning a GPA of 3.3 or better in each independent of study.
  - c) Completes an Honors Research Thesis that presents a clear understanding of the technical and theoretical literature relating to the independent research project, reports the empirical results of the independent research project, and discusses the relevant conclusions in the context of the body of preciously published research relating to the topic.
  - d) Presents a seminar on the research of at least 30 minutes duration to all interested members of the college community
  - e) Defends the Honors Research Thesis in a comprehensive oral examination before all members of the biology department.

### Independent Study Opportunities in Biology

Besides the courses described later in this document, the biology faculty offers various opportunities for individualized, independent activities for biology majors. These include Special Studies in Biology, Teaching Practicum in Biology, Guided Independent Study, and Honors Research (see the section above).

1. Special Studies (BIOX90, 1-4 credits each) are courses not regularly taught but which are offered when that unique combination of faculty and student interests suggests that an important learning experience may occur. Since these studies are usually offered above the normal faculty teaching load, class sizes will be small and students will assume greater responsibility for the preparation and conduct of the course. The biology faculty is prepared to teach a wide variety of special studies such as plant and fungal taxonomy, evolution, orchid biology, molecular studies, bioremediation, animal behavior, sensory biology, or aquatic biology.
2. The Teaching Practicum in Biology (BIO X98, 1-4 credits) allows students, especially those preparing to be biology teachers, to gain experience by performing and serving as a teaching assistant in certain biology courses. The practicum is also an excellent opportunity for students preparing for graduate and professional school admissions tests such as GRE, VAT, DAT and MCAT, to enhance their preparation for the biology portions of those tests by working in the tutor/ mentor role in introductory biology courses.
3. The Guided Independent Study (BIO X99, 1-4 credits) is for students interested in research. The student should approach a member of the biology faculty whose research interests match his/her own and inquire about research possibilities. If the faculty member judges that the student’s preparation and motivation warrant an independent study, the student and the faculty member will develop a research project. After approval by the biology faculty and the division chair, the project becomes an official guided independent study. Upon completion of the project, the student will have acquired hands on experience with experimental design, data collection and analysis. With motivation, perseverance (and a little luck), he/she may also have an opportunity to present research at a state or national meeting or

add a publication to her/his resume. A guided independent study during the junior year is an excellent way to explore the possibility of honors research (described above) and graduation with honors in the major.

4. With the above opportunities plus regular seminars presented by outside speakers and club activities provided by Tri Beta (the honor society for undergraduate biology students), the St. Andrews Biology Major has an excellent opportunity to carry her/his education beyond the level of conventional classroom activity to whatever level his/her personal skill and motivation allow.

### Major in Biology

### 48-66 Credits

The B.S. degree in Biology allows students (with the properly selected elective courses) to meet admissions requirements for medical school, veterinary school or graduate school in the biological sciences or to enter the work force directly.

The B.A. degree in Biology allows students to prepare for careers, professional schools and graduate schools which do not require the supporting science requirements of the B.S. degree such as biology teaching, master's and second bachelor's programs in physical therapy, and master's programs in wildlife management or environmental management. Since the B.A. degree requires fewer total credits, it provides an excellent opportunity for the student interested in interdisciplinary career to pursue a second major or a minor (such as English, history, politics, art, or business).

### B.S. Major in Biology

### 60-64 Credits

#### Required Courses:

#### 31 Credits

BIO 201	Concepts in Biology I	4
BIO 204	Concepts in Biology II	4
BIO 307	Ecology	4
BIO 310	Genetics	3
BIO 380	Junior Seminar	1
BIO 466	Senior Seminar	1
CHE 210	Essential Concepts of Chemistry	3
CHE 210L	Essential Concepts of Chemistry Lab	1
CHE 215	Introduction to Structural Inorganic Chemistry	3
CHE 215L	Introduction to Structural Inorganic Chemistry Lab	1
CHE 220	Introductory Organic Chemistry I	3
CHE 220L	Introductory Organic Chemistry I Lab	2
CHE 350	Introductory Organic Chemistry II	3
CHE 350L	Introductory Organic Chemistry II Lab	2

#### Additional Requirements:

#### 29-33 Credits

- One of the following human/animal courses: 4
  - BIO 221 Human Anatomy and Physiology I
  - BIO 222 Human Anatomy and Physiology II
  - BIO 353 Zoology
  - BIO 354 Mammalian Physiology
  - BIO 355 Animal Behavior
- One of the following plant courses: 4
  - BIO 340 Plant Diversity
  - BIO 349 Botany
- One of the following microbiology/molecular/cell courses: 3-5
  - BIO 348 Molecular Techniques
  - BIO 365 Microbiology
  - BIO 453 Cell Biology
  - BIO 460 Molecular Biology
- Two additional upper level elective courses from the lists above 8
- One of the following mathematics courses 4
  - MAT 205 Statistics I
  - MAT 221 Calculus I
- Choose one of the course sets below 6-8
  - i) PHY 201/211 Physics I or General Physics I
  - PHY 202/212 Physics II or General Physics II



EQ 241	Horse Science I	3
EQ 422	Horse Science II	3

**Additional Requirements: 27-31 Credits**

- One of the following human/animal courses: 4
  - BIO 353 Zoology
  - BIO 354 Mammalian Physiology
  - BIO 355 Animal Behavior
- One of the following plant courses: 4
  - BIO 340 Plant Diversity
  - BIO 349 Botany
- One of the following microbiology/molecular/cell courses: 3-5
  - BIO 348 Molecular Techniques
  - BIO 365 Microbiology
  - BIO 453 Cell Biology
  - BIO 460 Molecular Biology
- Two Equine Science courses: 6
  - EQ 3XX\* Nutrition
  - EQ 415 Current Therapies in Equine Internal Medicine
  - EQ 416 Introduction to Equine Clinical Pharmacology
  - EQ 417 Equine Orthopedic Lameness

This course can be met with an online Animal Nutrition course.
- One of the following mathematics courses 4
  - MAT 205 Statistics I
  - MAT 221 Calculus I
- Choose one of the course sets below 6-8
  - i) PHY 201/211 Physics I or General Physics I
  - PHY 202/212 Physics II or General Physics II
  - ii) CIS 225 Databases

And take either, CIS 127: Introduction to Programming,  
or, CIS 224: Introduction to Web Design.

[Students interested in entering medical school after graduation should be mindful that different schools require different Physics and Math courses.]

**Major in Biology:**

**Specialization in Equine Science, B.A. 52-54 Credits**

**Required Courses: 35 Credits**

BIO 201	Concepts in Biology I	4
BIO 204	Concepts in Biology II	4
BIO 307	Ecology	4
BIO 310	Genetics	3
BIO 380	Junior Seminar	1
BIO 466	Senior Seminar	1
CHE 210	Essential Concepts of Chemistry	3
CHE 210L	Essential Concepts of Chemistry Lab	1
CHE 215	Introduction to Structural Inorganic Chemistry	3
CHE 215L	Introduction to Structural Inorganic Chemistry Lab	1
MAT 205	Statistics I	4
EQ 241	Horse Science I	3
EQ 422	Horse Science II	3

**Additional Requirements: 17-19 Credits**

- One of the following human/animal courses: 4
  - BIO 353 Zoology
  - BIO 354 Mammalian Physiology
  - BIO 355 Animal Behavior
- One of the following plant courses: 4

