

## Biology (BIOL)

College of Arts and Sciences

Department of Biology

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Modern biology encompasses an extraordinary range of disciplines, from molecular genetics at one end of the spectrum to global ecology at the other. The biology curriculum at St. Thomas reflects this diversity, providing the breadth of experience that students need in their freshman and sophomore years with the depth that they value as juniors and seniors. Courses at all levels of the curriculum emphasize two fundamentals: mastering the essential material of each discipline and developing the intellectual skills needed to do science – asking the right questions, developing methods to answer these questions and critically evaluating the results of these investigations. As well as providing a broad-based liberal arts education in the biological sciences, the biology program serves as an excellent basis for students planning careers in academia, agricultural and forest science, bioinformatics and genomic research, biotechnology, biomedical research, conservation biology, environmental science, forestry and wildlife management, medicine, dentistry, and other health professions, and veterinary medicine.

A principle objective of the Department of Biology is to provide students with an excellent preparation for post-graduate pursuits. Graduates of the program command an understanding of core concepts in biology as well as an ability to design and implement studies of biological questions. The department evaluates its success in achieving these objectives using several tools, including assessments of seniors and alumni.

The curriculum for a major in biology is divided into three tiers, offering increasing levels of challenge, greater emphasis on independent work, and more extensive use of the primary literature. All biology majors take an introductory series of fourteen credits (BIOL 201, 202, 204 and 206) in the first of these tiers. These core courses cover the central concepts of modern biology and provide a foundation for more specialized study at higher levels of the curriculum.

The second-tier courses (BIOL 301-399) build on this foundation and offer a broad range of topics at an intermediate level, including research (BIOL 391-392). Some second-tier courses may be taken by students prior to completion of BIOL 204 and/or 206.

All third-tier courses (BIOL 401-498) require the completion of specific second-tier courses and involve advanced scholarship, independent research projects, and extensive use of the primary literature. Research courses (BIOL 491-494) are available to students wishing to pursue in-depth studies in laboratory and/or field situations. Individual Study courses (BIOL 495-498) allow for tutorial study in a specialized subject area of the student's choosing that is not otherwise available. Additional offerings in the form of Seminar (BIOL 483-486) or Topics (BIOL 487-490) courses are available from time to time. Courses numbered between BIOL 483-498 may, with approval of the department chair, be used to fulfill the 400-level requirement for the major.

Courses numbered BIOL 101-199 are intended for non-biology majors and cannot be used to fulfill either the major or minor requirements in biology. All of these courses fulfill the laboratory science requirement in the core curriculum.

Students planning to enter graduate school or a professional program after leaving St. Thomas should consult the entrance requirements of these programs while planning their choice of undergraduate courses. Students are strongly encouraged to consult with their biology adviser while making these plans.

Courses taken at other colleges by students already matriculated at St. Thomas may be credited toward the requirements of the major only with prior and explicit written approval of the departmental transcript evaluator. Approval will be granted only to reconcile schedule conflicts which otherwise would be unavoidable, to provide opportunities to enroll in appropriate courses that are not available in the St. Thomas curriculum, or to rectify problems arising from other special circumstances. These limitations apply to all requirements of the major, including courses in the allied requirements.

Transfer students desiring credit toward the major for work completed prior to matriculation at St. Thomas should contact the transcript evaluator in the Office of the University Registrar before seeking departmental approval.

Students receiving a 4 or 5 on the Biology Advanced Placement Exam or 5-7 on the International Baccalaureate exam will receive college credit for BIOL 101 (fulfills a natural science with laboratory course requirement), and may receive college credit for BIOL 201. Placement of AP or IB students in the core sequence must be determined in consultation with the chair and the department transcript evaluator.

### Extracurricular Expectations

All students are expected to participate in departmental assessment activities. In particular, graduating seniors are expected to take the Major Field Test in Biology and complete the departmental Senior Survey in the spring of their final year. All students are also strongly encouraged to attend the Biology Seminar Program on a regular basis.

### Departmental Participation

Students are encouraged to further engage the discipline of biology by participating in various departmental activities. Valuable experiences in the department include both paid and volunteer roles as research assistants (with ongoing faculty projects), teaching assistants, lab preparators, biology tutors and summer research or teaching assistants. Together with off-campus internships, membership in the Biology Club and the Beta Beta Beta National Biology Honor Society, as well as the Biology Seminar Program and various special events, these opportunities offer many ways to explore the vast discipline of biology and become better acquainted with faculty members and other students.

## Biology

### Biology Honor Society

*Beta Beta Beta*, the national biology honor society, chartered the *Gamma Tau* chapter at St. Thomas in 1990. The purpose of this organization is to recognize and encourage excellence in the study of biology, and to sponsor events and services of interest to biology students. The organization has a particular interest in promoting and recognizing student research, and encouraging students to consider vocations in the field of biology. *Beta Beta Beta* provides opportunities for presenting and publishing student work on a regional and national level.

Students are eligible for full membership when they have completed twelve credits in the department, with at least four credits at the 300-level, and have a grade point average of 3.0 or better in biology department courses. Associate membership in the chapter is available to all interested students.

### Biology Honors Program

Candidates for graduation with honors in biology must complete four credits in 400-level biology Research (491-494), present and defend a thesis based on their work; achieve a final cumulative grade point average of at least 3.50 in biology department courses, 3.25 in biology and allied courses and 3.00 overall; and present their research at a scientific meeting beyond the St. Thomas community.

### Interdisciplinary Programs

The Departments of Biology and Chemistry jointly offer a biochemistry major leading to a Bachelor of Science degree that draws upon the faculty and courses of both departments.

Students interested in concentrating in biology in an Environmental Studies major listed in this catalog should consult with a Department of Biology adviser to select appropriate courses.

### Pre-Health Professions Programs

Students interested in a career in the health professions should consult the university's pre-health professions adviser in the Owens Science building. See Pre-Professional Programs in this catalog for coursework suggestions, internships, and other information.

### Life Science Education

For information on the teaching licensure program in Life Sciences, see the School of Education Teacher Education section in this catalog. Students interested in specializing in biology at the elementary school level should consider the integrated major in Science and mathematics for Elementary Education (SMEE) described in the School of Education section of this catalog.

### Major in Biology (B.A.)

BIOL 201 Diversity and Adaptation (4 credits)

BIOL 202 Genetics, Evolution, and Ecology (4 credits)

BIOL 204 Cellular and Molecular Biology (4 credits)

BIOL 206 Global Ecology (2 credits)

*Note:* The normal expectation is that students will complete BIOL 201, 202, 204, and 206 by the end of their sophomore year.

*Plus twenty-two credits, at least four of which must be in courses numbered 400-498, from:*

BIOL 210 Introduction to Laboratory Research (2 credits)

BIOL 211 Introduction to Field Research (4 credits)

BIOL 298 Topics (4 credits)

BIOL 302 Animal Diversity (4 credits)

BIOL 315 Biology of Plants (4 credits)

BIOL 330 Animal Behavior (4 credits)

BIOL 333 Ecology (4 credits)

BIOL 349 Comparative Anatomy and Physiology: Locomotion and Systems Regulation (4 credits)

BIOL 350 Comparative Anatomy and Physiology: Energy Acquisition and Processing (4 credits)

BIOL 353 Microscopic Anatomy (4 credits)

BIOL 354 Neurobiology (4 credits)

BIOL 356 Microbiology (4 credits)

BIOL 360 Genetics (4 credits)

BIOL 365 Developmental Biology (4 credits)

BIOL 371 Cell Biology (4 credits)

BIOL 391, 392 Research (2 credits each)\*

BIOL 415 Plant Physiology and Adaptations to Stress (4 credits)

BIOL 430 Evolutionary Ecology (4 credits)

BIOL 435 Aquatic Biology (4 credits)

BIOL 462 Molecular Biology (4 credits)

BIOL 463 Immunology (4 credits)

BIOL 471 Evolution (4 credits)

BIOL 483, 484 Seminar (2 credits each)

BIOL 485, 486 Seminar (4 credits each)

BIOL 487, 488 Topics (2 credits each)

BIOL 489, 490 Topics (4 credits each)  
 BIOL 491, 492 Research (2 credits each)\*  
 BIOL 493, 494 Research (4 credits each)\*  
 BIOL 495, 496 Individual Study (2 credits each)\*  
 BIOL 497, 498 Individual Study (4 credits each)\*  
 CHEM 440 Biochemistry I (4 credits)\*\*

\*A maximum of eight credits in Research and/or Individual Study will be credited toward the requirements of the major.

\*\*CHEM 440 may be counted toward the major as a 300-level elective course.

#### Allied requirements

CHEM 111 General Chemistry I (4 credits)  
 CHEM 112 General Chemistry II (4 credits)  
 CHEM 201 Organic Chemistry I (4 credits)

*Plus four credits from the following:*

MATH 303 Statistics for the Applied Sciences (4 credits)  
 QMCS 220 Statistics I (4 credits)

*Note:* The normal expectation is that students will complete the above allied requirements by the end of the sophomore year.

*Plus at least two of the following selected in consultation with the departmental adviser:*

CHEM 202 Organic Chemistry II (4 credits)  
 MATH 109 Calculus with Review II (4 credits) *or* MATH 113 Calculus I (4 credits)  
 PHYS 109 General Physics I (4 credits) *or* PHYS 111 Introduction to Classical Physics I (4 credits)

*Note:* Alternative course combinations to satisfy elective allied requirements may be proposed by majors for approval by the departmental curriculum committee.

#### Major in Biology (B.S.)

BIOL 201 Diversity and Adaptation (4 credits)  
 BIOL 202 Genetics, Evolution, and Ecology (4 credits)  
 BIOL 204 Cellular and Molecular Biology (4 credits)  
 BIOL 206 Global Ecology (2 credits)

*Note:* The normal expectation is that students will complete BIOL 201, 202, 204 and 206 by the end of their sophomore year.

*Plus twenty six credits from (at least four of which must be in courses numbered 400-498):*

BIOL 210 Introduction to Laboratory Research (2 credits)  
 BIOL 211 Introduction to Field Research (4 credits)  
 BIOL 298 Topics (4 credits)  
 BIOL 302 Animal Diversity (4 credits)  
 BIOL 315 Biology of Plants (4 credits)  
 BIOL 330 Animal Behavior (4 credits)  
 BIOL 333 Ecology (4 credits)  
 BIOL 349 Comparative Anatomy and Physiology: Locomotion and Systems Regulation (4 credits)  
 BIOL 350 Comparative Anatomy and Physiology: Energy Acquisition and Processing (4 credits)  
 BIOL 353 Microscopic Anatomy (4 credits)  
 BIOL 354 Neurobiology (4 credits)  
 BIOL 356 Microbiology (4 credits)  
 BIOL 360 Genetics (4 credits)  
 BIOL 365 Developmental Biology (4 credits)  
 BIOL 371 Cell Biology (4 credits)  
 BIOL 391, 392 Research (2 credits each)\*  
 BIOL 415 Plant Physiology and Adaptations to Stress (4 credits)  
 BIOL 430 Evolutionary Ecology (4 credits)  
 BIOL 435 Aquatic Biology (4 credits)  
 BIOL 462 Molecular Biology (4 credits)  
 BIOL 463 Immunology (4 credits)  
 BIOL 471 Evolution (4 credits)  
 BIOL 483, 484 Seminar (2 credits each)  
 BIOL 485, 486 Seminar (4 credits each)  
 BIOL 487, 488 Topics (2 credits each)  
 BIOL 489, 490 Topics (4 credits each)  
 BIOL 491, 492 Research (2 credits each)\*  
 BIOL 493, 494 Research (4 credits each)\*  
 BIOL 495, 496 Individual Study (2 credits each)\*  
 BIOL 497, 498 Individual Study (4 credits each)\*

## Biology

CHEM 440 Biochemistry I (4 credits)\*\*

\*A maximum of eight credits in Research and/or Individual Study will be credited towards the requirements of the major.

\*\*CHEM 440 may be counted towards the major as a 300-level elective course.

### Allied requirements

CHEM 111 General Chemistry I (4 credits) *and* CHEM 112 General Chemistry II (4 credits)

*or* CHEM 115 Accelerated General Chemistry (4 credits)

CHEM 201 Organic Chemistry I (4 credits)

MATH 109 Calculus with Review II (4 credits) *or* MATH 113 Calculus I (4 credits)

MATH 303 Statistics for the Applied Sciences (4 credits) *or* QMCS 220 Statistics I (4 credits)

Note: The normal expectation is that students will complete the above allied requirements by the end of the sophomore year.

PHYS 109 General Physics I (4 credits) *or* PHYS 111 Introduction to Classical Physics I (4 credits)

### Other requirements

*Eight credits from the following*, selected in consultation with the departmental advisor. Alternative course combinations to satisfy this requirement may be proposed by majors for approval by the department chair:

Any Biology courses numbered above 206

CHEM 202 Organic Chemistry II (4 credits)

CHEM 300 Quantitative Analysis (4 credits)

ENGR 350 Introduction to Electronics (4 credits)

GEOL 113 The Earth's Record of Climate (4 credits)

GEOL 115 Environmental Geology (4 credits)

GEOL 130 Earth History (4 credits)

GEOG 223 Remote Sensing (4 credits)

HLTH 400 Epidemiology (4 credits)

IDSC 312 Gender and Science (4 credits)

MATH 114 Calculus II (4 credits)

MATH 315 Applied Mathematics and Modeling I (4 credits)

MATH 316 Applied Mathematics and Modeling II (4 credits)

PHYS 110 General Physics II (4 credits) *or* PHYS 112 Introduction to Classical Physics II (4 credits)

PSYC 206 The Brain and Human Behavior (4 credits)

PSYC 207 Alcohol, Other Drugs and Behavior (4 credits)

PSYC 401 Physiological Psychology (4 credits)

QMCS 230 Software Design Using the JAVA Language (4 credits)

QMCS 320 Statistics II (4 credits)

QMCS 342 Computer Applications in Experimental Sciences (4 credits)

### **Major in Biochemistry (B.S.)**

*See College of Arts and Sciences Interdisciplinary Programs*

### **Teacher Licensure**

Elementary Education with a Co-major in Science and Mathematics for Elementary Education

Elementary Education with a Specialty in Science (5-8)

Co-major in Science (5-8) – Life Science (9-12) and a Co-major in Secondary Education

*See Education*

### **Minor in Biology**

BIOL 201 Diversity and Adaptation (4 credits)

BIOL 202 Genetics, Evolution, and Ecology (4 credits)

*Plus:*

Twelve additional credits in biology courses numbered 200 or above, selected in consultation with a biology faculty member.

Note: CHEM 440 Biochemistry I cannot be counted towards the Biology minor.

### **BIOL 101 General Biology (4 credits)**

Emphasizing biology as a creative, investigative process and its relevance in today's world, this course provides an overview of cell biology, genetics, physiology, and human impact on the environment. Two laboratory hours per week. Not open to biology majors, pre-professional students, or students who have completed BIOL 105.

### **BIOL 102 Conservation Biology (4 credits)**

An introduction to the basic concepts of conservation biology, including the history of conservation, the value of biological diversity, threats to biodiversity, conservation at the population, species, and community levels, and applications to human activities. Laboratories will emphasize data collection and analysis, and the practical application of conservation practices. This course is designed to meet the needs of the Environmental Studies major for a core course in environmental biology. Two laboratory hours per week.

**BIOL 105 Human Biology (4 credits)**

An introduction to cells, genetics, development and the human body, and the impact of humans on the environment. Laboratories will emphasize investigative scientific problem solving and creative thinking. Does not fulfill entrance requirements for some health professions programs. Pre-health professional students should consult the Health Professions Adviser. This course is designed to meet the needs of social work and psychology majors. Two laboratory hours per week. Not open to biology majors, or students who have completed BIOL 101.

**BIOL 106 Women, Medicine and Biology (4 credits)**

This course addresses issues of biology from the perspective of women. The focus of the course will be to learn basic principles of biology in areas such as anatomy, physiology, genetics, cell biology, and microbiology in the context of issues relevant to women and women's health. Two laboratory hours per week. Not open to Biology majors or students who have completed BIOL 101 or BIOL 105.

**BIOL 201 Diversity and Adaptation (4 credits)**

A survey of living organisms with emphasis on their origins, relationships, and adaptation to their environment. An examination of structural and functional bases of adaptation. Laboratory work will emphasize hypothesis testing, experimental design, data collection and analysis. Three laboratory hours per week.

Prerequisite: Concurrent registration in CHEM 111 or CHEM 101 strongly recommended.

**BIOL 202 Genetics, Evolution, and Ecology (4 credits)**

A consideration of the mechanisms of heredity, evolution, and population ecology, using a problem-solving approach. Topics include: Mendelian genetics, genetic mapping, population genetics, selection theory, speciation, macroevolution and phylogenetics, and the growth and regulation of populations. Laboratory work will emphasize techniques for data analysis. Computer simulation will be employed. Three laboratory hours per week.

Prerequisite: BIOL 201; concurrent registration in CHEM 112 strongly recommended.

**BIOL 204 Cellular and Molecular Biology (4 credits)**

An examination of structure and function emphasizing unifying principles and regulatory mechanisms in cells. Coverage includes biologically important molecules and macromolecules, organelles and organellar systems, growth, metabolism, gene expression, and cellular differentiation. Laboratory work emphasizes experimental methods and data-based reasoning. Four laboratory hours per week.

Prerequisites: A minimum grade of C- in BIOL 202; CHEM 112, and concurrent registration in CHEM 201

**BIOL 206 Global Ecology (2 credits)**

A study of ecological processes operating at the community, ecosystem, and global level. Case studies will be used to integrate cellular, organismal, and ecological approaches to understanding these processes, and to explore the effects of human activities on the global environment. Classes will meet weekly and will combine lecture material with student presentations and discussion of reading assignments. Assessment will be based on the quality of these presentations, contribution to class discussions, and written assignments chosen by the faculty members teaching each section.

Prerequisites: BIOL 201 and 202; BIOL 204 and CHEM 101 or 111 strongly recommended

**BIOL 210 Introduction to Laboratory Research (2 credits)**

An introductory experience in the pursuit of laboratory based research problems in biology. Students work in teams to perform experiments designed to answer questions in a specified area of biology, maintain a journal of these experiments and their observations, and study and discuss pertinent literature. Emphasis on the application of the scientific method to biological problem solving, the role of research teams in science and the communication of findings to others as the end product of science. Area of investigation varies with the research interests of the instructor(s) for the course. Offered only in January term.

Prerequisite: Open to biology majors or prospective majors; BIOL 201. First-year or sophomore status or permission of instructor

**BIOL 211 Introduction to Field Research (4 credits)**

An introductory experience in field-based research problems in biology. Students will work individually or in small teams to define appropriate questions, design research methods, collect and analyze data, and present oral and written reports. Emphasis is on the application of the scientific method to biological problem solving and the communication of findings to others as the end product of science. Areas of investigation vary with the interests of the students and instructors and with the availability of research organisms. Generally offered in January term. Field trip of 2-3 weeks to a tropical site (Mexico, Belize, Ecuador, Jamaica, or Costa Rica) and additional fees required.

Prerequisites: Open to biology majors or prospective majors; BIOL 201. Preference given to students in their first or second year of study in the discipline.

**BIOL 215 Regions Hospital Volunteer Program (0 credit)**

Students volunteer for four hours a week at Regions Hospital in St. Paul serving in various patient care areas. Included in this year-long program, the student will have experience with the emergency room, the burn center, physical and occupational therapy, nursing stations specializing in orthopedics, pediatrics, surgery, medicine and obstetrics. This service gives the students the opportunity to test their interest in health care, obtain knowledge, gain experience, and provide service to the community.

## Biology

### BIOL 216 Basic Nursing Skills Training Program (0 credit)

Volunteers who have completed 215 are eligible for the Nursing Assistant Training Program offered at Regions Hospital in St. Paul. Topics include hospital organization, patient care techniques, CPR, sterile techniques, medical ethics and patient communication. Students will also become eligible to apply for paid positions as patient-care assistants at the hospital. Offered in January term.

Prerequisite: A minimum grade of C- in BIOL 215

### BIOL 217 Students and Physicians Program (0 credit)

The Students and Physicians Program at St. Joseph's Hospital provides students who are nursing assistants with the opportunity to accompany a physician during his/her duties at the hospital. This one-on-one experience allows students the opportunity to observe the daily work of physicians and to discuss with them the nature of a medical career. Offered in January term.

Prerequisite: A minimum grade of C- in BIOL 216

### BIOL 218 Pre-dental Internship Program (0 credit)

The Pre-dental Internship Program, a cooperative program between the university, the School of Dentistry at the University of Minnesota, and the American College of Dentists, provides students with the opportunity to learn about the dental profession through observation at a variety of dental practices. The program also includes seminar sessions at which students learn about the business and management sides of dentistry, admissions procedures for dental school, trends in the dental profession, different models for establishing a dental practice, *etc.*

### BIOL 291, 292 Topics without laboratory (4 credits)

Same as 295-298 except that these courses do not have a laboratory component.

Prerequisite: Permission of the instructor

### BIOL 295, 296 Topics (2 credits)

### BIOL 297, 298 Topics (4 credits)

The subject matter of these courses will vary from year to year, but will not duplicate existing courses. Courses in this category may be credited toward the requirements of the major depending on appropriateness of content, and with prior and explicit written approval of the instructor and the department chair. Descriptions of these courses are available at [www.stthomas.edu/registrar/onlineschedule/](http://www.stthomas.edu/registrar/onlineschedule/).

Prerequisite: Permission of the instructor

### BIOL 302 Animal Diversity (4 credits)

This course emphasizes the variety of morphological and physiological solutions that have evolved to satisfy the requirements of life as an animal in water and on land. Primary focus is on invertebrates. Students have access to marine and freshwater aquaria and to natural habitats for class study and individual projects. Three laboratory hours per week.

Prerequisite: BIOL 202 and CHEM 111

### BIOL 315 Biology of Plants (4 credits)

This course explores the biology of plants from several perspectives. Major topics include the evolution and diversity of plants, plant structure and physiology, as well as an introduction to local flora. Special topics may include such areas as the history of agriculture and the impact of genetic engineering on modern agriculture. Four laboratory hours per week. This course fulfills the second-level Computer Competency requirement in the core curriculum.

Prerequisite: A minimum grade of C- in BIOL 202; completion of or concurrent registration in CHEM 101 or CHEM 111 or permission of instructor

### BIOL 330 Animal Behavior (4 credits)

The study of animal behavior from an evolutionary perspective. The adaptive value of behaviors such as display, habitat selection, foraging pattern, and mating system is examined. Theoretical analyses of sexual selection and the evolution of cooperation and altruism are considered. Laboratory work emphasizes the measurement and analysis of animal behavior under natural conditions. Three laboratory hours per week.

Prerequisite: A minimum grade of C- in BIOL 202; QMCS 220 or MATH 303 recommended

### BIOL 333 Ecology (4 credits)

An exploration of the major concepts in modern ecology, including ecophysiology and adaptation, population growth and regulation, community and ecosystem ecology, and biodiversity and conservation biology. Laboratory and field work will complement these topics and will emphasize careful experimental design and statistical analysis of data. Four laboratory hours per week. This course fulfills the second-level Computer Competency requirement in the core curriculum.

Prerequisite: A minimum grade of C- in BIOL 202; QMCS 220 or MATH 303 recommended

### BIOL 349 Comparative Anatomy and Physiology: Locomotion and Systems Regulation (4 credits)

Examination of the functional morphology of the vertebrate skeletal, muscular, nervous, endocrine and reproductive systems. Emphasis will be placed upon the evolution, development and function of these systems as well as the control and integration of all organ systems in vertebrates. This course may be taken as part of a two-semester sequence with BIOL 350 but may also be taken alone. Four laboratory hours per week.

Prerequisite: A minimum grade of C- in BIOL 204 or permission of instructor

**BIOL 350 Comparative Anatomy and Physiology: Energy Acquisition and Processing (4 credits)**

An examination of the functional morphology of the vertebrate cardiovascular, respiratory, renal, and digestive systems, including control and integration of organ systems, adaptation to environment, and evolutionary development in vertebrates. Laboratory work will emphasize functional comparisons of vertebrate organ systems and an experimental approach to physiological problems. Four laboratory hours per week.

Prerequisite: A minimum grade of C- in BIOL 204; QMCS 220 or Math 303 strongly recommended

**BIOL 353 Microscopic Anatomy (Vertebrate Histology) (4 credits)**

Microscopic structure and its relationship to physiological function among the basic tissue types and in selected organ systems. Focus includes levels of biological organization from subcellular to organismal, with emphasis on humans and other mammals. Special consideration is given to the organization and function of integrating systems, including glandular, vascular, and neural, and to the molecular structure of, and functional integration among, cellular junctions and transport mechanisms, cytoskeletal components, and extracellular matrices. Participation in an experimental or other investigative project is expected. Four laboratory hours per week.

Prerequisite: A minimum grade of C- in BIOL 204

**BIOL 354 Neurobiology (4 credits)**

An introduction to the study of neuroscience from the cellular, systems, and behavioral perspectives. Topics will include how information is carried by neural tissues, the ionic basis for neuronal potentials, neurotransmitters and synaptic transmission, sensory and motor systems, and the neural mechanisms of learning, memory and behavior. Psychology and Behavioral Neuroscience students not meeting the prerequisites are encouraged to discuss enrollment with the instructor. This course fulfills the second-level Computer Competency requirement in the core curriculum. Prerequisites: A minimum grade of C- in BIOL 204; completion or concurrent enrollment in CHEM 202, or permission of instructor

**BIOL 356 Microbiology (4 credits)**

An in-depth study of the biology of microorganisms directed at gaining an understanding of the mechanisms that underlie the functions of bacteria and viruses. The importance of microorganisms as they relate to human disease, industry and the environment will be explored through lectures, readings from the literature and discussions. Laboratory includes an independent research project done in collaboration with the professor and peers. Four laboratory hours per week.

Prerequisite: A minimum grade of C- in BIOL 204; completion of or concurrent registration in CHEM 201

**BIOL 360 Genetics (4 credits)**

Detailed consideration of specific topics in transmission, molecular, and population genetics. Eukaryotic and prokaryotic systems discussed. Genetic reasoning and analysis will be emphasized. Three laboratory hours per week.

Prerequisite: A minimum grade of C- in BIOL 204; CHEM 201

**BIOL 365 Developmental Biology (4 credits)**

This course examines current concepts regarding the mechanisms, both genetic and epigenetic, underlying embryogenesis and metamorphosis in a wide variety of animal model systems and the experimental basis for those concepts. Laboratory work comprises an experimental investigation culminating in a written report in scientific format based on that investigation and grounded in relevant primary literature. Four laboratory hours per week.

Prerequisite: A minimum grade of C- in BIOL 204, CHEM 201.

**BIOL 371 Cell Biology (4 credits)**

An advanced investigation of topics in cell structure and the regulation of cellular activities, including signal transduction, protein transport, cell-cycle regulation, and cellular movement, emphasizing molecular mechanisms, current concepts and their experimental basis. Includes significant use of the primary literature. Four laboratory hours per week.

Prerequisites: A minimum grade of C- in BIOL 204; CHEM 201

**BIOL 391, 392 Research (2 credits)**

Original laboratory, field, library or other analytical investigation under the direction of a member of the biology faculty, culminating in either a written research paper or an oral presentation. Upper-class standing not required.

Prerequisite: BIOL 201

**BIOL 415 Plant Physiology and Adaptations to Stress (4 credits)**

An examination of fundamental principles in plant physiology, such as photosynthesis and plant water transport. In addition, special focus will be given to understanding how plants survive and adapt to adverse environmental conditions, e.g. drought, nutrient limitation, and extreme temperatures. Four hours laboratory per week. The laboratory will include an independent research project. This course fulfills the second-level Computer Competency requirement in the core curriculum.

Prerequisite: A minimum grade of C- in BIOL 204; any 300-level BIOL course

**BIOL 430 Evolutionary Ecology (4 credits)**

The influence of natural selection on behavior in relation to ecological conditions. Emphasis is on integration of theoretical and experimental methods. Includes critical reading of papers from the primary literature and completion of

## Biology

a significant independent research project. Four laboratory hours per week.

Prerequisite: A minimum grade of C- in BIOL 330 or 333; QMCS 220 or MATH 303 strongly recommended

### BIOL 435 Aquatic Biology (4 credits)

Characteristics of lakes, streams and other aquatic habitats; including plant and animal communities, water chemistry and productivity. Use of recent primary literature to learn and evaluate field techniques, data collection and data analyses. Both individual and class research projects focus on aquatic systems. Four laboratory hours per week.

Prerequisite: A minimum grade of C- in BIOL 330 or 333; QMCS 220 or MATH 303 strongly recommended

### BIOL 462 Molecular Biology (4 credits)

An investigation of current concepts in molecular biology including gene expression and its regulation, the organization of genetic information, recombinant DNA techniques, oncogenes and genetic engineering. The laboratory consists of a collaborative research project. Four laboratory hours per week.

Prerequisite: A minimum grade of C- in BIOL 360 or 371

### BIOL 463 Immunology (4 credits)

A study of the mammalian immune system emphasizing the genetic and cellular basis of the immune response. Basic immunological concepts will be used to explore the mechanisms of transplantation rejection, autoimmunity, AIDS and other topics of interest. Laboratory will consist of an independent research project done in collaboration with the professor and peers. Four laboratory hours per week.

Prerequisite: A minimum grade of C- in BIOL 356, 360 or 371

### BIOL 471 Evolution (4 credits)

An advanced exploration of the major concepts in modern evolutionary biology, including adaptation and natural selection, evolutionary genetics and microevolution, paleontology and macroevolution, and molecular evolution. Three laboratory/recitation hours per week.

Prerequisites: A minimum grade of C- in BIOL 204; any 300-level BIOL course

### BIOL 475, 476 Experiential Learning (2 credits)

### BIOL 477, 478 Experiential Learning (4 credits)

See the description of these courses at the beginning of the "Curricula" section of this catalog.

### BIOL 483, 484 Seminar (2 credits)

### BIOL 485, 486 Seminar (4 credits)

Investigation of selected problems in biology at an advanced level, involving student presentations based on the primary literature. The subject will vary and will be announced in the annual Class Schedule. These courses may, with approval of the department chair, be used to fulfill the 400-level requirement for the major.

Prerequisite: Upper-class standing and permission of the instructor

### BIOL 487, 488 Topics (2 credits)

### BIOL 489, 490 Topics (4 credits)

The subject matter of these courses will vary from year to year, but will not duplicate existing courses. Descriptions of these courses are available at [www.stthomas.edu/registrar/onlineschedule/](http://www.stthomas.edu/registrar/onlineschedule/). Courses in this category may be credited toward the requirements of the major depending on appropriateness of content, and with prior and explicit written approval of the instructor and the department chair. These courses may also, with approval of the department chair, be used to fulfill the 400-level requirement for the major.

Prerequisite: Permission of the instructor

### BIOL 491, 492 Research (2 credits)

Same as for BIOL 493 and 494, except that written research paper is not a formal research paper.

### BIOL 493, 494 Research (4 credits)

Original laboratory, field, library, or other analytical investigation under the direction of a member of the faculty, culminating in the writing of a formal research paper in standard scientific format that incorporates a review of the appropriate literature. Oral presentation of the work at a research symposium required. These courses may, with approval of the department chair, be used to fulfill the 400-level requirement for the major.

Prerequisite: Upper-class standing and permission of the instructor and the department chair

### BIOL 495, 496 Individual Study (2 credits)

### BIOL 497, 498 Individual Study (4 credits)

These courses provide a means for obtaining credit on a tutorial basis for courses not otherwise available at UST or other institutions in the ACTC consortium, and are intended to satisfy unusual needs and circumstances. Students interested in Individual Study should discuss their plans with the faculty member most likely to be their tutor. Individual Study contract forms must be completed and approved by the faculty member, the department chair, and the dean of the College prior to registration. These courses may, with approval of the department chair, be used to fulfill the 400-level requirement for the major.

Prerequisite: Permission of the instructor and the department chair