

480 Senior Presentation and Paper (formerly 494)**0 credit**

During the senior year or earlier, art history majors are expected to write a major research paper with an abstract and to describe the results of their research in a short oral presentation. The purpose of this paper and presentation is to allow the student to demonstrate competency in art historical methodology and to gain some experience from presenting the results to a group of peers.

Normally, this requirement is done in lieu of the regular paper assignment for one of the upper-level courses. The topic should be chosen in consultation with the instructor of the course by the end of the second week of the semester and should be completed no later than six weeks prior to graduation. In addition, students will present a short oral report on their research to a departmental symposium to be held prior to graduation. Registration for 494 should be made during the semester that the student anticipates writing the paper. A mark of pass or fail will be assigned upon completion.

483, 484, 485, 486 Seminar

See the description of these courses at the beginning of the “Departments and Curricula” section of this catalog.

487, 488, 489, 490 Topics

The subject matter of these courses, announced in the annual *Class Schedule*, will vary from year to year, but will not duplicate existing courses. See the description of these courses at the beginning of the “Departments and Curricula” section of this catalog.

491, 492, 493, 494 Research

See the description of these courses at the beginning of the “Departments and Curricula” section of this catalog.

495, 496, 497, 498 Individual Study

See the description of these courses at the beginning of the “Departments and Curricula” section of this catalog.

Prerequisite: permission of the instructor or supervisor and previous work in art history

Athletic Coaching**Athletic Training Certification**

See Department of Health and Human Performance.

Behavioral Neuroscience

See Department of Psychology.

Biology (BIOL)

Chaplin (chair), Cruise, DeJong, Emms, Evarts, Hartung, Manske, Nelson, Sherer, Sullivan

The Department of Biology encourages and supports diverse interests by offering both basic and specialized courses that reflect the variety of activities biologists undertake and that prepare students for challenging careers in biology.

Courses emphasize the process of science (the importance of asking the right questions, developing methods to answer these questions and critically evaluating the results of these investigations) in addition to the descriptive aspects of biology. The purpose of this approach is to prepare students who are able to understand and develop with a science that is actively changing.

Courses numbered 101-199 are intended for specialized groups of non-majors and cannot be used to fulfill either the major or minor requirements in biology.

The biology major curriculum is divided into three tiers of courses offering increasing levels of challenge with increased reliance on use of the primary literature and involving more independent work. All students who elect to major in biology are required to take the introductory series of four courses in the first of these tiers (BIOL 201, 202, 204 and 206). These core courses cover the fundamental concepts of modern biological thought across the spectrum of sub-disciplines within the field.

The second-tier courses (301-399) introduce additional areas of biology and further develop concepts and topics from the first-tier courses. Some second-tier courses may be taken by students prior to completion of BIOL 206. Each of the courses in the third and final tier (401-498) requires the completion of specific second-tier courses. This provides an opportunity for advanced investigations emphasizing use of the primary literature and independent research projects. In addition, research and individual study courses (BIOL 491-498) are offered to students who wish to pursue in-depth studies in the laboratory or in a particular subject area of their choosing. These courses may be used to fulfill the 400-level requirement for the major.

Biology

Students planning to continue studies in biology after graduating from St. Thomas should carefully examine the entrance requirements for the graduate or professional programs they expect to pursue. To help students customize their program of study, the department allows some flexibility in its allied course requirements in physics, mathematics, statistics and computer science. Students are encouraged to draw on the experience of the biology faculty and to plan their program in consultation with their biology adviser.

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 regular membership who have completed three courses in the department, with at least one course above the introductory major's level, and have a grade point average of 3.0 or better in biology. Associate membership in the chapter is available to all interested students.

Biology Honors Program

Candidates for graduation with honors in biology must complete one full course or two half-courses in 400-level Research (BIOL 491-494), present and defend a thesis based on their work; achieve grade point averages of at least 3.50 in the major, 3.25 in departmental and allied courses and 3.00 overall; and present their research at a scientific meeting beyond the St. Thomas community.

Biology-Related Professions

Students interested in a career in the health professions should consult the university's pre-health professions adviser. For information concerning health professions-related internships as well as further information regarding the health professions, see Pre-Professional Programs in this catalog.

For information on the teaching Licensure Program in Life Science, see Science Licensure Programs in this catalog. Students interested in specializing in biology at the elementary-school level should strongly consider the integrated major in Science and Mathematics Major for Elementary Education (SMEE) described elsewhere in this catalog.

Students interested in an ecology-oriented career should see listings for environmental studies, geology, and geography majors described elsewhere in this catalog and should consult with a departmental adviser to choose appropriate courses.

Major in Biology

- 201 Diversity and Adaptation
 - 202 Genetics and Population biology
 - 204 Cellular and Molecular Biology
 - 206 Global Ecology (2 credits)
- Plus twenty-two credits, at least four of which must be in courses numbered 400-498, from:*
- 210 Introduction to Laboratory Research (2 credits)
 - 211 Introduction to Field Research (2 credits)
 - 295-298 Topics
 - 315 General Botany
 - 330 Animal Behavior
 - 333 Ecology
 - 349 Comparative Anatomy and Physiology I
 - 350 Comparative Anatomy and Physiology II
 - 353 Microscopic Anatomy
 - 354 Neurobiology
 - 356 Microbiology
 - 360 Genetics
 - 371 Cell Biology
 - 391, 392 Research (2 credits)*
 - 430 Behavioral Ecology
 - 434 Field Biology
 - 435 Aquatic Biology
 - 462 Molecular Biology
 - 463 Immunology
 - 465 Developmental Biology
 - 471 Evolution
 - 483-486 Seminar
 - 487-490 Topics
 - 491, 492 Research (2 credits)*
 - 493, 494 Research*

495, 496 Individual Study (2 credits)*

497, 498 Individual Study*

CHEM 440 Biochemistry I**

*A maximum of four 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

CHEM 112 General Chemistry II

CHEM 201 Organic Chemistry I

The normal expectation is that students will complete 111-112 during the freshman year and 201 during the sophomore year.

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

CHEM 202 Organic Chemistry II

or one of:

MATH 109 Calculus with Review II

MATH 113 Calculus I

or one of:

MATH 303 Statistics for the Applied Sciences

QMCS 220 Statistics I

or one of:

PHYS 109 General Physics I

PHYS 111 Introduction to Classical Physics I

Alternative course combinations to satisfy elective allied requirements may be proposed by majors subject to prior approval by the departmental curriculum committee.

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 department 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 Registrar before seeking departmental approval.

All biology coursework to be credited toward the requirements of the major must be evaluated using the standard grading system.

Minor in Biology

201 Diversity and Adaptation

202 Genetics and Population Biology

Plus:

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

101 General Biology

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.

102 Conservation Biology

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.

103 Nature and Society

Exploring the natural systems and laws that led to the development of life on earth and are essential for the continuing support of that life; how human activities and social structures may alter this natural support system; basic principles underlying the use of natural resources that can explain the presence or absence of ecological problems. Two laboratory hours per week.

Biology

105 Human Biology

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 need of social work and psychology majors. Two laboratory hours per week. Not open to biology majors, or students who have completed BIOL 101.

201 Diversity and Adaptation

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 strongly recommended.

202 Genetics and Population Biology

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, 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: 201; concurrent registration in CHEM 112 strongly recommended.

204 Cellular and Molecular Biology

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: 202, CHEM 112, and concurrent registration in CHEM 201

206 Global Ecology

2 credits

An exploration of ecological processes that operate at a global level and human influences on these processes: physical causes of climate variation, effect of climate on the distribution of organisms and biological communities, energy flow and nutrient cycles within communities and within the entire biosphere, effect of human activity on extinction rates and on the health of natural ecosystems. Case studies will integrate cellular, organismal, and ecological approaches to several of these processes.

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

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. Preference given to students in their first year of study in the discipline.

211 Introduction to Field Research

2 credits

An introductory experience in the pursuit of field-based research problems in biology. See BIOL 210 for other details concerning this course.

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.

216 Nursing Assistant 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: 215

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. Available in January Term.

Prerequisite: 216

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.

291, 292 Topics without laboratory**295, 296, 297, 298 Topics**

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. The subject matter of these courses, announced in the annual *Class Schedule*, will vary from year to year, but will not duplicate existing courses. See the description of these courses at the beginning of the "Departments and Curricula" section of this catalog.

Prerequisite: Permission of the instructor

302 Animal Diversity

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: 202; CHEM 111

315 General Botany

A broad consideration of plant diversity, ecology, levels of organization, reproduction, growth and development, and function. Laboratories explore plant geography, taxonomy and diversity, morphology, anatomy, and physiology. Three laboratory hours per week. This course fulfills the second-level Computer Competency requirement in the core curriculum.

Prerequisite: 202; completion of or concurrent registration in CHEM 111, or permission of instructor

330 Animal Behavior

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. Four laboratory hours per week.

Prerequisite: 202; 206 recommended

333 Ecology

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.

Prerequisite: 206; QMCS 220 recommended

349 Comparative Anatomy and Physiology I (formerly 323)

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: 204 or permission of instructor

350 Comparative Anatomy and Physiology II (formerly 342)

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.

Prerequisites: 204; QMCS 220 strongly recommended

Biology

353 Microscopic Anatomy

Microscopic anatomy of the basic tissue types and selected organ systems of vertebrates, stressing relationships between structure and function. Emphasis is on humans and other mammals. Laboratory work includes preparation of fresh tissues for microscopic study. Four laboratory hours per week.

Prerequisite: 204

354 Neurobiology

An integrative approach will be used to study neural processes 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, transduction and processing of sensory information, motor systems, and the neurobiology 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: 204 and CHEM 202 or permission of instructor

356 Microbiology

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: 204; completion of or concurrent registration in CHEM 202

360 Genetics

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: 204; CHEM 202

371 Cell Biology

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.

Prerequisite: 204; CHEM 202

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: 210 or 211 or permission of instructor.

430 Behavioral Ecology

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

Prerequisite: 206, 330

434 Field Biology

Principles of ecology applied to the study of plant and animal communities. Use of recent primary literature to learn and evaluate field techniques, data collection and data analyses. The laboratory includes a class research project as well as a significant individual research project. Four laboratory hours per week.

Prerequisite: 333

435 Aquatic Biology

Characteristics of lakes, streams and other aquatic habitats. Plant and animal communities, water chemistry and productivity of selected ecosystems. Both individual and class research projects focus on aquatic systems. Three laboratory hours per week.

Prerequisite: 333

462 Molecular Biology

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: 360 or 371

463 Immunology

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: 360 or 371

465 Developmental Biology

Examination of the mechanisms which underlie the structural and functional development of animal embryos, including nucleocytoplasmic interaction, tissue interaction, and differential gene expression. Laboratory work emphasizes an experimental approach to the study of living organisms. Four laboratory hours per week.

Prerequisite: 360 or 371

471 Evolution

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. No formal laboratories, but students will be expected to attend bi-weekly tutorials and complete six substantial essays based on library research.

Prerequisites: 204; 330 or 333 or 360; QMCS 220 recommended

475, 476, 477, 478 Experiential Learning

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

483, 484, 485, 486 Seminar

Investigation of selected problems in biology at an advanced level, involving student presentations based on the primary literature. Subject will vary and will be announced annually in the class schedule. See the description of these courses at the beginning of the "Departments and Curricula" section of this catalog.

Prerequisite: Upper-class standing and permission of the instructor

487, 488, 489, 490 Topics

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. The subject matter of these courses, announced in the annual *Class Schedule*, will vary from year to year, but will not duplicate existing courses. See the description of these courses at the beginning of the "Departments and Curricula" section of this catalog.

Prerequisite: Permission of the instructor

492 Research**2 credits**

Same as for 494, except that written research paper is not a thesis.

494 Research

Original laboratory, field, library, or other analytical investigation under the direction of a member of the faculty, culminating in the writing of a formal thesis in standard scientific format, including a literature review. Oral presentation of the work at a research symposium required.

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

495, 496, 497, 498 Individual Study

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

Business**Division of Business**

W. Raffield, director; Fisher, director of student services

The Program in Business Administration offers the opportunity to acquire a general understanding of decision making within a business context. Students begin by building a foundation of basic knowledge and skills with courses in economics, statistics, computer concepts, and communications. They then take a series of business courses that span the functional areas of business. These functional areas are: accounting, marketing, finance, operations management, business law, and principles of management. These courses form a core from which the student may go in several directions.

The emphasis is on combining thorough academic preparation with realistic practical experience. A significant proportion of the students participate in consulting assignments developed through the Small Business Institute. Many also take advantage of the opportunities for internships and cooperative programs with businesses.

The business faculty can enhance the practical experience since a majority of the members of