



## **DEPARTMENT OF BIOLOGY**

Dr. David L. Bechler, Head

Room 2009, Nevins Hall

The Department of Biology has a program of courses which lead to a Bachelor of Science degree in Biology. The Department also participates in several pre-professional programs such as pre-pharmacy, pre-dental hygiene, pre-occupational therapy, pre-respiratory therapy, pre-optometry, and medical technology.

Biology is the study of life and represents one of the most dynamic disciplines in science. The courses offered encompass a wide range of subject matter, from microscopy to field-oriented studies. A large selection of courses emphasizing principles and concepts allows students to concentrate in a number of subdivisions of biology. The structuring of core and elective courses in the biology program is designed to prepare students for employment in biology-related positions, as well as for advanced study in graduate school, including biology, medicine, dentistry, veterinary science, and allied health fields.

The major in Biology leads to the Bachelor of Science degree. In addition to this degree, the department participates in several two-year programs. Upon completion of these two-year programs, the student may qualify for an Associate of Arts degree.

### **B.S. DEGREE WITH A MAJOR IN BIOLOGY**

The program of study in the Department of Biology has numerous desired outcomes. Examples of these outcomes include the following:

#### **Selected Educational Outcomes**

1. Develop and test hypotheses, collect and analyze data, and present the results and conclusions in both written and oral formats used in peer-reviewed journals and at scientific meetings.
2. Describe the evolutionary processes responsible for biological diversity, explain the phylogenetic relationships among the major taxa of life, and provide illustrative examples.
3. Demonstrate an understanding of the cellular basis of life.
4. Relate the structure and the function of DNA/RNA to the development of form and function of the organism and to heredity.
5. Interpret ecological data pertaining to the behavior of the individual organism in its natural environment; to the structure and function of populations, commu-

nities, and ecosystems; and to human impacts on these systems and the environment.

**Requirements for the Bachelor of Science Degree  
with a Major in Biology**

**Core Curriculum Areas A, B, C, D.2.a, and E ..... 42 hours**  
(See VSU Core Curriculum, pp. 95-98)

Biology majors are required to take Pre-calculus (MAT 1113) in Area A and Calculus (MAT 2261) or Statistical Methods (MAT 2620) in Area D.2.a. One hour of calculus will transfer to the upper elective hours. Biology majors are advised to take 3 hours of foreign language in Area C. Biology majors must take 8 hours of science in Area D.2.a and may choose any of the following courses: BIOL 2010, CHEM 1211, CHEM 1212 or calculus-based physics (PHYS 2211K and PHYS 2212K). If biology and/or chemistry courses are taken in Area D.2.a, Biology majors may take non-calculus based physics (PHYS 1111K and PHYS 1112K) in Area F.

**Core Curriculum Area F ..... 18 hours**

Selected from:

- BIOL 2010, BIOL 2230, BIOL 2270 ..... 4 hours each
- CHEM 1211K, CHEM 1212K ..... 4 hours each
- PHYS 1111K, PHYS 1112K ..... 4 hours each
- Foreign Language ..... 3 hours

Between Areas D.2.a and F, biology majors must complete 20 hours of science. All the science courses listed for Area F must be taken as part of the major, the exception being physics. To satisfy the 8 hours of required physics, a student has a choice of taking non-calculus based physics in Area F or calculus based physics in Area D2. Any course listed in Area F that is not taken as part of the required 20 hours of science in Areas D2 and F must be taken as part of the final 60 hours of the bachelor's degree.

**Senior College Curriculum ..... 60 hours**

Required Upper Division Courses for the

Biology Major..... 17 hours

Chosen from:

- BIOL 3100, BIOL 3200 ..... 4 hours each
- BIOL 3300, ..... 4 hours
- BIOL 3450, BIOL 3400 ..... 4 hours

BIOL 4900 ..... 1 hour  
Additional Biology courses and general electives ..... 23 hours

Biology majors must take sufficient additional hours in upper division biology courses so that a minimum of 40 hours of biology are taken for the major. Laboratory Practicum I and II (Bio 4830 and 4840) and Internship in Biology (BIO 4850) may not be used as biology electives, but may be used to satisfy general electives discussed below. Directed Study (BIOL 4950) may be used only once as a biology elective, but may be taken more than once if used as a general elective.

Required Upper Division Support Courses  
in Chemistry for the Biology Major ..... 11 hours  
CHEM 3401 Organic Chemistry I ..... 4 hours  
CHEM 3402 Organic Chemistry II ..... 4 hours  
CHEM 3601 Biochemistry I ..... 3 hours  
Additional hours and general electives ..... 9 hours

**Foreign Language requirement.** Biology majors must take sufficient credits in a foreign language such that they complete a minimum of 9 hours.

**General Electives.** Biology majors must take sufficient elective hours such that they complete 120 hours for the Bachelors of Science degree, with a minimum 39 hours being upper division courses.

**Total hours required for the degree ..... 120 semester hours**

The Department of Biology assesses the extent to which the program requirements create the desired outcomes by using a variety of techniques. Examples of these assessments include the following:

#### **Examples of Outcome Assessments**

1. Regular advising and evaluation of a student's academic progress are made each semester.
2. So that students possess a good foundation in basic biological principles before taking required and elective Senior College courses in biology, their academic progress in Area F core courses is monitored to ensure that they have achieved a minimum grade of C in each course.
3. The success of students taking Senior Seminar, the capstone course, is evaluated with respect to their understanding of advanced concepts and principles in biology, breadth of knowledge in key areas, and ability to write scientifically correct reports and engage in knowledgeable discourse and debate with their peers and faculty.



**DEPARTMENT OF CHEMISTRY**

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Students who complete the major in chemistry will graduate with a Bachelor of Science degree.

All chemistry majors complete the general chemistry sequence and a common forty hour sequence of major courses. These courses, plus the prerequisite hours in physics and mathematics, provide each student with a solid background in analytical, inorganic, organic, physical and biochemistry.

Each student is required to select six hours of advanced chemistry courses as part of the major. The selection, made with the assistance of a departmental adviser, will be made with the postgraduate needs of the student in mind. Students who wish to pursue graduate study in chemistry should select all chemistry courses, while those who wish to accept positions in industrial or government laboratories may wish to select some chemistry and some biology courses to complete the major. Those who plan to attend professional school (medicine, dentistry, veterinary medicine, law or business) will select courses to satisfy entry requirements in the particular program of interest.

The chemistry major is designed for students to develop the critical thinking skills needed for problem solving. Students will be able to state a problem succinctly, outline methods of solving the problem, and proceed to solve the problem after choosing a suitable method. Mastery of problem solving techniques is especially apparent in students who participate in an undergraduate research project. Although the research problems chosen for solution by students are taken from the chemical sciences, the methods developed for problem solving are applicable to other fields.

The core curriculum provides opportunity for every student in the university to obtain the skills necessary for effective written and oral communication. The department requires chemistry majors to demonstrate mastery of those skills by preparing several papers and presenting those papers in Chemistry 4210, Senior Seminar. In addition to completing the Chemistry 4210 course, each senior must present a departmental seminar on a topic which is generally not covered in courses in the department. Successful completion of the departmental seminar will demonstrate that the student is able to search the literature on an unfamiliar topic, prepare a pertinent outline and abstract of the topic, present the material in a clear oral presentation and answer questions on the topic from both faculty and student colleagues.

## B. S. DEGREE WITH A MAJOR IN CHEMISTRY

The major in chemistry is designed to prepare graduates to enter professional school, to attend graduate school or to join the work force in a government, industrial or commercial setting. Among the anticipated educational outcomes of the department are that each graduate will

### Selected Educational Outcomes

1. understand, speak, and write in the language used by professional chemists;
2. demonstrate proficiency in problem solving and experimental design and show proficiency in laboratory procedure and the skills of measurement, analysis, data treatment and interpretation;
3. demonstrate an understanding of professional ethics in terms of data collection, evaluation and reporting and an understanding of environmental issues concerning handling and disposal of chemicals and chemical wastes; and understand the importance of chemistry in its impact on society;
4. demonstrate proficiency in the principles and theories that govern chemistry and appreciate the fact that chemistry is a changing discipline which requires a commitment to life-long learning.

### Requirements for the Bachelor Of Science Degree with a Major In Chemistry: American Chemical Society Certified Degree

**Core Areas A, B, C, D.2.a, and E ..... 42 hours**  
(See VSU Core Curriculum, pp. 95-98)

Chemistry majors must take MATH 1113 in Area A and MATH 2261 in Area D.2.a. One hour of MATH 2261 will carry over to Area F. In Area D.2.a, Chemistry majors may select eight hours from CHEM 1211, CHEM 1212, PHYS 2211K, PHYS 2212K or BIOL 2010.

**Core Area F ..... 18 hours<sup>1</sup>**

MATH 2261 (Carryover from Area D.2.a.) ..... 1 hr  
MATH 2262 ..... 4 hours  
CHEM 1211K (unless taken in Area D.2.a.) ..... 0-4 hours  
CHEM 1212K (unless taken in Area D.2.a.) ..... 0-4 hours  
CHEM 2310 ..... 4 hours  
PHYS 2211K (unless taken in Area D.2.a.) ..... 0-4 hours  
PHYS 2212K (unless taken in Area D.2.a.) ..... 0-4 hours

<sup>1</sup> Hours in excess of 18 will carry over into the Senior College Curriculum.

**Senior College Curriculum ..... 60 hours**

Of the 60 semester hours, 39 must be in courses numbered 3000 or above.

CHEM 3401, CHEM 3402 .....	8 hours
CHEM 3601, CHEM 3601L .....	4 hours
CHEM 3801, CHEM 3802, CHEM 3802L .....	7 hours
CHEM 4210 .....	1 hour
CHEM 4310, CHEM 4510 .....	8 hours
CHEM 4810 .....	2 hours
Advanced courses in Chemistry .....	6 hours
Modern Foreign Language <sup>2</sup> .....	6-9 hours
Electives <sup>3</sup> .....	15-18 hours

<sup>2</sup> If three hours of language are taken in Area C of the core, only six will be required in this portion of the major.

<sup>3</sup> Includes hours which carry over from Area F.

**Total hours ..... 120 hours**

In order to follow the success with which the educational outcomes are fulfilled the chemistry department will develop a number of assessment techniques, both formal and informal. The formal assessment techniques include the following:

**Examples of Outcome Assessments**

1. The department will maintain a portfolio of each chemistry major that will contain the following materials.
  - a. results of discipline related American Chemical Society Examinations.
  - b. samples of written assignments (papers and laboratory reports) from upper division classes.
  - c. faculty evaluation of the student's senior seminar and abstract.
2. Each student will present a seminar on a subject related to chemistry in the senior year. The student will gather and organize the necessary information, develop appropriate visual media, and write an abstract of the talk.
3. A formal alumni interview will be used to evaluate the program.
4. The office of Institutional Research and Planning will be asked to assist in the design and distribution of an alumni survey to evaluate the program.

The chemistry department requires that the prerequisites for a number of chemistry courses be completed with a grade of C or better. Majors in the department should consult an advisor at frequent intervals to be certain that prerequisites are met at the appropriate time and with a suitable grade.



**BACHELOR OF ARTS PROGRAM  
WITH A MAJOR IN ECONOMICS**

The purposes of the B.A. program with a major in economics are: (1) to help students gain an understanding of the economic processes which provide the foundation for our business, political, and social behavior; (2) to teach students how to acquire, process and analyze information so as to make logical choices based upon the benefits and costs of the choices; and (3) to provide students with a rigorous preparation for graduate study in economics, the related areas of political and social science, business administration, and law, and for executive training programs in business and government. The program provides extensive training in tool areas such as mathematics and computer science. It develops the analytical skills of economics, while enabling students to develop knowledge in areas appropriate to their advanced field of training.

**BACHELOR OF ARTS DEGREE WITH A MAJOR IN ECONOMICS**

**Core Curriculum Areas A-E** (See VSU Core Curriculum, pp. 95-98) ..... **42 hours**

**Area F Recommendation** ..... **18 hours**

- ECON 2105, ECON 2106 ..... 6 hours
- MCL Foreign Language and Culture\* ..... 6 hours
- MATH 1261 ..... 3 hours
- CS 1000 or CISM 2201 ..... 3 hours

\* Note that the total foreign language requirement for this degree is 9 hours.

Students completing Area F courses in Areas B through E as part of their core curriculum will be required to substitute VSU core curriculum courses as part of their Area F requirements. Students should see their advisor to ensure that appropriate courses are selected in order to satisfy this requirement.

**Economics Major Curriculum** ..... **60 hours**

- Required<sup>1</sup> ..... 15 hours
  - BUSA 2100, ECON 3100, ECON 3500,  
ECON 3600, ECON 4900
- Economics Electives<sup>1</sup>: ..... 15 hours
  - Any 3000 or 4000 level ECON course
- Senior Electives<sup>1,3</sup> : ..... 15 hours
  - Any 3000 or 4000 level course not required above
- General Electives<sup>1,2</sup>: ..... 15 hours
  - Any 3000 or 4000 level course not required above

<sup>1</sup> The grade in each of these courses must be a “C” or better.

<sup>2</sup> If CISM 2201/CS 1000 and/or MATH 1261 are not taken in the general core (Areas A through F), they are required here.

<sup>3</sup> At least 6 hours in a single discipline outside economics.



## **ENGINEERING**

Dr. Arnold E. Somers, Jr., Coordinator  
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### **ENGINEERING TRANSFER PROGRAMS**

Engineering at Valdosta State University is part of the Department of Physics, Astronomy, and Geosciences. It is considered a pre-engineering discipline, since no degree in engineering is offered. However, courses from engineering, the sciences, mathematics, computer science, humanities, and the social sciences provide a strong and intensive curriculum that effectively covers two to three years of work for a wide variety of engineering fields. The remaining course work required for a Bachelor's degree is completed by transfer to a four-year engineering institution. Formal agreements exist for transfer to the Georgia Institute of Technology and to Mercer University, but informal transfer arrangements can also be made with other qualified institutions.

Engineering is the application of mathematical and scientific principles, technological tools, and practical experience to the solution of real-world problems. The Pre-Engineering program is designed to prepare students to transfer as third-year students into an engineering curriculum at a degree-granting institution. A major part of this program is the Regents' Engineering Transfer Program (RETP) administered by the Georgia Institute of Technology. The program covers course work through the first two years in four major tracks: Civil Engineering, Electrical Engineering, Industrial Engineering, and Mechanical Engineering. Other alternatives for transfer in engineering include the Mercer University Transfer Program in Biomedical Engineering, Electrical Engineering, Environmental Engineering, Industrial Engineering, and Mechanical Engineering, and the Engineering Dual Degree Program with the Georgia Institute of Technology enables a student to earn a B. S. degree from Valdosta State University and a B. S. degree in Engineering from Georgia Institute of Technology. The Regents' Engineering Transfer Program, the Mercer University Transfer Program, and the Transfer Program in Engineering enable a student to take core curriculum, mathematics, science, and engineering courses at Valdosta State University and then transfer to an engineering school to complete the requirements for a degree in engineering. regular transfer option to University of Georgia in Agricultural Engineering and Biological Engineering.

The Engineering Dual Degree Program with the Georgia Institute of Technology enables a student to earn a B. S. degree from Valdosta State University and a B. S. degree in Engineering from Georgia Institute of Technology. The Regents' Engineering Transfer Program, the Mercer University Transfer Program, and the Transfer Program in Engineering enable a student to take core curriculum, mathematics, science, and engineering courses at Valdosta State University and then transfer to an engineering school to complete the requirements for a degree in engineering.

Students who desire to enter one of these programs should consult the pre-engineering coordinator as early as possible to understand the requirements of the program and to develop an acceptable program of study. This contact is particularly important for planning the specialized dual degree curriculum.

Students in the pre-engineering program may be able to gain related work experience through the VSU Cooperative Education Program. Such experience can prove valuable in terms of career decisions, acquisition of new skills, and job opportunities. In most cases, the cooperative education work contract can be continued without interruption after a student transfers to a four-year engineering school. Students seeking more information should contact the Coordinator of Pre-Engineering or the Office of Cooperative Education.

## **PRE-ENGINEERING TRANSFER PROGRAMS**

### **Selected Educational Outcomes**

1. Students will demonstrate understanding of fundamental sciences through application to problem solving and experimental laboratory analysis.
2. Students will demonstrate understanding of mathematics through application to mathematical analysis and problem solving.
3. Students will be able to apply scientific and mathematical principles to solve engineering problems.
4. Students will demonstrate the effective use of computers through application packages, programming, scientific calculations, and graphical applications.

### **Recommended Courses for the REGENTS' ENGINEERING TRANSFER PROGRAM**

Engineering students are required to meet the Core Curriculum of Georgia Institute of Technology by taking Calculus I (MATH 2261) in Area A, Calculus II (MATH 2262) in Area DII, Computer Science (CS 1010) in Area B, and an approved lab science sequence in Area DII.

**Area A** ENGL 1101, 1102, MATH 2261 (1 hour counts in Area B) ..... **9 hours**

**Area B** Computer Science: CS 1010 ..... **4 hours**

**Area C Humanities ..... 0-6 hours**

**Area DII** BIOL 2010, CHEM 1211,  
CHEM 1212, GEOL 1121, PHYS 2211, PHYS 2212. .... **8 hours**  
MAT 2262 Calculus II (1 hour counts in Area F). .... **3 hours**

**Area E Social Sciences . .... 6-12 hours**

**Area F: ..... 18 hours**

PHYS 2211-2212, if not taken in Area DII ..... 0-8 hours  
Lab Science Sequence, if not taken in Area DII ..... 0-8 hours  
ENGR 2010 Introduction to Engineering ..... 2 hours  
MATH 2262 ..... 1 hour  
(3 hours count in Area D; 1 hour counts in Area F)  
MATH 2263 Calculus III ..... 4 hours  
MATH 2403\* Introduction to Differential Equations \*\*  
or MATH 2602\* Linear and Discrete Mathematics (for IE majors)  
4 hours

- \* MATH 2403 and MATH 2602 are Georgia Tech course numbers.
- \*\* Students should take MATH 3340 at VSU.

**Engineering Courses for different engineering majors:**

Civil ENGR 2010, 2200, 2500, 3210, 3220 ..... 14 hours  
Electrical ENGR 2010, \*2200, 2310, \*2500, 3320 ..... 15 hours  
Industrial ENGR 2010, \*2200, \*2500 ..... 8 hours  
Mechanical ENGR 2010, 2200, 2500, 3210, 3220 ..... 14 hours

\* Recommended but not required.

**Supporting Courses for different engineering majors:**

Civil: BIOL 2010 or GEOL 1121, CS 1301, ECON 2105,  
MATH 2150 .....  
..... 14 hours  
Electrical: CS 1301, ECON 2105, MATH 2150 ..... 16 hours  
Industrial: CS 1301, ECON 2105, MATH 2150 ..... 16 hours  
Mechanical: CS 1301, ECON 2105, MATH 2150 ..... 16 hours

**Recommended Courses for the  
MERCER TRANSFER PROGRAM**

For All Majors (Biomedical, Electrical, Environmental, Industrial, and Mechanical Engineering):

**Areas A - F: same as Regents' Engineering Transfer Program (previous page)**

**Engineering Courses ..... 21 hours**

ENGR 2010, 2200, 2500, 3210, 3220, 3310, 3320

**Supporting Courses ..... 9 hours**

COMM 1100, ENGL 3020, MATH 2150

**Recommended Courses for**

**REGULAR TRANSFER TO UNIVERSITY OF GEORGIA**

All Majors (Agricultural Engineering, Biological Engineering):

Students should follow the recommended courses for Regents' Engineering Transfer Program, Mechanical Engineering.

**Outcome Assessments**

The curricula used at VSU to prepare engineering students to transfer are controlled primarily by the courses required at the degree-granting institutions. To be accepted as transfer credit, VSU courses must duplicate the corresponding courses at the transfer institution. Assessment of the VSU engineering program must therefore monitor the individual course contents, which can change from time-to-time, as well as the success of the students who transfer. To monitor the progress of students who transfer, records of the final grades, degree conferred, and any honors received will be maintained and examined annually to determine the effectiveness of the Pre-Engineering program. Transfer students will also be asked to provide an evaluation of their VSU engineering preparation during their final year before graduation.

**DUAL DEGREE PROGRAM**

The Dual Degree program offers a student the opportunity to earn a Bachelor of Science degree from Valdosta State University and, in addition, a Bachelor of Engineering degree from Georgia Institute of Technology within a total time period of approximately five years. Three-fourths of the Valdosta State University degree requirements are completed before transfer to Georgia Institute of Technology (nominally three years), while the remaining Valdosta State University degree requirements and the remaining engineering degree requirements are completed at Georgia Institute of Technology (nominally two years). The bachelor's degree from Valdosta State University may be awarded when the student has satisfied the degree requirements.

The major selected at Valdosta State University should be one that can easily incorporate the mathematics and science courses required in the first two years of the engineering field the student plans to enter, i.e., either applied mathematics, computer science, physics, or chemistry. Other majors make the five-year time period unfeasible. The second degree at Georgia Institute of Technology may be selected from any of the fields of engineering.

### **Selected Educational Outcomes**

1. Students will demonstrate understanding of fundamental sciences through application to problem solving and experimental laboratory analysis.
2. Students will demonstrate understanding of mathematics through application to mathematical analysis and problem solving.
2. Students will be able to apply scientific and mathematical principles to solve engineering problems.
4. Students will demonstrate the effective use of computers through application packages, programming, scientific calculations, and graphical applications.

### **Recommended Courses For The Dual-Degree Program**

*Major:* See course requirements for VSU major. Students must complete at least 90 hours at VSU before transferring. See the Dual-Degree Coordinator for additional requirements that must be satisfied before transferring.

*Supporting Courses/Electives:* Students take the following courses as they fit into the major requirements at VSU and the engineering requirements at Georgia Tech. ENGR 2010, 2200, 2310, 2500, 3210, 3220, 3320, MAHT 2150, 3340.

The remaining 30 (or fewer) hours required for the VSU degree must be taken at Georgia Institute of Technology, to be accepted as transfer credit by Valdosta State University.

### **Examples of Outcome Assessments**

The curricula used at VSU to prepare engineering students to transfer is controlled primarily by the courses required at the degree-granting institutions. To be accepted as transfer credit, VSU courses must duplicate the corresponding courses at the transfer institution. Assessment of the VSU engineering program must therefore monitor the individual course contents, which can change from time-to-time, as well as the success of the students who transfer. To monitor the progress of students who transfer, records of the final grades, degree conferred, and any honors received will be maintained and examined annually to determine the effectiveness of the Dual-Degree Program in Engineering. Transfer students will also have an opportunity to evaluate their Dual-Degree experience during their final year at Georgia Tech. This will provide almost immediate feedback from recently transferring students, and will be a valuable assessment tool.