

# Engineering Studies

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## Engineering Transfer Programs

Engineering is the application of mathematical and scientific principles, technological tools, and practical experience to the solution of real-world problems. The Engineering Studies Program at Valdosta State University is part of the Department of Physics, Astronomy, and Geosciences. No degree in engineering is offered; however, courses from engineering, the sciences, mathematics, computer science, the 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.

The Engineering Studies 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 and computer engineering, industrial engineering, and mechanical and aerospace engineering. Other alternatives for transfer in engineering include the Mercer University Transfer Program in biomedical engineering, computer engineering, electrical engineering, environmental engineering, industrial engineering, and mechanical engineering; and the regular transfer option to the engineering programs at the University of Georgia, Southern Polytechnic University, and Georgia Southern University. The regular transfer program option also includes transfer to other universities in Georgia to complete a Bachelor of Science degree in an engineering technology major. In addition to the RETP, another degree program with the Georgia Institute of Technology, the Engineering Dual Degree Program, enables students to earn a B.S. degree from VSU as well as a B.S. in Engineering from Georgia Tech. Additional information about this program is given at the end of this section.

Students who desire to enter one of these programs should consult the engineering studies 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 Engineering Studies Program may be able to gain related work experience through the VSU Co-op Program. Such experience may prove valuable in terms of career exploration, acquisition of new skills, and career development. In most cases, the Co-op 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 Engineering Studies or the Office of Career Opportunities.

## 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.

## Examples of 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 are maintained and examined annually to determine the effectiveness of the Engineering Studies Program. Transfer students are also asked to provide an evaluation of their VSU engineering preparation during their final year before graduation.

## Recommended Courses for the Regents' Engineering Transfer Program

Engineering students are required to meet the Core Curriculum of the Georgia Institute of Technology by taking MATH 2261 in Area A, MATH 2262 and an approved lab science sequence in Area D, and CS 1010 in Area B.

### Core Curriculum Area A

ENGL 1101	Composition I	3
or ENGL 1101H	Honors Composition I	
ENGL 1102	Composition II	3
or ENGL 1102H	Honors Composition II	
MATH 2261	Analytic Geometry and Calculus I <sup>1</sup>	4

**Core Curriculum Area B**

CS 1010	Algorithmic Problem Solving	3
MATH 2261	Analytic Geometry and Calculus I <sup>2</sup>	4

**Core Curriculum Area C**

See course requirements for Area C in the VSU Core Curriculum		6
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**Core Curriculum Area D**

Select eight hours from the following:		8
BIOL 1107K	Principles of Biology I	
CHEM 1211 & 1211L	Principles of Chemistry I and Principles of Chemistry Laboratory I	
CHEM 1212 & 1212L	Principles of Chemistry II and Principles of Chemistry Laboratory II	
GEOL 1121K	Principles of Physical Geology	
PHYS 2211K	Principles of Physics I	
PHYS 2212K	Principles of Physics II	
MATH 2262	Analytic Geometry and Calculus II <sup>3</sup>	4

**Core Curriculum Area E**

See course requirements for Area E in the VSU Core Curriculum		12
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**Core Curriculum Area F**

PHYS 2211K	Principles of Physics I	4
Lab Science Sequence <sup>4</sup>		0-8
ENGR 2010	Introduction to Engineering	3
MATH 2262	Analytic Geometry and Calculus II <sup>5</sup>	4
MATH 2263	Analytic Geometry and Calculus III	4
MATH 3340	Ordinary Differential Equations	3

- <sup>1</sup> 1 hour counts in Area B
- <sup>2</sup> 3 hours count in Area A
- <sup>3</sup> 1 hour counts in Area F
- <sup>4</sup> if not taken in Area D
- <sup>5</sup> 3 hours count in Area D

The engineering studies curriculum for each track is shown below:

**Valdosta State University Engineering Studies Curriculum for Transfer to the Georgia Institute of Technology in Civil Engineering**

	Fall	Hours	Spring	First Year Hours
MATH 1113		3 MATH 2261		4
CHEM 1211 & 1211L		4 CS 1010		3
ENGR 2010		3 ENGR 2500		3
ENGL 1101		3 ENGL 1102		3
POLS 1101		3 HIST 2111 or 2112		3
		16		16
	Fall	Hours	Spring	Second Year Hours
MATH 2262		4 MATH 2263		4
PHYS 2211K		4 PHYS 2212K		4
CS 1301		4 ENGR 2200		3
Select one of the following:		3 BIOL 1107K		4
ENGL 2111		3		
ENGL 2112		3		
ENGL 2113		3		
		15		15

	Fall	Hours	Spring	Third Year Hours
MATH 3340		3 MATH 2150		3
ENGR 3210		3 ENGR 3220		3
Area C <sup>6</sup>		3 ECON 2105 or 2106		3
GEOL 1121K		4 Area C <sup>6</sup>		3
KSPE 2000		2 Area E		3
		15		15

Total Hours: 92

<sup>6</sup> COMM 1100 and ENGL 3020: recommended but not required  
ECON 2105 or ECON 2106 is acceptable for the economics requirement.

Other supported courses: CS 1302, MATH 3600.

## Valdosta State University Engineering Studies Curriculum for Transfer to the Georgia Institute of Technology in Computer Engineering or Electrical Engineering

	Fall	Hours	Spring	First Year Hours
MATH 1113		3 MATH 2261		4
CHEM 1211 & 1211L		4 CS 1010		3
ENGR 2010		3 Area C <sup>7</sup>		3
ENGL 1101		3 ENGL 1102		3
POLS 1101		3 HIST 2111 or 2112		3
		16		16

	Fall	Hours	Spring	Second Year Hours
MATH 2262		4 MATH 2263		4
PHYS 2211K		4 PHYS 2212K		4
CS 1301		4 ENGR 2310		4
Select one of the following:		3 Area C <sup>7</sup>		3
ENGL 2111		3		
ENGL 2112		3		
ENGL 2113		3		
		15		15

	Fall	Hours	Spring	Third Year Hours
MATH 3340		3 MATH 2150		3
ENGR 3320		3 ENGR 2200 <sup>7</sup>		3
CS 1302		4 Area D <sup>8</sup>		3
ECON 2105 or 2106		3 ENGR 2320		3
Area E		3 KSPE 2000		2
		16		14

Total Hours: 92

<sup>7</sup> ENGR 2500, COMM 1100, ENGR 2200: recommended but not required.  
ECON 2105 or ECON 2106 is acceptable for the economics requirement.

<sup>8</sup> Area D can be satisfied by BIOL 1107K, CHEM 1212, or GEOL 1121K.

## Valdosta State University Engineering Studies Curriculum for Transfer to the Georgia Institute of Technology in Industrial Engineering

	Fall	Hours	Spring	First Year Hours
MATH 1113		3 MATH 2261		4
Area D <sup>9</sup>		4 CS 1010		3
ENGR 2010		3 ENGR 2500 <sup>10</sup>		3
ENGL 1101		3 ENGL 1102		3
POLS 1101		3 HIST 2111 or 2112		3
		16		16

	Fall	Hours	Spring	Second Year Hours
MATH 2262		4 MATH 2263		4
PHYS 2211K		4 PHYS 2212K		4
CS 1301		4 CS 1302		4
Select one of the following:		3 Area C <sup>9</sup>		3
ENGL 2111		3		
ENGL 2112		3		
ENGL 2113		3		
		15		15
	Fall	Hours	Spring	Third Year Hours
Area D <sup>10</sup>		4 MATH 2150		3
PSYC 1101		3 ENGR 2200		3
ECON 2105		3 ECON 2106		3
MATH 3600		3 ENGL 3020		3
KSPE 2000		2		
		15		12

Total Hours: 89

<sup>9</sup> ENGR 2500 and COMM 1100:recommended but not required

<sup>10</sup> Area D can be satisfied by two of these courses: CHEM 1211/CHEM 1211L, CHEM 1212/CHEM 1212L, BIOL 1107K, and GEOL 1121K.

## Valdosta State University Engineering Studies Curriculum for Transfer to the Georgia Institute of Technology in Aerospace Engineering or Mechanical Engineering

	Fall	Hours	Spring	First Year Hours
MATH 1113		3 MATH 2261		4
CHEM 1211 & 1211L		4 CS 1010		3
ENGR 2010		3 ENGR 2500		3
ENGL 1101		3 ENGL 1102		3
POLS 1101		3 HIST 2111 or 2112		3
		16		16
	Fall	Hours	Spring	Second Year Hours
MATH 2262		4 MATH 2263		4
PHYS 2211K		4 PHYS 2212K		4
CS 1301		4 ENGR 2200		3
Select one of the following:		3 Area C <sup>11</sup>		3
ENGL 2111		3		
ENGL 2112		3		
ENGL 2113		3		
		24		14
	Fall	Hours	Spring	Third Year Hours
MATH 3340		3 MATH 2150		3
ENGR 3210		3 ENGR 3220		3
Area D <sup>12</sup>		4 ECON 2105 or 2106		3
Area E		3 ENGL 3020		3
KSPE 2000		2		
		15		12

Total Hours: 97

<sup>11</sup> COMM 1100, ENGL 3020: recommended but not required.  
ECON 2105 or ECON 2106 is acceptable for the economics requirement.  
Other supporting courses: CS 1302, MATH 3600

<sup>12</sup> Area D can be satisfied by BIOL 1107K, CHEM 1212/CHEM 1212L, or GEOL 1121K

## Recommended Courses for Regular Transfer to the University of Georgia

**All Majors (agricultural engineering, biological engineering):** Students should follow the recommended courses for Regents' Engineering Transfer Program, Mechanical Engineering.

### 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 Science degree in engineering from the 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 the Georgia Institute of Technology (nominally three years), while the remaining Valdosta State University degree requirements and the remaining engineering degree requirements are completed at the 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., applied mathematics, computer science, physics, or chemistry. Other majors make the five-year time period unfeasible. The second degree at the Georgia Institute of Technology may be selected from any of the fields of engineering.

### 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. The remaining 30 (or fewer) hours required for the VSU degree must be engineering courses (ENGR) taken at either VSU or Georgia Tech. All ENGR courses from Georgia Tech will be accepted as transfer credit by VSU. Below is a sample program for the Dual Degree in Physics and Engineering.

Core Curriculum Areas A-E (See VSU Core Curriculum)		42
Physics/Engineering Dual degree majors are required to take MATH 2261 in Area A and MATH 2262 in Area D2. They are advised to take PHYS 2211K and PHYS 2212K in Area D2.		
Core Curriculum Area F		18
MATH 2261	Analytic Geometry and Calculus I (1 hour left over from Area A)	1
MATH 2262	Analytic Geometry and Calculus II (1 hour left over from Area D)	1
MATH 2263	Analytic Geometry and Calculus III	4
CS 1301	Principles of Programming I	4
PHYS 2211K & PHYS 2212K	Principles of Physics I and Principles of Physics II (if not taken in Area D2)	0-8
Lab courses, if PHYS 2211K and PHYS 2212K are taken in Area D2		0-8
Senior College Curriculum		60
ENGR 2010	Introduction to Engineering	3
Required Courses in Physics		24
PHYS 2700	Modern Physics	1
Advanced Lab Courses		8
Select two of the following		
PHYS 3040	Electronics	
PHYS 3100	Optics	
PHYS 3810	Mathematical Methods of Physics	
PHYS 4040	Experimental Physics	
Upper Level Lecture Courses		15
Select five of the following:		
PHYS 3810	Mathematical Methods of Physics	
PHYS 4111	Theoretical Mechanics I	
PHYS 4112	Theoretical Mechanics II	
PHYS 4211	Electromagnetism I	
PHYS 4212	Electromagnetism II	
PHYS 4300	Plasma Physics	
PHYS/ENGR 4310	Thermodynamics	
PHYS 4411	Quantum Mechanics I	
PHYS 4412	Quantum Mechanics II	
Other Supporting Courses		6
MATH 2150	Introduction to Linear Algebra	

MATH 3340	Ordinary Differential Equations	
Engineering Courses		30
0-30 hours may be taken at engineering school		
Up to 13 hours may be taken from the following:		
ENGR 2010	Introduction to Engineering	
ENGR 2200	Statics	
ENGR 2310	Introduction to Signal Processing	
ENGR 2320	Introduction to Computer Engineering	
ENGR 2500	Engineering Graphics for Design	
ENGR 3210	Dynamics	
ENGR 3220	Mechanics of Deformable Bodies	
ENGR 3320	Circuit Analysis	
ENGR 2200	Statics	
ENGR 2310	Introduction to Signal Processing	
ENGR 2500	Engineering Graphics for Design	
ENGR 3210	Dynamics	
ENGR 3220	Mechanics of Deformable Bodies	
ENGR 3320	Circuit Analysis	
MATH 2150	Introduction to Linear Algebra	
MATH 3340	Ordinary Differential Equations	
Total Hours Required for the Degree		120

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 201, ENGR 2200, ENGR 2310, ENGR 2500, ENGR 3210, ENGR 3220, ENGR 3320, MATH 2150, MATH 3340.

**ENGR 1010. Technological Problem Solving. 3 Hours.**

Prerequisite: MATH 1111 or higher. Development of the features and principles of problem solving techniques based on a variety of fundamental models for general application, such as physical component, sketching, graphical, and mathematical models. Emphasis is placed on solving problems of a technological nature.

**ENGR 2001. Principles and Applications of Engineering Materials. 3 Hours.**

Prerequisite: CHEM 1211. A treatment of structures, properties, processing, and performance of engineering materials and their relationships. The course introduces the molecular and microstructural basis for electrical, optical, thermal, and mechanical properties of engineering materials including metals, ceramics, polymers, semiconductors, and composites.

**ENGR 2010. Introduction to Engineering. 3 Hours.**

Interpretation of the scope of engineering; introduction to engineering disciplines that form the basis for a variety of career opportunities; engineering design as creative problem solving; lessons from design failures; professionalism and ethics; introduction to problem solving using MATLAB.

**ENGR 2200. Statics. 3 Hours.**

Prerequisite: PHYS 2211. Prerequisite or corequisite: MATH 2263. Elements of statics in two and three dimensions; forces and moments; particles, objects, and structures in equilibrium; centroids; distributed forces and beams; friction.

**ENGR 2310. Introduction to Signal Processing. 4 Hours.**

Prerequisites: CS 1301 and MATH 2262. Introduction to signal processing for discrete-time and continuous-time signals. Filtering, frequency response, Fourier Transform, Z Transform. Laboratory emphasizes computer-based signal processing.

**ENGR 2320. Introduction to Computer Engineering. 3 Hours.**

Prerequisites: CS 1301 and MATH 2262. Computer system and digital design principles; architectural concepts, software, Boolean algebra, number systems, combinational datapath elements, sequential logic, and storage elements; design of DRAM control and I/O bus.

**ENGR 2500. Engineering Graphics for Design. 3 Hours.**

Introduction to engineering design and three-dimensional visualization; geometric construction; graphical projection and sketching; introduction to descriptive geometry; computer graphics.

**ENGR 3210. Dynamics. 3 Hours.**

Prerequisite: ENGR 2200. Kinematics and kinetics of particles; kinematics and kinetics of rigid bodies in plane motion; kinematics and kinetics of rigid bodies in three-dimensional motion.

**ENGR 3220. Mechanics of Deformable Bodies. 3 Hours.**

Prerequisite: ENGR 2200. Definition and analysis of strain and stress, applications to axially loaded elements, torsion of circular shafts and bending of beams, introduction to simple plasticity and column stability.

**ENGR 3320. Circuit Analysis. 3 Hours.**

Prerequisites: ENGR 2310 and PHYS 2212. Corequisite: MATH 3340. Introduction to the basic concepts of DC and AC circuit theory and analysis.

**ENGR 4310. Thermodynamics. 3 Hours.**

Also offered as PHYS 4310. Prerequisites: PHYS 2211, PHYS 2212, MATH 2263, or consent of the instructor. Basic principles of classical thermodynamics, which includes open and closed systems for both steady and transient processes.

**ENGR 4800. Engineering Internship. 3-9 Hours.**

Prerequisite: MATH 2261, Co-requisite: PHYS 2211K, a minimum GPA of 2.5, and permission of the internship coordinator. Graded "Satisfactory" or "Unsatisfactory". Active participation in supervised research or applied engineering project. Credit hours are determined by the engineering internship coordinator and are based on the project. A daily log of activities, a report on work done and experience gained or a research paper related to the project performed are required.

**ENGR 4950. Directed Study in Engineering. 1-3 Hours.**

Prerequisites: Junior standing; permission of advisor, instructor, and Department Head. Study in an area or subject not normally found in established courses offered by the department; may also allow student to explore in more depth an area or subject covered by the pre-engineering program. Up to maximum of 3 hours.