

ENGINEERING, B.S.

Requirements

The program for each student majoring in engineering is developed individually through consultation with the student's major adviser and leads to a bachelor of science in engineering. The degree is designed to meet ABET accreditation requirements:

1. a minimum of 30 semester credit hours of a combination of college-level mathematics and basic sciences with experimental experience
2. a minimum of 47 credit hours of engineering topics consisting of engineering sciences and engineering design and utilizing modern engineering tools*
3. a broad education component that complements the technical content of the curriculum
4. a culminating design experience within the major

In meeting the minimum of 30 hours of basic science and mathematics, students must complete the following:

Code	Title	Hours
Basic Science and Mathematics		
CHM 111 & 111L	College Chemistry I and College Chemistry I Lab	4
MST 111	Calculus with Analytic Geometry I	4
MST 112	Calculus with Analytic Geometry II	4
MST 113	Multivariable Calculus	4
MST 205	Introduction to Linear Algebra and Differential Equations	4
PHY 113 & 113L or PHY 123 & 123L	General Physics I and General Physics Lab and General Physics I - Studio Format and General Physics I - Studio Format Lab	4

Basic sciences, according to ABET, consist of disciplines focused on knowledge or understanding of the fundamental aspects of natural phenomena such as chemistry, physics, and the life, earth, and space sciences. An integrated science course with a laboratory component will be offered by engineering, EGR 113, and can also count as a basic science course. For the remainder of the minimum 30 credit hours of basic science and mathematics topics, students have the flexibility to select mathematics and basic science elective credits that promote the student's progress toward the completion of a minor or other relevant interests. Students must consult with Engineering Department faculty to ensure that the elective mathematics and basic science credits of interest will count toward this requirement.

In meeting the WFU Engineering minimum of 47 hours of engineering topics, students must complete the following:

Code	Title	Hours
EGR 111	Introduction to Engineering Design	4
EGR 112	Introduction to Engineering Experimentation	4
EGR 211	Materials and Mechanics	4
EGR 212	Transport Phenomena	4
EGR 311	Control Systems and Instrumentation	4
EGR 312	Computational Modeling in Engineering	4

EGR 313	Capstone Design I	1
EGR 314	Capstone Design II	4
EGR 315	Capstone Design III	4

A minimum of 14 additional credit hours in engineering topics must be satisfied through engineering technical electives and courses designated as engineering topics.*

* Computer science (CSC) topics may count as part of the minimum of 47 semester credit hours of engineering topics. A pre-approved list of Computer Science courses should be solicited from the Engineering Department Faculty.

To be well positioned for junior-level EGR coursework and to complete the degree in four years, students should complete the following courses during the first two years and should earn a minimum overall GPA of 2.0 in the following courses:

Code	Title	Hours
CHM 111 & 111L	College Chemistry I and College Chemistry I Lab	4
EGR 111	Introduction to Engineering Design	4
EGR 112	Introduction to Engineering Experimentation	4
EGR 211	Materials and Mechanics	4
EGR 212	Transport Phenomena	4
MST 111	Calculus with Analytic Geometry I	4
MST 112	Calculus with Analytic Geometry II	4
MST 113	Multivariable Calculus	4
MST 205	Introduction to Linear Algebra and Differential Equations**	4
or MST 121 & MST 251	Linear Algebra I and Ordinary Differential Equations	
PHY 113 & 113L or PHY 123 & 123L	General Physics I and General Physics Lab and General Physics I - Studio Format and General Physics I - Studio Format Lab	4

** The substitution of MST 121 and MST 251 in place of MST 205 may be of particular interest to those students thinking of declaring a Mathematics Minor and/or graduate school in an engineering field.

Note that EGR 111 is not a pre-requisite for EGR 112, so either EGR 111 or EGR 112 can be taken first. Similarly, EGR 211 is not a pre-requisite for EGR 212 and EGR 311 not a pre-requisite for EGR 312, so either EGR 211 or EGR 212 can be taken first and either EGR 311 or EGR 312 can be taken first.

Engineering Concentrations

Pursuit of an Engineering Concentration does not change the degree which is a Bachelor of Science in Engineering. Pursuit of an Engineering Concentration allows students to show focus in their selection of engineering technical elective courses.

Exit Requirement

In order to graduate with a B.S. Engineering, majors must take the Fundamentals of Engineering (FE) exam. The FE exam is a national exam and a precursor to licensure.

Four-Year Planning

A typical, yet customizable, schedule for the BS Engineering major is:

Code	Title	Hours
First Year		
EGR 111	Introduction to Engineering Design	4
EGR 112	Introduction to Engineering Experimentation	4
CHM 111 & 111L	College Chemistry I and College Chemistry I Lab	4
MST 111	Calculus with Analytic Geometry I	4
MST 112	Calculus with Analytic Geometry II	4
PHY 113	General Physics I	4
or PHY 123	General Physics I - Studio Format	
Second Year		
EGR 211	Materials and Mechanics	4
EGR 212	Transport Phenomena	4
MST 113	Multivariable Calculus	4
MST 205	Introduction to Linear Algebra and Differential Equations	4
Third Year		
EGR 311	Control Systems and Instrumentation	4
EGR 312	Computational Modeling in Engineering	4
EGR 313	Capstone Design I	1
EGR technical electives		
Math and/or Basic Science course		
Fourth Year		
EGR 314	Capstone Design II	4
EGR 315	Capstone Design III	4
EGR technical electives		
Math and/or Basic Science course		

Current lists covering all categories of approved courses are available in the Engineering Department and on its website. Additional courses and course updates may have been approved since the publication of this bulletin. The majority of engineering courses integrate theory and practice (e.g., labs, projects, studio) as well as personal and professional development skills.

Concentrations

Engineering Concentrations

Requires at least 8 hours across selected engineering technical electives with a focus in the concentration area, as well as the completion of a basic math and science elective from a shortlist specific to the concentration. Each completed course can only be counted toward one concentration. AP credits cannot count towards any of the courses. A minimum overall GPA of 2.0 must be earned on all Wake Forest Engineering courses taken to complete the concentration. The requirements for the concentration are those that are in effect at the time of the declaration of the concentration, as the curriculum and the departmental requirements may change slightly during the student's period of residence. Students interested in the concentration should contact an Engineering Faculty.

Biomedical Engineering

Code	Title	Hours
Select 8 hours engineering technical electives with biomedical focus from:		
EGR 320	Biomedical Engineering Applications	2
EGR 325	Medical Product Design	2
EGR 333	Tissue Engineering	2
EGR 336	Healthcare Engineering	2
EGR 337	Biofluid Mechanics	2
EGR 338	Bioprinting and Biofabrication	2
EGR 343	Biomaterials	2
EGR 349	Biomechanics of Human Movement	2
EGR 381	Engineering Research *	2

At least one from the following to satisfy basic math and science electives in the concentration:

HES 384	Special Topics in Health and Exercise Science	1.5-3
BIO 150 & 150L	Biology I and Biology I Lab	4

Civil and Environmental Concentration

Code	Title	Hours
Select 8 hours engineering technical electives with a civil/environmental focus from:		
EGR 319	Environmental Engineering	2
EGR 324	Hydrologic and Hydraulic Engineering	2
EGR 328	Inverse Problems in Engineering	2
EGR 330	Infrastructure Systems Design	2
EGR 332	Structural Engineering I	2
EGR 339	Engineering Reynolda	2
EGR 381	Engineering Research *	2

At least one from the following to satisfy basic math and science electives in the concentration:

BIO/ENV 220	Introduction to Earth Science	3
CHM 120 & 120L	Physics and Chemistry of the Environment and Physics and Chemistry of the Environment Lab	4
STA 111	Elementary Probability and Statistics	4
STA 112	Introduction to Regression and Data Science	3

Electrical Engineering Concentration

Code	Title	Hours
Select 8 hours engineering technical electives with an electrical focus from:		
EGR 214	Embedded Microcontroller Systems	2
EGR 215	Digital Electronics	2
EGR 334	Mobile Robotics	2
EGR 335	Field Programmable Gate Array (FPGA) Design and Implementation	2
EGR 350	Advanced Electronics	2
EGR 381	Engineering Research *	2

At least one from the following to satisfy basic math and science electives in the concentration:

PHY 114	General Physics II	4
or PHY 124	General Physics II - Studio Format	
PHY 230	Electronics	3

Materials and Chemical Engineering Concentration

Code	Title	Hours
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Select 8 hours engineering technical electives with a materials/chemical focus from:

EGR 321	Chemical Engineering Separations	2
EGR 332	Structural Engineering I	2
EGR 323	Chemical Reaction Engineering	2
EGR 329	Functional Advanced Materials Characterization	2
EGR 344	Mechanics of Intelligent Material Systems	2
EGR 381	Engineering Research *	2

At least one from the following to satisfy basic math and science electives in the concentration:

CHM 122 & 122L	Organic Chemistry I and Organic Chemistry I Lab	4
CHM 280	College Chemistry II	3
CHM 364 & 364L	Materials Chemistry and Materials Chemistry Lab	4

Mechanical Engineering Concentration

Code	Title	Hours
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Select 8 hours engineering technical electives with a mechanical focus from:

EGR 213	Mechanical Computer Aided Design I	2
EGR 316	Mechanical Computer Aided Design II	2
EGR 317	Renewable Energy Systems	2
EGR 331	Thermal Fluid Systems	2
EGR 340	Acoustics	2
EGR 341	3D Modeling and Additive Manufacturing	2
EGR 342	Design of Machine Elements	2
EGR 346	Engineering Analysis of Vibrations	2
EGR 347	Finite Element Analysis of Engineering Systems	2
EGR 348	Advanced Fluid Mechanics	2
EGR 349	Biomechanics of Human Movement	2
EGR 381	Engineering Research *	2

At least one from the following to satisfy basic math and science electives in the concentration:

PHY 114	General Physics II	4
or PHY 124	General Physics II - Studio Format	
PHY 262	Mechanics	3

Honors

Qualified majors are considered for honors in engineering. Students should consult with Engineering Department faculty or the major adviser for additional details.