

# School of Engineering

*Dr. Ronald G. Kander, Director*

Phone: (540) 568-8110

Location: Health & Human Services Building, Room 3228

E-mail: [kanderrg@enr.jmu.edu](mailto:kanderrg@enr.jmu.edu)

Web site: [www.jmu.edu/engineering/](http://www.jmu.edu/engineering/)

The Bachelor of Science in Engineering is a single engineering degree that spans the traditional engineering disciplines and includes course work in science, mathematics, business, technology management, engineering, design and interpersonal communication skills. The themes of the program are sustainability, engineering design and systems analysis.

Engineering for a sustainable world is, in short, a body of knowledge and set of holistic analytical design skills that contribute to the development of products, processes, systems, and infrastructures that simultaneously protect the environment, conserve resources, and meet human needs at an acceptable financial cost. By reframing traditional engineering practice, sustainability provides a way of moving toward the development of sustainable societies, where human quality of life is advanced with a minimum impact on finite resources and the environment. Sub-disciplines of engineering, such as mechanical, electrical or chemical will not be offered in this program. Rather, a broad-based engineering program that spans many areas of engineering will be emphasized to train engineering versatilists who are aware of the need for sustainability in the products, processes, and engineering systems they design.

The curriculum is designed to meet all engineering accreditation standards and to prepare students to pass the Fundamentals of Engineering (FE) pre-licensure examination. Graduates will be prepared to succeed in the engineering workforce or in advanced engineering degree programs by exhibiting the practical ingenuity of an engineering versatilist.

## Mission Statement

James Madison University engineering graduates will improve the sustainability of our world by participating in projects in which they analyze problems and design solutions in the context of environmental, energy, financial, and social impacts.

## Objectives

The JMU engineering program empowers and motivates students to engineer systems for sustainable societies by:

- analyzing and solving real-world human problems.
- modeling, simulating and testing complex interdependent socio-technical systems.
- integrating business, social, and ethical aspects into engineering solutions.
- working effectively in interdisciplinary teams and international environments.
- managing engineering projects in a timely and cost-effective manner.
- communicating effectively with diverse audiences.
- striving toward lifelong learning and creative critical thinking.

## Career Opportunities

Upon graduation, alumni will be prepared for a wide range of opportunities in the engineering workforce or in engineering graduate school. Typical fields of engineering that students will be prepared to enter include applications engineering, process design, product design, process engineering, project engineering and systems engineering. Other industry options include product service, technical sales, management training and technical marketing.

A wide range of graduate school options include master's and doctoral programs in civil engineering, environmental engineering, industrial engineering, materials engineering, mechanical engineering and systems engineering. Other post-graduation options include business school, law school, AmeriCorps, Peace Corps, military service, entrepreneurship (starting a small business), applied science fields, international experiences, medical school and careers in politics/public policy.

Some examples of the industries that hire engineers include, among others, aeronautic firms, airports, automobile manufactures, colleges and universities, computer service and software firms, consulting firms, energy systems firms, engineering firms, federal contractors, federal, state and local governments (e.g., NASA, EPA, NIST, DOD, DOE), non-profit agencies, manufacturing firms, inspection agencies, mining and petroleum firms, pharmaceutical and medical research companies, research and development laboratories, telecommunication companies, and waste management and recycling firms.

## Progression Standard and Prerequisite Chain

Students have two targets to watch while planning their engineering curriculum: the progression standard and the prerequisite chain.

### Progression Standard

Engineering students must meet the following progression standard before being admitted into junior-level (ENGR 3xx) or senior-level (ENGR 4xx) engineering courses.

The lowest grade of record for any of the following required in-major courses is a "C-."

- ENGR 112, ENGR 212, ENGR 221, ENGR 231, ENGR 232
- MATH 235, MATH 236, MATH 237, MATH 238
- PHYS 240, PHYS 140L, PHYS 250, PHYS 150L
- CHEM 131, CHEM 131L, CHEM 132L

A student's overall GPA and required major GPA (for the same list of courses) must be at least 2.500 (no rounding).

## Prerequisite Chain

Engineering students should be aware that many courses include prerequisites, or courses that must be successfully completed before enrollment in a specific course. The following list includes prerequisites that students should consider when planning their courses of study.

Course	Prerequisite Course(s)
ENGR 112	MATH 235, PHYS 240, PHYS 140L
ENGR 212	ENGR 112, PHYS 250, PHYS 150L, MATH 237, & MATH 238 <sup>1</sup>
ENGR 221	ENGR 112
ENGR 231	ENGR 112
ENGR 232	ENGR 231
Required ENGR 3xx Courses	All required ENGR 2xx Courses
ENGR 332	ENGR 331
Required ENGR 4xx courses	All required ENGR 3xx Courses
ENGR 432	ENGR 431
ENGR 412	ENGR 411

<sup>1</sup> Course may be taken concurrently as a corequisite.

## Degree and Major Requirements

### Bachelor of Science in Engineering

Required courses	Credit Hours
General Education <sup>1</sup>	41
Quantitative requirement <sup>2</sup>	3
Scientific Literacy requirement <sup>2</sup>	3-4
Major requirements (listed below) and electives	73-77
	<hr/> 120

<sup>1</sup> The General Education program contains a set of requirements each student must fulfill. The number of credit hours necessary to fulfill these requirements may vary.

<sup>2</sup> In addition to course work taken to fulfill General Education requirement.

### Recommended Schedule for Majors

First Year	Credit Hours
<b>Fall</b>	
MATH 235. Calculus I <sup>1</sup>	4
PHYS 240 & 140L. University Physics I & Laboratory <sup>2</sup>	4
General Education <sup>3</sup>	3
General Education <sup>4</sup>	3
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First Year	Credit Hours
<b>Spring</b>	
MATH 236. Calculus II	4
PHYS 250 & 150L. University Physics II & Laboratory	4
ENGR 112. Introduction to Engineering	3
General Education <sup>4</sup>	3
	<hr/> 14

Second Year	Credit Hours
<b>Fall</b>	
MATH 237. Calculus III	4
CHEM 131. General Chemistry I and 131L & 132L. General Chemistry Laboratories <sup>4</sup>	5
ENGR 221. Management of Technology	3
ENGR 231. Engineering Design I	1
General Education	3
	<hr/> 16

Second Year	Credit Hours
<b>Spring</b>	
MATH 238. Linear Algebra and Differential Equations	4
ENGR 212. Engineering Statics & Dynamics	4
ENGR 232. Engineering Design II	1
General biology or geology <sup>5</sup>	3
General Education	3
	<hr/> 15

Third Year	Credit Hours
<b>Fall</b>	
ENGR 311. Engineering Fluids & Transport + Lab	4
ENGR 313. Instrumentation & Circuits + Lab	4
ENGR 331. Engineering Design III	2
Technical elective	3
General Education	3
	<hr/> 16

Third Year	Credit Hours
<b>Spring</b>	
ENGR 312. Engineering Thermo & Heat Transfer + Lab	4
ENGR 314. Strength of Materials + Lab	4
ENGR 322. Management of Technology II	3
ENGR 332. Engineering Design IV	2
General Education	3
	<hr/> 16

Fourth Year	Credit Hours
<b>Fall</b>	
ENGR 411. Sustainability I	3
ENGR 413. Systems Analysis	3
ENGR 431. Engineering Design V	2
Technical elective	3
General Education	4
	<hr/> 15

Fourth Year	Credit Hours
<b>Spring</b>	
ENGR 412. Sustainability II	3
ENGR 432. Engineering Design VI	2
Technical elective	3
General Education	6
	<hr/> 14

<sup>1</sup> Also fulfills General Education requirement for Cluster 3, Group 1 (Mathematics)

<sup>2</sup> Also fulfills General Education requirement for Cluster 3, Group 2 (Science)

<sup>3</sup> Fulfills General Education requirement for Cluster 1 (Skills for the 21st Century)

<sup>4</sup> Engineering only sections of labs

<sup>5</sup> Also fulfills General Education requirement for Cluster 3, Group 3 (Science)