

## Engineering

**ENGR 101. Engineering First Year Student Seminar.** 1 credit. *Offered fall.*

This seminar course will introduce the engineering curriculum and career options to first year students and will describe how various elements of the curriculum and available electives in other disciplines relate to the goals and objectives of the program. This course will not only describe the engineering curriculum, but it will also contextualize the engineering profession with practical examples to help students determine if they want to pursue a career in the engineering profession.

**ENGR 112. Introduction to Engineering (1,2).** 3 credits. *Offered spring.*

ENGR 112 is the first course in the engineering curriculum; its purpose is to introduce students to some of the over-arching themes and culture in engineering and in our curriculum. Topics of coverage include professionalism, engineering and society, sustainable development, engineering fundamentals, systems approach in engineering problem solving, as well as creative problem solving practices.

**ENGR 212. Statics and Dynamics (3,1).** 4 credits. *Offered fall, spring.*

ENGR 212 provides the fundamental and governing principles of particles and rigid bodies for the analysis of these structures at rest (statics) and in motion (dynamics). Topics will include equilibrium of particles and rigid bodies, force and moment vectors, moments of inertia, kinematics of particles, work and energy. *Prerequisites: Grade of "C" or better in ENGR 112, PHYS 240 and PHYS 140L and MATH 237.*

**ENGR 221. Management of Technology I: Product Development and Entrepreneurial Engineering.** 3 credits. *Offered spring.*

ENGR 221 is the first of a two-course sequence introducing students to management of technology. The course will include general business functions (management, marketing, finance, accounting, and operations); systems analysis skills; and project management skills. Students will develop an understanding and appreciation for the importance of technology and innovation in organizations. *Corequisite: ENGR 232. Prerequisites: Grade of "C" or better in ENGR 112 and ENGR 231.*

**ENGR 231. Engineering Design I.** 2 credits. *Offered fall.*

This course is the first of six courses in the engineering design sequence. This course provides students with an overview of sustainable engineering design including history, concepts and practices; and an introduction to cognitive processes and interpersonal communication skills that lead to effective problem solving, idea generation and decision making; and basic technical design skills. *Prerequisite: Grade of "C" or better in ENGR 112.*

**ENGR 232. Engineering Design II.** 2 credits. *Offered spring.*

This course is the second course in the engineering design sequence. This course provides instruction in sustainable engineering design concepts and hands-on practice; individual cognitive processes, thinking and communication skills, and decision making; introduction to sustainability contexts (environmental, social, economic, and technical); and technical project design skills. *Prerequisite: Grade of "C" or better in ENGR 231.*

**ENGR 280. Projects in Engineering.** 1-4 credits. *Offered fall, spring, summer.*

Research projects, design projects, or special topics in engineering which are of interest to the lower-division student. May be repeated for credit when course content changes. Projects or topics selected may dictate prerequisites. Students should consult the instructor prior to enrolling in the course. *Prerequisite: Permission of the instructor.*

**ENGR 298. Topics in Engineering.** 1-3 credits.

This course is designed to provide students with the opportunity to explore engineering topics currently not covered in the standard curriculum. The specific topic of interest may dictate prerequisites. Students should consult the instructor prior to enrolling in the course.

**ENGR 301. Engineering Bridge Course for Transfer Students.** 3 credits.

*Offered fall, spring.*

This course provides transfer students with an introduction to the JMU engineering program. The purpose is to familiarize our students with our curriculum and sustainability vision. The course will also provide design instruction while introducing transfer students to the specific software tools and machine tools they will use over the remainder of their curriculum. *Prerequisite: Permission of the instructor.*

**ENGR 311. Thermal-Fluids I.** 4 credits. *Offered fall.*

The first course of a two-part sequence focuses on the fundamental principles of thermodynamics, heat transfer and fluid mechanics in a unified approach. Coverage includes the 1st law of thermodynamics, basic heat

transfer, and fluid statics. Wide-ranging applications of these principles to thermal-fluid systems across engineering disciplines are emphasized. An included laboratory component provides reinforcement of course material through experiments and computational modeling. *Prerequisites: Grade of "C" or better in ENGR 212 and MATH 238.*

**ENGR 312. Thermal-Fluids II.** 4 credits. *Offered spring.*

The second of a two-part sequence focuses on the fundamental principles of thermodynamics, heat transfer and fluid mechanics in a unified approach. Builds on concepts covered in ENGR 311 and incorporates the 2nd law of thermodynamics, transient heat transfer and fluid motion. Applications of principles to thermal-fluid systems across engineering disciplines are emphasized. An included laboratory component provides reinforcement of course material through experiments and computational modeling. *Prerequisite: Grade of "C" or better in ENGR 311.*

**ENGR 313. Circuits and Instrumentation.** 4 credits. *Offered fall, spring.*

This course presents the fundamentals of circuit analysis and measurement of physical phenomena. Circuit related topics include Ohm's law, Kirchoff's laws, complex impedance analysis, Laplace techniques and an introduction to AC circuits. Instrumentation topics include A/D conversion and common instruments such as strain gauges, thermocouples and accelerometers. Laboratory investigations will provide exposure to common electronics laboratory equipment, tools and measurement techniques. *Prerequisites: Grade of "C" or better in MATH 238, PHYS 250 and PHYS 150L.*

**ENGR 314. Materials and Mechanics.** 4 credits. *Offered fall, spring.*

The course explores the governing principles of materials science and mechanics of materials with an emphasis on materials selection in the engineering design process. Topics include process-structure-property relationships, crystalline structures, mechanical properties, strength of materials, mechanical design, failure mechanisms, and an introduction to materials processing. *Prerequisite: Grade of "C" or better in ENGR 212.*

**ENGR 322. Engineering Management II: Engineering Project Management.** 3 credits. *Offered fall.*

This is the second of a two-course sequence introducing students to management of technology. The course will include general business functions (management, marketing, finance, accounting, and operations), systems analysis skills, and project management skills. Students will develop an understanding and appreciation for the importance of technology and innovation in organizations and the principles of entrepreneurial engineering. *Corequisite: ENGR 331. Prerequisite: Grade of "C" or better in ENGR 221.*

**ENGR 331. Engineering Design III.** 3 credits. *Offered fall.*

This course is third in the six-course developmental design sequence. This project-based course provides instruction in life-cycle analysis, sustainability (environmental, social, technical, economic), design and construction, failure analysis and problem solving. *Corequisite: ENGR 322. Prerequisite: Grade of "C" or better in ENGR 212 and ENGR 232.*

**ENGR 332. Engineering Design IV.** 3 credits. *Offered spring.*

This course is fourth in the six-course 10-credit developmental design sequence. This project-based course provides instruction in holistic design principles, aesthetics and human interface in design, structured and unstructured problem solving, collaborative design, writing and communications, product modeling, and analytical prototyping. *Prerequisite: Grade of "C" or better in ENGR 331.*

**ENGR 360. Water in Africa.** 4 credits. *Offered summer.*

This course has a three-part focus: cross cultural training, promoting health in developing countries and using appropriate technologies for eradicating water-related illnesses. Project teams use course content as the foundation for developing and implementing service projects. This course is a service-learning course and addresses issues of social justice in West Africa.

**ENGR 411. Fundamentals of Sustainable Engineering and Design.**

3 credits. *Offered fall, spring.*

This course is the first in a part of a two-course sequence that provides a foundation in evaluating sustainable design and engineered systems. The material presented is a prerequisite for understanding the environmental, social and economic impacts of design and technology. The topics may be covered in a developmental manner in both courses, integrating the economic, environmental, social and technical components throughout ENGR 411 and ENGR 412. *Prerequisites: Grade of "C" or better in CHEM 132 and 132L or CHEM 133E and CHEM 133LE.*

**ENGR 412. Sustainable Engineering and Design II.** 3 credits. *Offered fall, spring.*

This course is the second in a two-course sequence that provides a foundation in evaluating sustainable design and engineered systems. The material presented furthers the understanding of the environmental, social, and economic impacts of design and technology by exploring the relationships between industrial and ecological systems. *Prerequisites: Grade of "C" or better in ENGR 312.*

**ENGR 413. Systems Analysis.** 3 credits. *Offered fall.*

This course focuses on the concepts of systems thinking and analysis for complex engineered systems. Students will develop basic knowledge and tools to identify a system, decompose it into parts, define interactions, perform analysis and apply control measures if necessary. Application of computational tools and mathematical modeling will be emphasized. *Corequisite: ENGR 431.*

**ENGR 431. Engineering Design V.** 3 credits. *Offered fall.*

This course is the fifth in the six-course 10-credit developmental design sequence. This project-based course provides instruction in collaborative project management, holistic design evaluation, social and community sustainability, design testing and marketing, principles of design marketing and accounting, problem solving analyses, software tools, project management and testing and analysis of prototypes. *Prerequisite: Grade of "C-" or better in ENGR 332.*

**ENGR 432. Engineering Design VI.** 3 credits. *Offered spring.*

This course is the sixth in the six-course 10-credit developmental design sequence. This project-based course provides instruction in collaborative design practices, capstone design project completion, holistic design analysis and design accounting and manufacturing. *Prerequisite: Grade of "C-" or better in ENGR 431.*

**ENGR 472. Biological Treatment Processes and Reactor Design.** 3 credits.

For engineering and environmental science students interested in biological reactor design. Water, wastewater and air treatment are emphasized. Students must be proficient in mathematics, chemistry and thermal sciences. Quantitative relationships are derived for characterizing water quality, designing biological reactors and modeling treatment systems. Systems are described by mass and energy balances that relate pollutant removal efficiency to process input parameters. *Prerequisites: CHEM 131, CHEM 131L, and either MATH 231 or MATH 235.*

**ENGR 474. Physical Chemical Treatment Processes.** 3 credits.

For engineering and environmental science students interested in physical/chemical waste treatment. Wastewater, groundwater, air and hazardous waste treatment is emphasized. Students must be proficient in mathematics, chemistry and thermal sciences. Quantitative relationships are derived for characterizing wastes, designing treatment processes, and modeling treatment systems. Systems are described by mass and energy balances that relate pollutant removal efficiency to process input parameters. *Prerequisites: CHEM 131, CHEM 131L, and either MATH 231 or MATH 235.*

**ENGR 476. Principles of Chemical Processes.** 3 credits.

An introduction to basic principles used in chemical, petroleum and environmental engineering. Emphasis on formulating and solving material and energy balances for simple and complex systems. Quantitative models and equilibrium concepts for chemical process systems will be developed and applied to assess product quality, economics, safety and environmental issues. For students interested in careers or graduate studies in chemical, environmental, biochemical, and petrochemical engineering.

**ENGR 478. Water Resources Engineering.** 3 credits.

This course will provide an introduction to basic engineering principles used in both water supply management and water excess management. Hydrologic and hydraulic processes will be investigated using the fundamentals of fluid mechanics. Specific emphasis will be placed on water sources flows, distribution and control. *Prerequisite: ENGR 311.*

**ENGR 480. Advanced Projects in Engineering.** 1-4 credits. *Offered fall, spring, summer.*

Research projects, design projects or special topics in engineering which are of interest to the upper-division student. May be repeated for credit when course content changes. Projects or topics selected may dictate prerequisites. Students should consult the instructor prior to enrolling in the course. *Prerequisite: Permission of the instructor.*

**ENGR 498. Advanced Topics in Engineering.** 1-3 credits.

This course is designed to provide upper-division students with the opportunity to explore engineering topics in greater depth. The specific

topic of interest may dictate prerequisites. Students should consult the instructor prior to enrolling in the course.

**ENGR 499A. Engineering Honors I.** 1 credit. *Offered spring.*

First course in a three-course sequence. Student generates an idea for and writes a proposal for an independent research project that meets the requirements set forth by the Honors program and the Department of Engineering. Student must identify and analyze an engineering-based problem, identify potential solutions, recommend an approach and prepare a written proposal.

**ENGR 499B. Honors Engineering Design II.** 1-3 credits. *Offered fall.*

Second course in a three-course sequence. Student completes the research for and prepares an oral and written presentation of their results for an independent research project that meets the requirements set forth by the Honors program and the Department of Engineering. Student completes and presents (in written and oral form) the project described in his or her proposal from ENGR 499A. *Prerequisite: ENGR 499A or permission of the engineering honors director/department head.*

**ENGR 499C. Honors Engineering Design III.** 2-3 credits. *Offered spring.*

Third course in a three-course sequence. Student completes the research for and prepares an oral and written presentation of their results for an independent research project that meets the requirements set forth by the Honors program and the Department of Engineering. Student completes and presents (in written and oral form) the project described in his or her proposal from ENGR 499A. *Prerequisite: ENGR 499B.*

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## English

**ENG 221. Literature/Culture/Ideas.** 3 credits.

This course will take a thematic approach to literature by examining multiple literary texts that engage with a common course theme concerned with the human experience. Themes address cultural, political, social, religious or philosophical aspect ideas through literature. Specific topics will vary. May be used for general education credit.

**ENG 222. Genre(s).** 3 credits.

An examination of representative works in a literary genre, in a set of related literary subgenres, or in both a literary genre and one or more closely connected genres in other humanities disciplines. May be used for general education credit.

**ENG 235. Survey of English Literature: From Beowulf to the Eighteenth Century.** 3 credits.

A general survey presented chronologically. May be used for general education credit.

**ENG 236. Survey of English Literature: Eighteenth Century to Modern.** 3 credits.

A general survey presented chronologically. May be used for general education credit.

**ENG 239. Studies in World Literature.** 3 credits.

Introduction to masterpieces of world literature with emphasis on non-Western literature. (May be focused regionally or topically). May be used for general education credit.

**ENG 247. Survey of American Literature: From the Beginning to the Civil War.** 3 credits.

A general survey presented chronologically. May be used for general education credit.

**ENG 248. Survey of American Literature: From the Civil War to the Modern Period.** 3 credits.

A general survey presented chronologically. May be used for general education credit.

**ENG 260. Survey of African-American Literature.** 3 credits.

Survey of literature by African-American authors from the 18th century to the present. May be used for general education credit.

**ENG 290. Intermediate Composition.** 3 credits.

This course stresses the argumentative and persuasive essay as well as grammar and usage. *Prerequisites: WRTC 103 or equivalent and junior or senior standing, or permission of the instructor.*

**ENG 293. Exploring Careers in English.** 2 credits.

An introduction to academic and career opportunities in English. Students will research and shape academic and career interests, with particular attention to articulating the relationship between the reading, writing and analytical skills they develop as majors and their long-term career plans. Does not count as an English elective.