Fundamentals of Engineering Program

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Nature of the Program

The Benjamin M. Statler College of Engineering and Mineral Resources' Fundamentals of Engineering Program (FEP) is designed to support engineering students as they build foundational engineering skills and discern their career interests within engineering and computing fields. The mission of this student-oriented program is to advise, prepare, and retain qualified students for degree programs in the Statler College. The FEP provides the academic and co-curricular support students need for their success in their: transition to college life; development of academic discipline and skills necessary for entering and succeeding in an academically challenging major; foundational courses (mathematics, chemistry, physics, and basic engineering); and selection of an engineering or computing discipline major. The FEP focuses on:

- communication between students, faculty, advisors, and others;
- academic support services to support students in the fundamental mathematics, science, and engineering courses;
- provision of a co-curricular environment that facilitates successful transition to the college environment, provides career exploration opportunities, and supports students' academic endeavors;
- quality and engaging fundamental engineering instruction.

The FEP provides a vibrant and supportive community for beginning engineering students centered in the Eugene V. Cilento Learning Center (ELC). Students have a "one-stop" place to get the answers they need as they navigate through the transition from high school to college. In the ELC, students receive free tutoring, find information about upcoming guest speakers and other College events, and spend a significant amount of time studying, doing homework, and working on team projects for their engineering courses. Academic support is provided to all FEP students in the following subjects: mathematics, chemistry, physics, and engineering.

To facilitate engagement with the engineering community and development as engineering and computing professionals, FEP students participate in and reflect upon "Out of Class Experiences" (OCEs). Typical OCE opportunities include: EngineerFEST, an engineering student organization fair held each year to encourage students to learn about and become involved in one or more of the College's many student chapters of professional engineering societies; Department Visits, in which each department hosts FEP students in an informational seminar describing their majors, relevant research opportunities, and the career paths of graduates; Panels of Practicing Engineers; and other seminars, presentations, panels, workshops, and experiences in which students learn academic success skills and strategies, are introduced to important professional expectations and life skills, and explore a variety of engineering and computing-related careers.

All policies, procedures, events and activities, and academic resources are listed on the FEP website. These curricular and co-curricular activities create a coherent program designed to facilitate student success in engineering and computing fields.

Additionally, students successfully completing the WVU Statler College Fundamentals of Engineering Program will select and enter an engineering or computing discipline major within the Statler College.

Program Objectives

The educational objective of the Fundamentals of Engineering Program (FEP) in the Statler College is to prepare students to be academically successful in the engineering or computing major of their choice. Students who complete the FEP successfully:

- Transition to college life;
- Develop the academic discipline and skills necessary for entering and succeeding in an academically challenging major;
- Complete foundational courses (mathematics, chemistry, physics, and basic engineering); and
- Select an engineering or computing discipline major.

Student Outcomes

Recognizing that the Fundamentals of Engineering Program (FEP) is the first step toward completing an engineering or computing discipline degree, students completing the FEP are introduced to the engineering and computing program educational outcomes listed below. Each of these outcomes are developed in the program in which the student completes a degree. Students who successfully complete the requirements of the WVU Fundamentals of Engineering Program begin to:

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. communicate effectively with a range of audiences
4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. acquire and apply new knowledge as needed, using appropriate learning strategies

ADMINISTRATION
ASSISTANT DEAN
• Robin A. M. Hensel - Ed.D. (West Virginia University)
  STEM education K-16, Student success and retention, Diversity and inclusion in STEM fields, Curriculum development

FACULTY
ASSISTANT DEAN
• Robin A. M. Hensel - Ed.D. (West Virginia University)
  STEM education K-16, Student success and retention, Diversity and inclusion in STEM fields, Curriculum Development

TEACHING PROFESSOR
• Lizzie Y. Santiago - Ph.D. (The Pennsylvania State University)
  Bioengineering, Engineering education, Curriculum development, Retention

TEACHING ASSOCIATE PROFESSORS
• Todd R. Hamrick - Ph.D. (West Virginia University)
  STEM education, Robotics, Industrial applications, Curriculum development

TEACHING ASSISTANT PROFESSORS
• Atheer Almasri - Ph.D. (Virginia Commonwealth University)
  Mechanical Engineering, STEM Education
• Carter Hulcher - Ph.D. (West Virginia University)
  Civil Engineering, Geomechanics, Student retention
• Xinyu (Catherine) Zhang - Ph.D. (University of Illinois at Urbana-Champaign)
  STEM education, Chemical and biomedical engineering, Sustainability of biomanufacturing

TEACHING INSTRUCTORS
• Michael K. Brewster - M.A. (West Virginia University)
  Mathematics, Statistics, STEM education K-16

Matriculation into Specific Engineering or Computing Majors

ENGINEERING DEGREE
Students can matriculate into the engineering discipline of their choice once they have successfully completed the following classes with a C- or better, and have a cumulative 2.25 GPA.

- MATH 154 or MATH 155
- CHEM 115 and CHEM 115L
- ENGL 101 or 103
- ENGR 101
- ENGR 102
- ENGR 191

COMPUTING DEGREE
Students can matriculate to the computing discipline of their choice (computer science or cybersecurity) once they have successfully completed the following classes with a C- or better, and have a cumulative 2.25 GPA.

- CS 110
- MATH 154 or MATH 155
- ENGL 101 or 103
• ENGR 101
• ENGR 191
• One of the following lab science sequences
  • BIOL 115 & BIOL 115L, CHEM 115 & CHEM 115L, CHEM 117 & CHEM 117L, PHYS 111, or GEOL 101 and GEOL 102

**EARLY ADMISSION TO MAJOR**

Freshman students with initial placement into Calculus I (MATH 155) or higher can be eligible to move into the engineering or computing discipline of their choice early based on the following criteria:

• Students who have at least 7 AP credits with at least 4 of those credits including CHEM 115 and 115L, PHYS 111 and 111L, or PHYS 112 and 112L; pass all their first semester math and science classes with at least a C-; and have a cumulative 3.50 or higher GPA

Or

• Students who pass all their first semester math and science courses with at least a C-; and have a cumulative 3.50 or higher GPA.

**ADMISSIONS REQUIREMENTS 2023-2024**

The Admissions Requirements above will be the same for the 2023-2024 Academic Year.

**Curriculum**

Students in the Fundamentals of Engineering Program will complete a minimum of 17 credit hours while completing the requirements to matriculate into their choice of engineering or computing discipline. The amount of credit hours and the time in the Fundamentals of Engineering Program is based on math readiness.

• Students who start in Calculus I (MATH 155) or higher can matriculate into their specific major in 1 year
• Students who start in two-semester Calculus I with Review (MATH 153) can matriculate into their specific major in 1.5 years or 1 year and 1 summer
• Students who start in College Algebra (MATH 126) can matriculate into the specific major within 2 years

**SUGGESTED PLAN OF STUDY FOR ENGINEERING MAJORS**

This curriculum is based on starting in Calculus I (MATH 155). Students who place into a different math class when they start at WVU should work with their advisor to determine their specific curriculum.

<table>
<thead>
<tr>
<th>First Year</th>
<th>Hours</th>
<th>Spring</th>
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<tbody>
<tr>
<td>Fall</td>
<td></td>
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<tr>
<td>MATH 155</td>
<td>4</td>
<td>MATH 156</td>
</tr>
<tr>
<td>ENGR 101</td>
<td>2</td>
<td>ENGR 102, MAE 102, or CHE 102</td>
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<tr>
<td>ENGR 191</td>
<td>1</td>
<td>PHYS 111 &amp; 111L</td>
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<tr>
<td>CHEM 115</td>
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<td>GEF Elective**</td>
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<td>&amp; 115L</td>
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<td>ENGL 101 or 103</td>
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<td>Choose one of the following:**</td>
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<td>Choose one of the following:*</td>
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<tr>
<td>GEF Elective</td>
<td>3</td>
<td>GEF Elective</td>
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<tr>
<td>GEOL 101</td>
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<td>CS 111</td>
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<tr>
<td>&amp; 101L</td>
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<td>CHEM 116 &amp; 116L</td>
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<tr>
<td>CS 110</td>
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<td>BIOL 115</td>
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<td>&amp; 115L</td>
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<table>
<thead>
<tr>
<th>Hours</th>
<th>17</th>
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<td>14</td>
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Total credit hours: 31

* Students intending to pursue a mining engineering degree should take GEOL 101 and GEOL 101L; Students intending to pursue a petroleum and natural gas engineering degree should take GEOL 101; Students intending to pursue a biometric systems engineering degree should take CS 110; Student intending to pursue a biomedical engineering degree should take BIOL 115 and BIOL 115L; all rest should take GEF Elective 5

** Students should select from GEF area 5, 6, or 7
Students intending to pursue a biometric systems engineering degree should take CS 111; Students intending to pursue a biomedical engineering degree should take CHEM 116 and CHEM 116L; Students intending to pursue a chemical engineering degree should take CHEM 116 and CHEM 116L; all rest should take GEF Elective 6 or 7.

**SUGGESTED PLAN OF STUDY FOR COMPUTING MAJORS**

This curriculum is based on starting in Calculus I (MATH 155). Students who place into a different math class when they start at WVU should work with their advisor to determine their specific curriculum.

<table>
<thead>
<tr>
<th>First Year</th>
<th>Fall Hours</th>
<th>Spring Hours</th>
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<tbody>
<tr>
<td>CS 110</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>COMM 112</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 101</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 191</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>MATH 155</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Lab Science I</td>
<td>4</td>
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</tbody>
</table>

Total credit hours: 36

* Lab Science courses are BIOL 115/115L and BIOL 117/117L; CHEM 115/115L and CHEM 116/116L; CHEM 117/117L and CHEM 118/118L; PHYS 111/111L and PHYS 112/112L; or GEOL 101/101L and GEOL 103/103L

NOTE: Students who place into math courses other than MATH 155, Calculus 1, must work with their academic advisor to create an appropriate plan to graduation.

**Policies**

**ADEQUATE ACADEMIC PROGRESS**

All students need to make adequate academic progress. Adequate academic progress for engineering and computing students is defined as meeting the prerequisites to take MATH 153 or MATH 155 by the beginning of the third semester within the Fundamentals of Engineering Program and meeting the criteria for admission to an engineering discipline major within four semesters of the date of entrance to the Statler College. Because each student’s case is unique, the academic progress of all students who have not started MATH 153/MATH 155 by the start of their third semester and all students who have not moved to an engineering discipline major by the end of their fourth semester will be reviewed.

**ENGR 100. Introduction to Engineering Applications. 3 Hours.**
PR or CONC: MATH 129 or MATH 153. Introduction to basic problem solving of engineering applications using algebra and trigonometry.

**ENGR 101. Engineering Problem Solving 1. 2 Hours.**
PR or CONC: MATH 154 or MATH 155. Engineering problem solving methodologies and analysis. Use of computers in problem solving, technical report writing, team based project work and presentations.

**ENGR 102. Engineering Problem-Solving 2. 3 Hours.**
PR: ENGR 101 and (MATH 154 or MATH 155) with a minimum grade of C- in each. Continued development of engineering problem-solving, teamwork, and communication skills with emphases on using the computer as a tool and algorithm development with a high-level language such as MATLAB.

**ENGR 103. Introduction to Nanotechnology Design. 3 Hours.**
PR: ENGR 101 and (MATH 154 or MATH 155 with a C or better) or Consent. Continued development of engineering problem-solving, teamwork, and communication skills with emphasis on the fundamentals of nanotechnology design, using the computer as a tool, and algorithm development with a high-level language such as MATLAB.

**ENGR 112. Professional Development in Engineering. 2 Hours.**
Professional development and academic success strategies for first-year students enrolled in the Freshman Engineering summer bridge program - Academy of Engineering Success (AcES).

**ENGR 129. Engineering Mathematics. 1 Hour.**
PR: Consent. Review of key pre-calculus and early calculus concepts and topics for engineering students.

**ENGR 140. Engineering in History. 3 Hours.**
Impact of engineering on society throughout history. Developments in warfare, architecture, agriculture, manufacturing, communication, transportation, and their impacts on society.
ENGR 142. Engineering Seminar. 1 Hour.
Faculty, alumni, graduate students, and industry representatives will provide presentations on various engineering research, career, and experience topics. Students will reflect and discuss the presentations on instructor monitored discussion boards.

ENGR 143. Engineering Concepts. 3 Hours.
Course covers engineering approaches to problem solving, design process, understanding technical communication, estimation, international standards and units, manufacturing processes and intellectual property, useful to students pursuing a career related to the engineering profession. Introduces the engineering disciplines and areas of application.

ENGR 150. Academic Success Skills. 1 Hour.
The development of academic skills that are needed to be a successful engineering student.

ENGR 151. Introduction to Engineering Reasoning. 3 Hours.
PR or CONC: MATH 126. An introduction to skills of critical reasoning. Application of reasoning skills to engineering problem solving, research and experimentation in engineering, and to the engineering design process. The course emphasizes the importance of elements of thought, universal intellectual standards, and essential intellectual traits in reasoning.

ENGR 155. Spatial Visualization. 1 Hour.
Introductory course offered to engineering students to strengthen their spatial thinking skills. These 3D visualization skills are beneficial for future engineering classes. Topics include: isometric drawing, orthographic projections, 3D object rotations, flat pattern developments, and surfaces and solids of revolution.

ENGR 191. First-Year Seminar. 1-3 Hours.
Engages students in active learning strategies that enable effective transition to college life at WVU. Students will explore school, college and university programs, policies and services relevant to academic success. Provides active learning activities that enable effective transition to the academic environment. Students examine school, college and university programs, policies and services.

ENGR 199. Orientation to Engineering. 1 Hour.
Orientation to degree programs and requirements, departmental resources, curriculum options, students’ responsibilities, and opportunities. Development of academic success strategies and University experiences to equip students to make life decisions.

ENGR 210. Engineering Decision Making. 2 Hours.
PR: ENGR 143. Examines engineering ethics, critical reasoning, and problem solving. Applies these ideas to questions, challenges, and issues in a variety of areas, including engineering applications. Covers important and controversial decisions made previously in the engineering field, and the related impacts and consequences.

ENGR 230. Exploring Culture and Technology of Germany Study Abroad. 3 Hours.
PR: Consent. Expose students to engineering as a global profession including language, culture, customs, and history of Germany, especially relating to engineering, through travel to Germany to visit factories, museums and universities.

ENGR 280. Sophomore Nanoscience Seminar. 1 Hour.
PR: ENGR 103. Introduces students to the original nanoscale science and engineering literature, including research on social, ethical and economic issues, and develops skills in interdisciplinary team building.

ENGR 293. Special Topics. 1-6 Hours.
PR: Consent. Investigation of topics not covered in regularly scheduled courses.

ENGR 310. Energy Engineering. 3 Hours.
An introduction to the basic principles governing energy use, energy sources, and the impact of energy production on the environment. Examines the amount of energy used by society, fossil fuels and alternative energy sources, and methods of energy production.

ENGR 380. Junior Nanoscience Seminar 1. 1 Hour.
PR: ENGR 280. Familiarizes students with science and engineering that is being carried out in the laboratories at WVU, and helps students understand the importance of other disciplinary approaches to Nanoscale Science and Engineering.

ENGR 381. Junior Nanoscience Seminar 2. 1 Hour.
PR: ENGR 380. This course matches students with appropriate host laboratories in preparation for their senior research project. It fosters appreciation for the importance of the disciplinary fundamentals learned in the development of nanoscale science and engineering.

ENGR 393. Special Topics. 1-6 Hours.
PR: Consent. Investigation of topics not covered in regularly scheduled courses.

ENGR 450. Technology Entrepreneurship and Enterprise Development. 3 Hours.
PR: Senior level or consent. Introduction to concepts, methods, and strategies involved in starting a successful business that is based upon new technology, products, and services. The course assists in identifying opportunities for existing markets, understanding how investors look at technology companies, managing intellectual property, financial and legal issues, commercializing real technologies, and information required for preparing a business plan to guide the enterprise.

ENGR 463. Find an Engineering Job/Internship. 1 Hour.
Assist engineering or computer science students in finding an engineering job or internship. Topics covered are resume and cover letter writing, interviewing skills, looking for a job, and assessing job offers.
ENGR 470. Fluid Mechanics Videos 1. 1 Hour.
Videos and discussion illustrate phenomena such as turbulence, compressibility, and surface tension. Supplements MAE 331 and MAE 335 and CE 321 and CE 322 and CE 522. Does not satisfy AE, CE, or ME technical elective requirement.

ENGR 471. Fluid Mechanics Videos 2. 1 Hour.
Videos and discussion illustrate phenomena such as turbulence, compressibility, and surface tension. Supplements MAE 331 and MAE 335 and CE 321, CE 322 and CE 522. Does not satisfy AE, CE, or ME technical elective requirement.

PR: Consent. Prearranged co-op experience in student's major. Involves placement in public or private enterprise, supervision, and evaluation for credit by faculty and employer.

ENGR 491. Professional Field Experience. 1-18 Hours.
PR: Consent. (May be repeated up to a maximum of 18 hours.) Prearranged experiential learning program, to be planned, supervised, and evaluated for credit by faculty and field supervisors. Involves temporary placement with public or private enterprise for professional competence development.

ENGR 493. Special Topics. 1-6 Hours.
PR: Consent. Investigation of topics not covered in regularly scheduled courses.

ENGR 494. Seminar. 1-3 Hours.
PR: Consent. Presentation and discussion of topics of mutual concern to students and faculty.

ENGR 495. Independent Study. 1-6 Hours.
Faculty supervised study of topics not available through regular course offerings.

ENGR 496. Senior Thesis. 1-3 Hours.
PR: Consent.

ENGR 497. Research. 1-6 Hours.
Independent research projects.

ENGR 498. Honors. 1-3 Hours.
PR: Students in Honors Program and consent by the honors director. Independent reading, study, or research.