Engineering Technology

Web Site: http://www.odu.edu/engtech

Vukica Jovanovic, Interim Chair

Old Dominion University has a unique advantage of having both engineering technology and engineering programs. The Engineering Technology Department offers baccalaureate programs in Civil, Electrical, Manufacturing, and Mechanical Engineering Technology with opportunities for specialization in multiple areas.

The primary goal of the Department of Engineering Technology and its programs is to provide a general yet sufficiently specialized education to equip the student for immediate employment in a variety of engineering and technical fields. In general, the engineering technology programs provide an opportunity for students who desire a technical undergraduate education to apply engineering knowledge to solve actual industrial problems. As a result, the engineering technology programs emphasize the practical application of technical knowledge with a strong laboratory program supporting the lecture content of the curricula. For further information, please visit the department web site: http://www.odu.edu/engtech.

Mission Statement

The mission of the Engineering Technology Department is to provide students with preeminent, nationally recognized engineering technology programs that carefully balance theory, robust applied laboratory and engaging classroom experiences designed to serve as a strong foundation of knowledge and skills, enabling graduates to seize opportunities in traditional and emerging careers in civil, electrical and mechanical engineering technology.

The Department of Engineering Technology offers programs in civil engineering technology (CET), electrical engineering technology (EET), manufacturing engineering technology, and mechanical engineering technology (MET) that lead to the Bachelor of Science in Engineering Technology degree. The CET, EET, and MET programs are accredited by the Engineering Technology Accreditation Commission of ABET, http://www.abet.org. Graduates of these programs are eligible to take the Fundamentals of Engineering (FE) or the Fundamentals of Land Surveying (FLS) examination in Virginia and in most states. The exam is the first step to licensure as a professional engineer. The CET, EET, and MET programs also offer different concentrations and areas of specialization to meet student interests and industry needs. These concentrations and areas of specialization are listed under each program.

All upper-level courses required for all engineering technology programs are delivered via distance learning through ODU’s distance learning system. Thus, students with associate degrees may complete degree requirements without attending the main campus.

Computer Requirement

The Frank Batten College of Engineering and Technology requires that all incoming freshmen to the college have a notebook or laptop computer that meets or exceeds the Mobile Monarch Student Notebook Program’s recommended models for engineering technology programs. Students are strongly encouraged to consider purchasing one of the Mobile Monarch Student Notebook Program’s notebooks; however, students may bring their own notebook if it meets the specifications. More information, including the notebook loaner program, can be found at https://www.odu.edu/efd.

Civil Engineering Technology

Michael Seek, Program Director

The Civil Engineering Technology (CET) program is accredited by the Engineering Technology Accreditation Commission of ABET, http://www.abet.org/. The CET program offers areas of specialization in construction management, structural design, and site development. Students in this program are prepared for employment in a wide range of professional and technical positions with the construction, consulting engineering, surveying and site development industries. Graduates are eligible to take the Fundamentals of Engineering exam, the first step to licensure as a professional engineer. CET courses include topics such as computer-aided drafting, statics, strength of materials, materials testing, surveying, building construction, steel and concrete design, soils and foundations, and hydrology and drainage. Effective written, oral and graphic communications are practiced throughout the curriculum along with computer literacy. The program culminates in a senior project that integrates course work with a practical project assignment in the student’s area of interest. To satisfy the upper-division general education requirements, students are encouraged to complete a minor in engineering management, business management, environmental health and safety, or mechanical engineering technology.

Construction Management Area of Concentration

This option prepares students for careers in the construction industry by providing a combination of knowledge and skills from a number of disciplines. In addition to the basic technical skills in structures, materials, fluids, etc., students in construction management take courses in scheduling, project management, cost estimating, and other topics that enable projects to be completed on schedule and within budget. Graduates of the construction management area of concentration are employed at both large and small companies as project engineers, field engineers, assistant superintendents, estimators, schedulers, and similar construction related positions. Students with a concentration in Construction Management must take the following core electives: CET 445, CET 460, and CET 465.

Structural Design Area of Concentration

This option prepares students for careers in both the public and private sectors. In addition to the basic technical skills in statics, strength of materials, structural analysis, etc., students concentrating in structural design take courses in computer applications in structural design, structural steel, reinforced concrete, wood design, bridge design, and environmental loads. Graduates from this concentration have found employment at both large and small companies as design engineers, project engineers, structural engineers, and similar structural related positions. Students with a concentration in Structural Design must take the following core electives: CET 400, CET 405, and both CET 410 and CET 450.

Site Development Area of Concentration

This option prepares students to develop survey plans, prepare subdivision plats, design site improvements, obtain approvals and entitlements, and provide turn-key services to manage developments. Students choosing this area of concentration will take course work in hydrology and drainage, land design and development, boundary law, and hydraulic engineering. Graduates from this concentration are employed in government agencies, engineering firms, and consulting firms. Students with a concentration in Site Development Management must take the following core electives: CET 325, CET 332, and CET 420.

Civil Engineering Technology Program

Mission Statement

The mission of the Civil Engineering Technology (CET) program is to sustain a high quality undergraduate program of study leading to the Bachelor of Science in Engineering Technology degree. The program prepares graduates to become certified in their area of specialization. Civil engineering technology is a significant component of the University’s commitment to science, engineering and technology, particularly in structural design, construction, site development and related fields, which are of major importance to civilization. Students around the world are enabled to expand opportunities to enhance their education and pursue baccalaureate level studies through the University’s distance learning program. Simultaneously, the program supports the general education requirements that yield a well-rounded graduate who is aware of and able to address societal needs and issues.

Program Objectives

The objective of the Civil Engineering Technology program is to prepare graduates to establish themselves as successful professionals in structural building design, construction, and surveying/land design or related areas...
during the first few years of their careers by having demonstrated their ability to:

1. Identify and solve increasingly complex technical problems, both theoretically and practically, as raised by continually evolving technologies and industry needs and practices.
2. Make well educated, responsible and ethical decisions in response to the needs of the profession and society, with these decisions solidly grounded in science and engineering fundamentals.
3. Work effectively as a member or leader of technical teams and clearly communicate ideas leading to successful team outcomes.

Typical technical problems that CET graduates will be able to address include: building and non-building type structures and construction operations. Typical technical tasks the CET graduates will be expected to perform include: planning and design, field testing and inspection, on-site technical coordination and control, and other tasks relevant to one’s emphasis area.

Program Outcomes

The civil engineering technology program has adopted, after deliberations by its constituents, five outcomes for the Bachelor of Science program in civil engineering technology. These outcomes are listed below.

1. an ability to apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, or technology to solve broadly-defined engineering problems;
2. an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems;
3. an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes;
4. an ability to function effectively as a member or leader on a technical team; and
5. an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature.

Accreditation

The Bachelor of Science in Engineering Technology - Civil Engineering Technology is accredited by the Engineering Technology Accreditation Commission of ABET www.abet.org. (http://www.abet.org)

Four-Year Plan - Civil Engineering Technology - BSET (http://catalog.odu.edu/undergraduate/frankbattencollegeofengineeringandtechnology/engineeringtechnology/et-cet-bset-fouryearplan/)

- The four-year plan is a suggested curriculum to complete this degree program in four years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

Civil Engineering Technology Four-Year Plan

Critical CET course sequences within the Civil Engineering Technology curricula require a minimum grade of C before progressing to subsequent courses. Refer to the individual CET course descriptions for information on specific C grade prerequisites. A grade of C- does not satisfy the requirement for a C grade.

Freshman

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<td>MATH 162M</td>
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<td>MATH 163</td>
<td>3</td>
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<tr>
<td>CHEM 121N</td>
<td>3</td>
<td>PHYS 111N</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 122N</td>
<td>1</td>
<td>ENGL 110C</td>
<td>3</td>
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<tr>
<td>Human Behavior Way of Knowing</td>
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Sophomore

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<td>CET 210</td>
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<td>CET 220</td>
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<td>MATH 211</td>
<td>4</td>
<td>CET 345W</td>
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</tr>
<tr>
<td>PHYS 112N</td>
<td>4</td>
<td>COMM 101R</td>
<td>3</td>
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<tr>
<td>ENGL 211C</td>
<td>3</td>
<td>ENMA 480C</td>
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Junior

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<td>4</td>
<td>CET 340C</td>
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<td>CET Elective5</td>
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<td>CET 341C</td>
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<td>ENGT 305</td>
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<td>CET Elective5</td>
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<tr>
<td>Upper Division Gen Ed5</td>
<td>3</td>
<td>ENMA 302</td>
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Senior

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<td>CET 410 or 450</td>
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<td>CET 440</td>
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<td>ENGT 435W</td>
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<td>CET Elective5</td>
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<td>Two CET Electives5</td>
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<td>Upper Division Gen Ed5</td>
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<td>EET 370</td>
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<td>Interpreting the Past Way of Knowing</td>
<td>3</td>
<td>ENGN 401</td>
<td>1</td>
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</table>

Total credit hours: 126

1. Does not include the University’s General Education language and culture requirement. Additional hours may be required.
2. Meets the philosophy and ethics general education requirement.
3. One or more additional courses will be required to complete a minor. See advisor for details.
4. Students with an interest in construction, design or site development may substitute an alternate course with approval of their advisor.
5. Declaring a concentration is not mandatory. However, if a concentration is declared, students must take the three core electives from that concentration. The core electives are CET 445, CET 460 and CET 465 for Construction Management, CET 325, CET 332, and CET 420 for Site Development, and CET 400, CET 405, and both CET 410

Engineering Technology
The General Education requirements in information literacy and research, impact of technology, and philosophy and ethics are met though the major.

**Electrical Engineering Technology**

Otilia Popescu, Program Director

The electrical engineering technology (EET) program is accredited by the Engineering Technology Accreditation Commission of ABET, http://www.abet.org/. The EET program offers computer engineering technology, communications systems technology, embedded systems technology, mechatronics systems technology, and power systems technology concentration areas. Students in all concentrations take courses in dc and ac circuits, electronic devices and circuits, digital electronics, linear electronics, microprocessors, and programming. Supporting laboratories provide experience in instrumentation, testing and troubleshooting, and design and implementation. Graduates should be qualified for application positions in electronic and electrical product design and development, electronic and electrical system operation and maintenance, field operations, and various other technical functions.

**Computer Engineering Technology Concentration**

Students choosing the computer engineering technology (ComET) concentration will take a series of courses offered by both the Department of Engineering Technology and the Department of Computer Science. These include additional C++ programming and problem solving, data structures, and software engineering. The remainder of the program will consist of a combination of senior electives in computer science and specific electrical courses that support the computer engineering technology concentration. Computer engineering technology program students will automatically satisfy a minor in computer science.

**Communications Systems Technology Concentration**

Students choosing the communications systems technology concentration (CMCT) will receive technical instruction in fundamental electrical engineering technology with a focus on communication systems through upper-division required communication courses. Students have the choice of two senior elective courses that can add to the communication systems concentration area or in other related areas of electrical engineering technology. To satisfy the upper-division general education requirement students are also required to complete any minor in either the College of Engineering and Technology or the College of Sciences.

**Embedded Systems Technology Concentration**

Students choosing the embedded systems technology concentration (EBST) will receive technical instruction in fundamental electrical engineering technology with a focus on embedded systems through upper-division required microprocessor/microcontroller-based courses. Students have the choice of two senior elective courses that can add to the embedded systems concentration area or in other related areas of electrical engineering technology. To satisfy the upper-division general education requirement students are also required to complete any minor in either the College of Engineering and Technology or the College of Sciences.

**Mechatronics Systems Technology Concentration**

Students choosing the mechatronics systems technology concentration (MCHT) will receive technical instruction in fundamental electrical engineering technology with a focus on mechatronics systems through upper-division EET required courses in microcontrollers/microprocessors, PLCs, power and communication systems. Students will also take mechatronics-related courses in the mechanical engineering technology program. Students completing the requirements of the mechatronics systems technology concentration will automatically satisfy a minor in mechanical engineering technology.

**Power Systems Technology Concentration**

Students choosing the power systems technology concentration (PWRT) will receive technical instruction in fundamental electrical engineering technology with a focus on electrical power systems through upper-division required electrical power-based courses. Students have the choice of two senior elective courses that can add to the power systems concentration area or in other related areas of electrical engineering technology. To satisfy the upper-division general education requirement, students are required to complete any minor in the College of Engineering and Technology or the College of Sciences.

**Electrical Engineering Technology Program**

**Mission Statement**

The mission of the Electrical Engineering Technology (EET) program is to sustain a high quality undergraduate program of study leading to the Bachelor of Science in Engineering Technology degree. It is a significant component of the University's commitment to science, engineering and technology, particularly in fields of major importance to the region. The University's distance learning program, the electrical engineering technology program provides opportunities for technical personnel throughout the state and elsewhere to enhance their education and pursue baccalaureate level studies. Simultaneously, the program supports the general education components that yield a well-rounded graduate who is aware of societal needs and issues.

**Program Objectives**

The objective of the electrical engineering technology program is to prepare graduates to establish themselves as successful professionals in electrical and computer engineering technology or related areas during the first few years of their careers by having demonstrated their ability to:

1. Identify and solve increasingly complex technical problems, both theoretically and practically, as raised by continually evolving technologies and industry needs and practices.
2. Make educated, responsible, and ethical decisions in response to the needs of the profession and society, with these decisions solidly grounded in science and engineering fundamentals.
3. Work effectively as a member or leader of technical teams and clearly communicate ideas leading to successful team outcomes.

Typical technical problems that EET graduates will be able to address include: planning, specification, development, design, procurement of equipment and materials, implementation, and performance verification. Typical technical tasks the EET graduates will be expected to perform include: conduct engineering experiments, make observations, collect and analyze data, and formulate conclusions.

**Program Outcomes**

The electrical engineering technology program has adopted, after deliberations by its constituents, five outcomes for the Bachelor of Science program in electrical engineering technology. These outcomes are listed below.

1. An ability to apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, or technology to solve broadly-defined engineering problems appropriate to the discipline;
2. An ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;
3. An ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature.
4. An ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes;
5. An ability to function effectively as a member or leader on a technical team;
Accreditation
The Bachelor of Science in Engineering Technology - Electrical Engineering Technology is accredited by the Engineering Technology Accreditation Commission of ABET (http://www.abet.org).

Electrical Engineering Technology Curriculum
Critical EET course sequences within the Electrical Engineering Technology curricula require a minimum grade of C before progressing to subsequent courses. Refer to the individual EET course descriptions for information on specific C grade prerequisites. A grade of C- does not satisfy the requirement for a C grade.

Four-Year Plan - Computer Engineering Technology Concentration (http://catalog.odu.edu/undergraduate/frankbattencollegeofengineeringandtechnology/engineeringtechnology/et-computerengn-bs-fouryearplan/)

• The four-year plan is a suggested curriculum to complete this degree program in four years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

Computer Engineering Technology Concentration*

<table>
<thead>
<tr>
<th>Freshman</th>
<th>First Term</th>
<th>Hours</th>
<th>Second Term</th>
<th>Hours</th>
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<tbody>
<tr>
<td>EET 120</td>
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<td>EET 110</td>
<td>3</td>
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<tr>
<td>EET 125</td>
<td>1</td>
<td>ENGT 111</td>
<td>2</td>
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<tr>
<td>ENGN 110</td>
<td>2</td>
<td>MATH 163</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MATH 162M</td>
<td>3</td>
<td>PHYS 111N</td>
<td>4</td>
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<tr>
<td>ENGL 110C</td>
<td>3</td>
<td>Laboratory</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Gen Ed Human Behavior (S)</td>
<td>3</td>
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<tr>
<th>Sophomore</th>
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<tbody>
<tr>
<td>First Term</td>
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<tr>
<td>EET 200</td>
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<tr>
<td>EET 205</td>
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<tr>
<td>EET 261</td>
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<td>PHYS 112N</td>
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<tr>
<td>CS 150</td>
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<td>ENGL 211C</td>
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<tr>
<th>Junior</th>
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<tbody>
<tr>
<td>First Term</td>
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<tr>
<td>EET 300</td>
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<tr>
<td>EET 310</td>
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<tr>
<td>EET 315</td>
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<tr>
<td>ENGT 305</td>
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<tr>
<td>CS 330 or 361</td>
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| Senior |
| First Term | Hours | Second Term | Hours |
| EET 373 | 3 | ENGT 435W | 3 |
| ENGT 434 | 1 | EET 370 | 3 |
| ComET Senior Elective | 3 | ComET Senior Elective | 3 |
| ENMA 480 | 3 | COMM 101R | 3 |
| CS Senior Electives | 3 | Gen Ed Human Creativity (A) | 3 |

Total credit hours: 128

* Does not include the University's General Education language and culture requirement. Additional hours may be required.
1 CHEM 121N and CHEM 122N are recommended, especially for those who plan to take the Fundamentals of Engineering Examination.
2 Meets philosophy and ethics general education requirement.
3 The ComET concentration will automatically satisfy a minor in Computer Science.

The General Education requirements in information literacy and research, impact of technology, and philosophy and ethics are met through the major.

Four-Year Plan - Communications Systems Technology Concentration (http://catalog.odu.edu/undergraduate/frankbattencollegeofengineeringandtechnology/engineeringtechnology/et-commsystems-bs-fouryearplan/)

• The four-year plan is a suggested curriculum to complete this degree program in four years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

Communications Systems Technology Concentration*

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<td>EET 120</td>
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<td>EET 125</td>
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<tr>
<td>ENGN 110</td>
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<tr>
<td>MATH 162M</td>
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<td>ENGL 110C</td>
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</table>

| Gen Ed Interpreting the Past (H) | 3 |

Total credit hours: 128

1 CHEM 121N and CHEM 122N are recommended, especially for those who plan to take the Fundamentals of Engineering Examination.
2 Meets philosophy and ethics general education requirement.
3 The ComET concentration will automatically satisfy a minor in Computer Science.

The General Education requirements in information literacy and research, impact of technology, and philosophy and ethics are met through the major.
### Sophomore

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<th>First Term</th>
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<td>EET 261</td>
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<td>EET 263</td>
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<td>PHYS 112N</td>
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<td>Laboratory Science¹</td>
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<td>COMM 101R</td>
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<td>ENGL 211C</td>
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### Junior

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<td>ENGT 305</td>
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<td>Gen Ed Literature (L)</td>
<td>3 Gen Ed Interpreting the Past (H)</td>
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### Senior

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<td>ENGT 434</td>
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<tr>
<td>EET Senior Elective</td>
<td>3 Minor Courses³</td>
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Total credit hours: 127

* Does not include the University’s General Education language and culture requirement. Additional hours may be required.

¹ CHEM 121N and CHEM 122N are recommended, especially for those who plan to take the Fundamentals of Engineering Examination.

² Meets philosophy and ethics general education requirement.

³ Students must select from any minor in either the College of Engineering and Technology or the College of Sciences. Note that minors requiring more than four courses will increase the total credits required to complete the degree.

The General Education requirements in information literacy and research, impact of technology, and philosophy and ethics are met through the major.

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### Embedded Systems Technology Concentration

#### Freshman

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<th>First Term</th>
<th>Hours</th>
<th>Second Term</th>
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<td>MATH 162M</td>
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<td>PHYS 111N</td>
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<td>Gen Ed Human Behavior (S)</td>
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#### Sophomore

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<td>EET 263</td>
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<tr>
<td>MATH 211</td>
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<td>COMM 101R</td>
<td>3</td>
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<td></td>
<td></td>
<td>ENGL 211C</td>
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#### Junior

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<tr>
<td>EET 315</td>
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<tr>
<td>ENGT 305</td>
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<td>EET 330</td>
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<tr>
<td>ENMA 480²</td>
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<td>EET 335</td>
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<td>Gen Ed Literature (L)</td>
<td>3 Gen Ed Interpreting the Past (H)</td>
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#### Senior

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<tr>
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<td>ENGT 435W</td>
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<td>EET 470</td>
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<td>EET Senior Elective</td>
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<td>6</td>
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<td></td>
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</tr>
</tbody>
</table>

* The four-year plan is a suggested curriculum to complete this degree program in four years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

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1 Four-Year Plan - Embedded Systems Technology Concentration (http://catalog.odu.edu/undergraduate/frankbattencollegeofengineeringandtechnology/engineeringtechnology/et-embeddedsyst-bs-fouryearplan/)

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5 Engineering Technology
EET Senior Elective 3

Total credit hours: 127

* Does not include the University’s General Education language and culture requirement. Additional hours may be required.

1 CHEM 121N and CHEM 122N are recommended, especially for those who plan to take the Fundamentals of Engineering Examination.

2 Meets philosophy and ethics general education requirement.

3 Students must select from any minor in either the College of Engineering and Technology or the College of Sciences. Note that minors requiring more than four courses will increase the total credits required to complete the degree.

The General Education requirements in information literacy and research, impact of technology, and philosophy and ethics are met through the major.

Four-Year Plan - Mechatronics Systems Technology Concentration (http://catalog.odu.edu/undergraduate/frankbattencollegeofengineeringandtechnology/engineeringtechnology/et-mechatronicssys-bset-fouryearplan/)

• The four-year plan is a suggested curriculum to complete this degree program in four years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

Mechatronics Systems Technology Concentration*

Freshman

<table>
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<tr>
<th>First Term</th>
<th>Hours</th>
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<th>Hours</th>
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<tbody>
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<td>EET 120</td>
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<td>EET 110</td>
<td>3</td>
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<td>MATH 162M</td>
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<td>PHYS 111N</td>
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<td>ENGL 110C</td>
<td>3</td>
<td>Gen Ed Human Creativity (A)</td>
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<td>Gen Ed Human Behavior (S)</td>
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15 15

Sophomore

<table>
<thead>
<tr>
<th>First Term</th>
<th>Hours</th>
<th>Second Term</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
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<td>EET 263</td>
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</tr>
<tr>
<td>MATH 211</td>
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<td>Laboratory Science</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 112N</td>
<td>4</td>
<td>COMM 101R</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 211C</td>
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Junior

<table>
<thead>
<tr>
<th>First Term</th>
<th>Hours</th>
<th>Second Term</th>
<th>Hours</th>
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<tbody>
<tr>
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<tr>
<td>EET 315</td>
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<td>EET 325</td>
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</tr>
<tr>
<td>EET 360</td>
<td>3</td>
<td>EET 330</td>
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<tr>
<td>ENGT 305</td>
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<td>EET 335</td>
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</tr>
<tr>
<td>ENMA 480</td>
<td>3</td>
<td>Gen Ed Interpreting the Past (H)</td>
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17 17

Senior

<table>
<thead>
<tr>
<th>First Term</th>
<th>Hours</th>
<th>Second Term</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EET 373</td>
<td>3</td>
<td>ENGT 435W</td>
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<td>ENGT 434</td>
<td>1</td>
<td>EET 370</td>
<td>3</td>
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<td>EET Senior Elective</td>
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<td>MET Minor Courses</td>
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<tr>
<td>Gen Ed Literature</td>
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</tr>
</tbody>
</table>

16 15

Total credit hours: 127

* Does not include the University’s General Education language and culture requirement. Additional hours may be required.

1 CHEM 121N and CHEM 122N are recommended, especially for those who plan to take the Fundamentals of Engineering Examination.

2 Meets philosophy and ethics general education requirement.

3 The EET Mechatronics concentration will automatically satisfy a minor in Mechanical Engineering Technology. The minor courses may be selected from the following: MET 370, MET 415, MET 426, MET 427, MET 431, MET 445.

The General Education requirements in information literacy and research, impact of technology, and philosophy and ethics are met through the major.

Four-Year Plan - Power Systems Technology Concentration (http://catalog.odu.edu/undergraduate/frankbattencollegeofengineeringandtechnology/engineeringtechnology/et-powersystems-bset-fouryearplan/)

• The four-year plan is a suggested curriculum to complete this degree program in four years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

Power Systems Technology Concentration*

Freshman

<table>
<thead>
<tr>
<th>First Term</th>
<th>Hours</th>
<th>Second Term</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>EET 120</td>
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<td>EET 110</td>
<td>3</td>
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<tr>
<td>EET 125</td>
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<tr>
<td>ENGL 211C</td>
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<td></td>
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</table>

15 17

Engineering Technology 6
ENGN 110 2  MATH 163 3
MATH 162M 3  PHYS 111N 4
ENGL 110C 3  Gen Ed Human Behavior (S) 3

* Does not include the University’s General Education language and culture requirement. Additional hours may be required.

1 CHEM 121N and CHEM 122N are recommended, especially for those who plan to take the Fundamentals of Engineering Examination.

2 Meets philosophy and ethics general education requirement.

3 Students must select from any minor in either the College of Engineering and Technology or the College of Sciences. Note that minors requiring more than four courses will increase the total credits required to complete the degree.

The General Education requirements in information literacy and research, impact of technology, and philosophy and ethics are met through the major.

**Mechanical Engineering Technology**

Nathan Luetke, Program Director

The mechanical engineering technology (MET) program is accredited by the Engineering Technology Accreditation Commission of ABET, http://www.abet.org/. The MET program offers areas of concentration in manufacturing systems, mechanical systems design, nuclear systems, mechatronics, and marine systems. Students in this program take common courses in areas such as computer-aided drafting, statics, strength of materials, dynamics, thermodynamics, fluid mechanics, automation and controls, and computer solid modeling. The program culminates in a senior project that integrates course work with a practical project assignment in the student's area of interest. To satisfy the upper-division general education requirements, students are required to complete a minor within the College of Engineering and Technology or the College of Sciences. Graduates should be qualified for application positions in mechanical product design, development and manufacturing, mechanical system operation and maintenance, field operations, and various other technical functions.

**Manufacturing Systems Area of Concentration**

Along with the courses previously mentioned, various senior electives are available in the manufacturing area such as robotics, computer numerical control in production, advanced manufacturing processes, and lean engineering. Graduates of the manufacturing systems area of concentration are prepared for employment in a wide range of professional and technical positions at both large and small companies in areas such as manufacturing engineering, quality control, production management, test engineering, and maintenance management. Choose from four of the following courses: MET 400, MET 405, MET 406, MET 410, MET 415, MET 420, MET 445, MET 455, MET 465, MET 485, EET 360.

**Mechanical Systems Design Area of Concentration**

The mechanical systems design area of concentration provides the skills for career success in designing, building, and installing mechanical systems of all descriptions including thermal and air conditioning systems, automated production equipment, and power systems. Graduates of this area of concentration are prepared for careers in engineering, fabrication, and technical positions in both the public and private sectors. Choose from four of the following courses: MET 420, MET 430, MET 431, MET 440, MET 450, MET 460, MET 465, MET 480, MET 485, EET 360.

**Mechatronics Systems Area of Concentration**

The Mechatronics System concentration provides skills necessary for success working in mechatronic systems and includes robotics, mechatronics, CNC, mechanical subsystem design, computer integrated manufacturing, lean engineering, and electrical power and machinery. MET 426, MET 427, MET 431, and any one additional course from the mechanical systems and/or manufacturing systems design electives, or EET 405.

**Marine Systems Area of Concentration**

The Marine Systems concentration provides the skills necessary for success working in the commercial or naval ship design field and includes exposure to basic ship characteristics, the unique aspects of ship design, product design, development and manufacturing, mechanical system operation and maintenance, field operations, and maintenance principles and philosophies. MET 475, MET 476, MET 485, and one additional 400 level MET elective.
related to nuclear power plant operation through Dominion Energy. These students receive advanced standing credits that apply to the MET degree based on their professional education in nuclear power systems.

MET 450, MET 471, MET 472, and any one additional course from the mechanical systems and/or manufacturing systems design electives,

**Mechanical Engineering Technology Program**

**Mission Statement**

The mission of the Mechanical Engineering Technology (MET) program is to sustain a high quality undergraduate program of study leading to the Bachelor of Science in Engineering Technology degree. It is a significant component of the University’s commitment to science, engineering and technology, particularly in fields of major importance to the region. Through the University’s distance learning program, the mechanical engineering technology program provides opportunities for technical personnel throughout the state and elsewhere to enhance their education and pursue baccalaureate level studies. Simultaneously, the program supports the general education components that yield a well-rounded graduate who is aware of societal needs and issues.

**Program Objectives**

The objective of the mechanical engineering technology program is to prepare graduates to establish themselves as successful professionals in mechanical engineering technology or related areas during the first few years of their careers by having demonstrated their ability to:

1. Identify and solve increasingly complex technical problems, both theoretically and practically, as raised by continually evolving technologies and industry needs and practices.
2. Make educated, responsible, and ethical decisions in response to the needs of the profession and society, with these decisions solidly grounded in science and engineering fundamentals.
3. Work effectively as a member or leader of technical teams and clearly communicate ideas leading to successful team outcomes.

Typical technical problems that MET graduates will be able to address include: planning, specification, development, design, procurement of equipment and materials, implementation, and performance verification. Typical technical tasks the MET graduates will be expected to perform include: conduct engineering experiments, make observations, collect and analyze data, and formulate conclusions.

**Program Outcomes**

The mechanical engineering technology program has adopted, after deliberations by its constituents, five outcomes for the Bachelor of Science program in mechanical engineering technology. These outcomes are listed below:

1. An ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline;
2. An ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;
3. An ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature;
4. An ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and
5. An ability to function effectively as a member as well as a leader on technical teams.

**Accreditation**

The Bachelor of Science in Engineering Technology - Mechanical Engineering Technology is accredited by the Engineering Technology Accreditation Commission of ABET www.abet.org. (http://www.abet.org)

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Four-Year Plan - Mechanical Engineering Technology - BSET (http://catalog.odu.edu/undergraduate/frankbattencollegeofengineeringandtechnology/engineeringtechnology/et-met-bset-fouryearplan/)

- The four-year plan is a suggested curriculum to complete this degree program in four years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

**Mechanical Engineering Technology Four-Year Plan**

Critical MET course sequences within the Mechanical Engineering Technology curricula require a minimum grade of C before progressing to subsequent courses. A grade of C- does not satisfy the requirement for a C grade.

The following courses require a minimum grade of C: ENGL 110C, ENGL 211C, MATH 162M, MATH 163, MATH 211, PHYS 111N, MET 220, MET 300, and ENGT 435W.

**Freshman**

<table>
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<th>Hours</th>
<th>Second Term</th>
<th>Hours</th>
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<td>MET 230</td>
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<td>ENGN 110</td>
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<td>ENGT 111</td>
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<td>MATH 162M</td>
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<td>MATH 163</td>
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<td>CHEM 121N**</td>
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<td>CHEM 122N**</td>
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<td>ENGL 110C</td>
<td>3</td>
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<td>Human Behavior Way of Knowing</td>
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**Sophomore**

<table>
<thead>
<tr>
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<th>Second Term</th>
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<tbody>
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<tr>
<td>MATH 211</td>
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<td>STEM 221 or 231</td>
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<td>COMM 101R</td>
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<td>ENGL 211C</td>
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<td>Human Creativity Way of Knowing</td>
<td>3</td>
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**Junior**

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<td>MET 335</td>
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<td>MET 320</td>
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<td><strong>Total</strong></td>
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### Senior

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<td>Senior Electives (400-level MET courses)</td>
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<tr>
<td>Interpreting the Past Way of Knowing</td>
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</table>

**Total credit hours: 127**

* Does not include the University’s General Education language and culture requirement. Additional hours may be required.

** Must be taken together.

*** Must be taken together.

**** Meets philosophy and ethics general education requirement.

***** Students must select one of the following four options to satisfy the university’s general education goal to Integrate knowledge at the advanced level:

1. A minor from the College of Engineering and Technology
2. A minor from the College of Sciences
3. A minor in Cybersecurity

Note that minors requiring more than four courses will increase the total credits required to complete the degree.

General Education requirements in information literacy and research, impact of technology, and philosophy and ethics are met through the major.

### Manufacturing Engineering Technology Major

Four-Year Plan - Manufacturing Engineering Technology - BSET (http://catalog.odu.edu/undergraduate/frankbattencollegeofengineeringandtechnology/engineeringtechnology/et-manufacturing-bset-fouryearplan/)

The four-year plan is a suggested curriculum to complete this degree program in four years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

Students completing this program will receive a minor in engineering management.

Critical MET course sequences within the Manufacturing Engineering Technology curricula require a minimum grade of C before progressing to subsequent courses. A grade of C- does not satisfy the requirement for a C grade.
The program consists of 12 credits. The specified courses are as follows:

- ** Learning.
- ** Examination. The courses are offered both on campus and through distance learning.
- ** It is particularly helpful for those who are preparing for the Fundamentals of Engineering examination.
- ** Mechanical engineering technology majors) who have completed at least one three-credit course in calculus. It is particularly helpful for those who are preparing for the Fundamentals of Engineering examination. The courses are offered both on campus and through distance learning.

## Minor in Electrical Engineering Technology – Construction

The minor in electrical engineering technology – construction is open to all students (except civil engineering technology majors). The program consists of 12 credits and the specified courses are as follows:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CET 355</td>
<td>Sustainable Building Practices</td>
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</tr>
<tr>
<td>CET 445</td>
<td>Construction Planning and Scheduling</td>
<td>3</td>
</tr>
<tr>
<td>CET 460</td>
<td>Construction Cost Estimating</td>
<td>3</td>
</tr>
<tr>
<td>CET 465</td>
<td>Construction Project Management</td>
<td>3</td>
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</tbody>
</table>

**Total Hours:** 12

The courses are offered both on campus and through distance learning.

For completion of a minor, a student must have a minimum overall cumulative grade point average of 2.00 in all courses specified as a requirement for the minor exclusive of lower-level courses and prerequisite courses and complete at least six hours in upper-level courses in the minor requirement through courses offered by Old Dominion University.

## Minor in Mechanical Engineering Technology

The minor in mechanical engineering technology is open to students (except mechanical engineering, manufacturing engineering technology, and mechanical engineering technology majors) who have completed at least one three-credit course in calculus. It is particularly helpful for those who are preparing for the Fundamentals of Engineering examination. The courses are offered both on campus and through distance learning.

The program consists of 12 credits and the specified courses are as follows:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MET 300</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>MET 310</td>
<td>Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>MET 330</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>MET 350</td>
<td>Thermal Applications</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Hours:** 12

Certain substitutions are possible if suitable justification is provided.

For completion of a minor, a student must have a minimum overall cumulative grade point average of 2.00 in all courses specified as a requirement for the minor exclusive of lower-level courses, prerequisites and corequisites and complete at least six hours in upper-level courses in the minor requirement through courses offered by Old Dominion University.

## Minor in Marine Engineering

The minor in marine engineering is open to all students with the exception of those students in the Mechanical Engineering Technology program’s Marine Engineering option. Students seeking the minor must satisfy all pre- or corequisite requirements for the courses selected. The minor is multidisciplinary and consists of four courses in topics that are relevant to the shipbuilding, maintenance, repair and maritime operations industries.

The course requirements are as follows:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MET 475</td>
<td>Marine Engineering I</td>
<td>3</td>
</tr>
<tr>
<td>MET 476</td>
<td>Marine Engineering II</td>
<td>3</td>
</tr>
<tr>
<td>MAE 450</td>
<td>Principles of Naval Architecture</td>
<td>3</td>
</tr>
<tr>
<td>MAE 417</td>
<td>Propulsion Systems</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Hours:** 12

For completion of a minor, a student must have a minimum overall grade point average of 2.00 in all courses specified as a requirement for the minor exclusive of lower-level courses, prerequisites and corequisites and complete at least six hours of upper-level courses in the minor requirement through courses offered by Old Dominion University.
CIVIL ENGINEERING TECHNOLOGY Courses

CET 120. Civil 2D Computerized Aided Drafting. 3 Credits.
This course is computer based drafting, where methods are taught with a major emphasis on practical application using two-dimensional AutoCAD software in the computer lab. This includes the basic principles of Civil Engineer drawings to include but not limited to: dimensioning and tolerances, spot elevations, contours, plan and profile view, section views, details, scaling, measurements. It will introduce students to site plan drawings, mechanical view, structural views, architectural views, roadway plan and profiles, as well as buried infrastructure plan and profiles. Finally, it will be the basis for preparation of a working set of plans, for use in all follow-on CET courses.

CET 200. Statics. 3 Credits.
Scalar methods and free body diagrams are employed in the analysis of discrete and distributed force systems and their application to bodies in external equilibrium. Friction, moment of inertia, and center of gravity are also included. Pre- or corequisite: MATH 211.

CET 205. Principles of Surveying. 3 Credits.
Basic plane surveying measurements and computations, survey control systems, elementary digital mapping and simple curves, and building construction survey and stakeout. Field exercises using standard surveying instrumentation, traverse and leveling techniques, topographic mapping and curve layout. Prerequisites: MATH 163 and MET 120 or CET 120.

CET 210. Fundamentals of Building Construction. 3 Credits.
Introduction to various materials and methods available for design and construction of buildings. Covers application and combination of traditional materials and methods, and recent innovations in construction systems.

CET 220. Strength of Materials. 3 Credits.
Mechanical behavior of materials subjected to various external loads. Stress-strain relationships are utilized to design members subjected to shear, axial, bending, and torsional loads. Deformations are predicted and Mohr's circle is introduced. Prerequisites: MATH 211 and a C or better in CET 200.

CET 260. Plan and Specifications. 3 Credits.
A detailed study of the form and content of typical plans and specification documents used in the construction industry. The use of computer-aided-drafting (CAD) in assembling a set of plans and specifications. Prerequisites: CET 120 or MET 120 and CET 210.

CET 295. Topics. 1-3 Credits.
Study of selected topics.

CET 296. Topics. 1-3 Credits.
Study of selected topics.

CET 301. Structural Analysis. 3 Credits.
Determination of forces, moments, and deflections in statically determinate and indeterminate beams, frames, and trusses due to various load cases and load combinations. Methods of analysis will include matrix stiffness analysis, moment distribution and other approximate and computer methods. Prerequisites: CET 220 and MATH 211.

CET 325. Introduction to Land Development. 3 Credits.
Applications of fundamental site engineering principles, land design principles and permitting issues. A brief historical review of exemplary subdivision, urban designs and their impact on current practice. Site surveying and engineering issues including hydrology, storm water management, site geometry, grading, design of roads, engineering design standards, and computer applications in site engineering are examined. The principles of siting and theories of design for aesthetic and efficient alignment of roads, layout of structures, and subdivision parcels are introduced. Prerequisite: CET 210.

CET 330. Fluid Mechanics. 4 Credits.
Elementary mechanics of fluids. Fluid properties; hydrostatics; fluid kinematics; equations of motion; energy equation; momentum principles; flow of liquids and gasses in closed conduits; flow in open channels and/ or compressible flow. Laboratory will demonstrate principles from the lecture material. All experiment results will be submitted in a written report format, including presentation and interpretation of experimental data. Use of spreadsheets is required. Prerequisites: CET 220 and MATH 211.

CET 332. Water Resources Engineering. 3 Credits.
Hydrologic and Hydraulic principles are utilized in the planning, design, operation and construction of water management projects. The course addresses fundamental Hydrology - the occurrence and movement of surface water including weather and climate; precipitation; evaporation; transpiration; runoff; infiltration; stream flow; hydrograph analysis; erosion; and sedimentation. Additional topics covered will include water distribution, use of water, and sustainability of water as a natural resource. Prerequisites: CET 330.

CET 333. Computer Applications in Hydraulic Engineering. 3 Credits.
Application of computer software in solving water resources problems; program development or application of available packages to solve assigned water resources problems. Use and application of commercial software for analysis and design of water distribution networks and gravity sewer collection systems. Prerequisite: CET 330.

CET 335. Fluid Mechanics Laboratory. 1 Credit.
A laboratory to demonstrate the verification of fluid equations and principles as well as the characteristics of fluid machinery. All experimental results will be submitted in a report format, including presentation and interpretation of experimental data. Use of spreadsheets is required. This is an online asynchronous class open only to transfer students with credit for the lecture portion of CET 330. Prerequisites: CET 330.

CET 340. Soils and Foundations. 3 Credits.
A study of the engineering properties of soil including stress, shear strength, and bearing capacity. Movement of water through soils, consolidation and settlement of structures and the design of shallow and deep foundations are also covered. Use of Excel spreadsheets is a requirement. Prerequisites: CET 330.

CET 341W. Soils Testing Laboratory. 2 Credits.
Course includes standard methods for inspecting, sampling, testing, and evaluating soils. Students use typical test equipment and perform tests on samples of local soils. A written report is required for each experiment. This is a writing intensive course. Prerequisites: a grade of C or better in ENGL 211C or ENGL 221C or ENGL 231C. Pre- or corequisite: CET 340.

CET 345W. Materials Testing Laboratory. 2 Credits.
Standard methods of inspecting and testing structural materials used in construction are followed. A written report is required for each experiment. This is a writing intensive course. Prerequisites: grade of C or better in ENGL 211C or ENGL 221C or ENGL 231C. Pre- or corequisite: CET 220.

CET 355. Sustainable Building Practices. 3 Credits.
The course will examine industry trends in sustainable building practices. It explores the green building strategies used in the design and construction of sustainable buildings. The role of site selection, water efficiency, energy, materials and resources, and indoor environmental quality will be explored. Prerequisites: Junior standing.

CET 365. Building Information Modeling (BIM). 3 Credits.
This course is an introduction to building information modeling (BIM) and its implementation in building design and construction. Topics include the fundamentals of information modeling; business benefits of BIM; impacts of BIM on design and construction processes; integrated design process and project delivery; popular software applications and basic modeling techniques; and popular areas and best practices of BIM implementation. Prerequisite: CET 260.

CET 367. Cooperative Education. 1-3 Credits.
Available for pass/fail grading only. Student participation for credit based on the academic relevance of the work experience, criteria, and evaluative procedures as formally determined by the department and Career Management prior to the semester in which the work experience is to take place. (offered fall, spring, summer) (qualifies as a CAP experience) Prerequisites: Approval by the CET program director and Career Development Services (CDS) in accordance with the policy for granting credit for Cooperative Education programs; a student who needs to add additional credit to maintain full-time status should contact the program director.
CET 368. Internship. 1-3 Credits.
Available for pass/fail grading only. Academic requirements will be established by the department and will vary with the amount of credit desired. Allows students to gain short duration career-related experience. Prerequisites: approval by department and Career Development Services.

CET 369. Practicum. 1-3 Credits.
Available for pass/fail grading only. Prerequisites: approval by department and Career Development Services.

CET 395. Topics. 1-3 Credits.
Topics in Civil Engineering Technology. Prerequisites: permission of the instructor.

CET 396. Topics. 1-3 Credits.
Topics in Civil Engineering Technology. Prerequisites: permission of the instructor.

CET 400. Computer Applications in Structural Design. 3 Credits.
Use and application of commercial software for analysis and design of building and non-building type structures. Determination of compliance with strength, serviceability, and fabrication requirements. Introduction to computer modeling in 2D and 3D, pre and post processors, interpretation of results and development of professionally written reports. Pre- or corequisite: CET 301.

CET 405. Environmental Loads. 3 Credits.
Familiarize the student with the analysis of environmental design loads required for the design of building and non-building type structures in the United States. A thorough study of loading categories and load combinations for ASD and LRFD is also covered. Extensive use of the International Building Code (IBC) and the Minimum Design Loads for Building and Other Structures (ASCE 7) is expected. Prerequisites: CET 220.

CET 408. Hydraulic Engineering. 3 Credits.
Analysis of hydraulics problems associated with the design of civil engineering structures. Uniform, steady flow in open channels; hydraulic models; design problems for dams; spillways and hydraulic structures; hydraulic machinery and other related topics will be discussed. Use of spreadsheets is required. Prerequisites: CET 330.

CET 410. Reinforced Concrete Design. 3 Credits.
Structural analysis and design of reinforced concrete members. Topics include flexural analysis and design of structures, including slabs, beams and columns using strength design procedures. Prerequisite: Junior standing. Pre- or corequisite: CET 301.

CET 415. Design of Structural Systems. 3 Credits.
This course focuses on assembly design as opposed to member design as learned in structural design courses. The students are able to work on the overall stability of structures using one or more building materials such as concrete, wood, steel, cold-formed steel, and/or masonry. The use of building codes, standards and specifications is required. The main objective of this class is to adequately prepare the student for the senior design project. The course also offers an introduction to low-rise building design. Prerequisites: CET 450 or CET 410 or CET 452.

CET 420. Hydrology and Drainage. 3 Credits.
Hydrologic and hydraulic principles are utilized in the planning, design, operation and construction of water management projects. Topics include elements of stormwater drainage pertaining to hydrology, hydraulics of open channel and pipe flow, stormwater management, and issues pertinent to state stormwater regulations and the Chesapeake Bay Preservation Act. Prerequisites: CET 330.

CET 428. Buried Infrastructure. 3 Credits.
This is a capstone design course in the field of water resources. It incorporates pressurized pipe flow, gravity flow, and hydrology into the design of municipal infrastructure for water, sewer and stormwater projects. Topics will also cover rehabilitation and replacement of aging infrastructure in urban and neighborhood settings. Use of spreadsheets is required. Prerequisites: CET 332 or CET 334 or CET 325.

CET 435. Design of Reinforced Concrete Foundations. 3 Credits.
Analysis and design of reinforced concrete foundations typically used in buildings and bridges. Topics include loads and loading groups, methods of analysis and design, abutments, and isolated and continuous footings. The class will be focused on the load and resistant factor design method. Use of the ASCE 7, ACI and AASTHO codes is necessary. Prerequisites: CET 340 and CET 410.

CET 440. Contract Documents. 3 Credits.
The basic concepts of contracts and the standard contract documents used in construction. Also included is a study of the dispute resolution process in arbitration. Prerequisites: CET 210.

CET 445. Construction Planning and Scheduling. 3 Credits.
The basic elements of planning and scheduling building construction projects. All elements of building construction, including the precedence methods of scheduling. Use of computers and planning and scheduling software are emphasized. Prerequisites: CET 210.

CET 450. Structural Steel Design. 3 Credits.
Structural analysis and design of steel structures, including beams, girders, columns, composite sections, trusses, rigid frames and connections using the LRFD method. Analysis of statically-determinate cantilever (hungsap) systems also are covered. Prerequisite: Junior standing. Pre- or corequisite: CET 301.

CET 452. Wood Design. 3 Credits.
Analysis and design of wooden structural elements of buildings to satisfy design codes. Included are shearwall design and connections as well as beams, columns and other elements. Pre- or corequisite: CET 301.

CET 456. Resilience and Sustainability. 3 Credits.
An investigation of emerging construction industry trends in resilience and sustainability. Evaluation of applications for vulnerable, small-scale and rural projects. Quantity increases in project value by incorporating life cycle analysis, planning for continuity of function, and deliberate risk management. Prerequisites: CET 355.

CET 460. Construction Cost Estimating. 3 Credits.
Evaluation and analysis of the basic elements of estimating construction costs for buildings. Elements of take off and pricing for Division 1 through Division 6 are covered. Use of computers and estimating software are emphasized. Prerequisites: CET 210.

CET 465. Construction Project Management. 3 Credits.
An introduction to the procedures and methods that are used by a contractor during the construction phase of a project. Special emphasis on planning, managing and documenting project activities. Topics include job site layout and control, subcontracting and purchasing and changes and claims/progress payments. Prerequisite: CET 210.

CET 468. Construction Finance. 3 Credits.
A study of financial management in construction for civil engineering projects based on conceptual and construction plans. The emphasis of the course is on building construction but equally applicable to other construction type projects. Development of techniques required to effectively monitor the financial aspects of construction projects. This course is practice oriented. Use of spreadsheets is highly recommended. Prerequisite: Junior Standing.

CET 470. Infrastructure, Heavy Highway and Equipment. 3 Credits.
Methods and resources used to construct traditional civil infrastructure systems. Equipment utilization. Prerequisites: CET 205 and CET 210.

CET 485. Bridge Design. 3 Credits.
Familiarize the student with the analysis and design of simple and continuous span bridge structures utilizing the Load and Resistance Factor Design (LRFD) methodology. Determination of the most common design loads used in bridge design. Introduction to the AASHTO Specification for Structural Bridge Design used in United States. Prerequisite: CET 410 or CET 450.

CET 495. Topics. 1-3 Credits.
Topics in civil engineering technology. Prerequisites: permission of the instructor.
CET 496. Topics. 1-3 Credits.
Topics in civil engineering technology. Prerequisites: permission of the instructor.

ELECTRICAL ENGINEERING TECHNOLOGY Courses

EET 110. Electrical Circuits I. 3 Credits.
Fundamentals of electrical circuits including basic electrical parameters and variables, circuit laws and theorems, mesh analysis, node analysis, Thevenin’s and Norton’s Theorems, capacitance, inductance, magnetism, and elementary RC and RL transients. Prerequisite: MATH 162M.

EET 120. Logic Circuits and Microprocessors. 3 Credits.
An introduction to logic circuits, Boolean algebra, digital interface devices, combinational and sequential logic design, and microprocessor fundamentals. (Offered Fall).

EET 125. Logic and Microprocessor Laboratory. 1 Credit.
Team-oriented experiments in basic combinational and sequential logic circuits and an introduction to fundamental microprocessors. (offered fall) Pre- or corequisite: EET 120.

EET 195. Topics. 1-3 Credits.
Study of selected topics.

EET 200. Electrical Circuits II. 3 Credits.
A continuation of EET 110 with emphasis on steady-state ac circuit analysis and applications. Topics include alternating current and voltage, phasors and complex numbers and their applications in circuit analysis, series and parallel resonance, complex power, and polyphase circuits. Prerequisites: MATH 163 and a grade of C or better in EET 110. (offered fall).

EET 205. Circuits Laboratory. 1 Credit.
Electrical laboratory instruction including test equipment, measurements, data analysis, verification of circuit laws, formal report preparation, and circuit construction. Pre- or corequisite: EET 200.

EET 210. Electronic Devices and Circuits. 3 Credits.
Semiconductor properties and semiconductor devices including diodes, MOS field-effect transistors, junction field-effect transistors and bipolar junction transistors. The ideal operational amplifier and its applications. FET and BJT biasing, including constant current biasing, and amplifier circuits with emphasis on dc modeling and graphical analysis. Multisim simulation of circuit biasing. Prerequisites: EET 110.

EET 225. Electronics Laboratory. 1 Credit.
Practical design, construction, testing and troubleshooting of electronic circuits including single state and multistage amplifiers, power amplifiers, linear integrated circuits, and control devices. Prerequisites: EET 205. Pre- or corequisite: EET 210.

EET 261. Introduction to Microprocessors and Microcontrollers. 3 Credits.
Introduction of software and hardware that relates to PIC16FXXX 8 bit microprocessor and microcontroller architectures, interface circuitry, and system designs. Programming in controls of internal and external hardware peripherals, communication protocols between the logic circuits, peripherals, and MCUs. The ASM programming and design is the focus and C coding will also be introduced. Prerequisites: EET 120 and EET 125.

EET 263. Introduction to Programmable Logic Controllers (PLCs). 3 Credits.
An introduction to the design and programming of automatic machine controls. Topics include controls diagrams, programmable logic controllers, ladder logic programming, interfacing, sensors, transducers, encoders, analog I/O, PID, motor controls, codes and standards, controls programming languages, controls safety, and pneumatics. Lab assignments include ladder logic program simulations. Prerequisites: EET 120 or EET 350. Pre- or corequisite: EET 210.

EET 295. Topics. 1-3 Credits.
Study of selected topics.

EET 300. Advanced Circuit Analysis. 3 Credits.
General analysis of linear networks using classical methods, Laplace transforms and computer-aided methods. Topics include single element transients, first- and second-order circuits, transfer function analysis, and phasor analysis, Bode plots and waveform analysis. Circuit analysis software is used to supports the analytical methods. Prerequisites: MATH 211 and a grade of C or better in EET 200.

EET 310. Digital Electronics. 3 Credits.
First course in an upper division sequence in digital electronics circuits and systems. Topies include a comprehensive treatment of Boolean algebra, computer arithmetic, and applications of digital integrated circuits. Prerequisites: EET 120, EET 125, EET 205, and EET 210.

EET 312. Principles of Communication Systems. 4 Credits.
Overview of communications systems including both time and frequency domain analysis. Topies include spectrum analysis, analog modulation methods, digital modulation methods, receiver design, and multiplexing methods. Virtual laboratory projects utilizing simulation software. Prerequisites: EET 300 and ENGT 305.

EET 315. Digital Electronics Laboratory. 2 Credits.
Application-oriented experiments and design problems in digital electronics. Multistage prototype construction requiring system design, module interface, and Engineering Design Journaling. Prerequisites: junior standing. Pre- or corequisite: EET 310.

EET 320. Advanced Microprocessors and Microcontrollers. 3 Credits.
This is the second course in the digital electronics course sequence. The course will focus on software/hardware design of microprocessors and microcontrollers in C under ARM M4 and PIC microcontrollers, interface circuitry, simulation, and system designs in CAD circuit layout. The focus will be on application of microprocessor-based systems design. Prerequisites: EET 261 and EET 310.

EET 325. Microprocessor Laboratory. 2 Credits.
Hands-on implementation of microprocessor and microcontroller systems and peripheral interfacing experiments. Emphasis is placed on the hardware and software design and firmware construction in embedded system applications. Prerequisites: junior standing. Pre- or corequisite: EET 320.

EET 330. Linear Electronics. 3 Credits.
General treatment of linear electronic circuits with emphasis on the operational amplifier and integrated circuits derived from it. Topics include various amplifier circuits and converters, integrators and differentiators, comparators, waveform generators, active filters, A/D and D/A converters, and regulators. Design of circuits to meet specifications. Circuit analysis software is used to validate some of the designs. Prerequisites: EET 210 and EET 300.

EET 335. Linear Electronics Laboratory. 2 Credits.
Design testing, and evaluation of 'linear' electronic circuits and subsystems with primary emphasis on circuit components and modules. Measurement techniques, instrumentation and error analysis. Simulation of circuit designs using Multisim including transient response and frequency response. Prerequisite: junior standing. Pre- or corequisite: EET 330.

EET 340. Transmission Networks. 3 Credits.
Transmission line theory including both transients and steady-state conditions. Smith chart and its application to RF design. Introduction to electric and magnetic fields and plane wave propagation. Circuit analysis software is used to support the analytical methods. Prerequisite: EET 300.

EET 350. Fundamentals of Electrical Technology. 3 Credits.
A comprehensive course in electrical engineering technology for nonmajors. Major topics are basic electricity (AC and DC), circuit analysis, linear electronics and digital electronics. Not open to electrical engineering technology majors except as a substitute for EET 110 in special cases. Prerequisite: junior standing. Pre- or corequisite: MATH 211.

EET 355. Electrical Laboratory. 1 Credit.
Selected electrical laboratory topics for nonmajors including basic measurements, instrumentation, operational amplifiers, digital circuits, and rotating machines. Not open to electrical engineering technology majors. Prerequisites: junior standing. Pre- or corequisite: EET 350.
EET 360. Electrical Power and Machinery. 3 Credits.
A study of synchronous and asynchronous AC machinery, DC machinery, power distribution systems, and introduction. Prerequisite: EET 200 or EET 350.

EET 365W. Electrical Power and Machinery Laboratory. 2 Credits.
A laboratory course dealing with electrical power and machinery as covered in EET 360. Formal written reports will be required. This is a writing intensive course. Prerequisites: A grade of C or better in ENGL 211C or ENGL 221C or ENGL 231C; EET 205 or EET 355. Pre- or corequisite: EET 360.

EET 366. Electrical Power and Machinery Laboratory. 1 Credit.
A laboratory course dealing with electrical power and machinery as covered in EET 360. Students taking this lab should not take EET 365W. Prerequisite: EET 205 or EET 355. Pre- or corequisite: EET 360.

EET 367. Cooperative Education. 1-3 Credits.
Available for pass/fail grading only. Student participation for credit based on the academic relevance of the work experience, criteria, and evaluative procedures as formally determined by the department and Career Development Services prior to the semester in which the work experience is to take place. Prerequisites: approval by the department and Career Development Services in accordance with the policy for granting credit for Cooperative Education programs.

EET 368. Internship. 1-3 Credits.
Available for pass/fail grading only. Academic requirements will be established by the department and will vary with the amount of credit desired. Allows students to gain short duration career-related experience. Prerequisites: approval by department and Career Development Services.

EET 369. Practicum. 1-3 Credits.
Available for pass/fail grading only. Prerequisites: approval by department and Career Development Services.

EET 370. Energy and The Environment. 3 Credits.
A study of existing and new energy production methods, energy as a purchased/traded commodity, physics of energy, positive and negative implications for the environment, economics of energy alternatives, and resulting human/social impacts. Prerequisites: PHYS 101N or PHYS 111N or PHYS 226N or PHYS 223N.

EET 373. Instrumentation. 3 Credits.
Fundamental concepts of electro-mechanical devices used in mechatronics and automation control systems. The working principles, calibration, interfacing methods and control loops of analog and digital instrumentation devices in a process control system. The instrumentation devices, including sensors, actuators, signal conditioning circuits and data acquisition boards, will be used in class projects as basic feedback control blocks in practical simulation and PLC based mechatronics systems. The simulation projects will use PLC hardware, MATLAB and/or LabView software. Prerequisites: EET 210 and EET 363 or EET 263, or MET 370.

EET 395. Topics. 1-3 Credits.
Study of selected topics. Prerequisite: junior standing.

EET 396. Topics. 1-3 Credits.
Study of selected topics. Prerequisite: junior standing.

EET 400. CAD Electronics. 3 Credits.
An upper-division study of the fundamentals of electronic schematic capture, circuit simulation, and printed circuit board design using microcomputers. Schematic symbols, simulation models, and pcb modules are developed by the students. Prerequisites: EET 310, EET 320, and EET 325.

EET 405. Data Communications and Computer Networks. 3 Credits.
The course provides an overview of the local area networks (LANs), wide-area networks (WANS), and backbone technologies. It combines the fundamental concepts of data communications and networking with practical applications and emphasizes the OSI reference model and its relationship to traditional and next-generation LAN/WAN technologies, as well as general topics such as network topology, network interface, client/server hardware, bridges and routers. Hands-on activities using Wireshark are included. Prerequisites: ENGT 305.

EET 410. Communication Principles. 3 Credits.
Fourier series and transforms, spectral analysis, signal transmission, analog modulation and detection methods, sampling theorem, pulse and digital modulation methods, and time-division and frequency-division multiplexing. Prerequisite: EET 300 or EET 350.

EET 412. Wireless Communication Systems. 3 Credits.
Topics include digital encoding techniques, signal-to-noise comparisons of different analog and digital modulation methods, link analysis, basic data transmission, cellular networks, wireless standards, basic computer networks framing and protocols, and satellite communication. System level simulations for determining subsystem design requirements and overall performance. Prerequisites: ENGT 305.

EET 420. Advanced Logic Design. 3 Credits.
Advanced digital logic design and circuit reduction. Topics include lattice structure, symmetry recognition and simplification, threshold logic, design-for-testing techniques, shortest path test planning, adaptive testing, and fuzzy logic. Computer assignments include design simulation and testing. Prerequisite: EET 310.

EET 430. Advanced Motion Control Systems. 3 Credits.
A study of modern control devices and applications including electrical, mechanical and pneumatic systems. This course is a study of modern electro-mechanical devices and advanced PLCs as applied to modern automation process control systems. The course covers motion control mathematical modeling, design using advanced PLCs and motion control PLC module cards, closed loop control theory and simulations. The emphasis is on understanding the underlying principles that support the building blocks of industrial process control systems. Prerequisites: ENGT 305, EET 360, and EET 373.

EET 440. High Frequency and Microwave Technology. 3 Credits.
Methods for generating, transmitting, and detecting signals in the VHF, UHF, and microwave frequency ranges. Laboratory will emphasize high frequency and microwave measurements including bridges, slotted lines, spectrum analyzers and reflectometers. Prerequisite: EET 340.

EET 460. Modern Communication Systems. 3 Credits.
Overview of the principles of satellite communications, television systems, fiber optics, antennas and other relevant topics. Prerequisite: EET 410.

EET 470. Microcontrollers/Embedded-Based Designs. 3 Credits.
Advanced embedded system designs. Topics focus in ADC, DAC, EEPROM External Memories, temperature sensor, digital RF wireless communications, communications in synchronous and asynchronous serial forms of SCI, SPI, & I2C, and parallel communication in system integration and design. The 32 bit ARM M4 in C code designs will be used in the course. Prerequisites: EET 310, EET 320, and EET 325.

EET 483. Introduction to Smart Grids. 3 Credits.
The course introduces the fundamental principles and techniques in smart grids, with focus on information and communication technologies (ICT) deployed to modernize the electric energy infrastructure. It provides an overview on: the smart grid and its main components; smart devices at transmission, distribution and customer level; distributed energy resources (DER) and emerging technologies; customer systems, including demand response, home energy management and smart appliances; communications technologies and standards/protocols for the smart grid; and smart distribution and customer system projects from real-world smart grid projects. Prerequisites: EET 360 and ENGT 305.

EET 485. Electrical Power Systems. 3 Credits.
Fundamentals of electrical power transmission and distribution systems. Transformer operation/application, balanced/unbalanced loads, power factor correction, per-unit system application, fault calculations, power quality, over-current protection, relay construction/application, lighting system design, grounding, and introduction to the National Electric Code. Prerequisite: EET 360 and ENGT 305.
EET 490. Computer-Aided Circuit Simulation. 3 Credits.
Advanced treatment of computer-aided analysis software such as Multisim and MATLAB and the applications to electronic circuit analysis and design. Topics include non-linear models, distortion analysis, spectral analysis, and Monte Carlo techniques. Prerequisites: EET 300, EET 330, EET 335, and EET 340.

EET 495. Topics in Electrical Engineering Technology. 1-3 Credits.
Study of selected topics. Prerequisite: junior standing.

EET 496. Topics in Electrical Engineering Technology. 1-3 Credits.
Study of selected topics. Prerequisite: junior standing.

ENGINEERING TECHNOLOGY Courses
ENGT 111. Engineering Technology Information Literacy/Research. 2 Credits.
Fundamental information literacy and research as applied to engineering technology. Course includes where and how to efficiently locate and critically evaluate technical information. Proper use of technical information and the associated ethical and legal issues will be examined. Prerequisite: ENGL 110.

ENGT 305. Advanced Technical Analysis. 3 Credits.
Analytical and computational methods to support upper-division engineering technology courses. Topics include linear algebra, ordinary differential equations of engineering systems, elements of vector analysis, introductory statistical concepts, and software usage/development. MATLAB is used throughout the course to support all the topics. Presentation of various topics is adjusted for CET, EET or MET programs. Prerequisite: a grade of C or better in MATH 211.

ENGT 434. Introduction to Senior Project. 1 Credit.
This course must be taken in the semester prior to the Senior Project course. A collection of career-related topics pertaining to engineering technology. Topics include engineering codes and standards, engineering ethics, technical report writing, job search and resume writing techniques, patents and property rights, and professional engineering licensure. The course concludes with the selection of the student's project topic for the subsequent Senior Project course. Prerequisite: ENGT 305.

ENGT 435W. Senior Design Project. 3 Credits.
A capstone course utilizing upper-level coursework involving independent or group design projects under the direction of a sponsoring faculty member. Projects may involve analytical and/or experimental results. Formal written and oral reports will be required. This is a writing intensive course. Prerequisites: ENGT 434; senior standing or faculty approval; grade of C or better in ENGL 211C or ENGL 221C or ENGL 231C.

MECHANICAL ENGINEERING TECHNOLOGY Courses
MET 200. Manufacturing Processes and Methods. 3 Credits.
Application and characteristics, both physical and chemical, of the materials most commonly used in industry as well as procedures and processes used in converting raw materials into a finished product.

MET 210. Statics. 3 Credits.
Scalar methods and free body diagrams are employed in the analysis of discrete and distributed force systems and their application to bodies in external equilibrium. Friction, moment of inertia, and center of gravity are also included. Prerequisites: PHYS 111N. Pre- or corequisite: MATH 211.

MET 220. Strength of Materials. 3 Credits.
Mechanical behavior of materials subjected to various external loads. Stress-strain relationships are utilized to design members subjected to shear, axial, bending, and torsional loads. Deformations are predicted and Mohr's circle is introduced. Prerequisites: MET 210 or CET 200.

MET 225. Strength of Materials Laboratory. 1 Credit.
A laboratory course dealing with the standard methods of inspecting and testing materials used in engineering applications with emphasis on laboratory reports, including presentation and interpretation of experimental data. Pre- or corequisite: MET 220.

MET 230. Engineering Graphics and Computer Solid Modeling. 3 Credits.
Graphical communication for engineers studies the concept of 3D parametric modeling and its application in industry. In this course students will learn the fundamentals of sketching, basics of surface design, assembly modeling, and dynamic modeling of mechanisms using industry standard parametric modeling software. Emphasis on developing the skills needed for engineering design.

MET 295. Topics. 1-3 Credits.
Study of selected topics.

MET 300. Thermodynamics. 3 Credits.
The basic laws of thermodynamics, properties of fluids, heat, and work and their applications in processes and cycles and an introduction to conduction heat transfer. Prerequisites: CHEM 121N, MATH 211, and PHYS 111N or PHYS 231N.

MET 305. Fundamentals of Mechanics. 3 Credits.
Selected topics in statics and strength of materials are applied to mechanical engineering technology. Coverage includes force systems, equilibrium, friction, and stress-strain relationships and their application to the mechanical behavior of materials. Prerequisites: PHYS 111N and MATH 211.

MET 310. Dynamics. 3 Credits.
A fundamental treatment of planar and three-dimensional kinematics and kinetics of particles and rigid bodies, including relative motion, mass moments of inertia, Newton's laws, work and energy, impulse and momentum, and simple vibrations. Prerequisites: MATH 211, and MET 210 or CET 200.

MET 320. Design of Machine Elements. 3 Credits.
Practical analyses of fundamental machine elements such as shafts, springs, and screws. Fundamental principles required for the correct design of the separate elements which compose the machine with attention given to problems of synthesis and the interrelationships of the design of elements within the sub-assembly. Topics include stress analysis of screws, belts, clutches, brakes, chains and thin and thick cylinders, and lubrication and bearings Prerequisites: MATH 211, and a grade of C or better in MET 220 or CET 220.

MET 330. Fluid Mechanics. 3 Credits.
The study of fluid statics and dynamics, including momentum, energy, Bernoulli's equation, laminar and turbulent fluid flow and friction in pipes, fluid machinery, and open-channel flow. Prerequisites: MET 310.

MET 335. Fluid Mechanics Laboratory. 1 Credit.
A laboratory course dealing with the verification of fluid equations and principles and the characteristics of fluid machinery with emphasis on presentation and interpretation of experimental data. Prerequisites: Junior standing. Pre- or corequisite: MET 330 or CET 330.

MET 350. Thermal Applications. 3 Credits.
A study of the applications of thermodynamics. Topics include the basic steam and gas turbine power cycles, internal combustion engines, introduction to refrigeration systems, gas mixtures, and psychrometrics applied to air conditioning processes. Prerequisites: MET 300 with a grade of C or better.

MET 367. Cooperative Education. 1-3 Credits.
May be repeated for credit. Available for pass/fail grading only. Student participation for credit based on the academic relevance of the work experience, criteria, and evaluative procedures as formally determined by the department and the Career Development Services program prior to the semester in which the work experience is to take place. (offered fall, spring, summer) Prerequisites: approval by the department and Career Development Services in accordance with the policy for granting credit for Cooperative Education programs.
MET 368. Internship. 1-3 Credits.
Available for pass/fail grading only. Academic requirements will be established by the department and will vary with the amount of credit desired. Allows students to gain short duration career-related experience. Prerequisites: approval by department and Career Development Services.

MET 369. Practicum. 1-3 Credits.
Available for pass/fail grading only. Prerequisites: approval by department and Career Development Services.

MET 370. Automation and Controls. 3 Credits.
A study of the design and analysis of feedback control system. Includes the fundamentals of programmable controllers as well as practical applications of interfacing mechanical, electrical, pneumatic and hydraulic feedback control circuits. Computer simulation software is used to model system responses. Corequisite: MET 386. Prerequisite: MATH 211 and either EET 350 or EET 360.

MET 386. Automation and Controls Laboratory. 1 Credit.
Laboratory and computer simulation of control systems including programmable controllers as well as practical applications of interfacing mechanical, electrical and pneumatic control systems. Corequisite: MET 370. Prerequisites: MATH 211 and either EET 350 or EET 360.

MET 387. Power and Energy Laboratory. 2 Credits.
Experiments dealing with applied thermodynamics, mechanical power and energy systems with emphasis on laboratory report writing, including presentation and interpretation of experimental data. Prerequisites: MET 350, and MET 335 or MET 335W.

MET 395. Topics. 1-3 Credits.
Study of selected topics. Prerequisite: permission of the instructor.

MET 396. Topics. 1-3 Credits.
Study of selected topics. Prerequisite: permission of the instructor.

MET 400. Computer Numerical Control in Production. 3 Credits.
Principles of computer numerical control consistent with most recently developed standards, industry practices, and CAD/CAM systems including such topics as types of CNC machines, CNC milling, CNC turning and CNC electro-discharge machinery. A significant portion of the course includes programming in multiple axes. Prerequisites: ENGT 305.

MET 405. Introduction To Welding Technologies. 3 Credits.
An introduction to conventional and non-conventional welding processes. This course is intended to provide the student with a basic understanding of the various welding processes, welding terminology, joints, symbols, welding defects, equipment. Topics covered include welding processes, heat and fluid flow, structure of metals, solidification phenomena, phase transformations, residual stresses, and nondestructive examination techniques. Real life examples will be used to illustrate the fundamental concepts of the course. The student will also be introduced to career opportunities in the welding field. Lab time will be used to enforce lecture topics when needed. Prerequisites: ENGT 305.

MET 406. Additive Manufacturing. 3 Credits.
This course provides an overview of various additive manufacturing (AM) processes. Topics include fundamentals of polymer, composite, and metal AM processes, process parameters, AM software, AM cost, and AM’s industrial potential such as prototyping, tooling, production customization, spare parts, art, design, architecture and construction. Prerequisites: ENGT 305.

MET 410. Advanced Manufacturing Processes. 3 Credits.
A course in nontraditional manufacturing processes including ultrasonic machining, abrasive jet machining, waterjet cutting, electromechanical machining, electrical discharge machining, plasma arc machining and chemical milling. Semester project is required. (Qualifies as a CAP experience) Prerequisites: ENGT 305.

MET 415. Introduction to Robotics. 3 Credits.
An introductory course in robotics dealing with the history and development of robots, mechanical components and control systems, actuators, robot programming and utilization. Included are laboratory experiments in robot motion and programming. Prerequisites: ENGT 305.

MET 420. Design for Manufacturing. 3 Credits.
Principles of design for manufacturing, materials and process selection for design, design for assembly, design for production and case studies. Also includes impact of product design, design for maintenance, recyclability, disposability, quality and robustness. Semester project requires redesign of an existing product for manufacturing. Prerequisites: ENGT 305.

MET 426. Introduction to Mechatronics. 3 Credits.
A study of the mechatronics concepts and their application on actual problems encountered in engineering practice. Includes the basics of electromechanical systems, electrical circuits, solid-state devices, digital circuits and motors, all of which are fundamental to understanding mechatronic systems. Prerequisites: ENGT 305.

MET 427. Mechatronic System Design. 3 Credits.
A study of the integrated modeling and optimal design of a physical system, which includes sensors, actuators, electronic components, and its embedded digital control system. Includes simultaneous optimal design practice with respect to the realization of the design specifications related to different engineering domains. Prerequisites: ENGT 305.

MET 430. Mechanical Subsystem Design. 3 Credits.
Fundamental principles required for the correct design of the separate elements which compose the machine with attention given to problems of synthesis and the interrelationships of the design of elements within the sub-assembly. Topics include stress analysis of screws, belts, clutches, brakes, chains and thin and thick cylinders, and lubrication and bearings. Prerequisites: MET 320.

MET 431. Modeling and Simulation of Mechatronic Systems. 3 Credits.
The course provides foundations, principles, methods, and tools for modeling and simulation of electro-mechanical components and systems using appropriate modeling techniques. The course is focused on the multi-body dynamics systems, fluid, hydraulic, and electrical systems. Prerequisite: ENGT 305.

MET 440. Heat Transfer. 3 Credits.
A study of conduction, convection and radiation heat transfer and heat exchangers. Emphasis is on applications and problem solving using current techniques, and modern correlations. Prerequisite: MET 300.

MET 445. Computer Integrated Manufacturing. 3 Credits.
Principles of computer integrated manufacturing, system integration, architecture and data base development. Topics include part design specifications, process engineering, fixed automation and process planning. Prerequisites: ENGT 305.

MET 450. Energy Systems. 3 Credits.
A study of the application of thermodynamics to power plants, engines, compressors, turbines, and associated systems. A detailed study is made of fossil fuel power plants with an introductory study of nuclear power and other energy conversion systems. Prerequisites: MET 350.

MET 455. Lean Engineering. 3 Credits.
This course looks at the history of lean and six sigma philosophies, their principles and implementation methodologies for creating a world class enterprise. Topics in Lean include five s, value stream mapping, cellular manufacturing, pull system, performance metrics, Lean supplier network, Lean product development and Lean implementation models. Semester research report is a course requirement. Class activities may involve physical simulation of production environment. Prerequisites: ENGT 305.

MET 460. Refrigeration and Air Conditioning. 3 Credits.
The design and application of refrigeration and air conditioning systems. Studies are made of compressors, condensers, evaporators, psychometric processes, load calculations and air distribution systems. High performance vapor compression systems, absorption systems and other cycles are analyzed. Prerequisites: MET 330 and MET 350.

MET 465. Geometric Dimensioning and Tolerancing. 3 Credits.
Methods and rules of dimensioning and tolerancing, calculation of fits, and geometrical tolerances using ANSI-Y14.5M, tolerances of form, orientation, and profile, including flatness, straightness, circularity, cylindricity, angularity, etc. Student work consists of designing and detailing various product drawings. Prerequisites: ENGT 305.
MET 471. Nuclear Systems I. 3 Credits.
Reactor physics principles as applied to the design and operation of various
types of commercial nuclear power reactors. Topics include sources of
radiation and interaction with matter, neutron interactions, diffusion theory,
and reactor kinetics. Prerequisites: ENGT 305.

MET 472. Nuclear Systems II. 3 Credits.
Complete study of the nuclear fuel cycle, from mining through fabrication,
fuel management in an operating commercial power reactor, spent fuel
management, and fuel reprocessing, with emphasis on chemical engineering
considerations. Prerequisites: ENGT 305.

MET 475. Marine Engineering I. 3 Credits.
This course includes: fundamental principles of naval architecture including
nomenclature, geometry, stability, hydrostatics, structures, and motions;
ship design processes; and a basic introduction to shipboard systems such as
HVAC, refrigeration, power generation, propulsion, hydraulics, electronics,
cargo handling systems, seawater systems, freshwater systems, and fuel, lube
and other oil systems. Prerequisites: MET 330 and MET 350.

MET 476. Marine Engineering II. 3 Credits.
This course builds upon MET 475 and provides a more in-depth look on
how the marine shipbuilding industry is using various software including
SIEMENS PLM, 3D CAD modeling and new technologies like laser
scanners and augmented reality to reshape the future of shipbuilding,
maintenance, and repair processes. Focus will be based on model-based
learning and creating a 'digital thread' of information. Students will practice
what they learn on shipbuilding concepts using commercial software
that is widely used across automotive, aerospace, and marine industries.
Prerequisites: MET 475.

MET 480. High Performance Piston Engines. 3 Credits.
A study of the fundamental principles and performance characteristics of
spark ignition and diesel internal combustion engines. Overview of engine
types and their operation, engine design and operating parameters; ideal and
semi-empirical models of engine cycles; combustion, fluid flow and thermal
considerations in engine design and performance. Laboratory evaluation of
engine performance using flow and dynamometer systems. (cross-listed with
MAE 477/MAE 577) Prerequisite: MET 350 or MAE 312.

MET 485. Maintenance Engineering. 3 Credits.
This course looks at maintenance systems: predictive, preventative and
corrective; large scale maintenance systems, principles of reliability
engineering, maritime logistics; planning for maintenance and repair, using
and ordering spare parts, technical manuals, system specifications, and
shipyard operations. Prerequisites: ENGT 305.

MET 495. Topics in Mechanical Engineering Technology. 1-3 Credits.
Study of selected topics. Prerequisite: permission of the instructor.

MET 496. Topics in Mechanical Engineering Technology. 1-3 Credits.
Study of selected topics. Prerequisite: permission of the instructor.