Frank Batten College of Engineering and Technology

Web Site: http://www.odu.edu/eng (http://www.odu.edu/eng/)

Kenneth Fridley, Dean
To be Named, Associate Dean for Undergraduate Education
Khan Iftekharuddin, Associate Dean for Research & Graduate Education
Anthony Dean, Assistant Dean for Administration

Mission Statement

In accordance with the mission of Old Dominion University, the Frank Batten College of Engineering and Technology promotes the advancement of engineering knowledge, both by its creation and dissemination and by providing successful graduates and a continuously improving learning environment to its constituents, while maintaining ethical, multicultural and global standards.

College Diversity, Equity, and Inclusion Statement

The Frank Batten College of Engineering and Technology recognizes that diversity and inclusion are foundational to developing creative and robust engineering solutions to address complex global challenges. We are committed both to a diverse, equitable, and inclusive environment for students, faculty, and staff and to educating our students on the need for diversity and inclusion in the engineering profession.

Overview

The Frank Batten College of Engineering and Technology at Old Dominion University offers degrees in engineering and in engineering technology. The course of study that leads to engineering degrees is characterized by a solid foundation in the theoretical underpinnings of engineering based on science and mathematics. Graduates are well equipped to pursue graduate education, pursue professional registration, or enter the engineering profession. The course of study that leads to engineering technology degrees is characterized by strong laboratory experiences and an emphasis on the application of engineering fundamentals and techniques that will prepare the graduate to be ready to embark on applied engineering jobs and implement advanced design analysis and development concepts. The engineering technology degree is considered to be a terminal degree and graduates are prepared for manufacturing, testing, production, and operations.

The engineering and engineering technology programs at Old Dominion University are specifically designed to take advantage of the unique assets in the Hampton Roads area. These assets include:

1. a strong technology center to promote and use modeling and simulation
2. the NASA Langley Research Center with its focus on aerospace and virtual environments
3. the Jefferson Laboratories, a major center of nuclear physics and engineering
4. one of the major international deep-water ports on the east coast of the United States
5. a major shipbuilding and ship repair industry
6. a major high technology industry base
7. a very large presence of military facilities and military contractors

These assets have enabled the development of distinctive engineering and technology curricula. Points of distinction (from other programs in and out of the state) include the following.

Career Development Services

Engineering and technology graduates get a head start on the engineering job market by preparing academically and experientially for their engineering and technology careers. Students receive direct assistance in locating full- and part-time employment including co-op and internship opportunities through the college's Career Development Services office.

Engineering Up-Front

Freshmen immediately become engaged in practical engineering and technology activities through a required course, ENGN 110 Explore Engineering and Technology. Team projects in different engineering disciplines allow students to experience the professional spectrum from idea generation through its translation into the design, manufacture, and commercialization cycle. Students are encouraged to complete this course before declaring a specific engineering discipline as a major.

Multi-Disciplinary Industry Senior Project

Seniors may choose to join a multi-disciplinary team of students led by faculty and industry representatives to work on an industry project subject to specific deliverables and time and budget constraints.

Linked Bachelor's/Master's Degree Programs

Students in the Batten College of Engineering and Technology may be accepted into both a bachelor's and master's program at the freshman year through the junior year. The degrees need not be in the same field of engineering.

Engineering Makerspace & Invention Center

Undergraduate and graduate students in the Batten College of Engineering and Technology have access to a 7,000 square-foot facility where they can learn how to use advanced hardware and software tools that enable 1) the analysis of complex problems, 2) the development of engineering solutions, 3) the analysis and testing of engineering solutions, 4) the development of prototypes from low to high-fidelity, 5) collaboration with students from different engineering programs and engineering disciplines, 6) collaboration with other colleges within the university, 7) collaboration with industry and research partners, and 8) the promotion of entrepreneurial and commercialization activities.

Professional Engineer (P.E.) Certification

The College encourages all of its graduates to eventually be certified as Professional Engineers (P.E.). The certification requires taking the Fundamentals of Engineering (FE) Examination and the Professional Engineering (P.E.) Examination. All students are encouraged to take the FE Examination in their senior year. For details, contact the Dean's Office and the following web site: www.dpor.virginia.gov (http://www.dpor.virginia.gov).

For further information, please visit the college's web site: http://www.odu.edu/eng. (http://www.odu.edu/eng/)

Programs of Study

Bachelor of Science (Majors)

Engineering Programs

- Civil Engineering
- Computer Engineering (Computer Engineering Major)
- Computer Engineering (Modeling & Simulation Engineering Major)
- Electrical Engineering
- Mechanical Engineering

Engineering Technology

- Civil Engineering Technology
- Electrical Engineering Technology
- Manufacturing Engineering Technology
- Mechanical Engineering Technology

Minors

- Minor in Aerospace Engineering (Department of Mechanical and Aerospace Engineering)
The following are engineering technology programs accredited by the Engineering Technology Accreditation Commission ABET www.abet.org:

- Bachelor of Science in Mechanical Engineering
- Bachelor of Science in Electrical Engineering
- Bachelor of Science in Computer Engineering
- Bachelor of Science in Civil Engineering

The following are engineering programs accredited by the Accreditation Commission of ABET www.abet.org:

- Doctoral Programs
  - Aerospace Engineering
  - Biomedical Engineering
  - Civil Engineering
  - Electrical and Computer Engineering
  - Mechanical Engineering
  - Modeling and Simulation
  - Systems Engineering

- Master's Programs
  - Aerospace Engineering
  - Biomedical Engineering
  - Civil Engineering
  - Electrical and Computer Engineering
  - Environmental Engineering
  - Mechanical Engineering
  - Modeling and Simulation
  - Systems Engineering

- Collaborative Programs
  - Commonwealth Graduate Engineering Program (CGEP)

  - Master of Engineering Management
  - Master of Engineering Management and Systems Engineering
  - Master of Engineering Management and Cybersecurity Engineering
  - Master of Engineering Management and Modeling and Simulation
  - Master of Engineering Management and Systems Engineering

- Enterprise Centers

  - Applied Research Center (ARC)

  - National Center for System of Systems Engineering (NCOSSE)

- Affiliated Centers

  - Frank Reidy Research Center for Bioelectrics

  - Frank Batten College of Engineering and Technology
The mission of the Center is to increase scientific knowledge and understanding of the interaction of electromagnetic fields and ionized gases with biological cells and to apply this knowledge to the development of medical diagnostics, therapeutics, and environmental contamination. The objectives of the Center are to perform leading-edge interdisciplinary and multi-institutional research, recruit top faculty and exceptional graduate students, support regional, national, and international programs, and increase external funding and institutional visibility. For more information: odu.edu/bioelectrics.

**Center for Bioelectronics**

Gymama Slaughter, Director

The mission of the Center is to lead the effort of advancing scientific frontiers, ensuring educational accessibility for underrepresented students in STEM, and securing research leadership in critical areas, such as smart health and biomedical research. The ODU Center for Bioelectronics is dedicated to the mission of diversity, equity, and inclusion in education and the workforce. For more information: odu.edu/cbe.

**Virginia Modeling, Analysis, and Simulation Center (VMASC)**

Eric Weisel, Associate Vice President for Applied Research and Executive Director, VMASC

The Virginia Modeling, Analysis, and Simulation Center (VMASC) is an enterprise center of Old Dominion University, supporting the University’s research mission through innovation, workforce development, and industry ecosystem engagement programs that create and integrate digital technologies into everyday practice. The Center performs applied research leading to digital transformation. For more information: www.vmasc.org (http://www.vmasc.org/).

**Departmental Institutes**

**Coastal Engineering** is part of the college’s Department of Civil and Environmental Engineering. Its mission is to foster interdisciplinary educational and research opportunities for faculty and students interested in applied coastal science and engineering. Director: Gangfeng Ma.

**Naval Systems and Marine Engineering Institute (NEMSI)** was founded in 2014 with the vision to build a robust, sustainable center of excellence that supports the Naval Enterprise and Marine Industry in research and professional workforce development. NEMSI’s mission is to: (1) expand Old Dominion University’s research capabilities to assist the Navy and industry in addressing complex challenges in design, construction, operations and modernization of marine vessels for military, commercial and recreational use and (2) promote curriculum and lab advancements, faculty-student research at the undergraduate and graduate level, and student engagement and retention initiatives to produce an engineering workforce that meets the national competitive needs of the navy and marine industry constituencies. Director: Jennifer Michaeli.

**Plasma Engineering and Medicine Institute** is focused on conducting fundamental and applied investigations using Laser and Plasma Technologies. It offers state-of-the-art equipment and a vibrant academic environment where faculty, graduate and undergraduate students engage together in advanced research encompassing fundamental and applied research aspects in the field of cold plasmas, and its applications in engineering and medicine. Director: Mourin Laroussi.

**Sustainable Development Institute** promotes and provides engineering, ecological, environmental, and economic assistance to local, regional, and national governmental agencies, as well as international organizations and businesses. The institute actively participates in community service by conducting waste minimization and pollution prevention assistance to local businesses. Director: Mujde Erten-Unal.

**Transportation Research Institute** collaborates with centers and departments across the ODU campus to conduct innovation-based research in the core areas of transportation operations, transportation safety, transportation planning, freight transportation, and environment, energy, and sustainable transport. Director: Mecit Cetin.

**Virginia Institute for Photovoltaics** research spans from the Nanoscale (Fundamental Sciences and Engineering) through the Devices and balance of systems, to the deployment of Gigascale commercial power generation. The current focus is to research and develop the Science and Engineering of Photovoltaic Devices (or Solar cells) and bring them from the laboratory to the industry. Director: Sylvain Marsillac.

**Virginia Institute for Vision Analysis** aims to leverage complimentary expertise of faculty in computer vision, signal/image processing and machine learning to become one of the leading institutes in the field. Research focuses on novel theory, state-of-art algorithms, architectures, real-time implementations for biomedical engineering, human and machine-centric recognition, environmental and geoscience applications and computer-aided medical diagnosis systems. Director: Khan Iftekharuddin.

**Special Programs**

**Cooperative Education/Internships Program**

The cooperative education programs in the Frank Batten College of Engineering and Technology at Old Dominion University are of the highest academic quality. These programs allow students to combine academic study with professional-level training. Cooperative education positions may be based on the alternating program style in which periods of full-time study are alternated with periods of full-time employment. Full-time employment periods must accumulate to the equivalent of one calendar year. Participation in the cooperative education program can be a source of financial support to help meet a substantial portion of college expenses. All departments in the Frank Batten College of Engineering and Technology strongly endorse the concept of cooperative education and internships.

**Linked Bachelor's/Master's Degree Programs**

These are designed to allow qualified students to secure a space in a master's program available in the Frank Batten College of Engineering and Technology while they are still pursuing their undergraduate degrees. An eligible student can choose a master's program in the same discipline as his/her bachelor's program or in a complementary discipline. Subject to the approval of the undergraduate and graduate program directors, a student enrolled in a linked program can count up to six credit hours of course work towards both the undergraduate and the graduate degrees. Full-time students may be able to complete the requirements for the bachelor's degree in four years and the master's degree in one additional year. Students in linked programs must earn a minimum of 150 credit hours (120 discrete credit hours for the undergraduate degree and 30 discrete credit hours for the graduate degree).

Students who are matriculated in an undergraduate major in the Frank Batten College of Engineering and Technology with a GPA of at least 3.00 overall and 3.00 in the major are eligible to apply for admission to a linked bachelor's/master's program. Transfer students who desire to be admitted to a linked program at the time they join an undergraduate major at Old Dominion University are eligible to apply if their overall GPA at their previous institution is 3.25 or higher. Prerequisite courses may be required for engineering technology majors to pursue a master's degree in engineering. Continuation in a linked bachelor's/master's program requires maintenance of a GPA of 3.00 or higher overall and in the major.

**Old Dominion University/Eastern Virginia Medical School Joint Program in Medicine**

The joint program in medicine is designed to encourage highly qualified students to receive a BS from Old Dominion University and an MD from Eastern Virginia Medical School. Students apply after completion of their freshman year at Old Dominion University. Upon successful completion of requirements and graduation from Old Dominion University, a student accepted in the ODU/EVMS Joint Program in Medicine will be guaranteed admission to Eastern Virginia Medical School. Engineering and engineering
technology students are encouraged to apply for this program. Complete
information can be found in the College of Sciences section of this catalog.

**Bachelor-to-PhD Programs**

For a select number of exceptionally well-qualified students, the college has
established a linked doctoral program that enables students to be admitted
directly into the PhD program upon completion of the baccalaureate degree.
A select number of exceptionally well-qualified students can be admitted to
the Bachelor/PhD program in their junior year while they are pursuing one of
the undergraduate programs at Old Dominion University. This program
encourages admitted students to work closely with faculty members and
pursue a research experience. Just as in the linked Bachelor/MS program,
six credit hours of graduate course work may again be counted towards
the undergraduate degree and doctoral course work mentioned above for
the Bachelor/PhD program. For linked bachelor’s to doctoral programs,
students must earn a minimum of 196 credit hours (120 discrete credit hours
for the undergraduate degree and 78 discrete credit hours for the graduate
degree). Students in these programs must maintain a GPA of 3.50 or better
throughout their bachelor’s and doctoral studies.

The student may opt to obtain the master's degree along the way to the
doctorate. To obtain the master’s degree, the student must utilize the six
credit hours obtained as part of their undergraduate program, use 18
credits of the graduate course work that is part of the PhD, and also write a
master's thesis.

**Cybersecurity Interdisciplinary Minor**
Saltuk Karahan, School of Cybersecurity, Coordinator (skarahan@odu.edu)

This interdisciplinary minor in cybersecurity is focused on the technological,
structural, social, and legal frameworks used to secure computer networks
and software. The study of cybersecurity combines multiple fields including
computer science, engineering, information technology, criminal justice,
and philosophy, to name a few. In an effort to promote the security of
computer networks, software, and cyber information, an interdisciplinary
understanding about technological, legal, philosophical, and structural
aspects of cybersecurity is needed. This minor will provide students from
different majors the knowledge they need to prevent or respond to cyber
incidents they are likely to encounter in their careers.

Course options are as follows:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRJS 310</td>
<td>Cybercriminology: Foundations</td>
<td>3</td>
</tr>
<tr>
<td>CS 462</td>
<td>Cybersecurity Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>or ECE/MSIM 470</td>
<td>Foundations of Cyber Security</td>
<td></td>
</tr>
<tr>
<td>CS 463</td>
<td>Cryptography for Cybersecurity</td>
<td>3</td>
</tr>
<tr>
<td>CS 464</td>
<td>Networked Systems Security</td>
<td>3</td>
</tr>
<tr>
<td>CS 465</td>
<td>Information Assurance for Cybersecurity</td>
<td>3</td>
</tr>
<tr>
<td>CS 466</td>
<td>Principles and Practice of Cyber Defense</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 300</td>
<td>Introduction to Cybersecurity</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 301</td>
<td>Cybersecurity Techniques and Operations</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 406</td>
<td>Cyber Law</td>
<td>3</td>
</tr>
<tr>
<td>CYSE 407</td>
<td>Digital Forensics</td>
<td>3</td>
</tr>
<tr>
<td>ECE 416</td>
<td>Cyber Defense Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>or MSIM 416</td>
<td>Cyber Defense Fundamentals</td>
<td></td>
</tr>
<tr>
<td>ECE 419</td>
<td>Cyber Physical System Security</td>
<td>3</td>
</tr>
<tr>
<td>or MSIM 419</td>
<td>Cyber Physical Systems Security</td>
<td></td>
</tr>
<tr>
<td>EET 405</td>
<td>Data Communications and Computer Networks</td>
<td>3</td>
</tr>
<tr>
<td>or EET 412</td>
<td>Wireless Communication Systems</td>
<td></td>
</tr>
<tr>
<td>IT 416</td>
<td>Network Server Configuration and Administration</td>
<td>3</td>
</tr>
<tr>
<td>IT 417</td>
<td>Management of Information Security</td>
<td>3</td>
</tr>
<tr>
<td>IT 418</td>
<td>Enterprise Information Assurance</td>
<td>3</td>
</tr>
<tr>
<td>IT 419</td>
<td>Enterprise Cyber Defense</td>
<td>3</td>
</tr>
<tr>
<td>IT 461</td>
<td>Implementing Internet Applications</td>
<td>3</td>
</tr>
<tr>
<td>PHIL 355E</td>
<td>Cybersecurity Ethics</td>
<td>3</td>
</tr>
<tr>
<td>RMI 443</td>
<td>Enterprise Risk Management</td>
<td>3</td>
</tr>
<tr>
<td>or RMI 412</td>
<td>Property &amp; Liability Insurance Company Operations</td>
<td></td>
</tr>
</tbody>
</table>

The interdisciplinary minor in cybersecurity requires 12 credit hours of
300/400-level courses selected from at least two different disciplines with
a maximum of six credits from any one discipline. For completion of the
interdisciplinary minor, students 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. At least
six hours of upper-level courses must be taken through courses offered by
Old Dominion University. Three credit hours may be in the major, if a major
course is listed as an option for the interdisciplinary minor. As such, it will
be credited toward both the major and the interdisciplinary minor.

**Energy Engineering Interdisciplinary Minor**
Sanjeev Kumar, Department of Civil and Environmental Engineering, Coordinator

This interdisciplinary minor is for students who would like to learn about
energy engineering fundamentals, socio-environmental impacts of energy
systems, and novel energy engineering technologies. The minor will
enhance students’ abilities to integrate knowledge from different disciplines
with concepts used in energy engineering and offer students the opportunity
to be recognized for study in this growing interdisciplinary field.

The interdisciplinary minor requires 12 credit hours of 300/400-level courses
selected from at least two different disciplines with a maximum of six credits
from any one discipline. The course requirements are as follows:

Four courses chosen from: 12

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CET 355</td>
<td>Sustainable Building Practices</td>
</tr>
<tr>
<td>CEE 458</td>
<td>Sustainable Development</td>
</tr>
<tr>
<td>CEE 459</td>
<td>Biofuels Engineering</td>
</tr>
<tr>
<td>ECE 303</td>
<td>Introduction to Electrical Power</td>
</tr>
<tr>
<td>ECE 403</td>
<td>Power Electronics</td>
</tr>
<tr>
<td>ECE 471</td>
<td>Introduction to Solar Cells</td>
</tr>
<tr>
<td>ECON 447W</td>
<td>Natural Resource and Environmental Economics</td>
</tr>
<tr>
<td>EET 340</td>
<td>Transmission Networks</td>
</tr>
<tr>
<td>EET 370</td>
<td>Energy and The Environment</td>
</tr>
<tr>
<td>EET 483</td>
<td>Introduction to Smart Grids</td>
</tr>
<tr>
<td>EET 485</td>
<td>Electrical Power Systems</td>
</tr>
<tr>
<td>ENMA 301</td>
<td>Introduction to Engineering Management</td>
</tr>
<tr>
<td>ENMA 302</td>
<td>Engineering Economics</td>
</tr>
<tr>
<td>MAE 411</td>
<td>Mechanical Engineering Power Systems Theory and Design</td>
</tr>
<tr>
<td>MAE 413</td>
<td>Energy Conversion</td>
</tr>
<tr>
<td>MAE 416</td>
<td>Introduction to Solar Energy Engineering</td>
</tr>
<tr>
<td>MET 300</td>
<td>Thermodynamics</td>
</tr>
<tr>
<td>MET 450</td>
<td>Energy Systems</td>
</tr>
<tr>
<td>MET 471</td>
<td>Nuclear Systems I</td>
</tr>
<tr>
<td>OEAS 415</td>
<td>Waves and Tides</td>
</tr>
<tr>
<td>PHYS 415</td>
<td>Introduction to Nuclear and Particle Physics</td>
</tr>
</tbody>
</table>

One course relevant to energy engineering from the student’s major can also
be used as a minor course with the approval of the minor coordinator.

For completion of the minor, students must have a minimum overall grade
point average of 2.00 in all courses specified as a requirement for the minor
exclusive of prerequisites. At least six hours of the required 12 must be taken
through courses offered by Old Dominion University.

**Global Engineering Minor**
Rafael Landaeta, Associate Dean, Coordinator

The minor in global engineering is for students who plan to seek career
opportunities in companies with global operations. With globalization of
design and manufacturing, it has become important for engineers, engaged in transnational projects, to not only have better teamwork and communication skills, but also a good understanding of the socioeconomic, environmental and cultural aspects of global engineering projects. The global engineering minor provides an understanding of these aspects through courses that develop an understanding of global technology, quality assurance standards, and differences in cultural, communication and business practices in a global work environment.

Students may obtain a minor in global engineering by successful completion of 12 semester credit hours in approved core course work at the 300- or 400-level. In addition, a student seeking a minor in global engineering must satisfy all pre- or corequisite requirements for the courses selected. The requirements are as follows:

CEE 458  Sustainable Development  3
CEE 367  Cooperative Education  3
or MAE 367  Cooperative Education
Select two from the following:  6
GEOG 305  World Resources
ENGL 371W  Communication Across Cultures
MKTG 411  Multi-National Marketing

Total Hours  12

* Preferably at a multinational company.

For completion of a minor, a student must have a 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.

Undergraduate Programs

The Bachelor of Science in Civil Engineering, the Bachelor of Science in Computer Engineering, the Bachelor of Science in Electrical Engineering, and the Bachelor of Science in Mechanical Engineering are accredited by the Engineering Accreditation Commission (EAC) of ABET, http://www.abet.org.

The Bachelor of Science in Engineering Technology has programs in civil engineering technology, electrical engineering technology, and mechanical engineering technology that are accredited by the Engineering Technology Accreditation Commission (ETAC) of ABET, http://www.abet.org.

Engineering Fundamentals Division

The Engineering Fundamentals Division (EFD) is designed to provide support to first-year engineering and transfer students as they make the transition into the Frank Batten College of Engineering and Technology. All students are admitted to this division until they are prepared to successfully take courses in their major. While in this division, students receive individualized counseling, mentoring, and advising support designed to prepare them for success in their chosen engineering or technology major. A key experience for students in this division is ENGN 110, Explore Engineering and Technology. This group-oriented course uses hands-on projects to expose students to the spectrum of engineering practices from innovation through design, manufacture and commercialization of a product or process. It also provides students with an opportunity to experience various aspects of engineering and have a basis for selecting their major.

Admission

Students who qualify for regular admission to the University will be accepted into EFD. Students in EFD may identify a desired degree program or may declare that they are undecided among engineering and engineering technology programs. They will be assigned an intended major code classification, which indicates that they are enrolled and, if appropriate, which is their preferred program.

Matriculation into a Degree Program

Students must meet with a major advisor and meet the following requirements in order to be declared:

1. Earn an overall GPA of 2.0 or better
2. Complete the Engineering Fundamental courses listed below and earn at least 30 credit hours applicable toward a degree
3. Complete ENGN 110 and major-specific information literacy and research course (CEE 111, ECE 111, ENGT 111, MAE 111, MSIM 111)
4. Complete ENGL 110C with a C or higher
5. Complete all freshman-level math courses with a C or higher (MATH 211 & MATH 212 for engineering majors and MATH 162M and MATH 163 or higher for engineering technology majors)
6. Complete any other major-specific requirements

Normally, students are not eligible to enroll in major courses until they are accepted into the degree program. Students may petition to waive this rule when extenuating circumstances warrant.

Continuance

Students are eligible to continue in the EFD as long as, within two years, they:

1. meet the continuance regulations of the University and
2. make reasonable progress toward matriculation into an engineering or engineering technology program.

A student who has ceased reasonable progress toward matriculation into a college degree program will be notified in writing. One semester following this notification, if reasonable progress has not resumed, the student will be referred to the Center for Major Exploration. A student who successfully completes the requirements must apply to and be accepted by a college degree program. Students not accepted into a degree program during a period of one semester beyond completion of the requirements will be referred to the Center for Major Exploration.

Computer Requirement

The Frank Batten College of Engineering and Technology requires that all incoming freshmen and transfer students to the college have a notebook or laptop computer that meets or exceeds the Mobile Monarch Student Notebook Program's recommended models for engineering majors. 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. Contact the campus Monarch Techstore for technology requirements and student programs at: https://www.odu.edu/techstore/ Please note, Apple computers are not compatible with engineering software.

Engineering Fundamentals—Engineering Programs

The following courses are to be taken Freshman year. Please see the individual department pages for four-year academic plans.

<table>
<thead>
<tr>
<th>Engineering Fundamental Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGN 110</td>
</tr>
<tr>
<td>MATH 211</td>
</tr>
<tr>
<td>MATH 212</td>
</tr>
<tr>
<td>CHEM 121N</td>
</tr>
<tr>
<td>CHEM 122N</td>
</tr>
<tr>
<td>ENGL 110C</td>
</tr>
<tr>
<td>COMM 101R</td>
</tr>
<tr>
<td>PHYS 231N</td>
</tr>
<tr>
<td>CEE 111</td>
</tr>
<tr>
<td>or ECE 111</td>
</tr>
</tbody>
</table>
Engineering Fundamentals—Engineering Technology Programs

Refer to the program curriculum listing appearing in the Engineering Technology section.

Advanced Placement

The University provides for possible advanced placement for up to 60 semester hours of course work. The student should refer to the advanced placement policy of specific departments (Mathematics and Statistics, Physics, Chemistry and Biochemistry, etc.) and the Policy for Prior Learning Assessment Credit Options at the Undergraduate Level found in this Catalog.

Qualified students may take advanced placement examinations in certain courses in the various departments of the Batten College of Engineering and Technology. The student should contact the chair of the department offering the course for information on applicability and approval.

Prospective freshmen are encouraged to take as many advanced placement courses as possible in high school. Further, prospective freshmen are encouraged to take as many AP examinations of the Educational Testing Service and CLEP examinations as possible. Qualifying scores on these examinations may result in advanced placement credit. However, freshmen should still consult with their faculty advisor before “skipping” courses given at Old Dominion University.

Additional information on advanced placement credit awarded for qualifying scores on AP and IB subject examinations can be found on the equivalency charts on the Office of Undergraduate Admissions website at https://www.odu.edu/admission/undergraduate/credit (https://www.odu.edu/admission/undergraduate/credit/).

Transfer Students

Transfer students seeking admission to an engineering or engineering technology program at Old Dominion University must complete the standard admission procedures as established by the Office of Admissions.

Transfer students are usually in one of the following categories:

(a) students who have completed some course work, but who have not completed associate degrees

(b) students who have completed associate degrees in appropriate fields before transferring.

Certain special policies have been developed for students in category (b). If the overall educational background of the transfer student who has completed an associate degree is felt to be sufficiently strong to permit him or her to pursue upper-division work satisfactorily, a composite or "package" evaluation of transfer credit may be made. This approach will permit some flexibility in accommodating students with slightly different but equally appropriate backgrounds, dependent on the engineering or engineering technology program involved. Certain deficiencies can be made up while the student is pursuing upper-division studies.

To be admitted as a transfer student with departmental junior standing, the student should have either completed an associate degree in an acceptable program or received full credit for two years of work indicated by the completion of the equivalent number of semester hours in the chosen engineering or engineering technology curriculum with a grade of C or better in each course.

Transfer students must earn a minimum of 25 percent of the total number of credits required for the degree from Old Dominion University and complete a minimum of 12 credit hours in upper-level courses in the major program from Old Dominion University.

Students transferring from the Virginia Community College System may view information about Old Dominion University’s Guaranteed Admission Agreement, curriculum sheets, the letter of intent process, and Articulation Agreements on the Transfer Student Centers website (http://www.odu.edu/newtransfer/advising/).

ENGINEERING Courses

ENGN 100. Spatial Visualization. 0 Credits.

This course introduces students to spatial visualization/thinking. The objective of the course is to enhance students' ability of thinking in three dimensions. The course covers student experience with spatial visualization/thinking, design and representation, and strategic use. Educational interventions and testing to improve three-dimensional visualization skills are used. The course does not count towards College of Engineering & Technology graduation credit. Prerequisites: Permission of instructor required; enrollment limited to first-year engineering students participating in the Summer Preview/Orientation.

ENGN 108. Introduction to Engineering. 3 Credits.

A one-semester course covering topics in civil, environmental, mechanical, electrical and computer engineering. For non-engineering majors. Prerequisites: MATH 102M.

ENGN 110. Explore Engineering and Technology. 2 Credits.

This course involves a series of projects to introduce a variety of engineering and technology disciplines: hands-on experiences with selected engineering problems and issues; a team approach to managing engineering projects; discovering the unknown, formulating solutions, designing, manufacturing, and testing; and emphasis on learning modules, communication and presentation skills, creativity and innovation. For engineering and engineering technology majors only. Pre- or corequisite: eligible to enroll in MATH 162M or higher.

ENGN 150. Computer Programming for Engineering Problem Solving. 4 Credits.

Introduction to computer programming using engineering problem-solving. Software design topics include program design, algorithm development, and testing. Programming language concepts include data types (primitive, composite, abstract, pointer) and program structure (assignment and control flow statements, functions). Laboratory exercises involve utilizing C++ and Matlab to solve engineering problems (control, information processing, simulation, data analysis). Pre- or corequisite: MATH 163 or MATH 166.

ENGN 301. e-Engineering. 3 Credits.

A study of the theory and best practices involved in conducting physically-dispersed engineering team collaboration. Student teams will apply e-Engineering concepts using a distributed product engineering scenario. Course module topics include project management, virtual teaming, distributed collaborative tools, and scenario-specific engineering skills. Prerequisites: junior standing.

ENGN 401. Fundamentals of Engineering Review. 1 Credit.

This course prepares the engineering and engineering technology students for the Fundamentals of Engineering Examination. Prerequisites: Senior standing.
ENGN 402. Introduction to Engineering Design for Teachers. 3 Credits.
This course is for K-12 teachers seeking endorsement. No credit will be given to students pursuing majors in the College of Engineering and Technology. The major focus of this course is to expose students to the design process, research and analysis, teamwork, communication methods, global and human impacts, engineering standards, and technical documentation. Topics include engineering design process, modeling, sketching, measurement, statistics and applied geometry, engineering drawing standards, CAD solid modeling, reverse engineering, consumer product design innovation, graphic design and virtual design teams. Prerequisites: MATH 211 and PHYS 111N.

ENGN 403. Statics for Teachers. 3 Credits.
This course is for K-12 teachers seeking endorsement. No credit will be given to students pursuing majors in the College of Engineering and Technology. 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: MATH 211.

ENGN 404. Introduction to Fluids for Teachers. 3 Credits.
This course is for K-12 teachers seeking endorsement. No credit will be given to students pursuing majors in the College of Engineering and Technology. 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: CET 200.

ENGN 405. Introduction to Thermodynamics for Teachers. 3 Credits.
This course is for K-12 teachers seeking endorsement. No credit will be given to students pursuing majors in the College of Engineering and Technology. 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 will be covered. Prerequisites: CHEM 121N, MATH 211, and PHYS 111N.

ENGN 444. Veterans in Engineering and Engineering Technology Seminar. 1 Credit.
This course aims to augment the transition from service to student to engineer through helping the veteran achieve a sense of belonging to the engineering profession through class discussions, seminars, and workshops designed to develop their identities as engineers and increase their feeling of belonging in engineering fields through self-efficacy and help with their persistence to degree completion. Class activities are designed to build a sense of community and increase students' relevance by helping students develop a career identity in engineering. Prerequisite: Junior standing or instructor permission.

ENGN 495. Multidisciplinary Topics in Engineering and Technology. 1-3 Credits.
Special interdisciplinary or multidisciplinary topics of interest with emphasis on emerging areas in engineering. Prerequisites: instructor permission.