

Frank Batten College of Engineering and Technology

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

Kenneth Fridley, Dean
Jeffrey Lacombe, Associate Dean for Undergraduate & Graduate Education
Sherif Ishak, Associate Dean for Research & Innovation
Stacie Ringleb, Associate Dean for Diversity, Equity, Inclusion and Access
Anthony Dean, Assistant Dean for Maritime and Defense Initiatives

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)
- Minor in Biomedical Engineering (Interdisciplinary, Department of Electrical and Computer Engineering)
- Minor in Civil Engineering (Department of Civil and Environmental Engineering)
- Minor in Civil Engineering Technology-Construction (Department of Engineering Technology)
- Minor in Computer Engineering (Department of Electrical and Computer Engineering)
- Minor in Cybersecurity (Interdisciplinary, see details below)
- Minor in Electrical Engineering (Department of Electrical and Computer Engineering)
- Minor in Electrical Engineering Technology (Department of Engineering Technology)
- Minor in Energy Engineering (Interdisciplinary, see details below)
- Minor in Engineering Management (Department of Engineering Management & Systems Engineering)
- Minor in Environmental Engineering (Department of Civil and Environmental Engineering)
- Minor in Global Engineering (Interdisciplinary, see details below)
- Minor in Marine Engineering (Department of Engineering Technology)
- Minor in Mechanical Engineering (Department of Mechanical and Aerospace Engineering)
- Minor in Mechanical Engineering Technology (Department of Engineering Technology)
- Minor in Military Leadership (Department of Naval Science)
- Minor in Modeling and Simulation (Department of Electrical and Computer Engineering)

Master's

Engineering Programs

- Aerospace
- Biomedical
- Civil
- Electrical and Computer
- Engineering Management
- Environmental
- Mechanical
- Modeling & Simulation
- Systems Engineering

Doctoral

Engineering Programs

- Aerospace
- Biomedical
- Civil and Environmental
- Cybersecurity Engineering
- Electrical and Computer
- Engineering Management and Systems Engineering
- Mechanical
- Modeling and Simulation

Accreditation

The following are engineering programs accredited by the Engineering Accreditation Commission of ABET www.abet.org (<http://www.abet.org>):

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

The following are engineering technology programs accredited by the Engineering Technology Accreditation Commission ABET www.abet.org (<http://www.abet.org>):

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

The following program is certified by the American Society for Engineering Management www.asem.org (<http://www.asem.org>):

Master of Engineering Management

Collaborative Programs

Cardinal Education

Anthony Dean, Director

Cardinal Education is a unique cooperative agreement. This agreement is among the six largest engineering schools in the Commonwealth of Virginia: Old Dominion University, George Mason University, the University of Virginia, Virginia Commonwealth University, Virginia State University and Virginia Polytechnic Institute and State University. The program was developed in response to the diverse continuing education needs of engineering graduates working in industry and government.

Graduate engineering courses leading to a Master of Science, Master of Engineering degree or a variety of graduate certificates are offered through these universities via a statewide interactive distance-learning network.

Students seeking admission to the various degree programs should request and process their applications through the Cardinal Education Program Office in the Batten College of Engineering and Technology at Old Dominion University: <https://www.odu.edu/eng/programs/cgep> (<https://www.odu.edu/eng/programs/cgep/>).

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.

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.

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>. (<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.

Engineering Fundamental Courses

ENGN 110	Explore Engineering and Technology	2
MATH 211	Calculus I	4
MATH 212	Calculus II	4
CHEM 121N	Foundations of Chemistry I Lecture	3
CHEM 122N	Foundations of Chemistry I Laboratory	1
ENGL 110C	English Composition (grade of C or better required)	3
COMM 101R	Public Speaking	3
PHYS 231N	University Physics I	4
Select one of the following: *		2
CEE 111	Information Literacy and Research *	
ECE 111	Information Literacy and Research for Electrical and Computer Engineering	
MAE 111	Mechanical and Aerospace Engineering Information Literacy and Research	
MSIM 111	Information Literacy and Research for Modeling and Simulation Engineers	
ENGT 111	Engineering Technology Information Literacy/Research	

* Meets information literacy and research general education requirement in conjunction with courses in the major.

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:

1. students who have completed some course work, but who have not completed associate degrees
2. 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/>).

Departments

- Civil and Environmental Engineering (<http://catalog.odu.edu/undergraduate/engineering-technology/civil-environmental-engineering/>)
- Electrical and Computer Engineering (<http://catalog.odu.edu/undergraduate/engineering-technology/electrical-computer-engineering/>)
- Engineering Management and Systems Engineering (<http://catalog.odu.edu/undergraduate/engineering-technology/engineering-management-systems/>)
- Engineering Technology (<http://catalog.odu.edu/undergraduate/engineering-technology/engineering-technology/>)
- Mechanical and Aerospace Engineering (<http://catalog.odu.edu/undergraduate/engineering-technology/mechanical-aerospace-engineering/>)
- Naval Science (Naval Reserve Officers Training Corps) (<http://catalog.odu.edu/undergraduate/engineering-technology/naval-science/>)

Programs

Bachelor of Science in Civil Engineering

- Civil Engineering (BSCE) (<http://catalog.odu.edu/undergraduate/engineering-technology/civil-environmental-engineering/civil-engineering-bsce/>)

Bachelor of Science in Computer Engineering

- Computer Engineering (BSCE) (<http://catalog.odu.edu/undergraduate/engineering-technology/electrical-computer-engineering/computer-engineering-bsce/>)
- Computer Engineering with a Major in Modeling & Simulation Engineering (BSCE) (<http://catalog.odu.edu/undergraduate/engineering-technology/electrical-computer-engineering/computer-engineering-modeling-simulation-bsce/>)

Bachelor of Science in Electrical Engineering

- Electrical Engineering (BSEE) (<http://catalog.odu.edu/undergraduate/engineering-technology/electrical-computer-engineering/electrical-engineering-bsee/>)

Bachelor of Science in Engineering Technology

- Engineering Technology with a Major in Civil Engineering Technology (BSET) (<http://catalog.odu.edu/undergraduate/engineering-technology/engineering-technology/engineering-technology-civil-bset/>)
- Engineering Technology with a Major in Electrical Engineering Technology (BSET) (<http://catalog.odu.edu/undergraduate/engineering-technology/engineering-technology/engineering-technology-electrical-bset/>)
- Engineering Technology with a Major in Manufacturing Engineering Technology (BSET) (<http://catalog.odu.edu/undergraduate/engineering-technology/engineering-technology/engineering-technology-manufacturing-bset/>)
- Engineering Technology with a Major in Mechanical Engineering Technology (BSET) ([http://catalog.odu.edu/undergraduate/engineering-technology/engineering-technology-mechanical-bset/](http://catalog.odu.edu/undergraduate/engineering-technology/engineering-technology/engineering-technology-mechanical-bset/))

Bachelor of Science in Mechanical Engineering

- Mechanical Engineering (BSME) (<http://catalog.odu.edu/undergraduate/engineering-technology/mechanical-aerospace-engineering/mechanical-engineering-bsme/>)

Minor Programs

- Aerospace Engineering Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/mechanical-aerospace-engineering/aerospace-engineering-minor/>)
- Biomedical Engineering Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/electrical-computer-engineering/biomedical-engineering-minor/>)
- Civil Engineering Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/civil-environmental-engineering/civil-engineering-minor/>)
- Civil Engineering Technology - Construction Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/engineering-technology/civil-engineering-technology-construction-minor/>)
- Computer Engineering Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/electrical-computer-engineering/computer-engineering-minor/>)
- Cybersecurity Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/minors/cybersecurity-minor/>)
- Electrical Engineering Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/electrical-computer-engineering/electrical-engineering-minor/>)
- Electrical Engineering Technology Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/engineering-technology/electrical-engineering-technology-minor/>)
- Energy Engineering Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/minors/energy-engineering-minor/>)
- Engineering Management Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/engineering-management-systems/engineering-management-minor/>)

- Engineering Solutions for Climate Adaptation and Resilience Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/civil-environmental-engineering/engineering-solutions-climate-adaptation-resilience-minor/>)
- Engineering Solutions for Climate Adaptation and Resilience Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/engineering-technology/engineering-solutions-climate-adaptation-resilience-minor/>)
- Environmental Engineering Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/civil-environmental-engineering/environmental-engineering-minor/>)
- Global Engineering Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/minors/global-engineering-minor/>)
- Marine Engineering Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/engineering-technology/marine-engineering-minor/>)
- Mechanical Engineering Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/mechanical-aerospace-engineering/mechanical-engineering-minor/>)
- Mechanical Engineering Technology Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/engineering-technology/mechanical-engineering-technology-minor/>)
- Military Leadership Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/naval-science/military-leadership-minor/>)
- Modeling and Simulation Minor (<http://catalog.odu.edu/undergraduate/engineering-technology/electrical-computer-engineering/modeling-simulation-minor/>)

Naval ROTC Program

- NROTC (<http://catalog.odu.edu/undergraduate/engineering-technology/naval-science/nrotc/>)

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.

Continuance in a linked bachelor's/master's program requires maintenance of a GPA of 3.00 or higher overall and in the major.

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 198 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 graduate credits 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.

Enterprise Centers

The Batten College of Engineering and Technology is a catalyst for the economic development of Hampton Roads. To this end, the college has established a number of centers to serve as engines for enterprise development. These centers utilize all University resources, including students and faculty. The former engineering centers now elevated as University Centers are: VMASC (the Virginia Modeling, Analysis and Simulation Center) and Bioelectrics. One that has been transferred to the Commonwealth is MARS (the Mid-Atlantic Regional Spaceport).

Applied Research Center (ARC)

Hani Elsayed-Ali, Director

ARC is an advanced materials engineering and laser technology research center. Staffed with industry/university teams utilizing the Jefferson Lab technologies, ARC provides commercial product-related research in the areas of thin-film technology, laser and plasma processing of materials, materials analysis, and devices and sensor fabrication. For more information: www.eng.odu.edu/arc (<http://www.eng.odu.edu/arc/>).

National Center for System of Systems Engineering (NCSOSE)

Charles Keating, Director

NCSOSE is a collection of independent, nonprofit, engineering research and application organizations, government entities, and universities that have joined together with a common goal to solve problems, develop technologies, and direct research focused on critical issues related to the integration of complex systems of systems.

Affiliated Centers

Frank Reidy Research Center for Bioelectrics

Andrei Pakhomov, Interim Executive Director

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.

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: Mounir 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.