ENGN - Engineering

ENGN 100 Spatial Visualization (0 Credit Hours)
The 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 Credit Hours)
A one-semester course covering topics in civil, environmental, mechanical, electrical and computer engineering.
Pre- or corequisite: Students should be simultaneously enrolled in a mathematics course

ENGN 121 Introduction to Engineering and Technology (4 Credit Hours)
This course introduces engineering and engineering technology disciplines, and develops problem-solving and teamwork skills required in the design and commissioning of an engineered product. Students will collaborate in hands-on, group projects to understand the engineering design process and explore roles and responsibilities in an engineering team. Students will develop technical skills, such as identifying, formulating, and solving engineering problems, prototype creation and testing, representation and analysis of data using software packages to form conclusions and solve problems. Students will also learn professional skills needed to become successful engineering students and engineers including, but not limited to teamwork, project management, communication (written, oral, and graphical), engineering ethics, information literacy, and critical reading skills.
Pre- or corequisite: MATH 162M

ENGN 122 Computer Programming for Engineering (4 Credit Hours)
Introduction to engineering problem-solving through computer programming. Topics include computational thinking, program design, algorithm development, and testing. Programming language concepts will include variables, data types and expressions, assignment, control-flow statements, and functions. Laboratory exercises involve C++ and Matlab to solve engineering problems (information processing, simulation, data analysis).
Pre- or corequisite: MATH 163 or MATH 166

ENGN 195 Special Topics in Engineering I (3 Credit Hours)
Interdisciplinary or multidisciplinary topics for first year students enrolled in engineering or engineering technology majors.

ENGN 295 Special Topics in Engineering II (3 Credit Hours)
Interdisciplinary or multidisciplinary topics for second year students enrolled in engineering or engineering technology majors.

ENGN 301 e-Engineering (3 Credit Hours)
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 Hour)
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 Credit Hours)
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 Credit Hours)
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 Credit Hours)
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 Credit Hours)
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 Hour)
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.
Prerequisites: Junior standing or instructor permission

ENGN 485 Introduction to Uncrewed Aerial Systems (3 Credit Hours)
This course introduces Small Uncrewed Aircraft Systems (sUAS) types and platforms (such as multirotor, fixed wing, hybrids) and explores mission planning, applications, payloads, flight authorization processes, and crew resource management. Additionally, this course introduces operation of autonomous vehicles in the National Airspace System including Universal Traffic Management, radio frequency allocations, and airport usage, including knowledge of government and industry compliance standards. Attention will be paid to topics of system integration for operations efficiency, risk management, safety, and human factors and human / machine interface in autonomous systems. Includes case studies.
Prerequisites: PHYS 112N or equivalent

ENGN 486 Multirotor UAS Design and Construction (3 Credit Hours)
A look at engineering multi-rotor Uncrewed Aerial System (UAS) design. Course topics will include Stability and control of UAS, Electric propulsion and battery technology. Overview of sensors (lidar, sonar, vision etc.); autopilot design and automatic control; airframe structural design of UAS; Flight dynamics and simulation for UAS. Accompanying laboratory topics include motor/propeller testing, building small quadcopters, understanding system elements, PID tuning, programming UAS, and autonomous drone operations. Students will learn to specify all components including motors, propellers, power system, autopilot, GPS, power monitor, frame, etc. Additional topics will include autopilot setup, firmware configuration, telemetry configuration, ground station setup and sensor specifications and integration (lidar, sonar, radar, optical flow). Mission planning, and test flights will complete the course.
Prerequisites: PHYS 112N or equivalent

ENGN 487 Fixed Wing and VTOL UAS Design and Construction (3 Credit Hours)
This course covers fixed wing aerodynamics and aircraft performance, propeller performance; basic stability and automatic control of aircraft. Introduction to vertical takeoff and landing, hybrid UAS design including tail sitting and lift-to-cruise configurations. Electric propulsion: motor selection, prop matching and system integration. Basic airframe structural design methods. Instrumentation for autonomous flight. Accompanying laboratory topics include: building small fixed wing/VTOL aircraft; autopilot configuration; flight test, planning and operations.
Prerequisites: ENGN 486

ENGN 488 Autonomous Mission Platforms Systems Integration (3 Credit Hours)
This interdisciplinary class is a mission based, collaborative course with majors across the college working alongside industry partners and or mentors. Students will work in teams to research, design, build (or rebuild existing) Unmanned Vehicles and apply them toward ecologically, humanitarian or 'customer based' focused projects.
Prerequisites: ENGN 486

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

ENGN 602T Engineering for Secondary School Teachers (1-3 Credit Hours)
An introduction to foundations of design and civil, environmental, electrical, mechanical, and computer engineering. The course will consist of secondary school appropriate content and concepts that directly correlate with the state and local school systems' science and mathematics curriculum. May lead to a Project Lead the Way certification when applicable.
Prerequisites: Bachelor's degree or permission of the instructor

ENGN 603T Engineering Seminar for Teachers (1-3 Credit Hours)
An introductory seminar on specific multi-disciplinary or interdisciplinary engineering topics for MS or HS teachers.
Prerequisites: Bachelor's degree or permission of the instructor

ENGN 611 Financial Engineering (3 Credit Hours)
Financial engineering management, accounting, financial reports and analysis, capital budgeting, investment decisions.

ENGN 612 Analysis of Organizational Systems (3 Credit Hours)
Introduction to fundamental concepts in the analysis of organizations. Examination of social, structural, procedural, and environmental aspects by systems approach. Modules include: History and systems of organizations and management; Basic organizational systems and models; Organizational behavior models; Integration of systems perspectives; and Organizational structures.

ENGN 620 The Entrepreneurial Engineer (2 Credit Hours)
This course is designed to provide engineers and engineering technologists with the knowledge, skills and experience needed to create products and services that will be attractive to consumer markets and to bring those products and services to market in new commercial ventures. Topics covered include: how to evaluate entrepreneurial opportunities in the engineering field; elements of a viable business plan; governance models; management succession planning; use of social media; and creating an ethical engineering enterprise in the global economy.

ENGN 621 The Entrepreneurial Engineer (2 Credit Hours)
This course is designed to provide engineers and engineering technologists with the knowledge, skills and experience needed to create products and services that will be attractive to consumer markets and to bring those products and services to market in new commercial ventures. Topics covered include: How to evaluate entrepreneurial opportunities in the engineering field; elements of a viable business plan; governance models; management succession planning; use of social media; and creating an ethical engineering enterprise in the global economy.

ENGN 623 Leadership and Human Dynamics for the Entrepreneurial Engineer (2 Credit Hours)
This course covers the concepts, skills, and characteristics of effective and successful entrepreneurial leaders in the 21st century. The course covers leadership for entrepreneurial engineers through case studies and literature review in areas such as the fundamentals of leadership, ethical leadership, social capital, emotional intelligence, and three-dimensional leadership.

ENGN 625 Business Planning for Entrepreneurial Engineers (2 Credit Hours)
This course is the capstone of the Entrepreneurship and Innovation graduate certificate for engineers. With data and expertise through prior certificate coursework, students develop and present a comprehensive and viable entrepreneurial business plan in engineering. Topics covered include: Product lifecycle management, marketing and strategic planning, entrepreneurial finance, and effective presentation techniques. The final presentation is delivered to a panel of ODU faculty and engineering practitioners who provide sound feedback to the student.

ENGN 630 Advanced Bioelectrics (3 Credit Hours)
A one-semester course covering advanced topics in bioelectrics. The course will cover advanced application of pulsed power and plasma in the medical, biological and environmental fields. (Cross-listed with ECE 630).
Prerequisites: bachelor's degree in physics, engineering or biology

ENGN 671 Carbon-Free Clean Energy (3 Credit Hours)
Nuclear power and nuclear energy; solar energy; wind energy; geothermal energy; hydroelectric power; hydrogen as energy resource; hydrogen fuel cells; hybrid technologies; global economics and environmental impacts of carbon-free energy.

ENGN 672 Energy Systems Management (3 Credit Hours)
System management principles; energy systems safety and security; automation and control; environmental effects and comparative risk assessment; energy storage; carbon sequestration; energy systems scale up issues; energy systems integration; hybrid systems; energy systems optimization; effects of public policies on energy systems management.

ENGN 695 Multidisciplinary Topics in Engineering (1-3 Credit Hours)
Special interdisciplinary or multidisciplinary topics of interest with emphasis on emerging areas in engineering.

ENGN 697 Independent Study in Energy Engineering (3 Credit Hours)
Individual analytical, experimental, computational and/or design study selected by the student and supervised by the course instructor.

ENGN 811 Methodologies for Advanced Engineering Projects (3 Credit Hours)
Critical evaluation of published literature; experimental design and analysis; optimization methods; pre-project planning; definition of scope, projects risks, technical, economical, social, and political constraints; execution strategies; effective proposal development.
Prerequisites: Graduate standing

ENGN 812 Engineering Leadership (3 Credit Hours)
Effective communication techniques, strategic planning, building
collaborative relationships, conflict management, building high-performance
teams, risk management, managing innovations.
Prerequisites: Graduate standing

ENGN 813 Engineering Ethics (3 Credit Hours)
Scope of engineering ethics, moral reasoning and ethical theories, the
engineer's responsibility for safety, responsibilities to the employer,
responsibilities to the public, rights of engineers, global issues, professional
codes of ethics, case studies.
Prerequisites: Graduate standing

ENGN 998 Master's Graduate Credit (1 Credit Hour)
This course is a pass/fail course for master's students in their final semester.
It may be taken to fulfill the registration requirement necessary for
graduation. All master's students are required to be registered for at least one
graduate credit hour in the semester of their graduation.