Civil Engineering: Degree and Profession

Old Dominion University
Civil and Environmental Engineering
• Application of math and science to **create something** of value from natural resources

• Problem solver! Create new solutions or improve upon existing ones

• “It is a great profession. There is the fascination of watching a figment of the imagination emerge through the aid of science to plan on paper. Then it brings jobs and homes…it elevates the standard of living and adds to the comforts of life. This is an engineer’s high privilege.” - Herbert Hoover

• Profession:
  • Knowledge – education, judgment, discretion
  • Organization – standards of conduct and codes of ethics
  • Public Good – service and public welfare
Civil Engineering

Oldest and quintessential engineering profession

Design, build, and maintain infrastructure all for the well being of the society
Pyramids, Giza, Egypt - 2500 BC

Roman Aqueduct - 312 BC – AD 109

The Coliseum, Rome - AD 72-80

Eiffel Tower, Paris - 1889

Panama Canal - 1914
HRBT Expansion Project

- 8000 ft tunnel
- A design-build project
- Cost: $3.8 Billion
- Scheduled completion: end of 2025
What is infrastructure?

- Civil engineers create and maintain the world’s infrastructure:
  - Buildings, bridges, power plants and transmission lines, industrial facilities
  - Highways, streets, roads, and canals
  - Railroads, airports, airplanes, ships
  - Reservoirs, water pipelines, water treatment plants, flood control, coastal structures, wastewater treatment, solid-waste treatment and disposal, hazardous waste management, and more
Civil Engineering Specialties

- Structural
- Geotechnical
- Water Resources and Coastal
- Transportation
- Environmental

https://www.youtube.com/watch?v=cJaRjI7K-Lw
Structural Engineering

- Analyze and design structures to serve human needs
- Consider hurricanes, earthquakes, blizzards, and floods.
- Structures include homes, office buildings, stadiums, arenas, skyscrapers, bridges, space platforms, amusement park rides.
Cable Stayed Bridge

Hoover Dam Arch Bridge
Geotechnical Engineering

- Geotechnical engineers solve problems involving earth material
- Tunnels, building and bridge foundations, and pipelines
- Highway pavement
- Dams, levees, embankments
Slope Stabilization
Water Resources Engineering

- Planning, design, construction, and maintenance of hydro-electric power facilities, canals, dams, pumping stations, pipelines, and detention basins, and ports.
Meeting water supply needs of communities – at the sake of the environment?

Sustainability - striking a balance between human activities and natural systems
Coastal Engineering

- Accelerated Sea Level Rise (SLR) threatens coastal areas where most people live in the world.
- Coastal engineers study, plan, design, construct and maintain coastal defense systems.
- Beaches are natural defenses and have become the preferred alternative for shore protection.
Coastal Engineering

- Coastal Erosion Protection – jetties, groins, etc.
- Beach Replenishment
- Dredging
- Piers and Port Structures
- Tidal Flooding
- Currents and Storm Surges
Transportation Engineering

- Planning, Design, Operation and Maintenance of safe and efficient transportation systems
- Intelligent Transportation Systems
- Connected Vehicles: [https://www.youtube.com/watch?v=Q8Cn47L8FRQ](https://www.youtube.com/watch?v=Q8Cn47L8FRQ)
- Autonomous Cars: [https://www.youtube.com/watch?v=P1tfOeChenQ](https://www.youtube.com/watch?v=P1tfOeChenQ)
Environmental Engineering

- Protection of the fragile resources of our planet
- Remove pollutants from water and soil
- Capture or destroy pollutants before they are released to water, air, or soil
- Water and Wastewater Treatment Processes
- Stormwater Management
- Air Pollution Control
- Solid and Hazardous Waste Management
American Society of Civil Engineers

Civil Engineering
Body of Knowledge
Outcomes: concepts, terms, and activities that make up the profession domain

Foundational
- Mathematics
- Natural Sciences
- Social Sciences
- Humanities

Engineering Fundamentals
- Materials Science
- Engineering Mechanics
- Experiment Methods and Data Analysis
- Critical Thinking and Problem Solving

Technical
- Project Management
- Engineering Economics
- Risk and Uncertainty
- Breadth in CE Areas
- Design
- Depth in CE Area
- Sustainability

Professional
- Communication
- Teamwork and Leadership
- Lifelong Learning
- Professional Attitudes
- Professional Responsibilities
- Ethical Responsibilities
Pathways to Outcomes

- Undergraduate Education (four year ABET accredited program)
- Postgraduate Education (MS and PhD, or continuing education)
- Mentored Experience (internships and early career experience)
- Self-Development (self-study, personal observation and reflection)
Desired Attributes of Civil Eng

• Most Important Skills for a Civil Engineer to Succeed: https://www.youtube.com/watch?v=HAx7E3Bu7gA&feature=youtu.be
  • Good communication skills
  • High ethical standards
  • Critical thinking and creativity
  • Solid foundation of math, physics, statistics, life sciences, information technology
  • Design skills
  • Knowledge of economics, history, environment, and societal needs
  • Ability to work in multidisciplinary work environment
ODU Civil Engineering Degree Program

- 15 full time faculty and instructors
- Curriculum: 130 Credit Hours
  - Structural
  - Geotechnical
  - Water Resources and Coastal
  - Transportation
  - Environmental
  - Plus General Education Courses (Mathematics, Natural Sciences, Social Sciences, Humanities)
- Minor in Environmental Engineering
- ABET Accredited
- Small class sizes:
  - More individual attention
  - Good academic and career advising system
Civil Engineering Curriculum
Student Success

- Good communication skills
- Critical thinking and problem-solving skills
- Design skills
- Leadership skills
- Ability to work in multidisciplinary work environment
Extra-Curricular Activities

Student chapter organizations:
- American Society of Civil Engineers
- Environmental Engineering Student Association
- National CE Honor Society, and others

ASCE competitions:
- Concrete Canoe
- Steel Bridge

Research Engagement
Old Dominion University Student Chapter

http://www.asce.org
Student Activities

The TED
Chi Epsilon (XE)
National Civil Engineering Honor Society (ODU Chapter)

Student Activities
Civil Engineering Jobs/Earnings

**Jobs**

- Consulting Firms (51%)
- State or Local Government (22%)
- Construction and Manufacturing (12%)
- Federal Government (10%)
- Self-Employed (5%)
- Other (<1%)

**Earnings**

- 2016 median: $83,540 annual or $40.16 hourly
- Jobs in 2014 = 281,400
- 8% expected growth in jobs till 2024, adding 23,600 jobs
Civil and Environmental Engineering Visiting Council (CEEVC)

- Organized exclusively for charitable, scientific and education purposes
- The CEEVC is to provide advice and support to the CEE department
- Provide guidance in planning the departmental activities
- Raise discretionary or special purpose funds on behalf of the Department
Exciting Time to be a Civil Engineer!

- Dominating Issues
  - Creating **sustainable communities** for society, environment, and economy – tackling new challenges and seeking better solutions
  - Reinforcing and rebuilding the **infrastructure system** – old, rusty, and energy inefficient
  - **Redefining mobility** – Connected/Automated Vehicles, Shared-Use Mobility for more efficiency and safety
  - Seeking **renewable energy** and reducing footprint of current energy practices – exploring more sustainable ways of harvesting energy
More Information on ODU CEE

https://www.odu.edu/cee