Online Ethics Center
FOR ENGINEERING AND SCIENCE

Ethics Activities in the Civil Engineering Curriculum at the United States Coast Guard Academy

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Description

This activity is considered an NAE Exemplar in Engineering Ethics Education and was included in a 2016 report with other exemplary activities. This activity discusses the ethics program at the United States Coast Guard Academy.

Body

Exemplary features: Deeply embedded ethics education that is integrated through a multiyear program

Why it's exemplary: The Civil Engineering Program at the United States Coast Guard Academy (USCGA) fosters ethical leader development and global awareness through a breadth of required core courses in the humanities, science, engineering, mathematics, professional maritime studies, organizational behavior, management, leadership, and law. Civil Engineering faculty, guided by our ABET assessment

framework, advance student development in ethics, global, and cross-cultural issues that are tied specifically to the civil engineering profession through assignments and other curricular experiences that are regularly assessed and improved. Leadership and ethical development are cornerstones of the USCGA education and the civil engineering faculty, like all faculty across campus, are charged with ensuring that upon graduation, each student has developed into a leader of character. The combination of core courses, major-specific engineering courses, and cocurricular activities provides students with opportunities to develop leadership and professional ethical conduct required for engineering practice and service as Coast Guard officers.

Program description: During their sophomore year, civil engineering students take the Leadership and Organizational Behavior (3 credits) course in which they are exposed to fundamental leadership and management concepts. Some of the concepts discussed include values and ethics, personality, self-awareness, working in teams, motivation, and setting a vision, with particular emphasis on practical leadership implications. As juniors, civil engineering students take required core courses such as Morals and Ethics (3 credits) and Criminal Justice (3 credits). As seniors, they study Maritime Law Enforcement (3 credits). The Morals and Ethics course includes two main components: (1) ethical theories, both historical and contemporary, with arguments for and against them; and (2) applied ethics, both in general and using case studies in a specific field. Throughout the semester, students examine a range of philosophical views about what makes actions right or wrong, characters good or bad, to develop their decision-making abilities, their own moral voice, and an appreciation for the place of reasoned argument in the treatment of ethical problems. Students also study and explore basic legal concepts in Criminal Justice and Maritime Law Enforcement, learning specifically about the US civilian and military criminal justice system and legal issues associated with the Coast Guard’s law enforcement mission in the maritime environment. Ethical and global issues are also progressively woven into the major-specific civil engineering courses. Some examples of how professional ethics are emphasized throughout the civil engineering curriculum are highlighted below:

- Case studies, practical examples, or demonstrations are used where appropriate. For example, in Structural Analysis the instructor developed a “professional practice moment” in which students take turns presenting a

current event (that includes ethical conduct) related to structural engineering during the last 5 minutes of each class.

- In the Geotechnical Engineering Design course, students engage in forensic investigation and evaluation by reviewing four case studies, one of which involves an ethical dilemma. Case studies provide opportunities for students to make the connection between theory and real-life application of engineering principles and concepts.
- In Environmental Engineering I, for a case study involving exceedance of pollutant limits, students evaluate the situation from multiple perspectives and relate the issues to the Engineers Code of Ethics. Their progress is evaluated using a rubric linked to performance indicators. Students also research and prepare presentations for the class on Superfund sites around the country to develop an understanding of various problems and remediation technologies as well as the legal, ethical, and societal issues involved in identifying and cleaning up hazardous waste sites. Coverage of professional ethics in civil engineering is provided in detail in the Civil Engineering Design course. Students in this capstone design course apply knowledge from a broad range of technical, managerial, and humanities coursework to develop solutions that consider the economic, sociopolitical, ethical, and environmental aspects of real-world problems. They produce engineering calculations, construction drawings, project schedules, cost estimates, and other necessary project-specific documents, and then communicate the results of their capstone project via a final report and presentation to their client. Major components of the course are the preparation of leadership essays as well as research and presentation of an ethical scenario from ASCE’s Question of Ethics case study archive. The case studies are related to the seven canons of the ASCE Code of Ethics. Each group has 15 minutes to present its Ethics Case Study and the team facilitates a short in-class discussion. The objective is to present relevant engineering ethical situations in the classroom to stimulate discussion of the ASCE Code of Ethics and critical thinking. Students select one of the ASCE Code of Ethics canons, research, identify, and review relevant case studies, and present their findings to the class. Following are samples of 2015 case study presentation topics:
    - Ensuring the safety, health, and welfare of the public, investigated in reference to ASCE Canon 1: “Engineers shall hold paramount the safety, health, and welfare of the public and shall strive to comply with the

principles of sustainable development in the performance of their professional duties."

- An engineer's misrepresentation of credentials or dishonesty, in reference to ASCE Canon 2: "Engineers shall perform services only in areas of their competence."
- Engineers who gave false geotechnical information, ASCE Canon 3: "Engineers shall issue public statements only in an objective and truthful manner."
- The proper use of professional credentials, ASCE Canon 4: "Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest" and ASCE Canon 5: "Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others."
- Fraud, ASCE Canon 6: "Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession and shall act with zero tolerance for bribery, fraud, and corruption."
- Employer's responsibility to employees, ASCE Canon 7: "Engineers shall continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision."

Assessment information: USCGA has established a set of shared-learning outcomes (for all academic programs) that include leadership abilities; personal and professional qualities; the ability to acquire, integrate, and expand knowledge; effective communication; and the ability to think critically. The shared-learning outcomes are aligned with the ABET Student Outcomes, with specifically developed performance indicators related to ethics. Faculty members have created assignments and rubrics to assess student progress and improve student development in professional ethics for each performance indicator. By integrating professional ethics development and assessment in the existing civil engineering assessment model, faculty have successfully threaded this competency into the curriculum using a sustainable and effective framework. For example, the performance indicators for two ABET student outcomes, 3f and 3h, are used to assess ethics and professional issues in the civil engineering curriculum. ABET 3f, "an understanding of professional and ethical responsibility," is evaluated by the

following specific performance indicators:

- 3f-1: “articulate importance of professional code of ethics”
- 3f-2: “identify ethical dilemmas and propose ethical solutions in accordance with professional code of ethics.”

ABET 3h, “the broad education necessary to understand the impact of engineering solutions in global, economic, environmental, and societal contexts,” is addressed with two performance indicators:

- 3h-1: “explain the economic, social, and global aspects of engineering solutions”
- 3h-2: “discuss the environmental implication of engineering solutions.”

Faculty members have crafted assignments and rubrics related to these performance indicators to ensure student development in ethical and global issues relating to civil engineering. Thresholds and performance targets were established for the successful achievement of the performance indicators, with different performance targets for exams and nonexam activities (e.g., projects, homework, reports, technical paper, oral presentations). Students are considered to have demonstrated satisfactory achievement of a performance indicator if their score (grade on a particular assessment tool) meets or exceeds 70%. A course is classified as producing satisfactory student achievement on a performance indicator if it meets one or both of the following performance targets:

- Exams: At least 70% of students must exceed the performance indicator score of 70% (C grade).
- Nonexam assignments: At least 85% of students must exceed the performance indicator score of 70% (C grade).

This well-established ABET assessment system is used to evaluate student progress throughout the academic year and monitored at the end of course review, when assessment data on student performance are discussed for each course. To ensure continuous improvements, recommendations are documented for implementation during the next cycle of course offerings. Graduates of USCGA receive a degree and a commission as a Coast Guard officer: We are preparing students to provide engineering expertise while serving their mandatory 5-year commitment to the Coast Guard, and their ethics and leadership are continually service tested for a

minimum of 5 years after graduation.

Additional resources:

1. American Society of Civil Engineers Code of Ethics

Rights

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Resource Type

Educational Activity Description

Parent Collection

NAE Exemplars in Engineering Ethics Education

Topics

Pedagogical Approaches

Discipline(s)

Engineering
Teaching Ethics in STEM