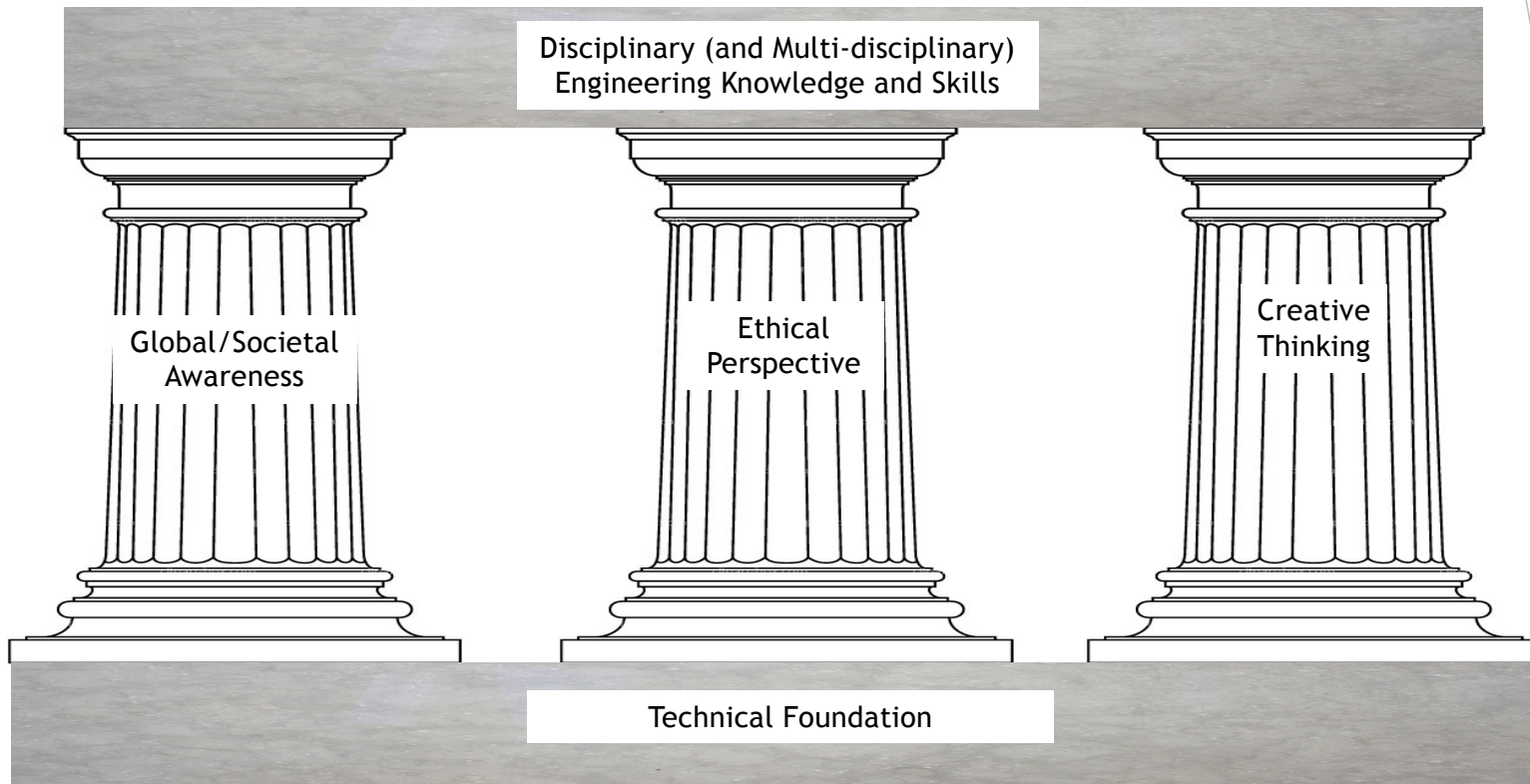# Enhancing Ethical Context in the CoE Curriculum

Jon Kuhl & Tom Casavant

Three Dimensions of 21st Century Engineers

Disciplinary (and Multi-disciplinary) Engineering Knowledge and Skills

Global/Societal Awareness

Ethical Perspective

Creative Thinking

Technical Foundation

Three Dimensions of 21st Century Engineers

1. **Disciplinary Knowledge and Skills**

   ▶ Within eight existing programs of study in the CoE. Already doing this quite well.

2. **Technical Foundations**

   ▶ Subject matter that cuts across the spectrum of tools needed by engineers in all disciplines. E,g., AI/ML, mathematics, probability, physical and/or life sciences

3. **Essential Qualitative Characteristics – Ethics**

   ▶ A carefully crafted and responsive CoE Core should produce engineers with the *ability to anticipate and consider the societal impacts of the capabilities of the techniques and technologies emerging from areas such as Artificial Intelligence*. Other areas to be considered such as Sustainability, Entrepreneurship, Global Perspectives, and Open-ended Problem Solving. These are critical universal themes for all engineering disciplines.

Expanding on #3 – <u>Ethics</u> and other essential qualitative characteristics

▶ Goal: …. [not simply make students aware of these issues, but] *engage them in exercises that put them "in the shoes" of a practicing engineer.*

▶ As an outcome, our graduates will be equipped with practical tools for discovering and confronting ethical dilemmas as they naturally arise in their future careers.

Concrete Components of Ethics Curriculum

▶ An initial Orientation course to define terms as well as the scope of Ethics as it applies to the professional engineer.

▶ The development of ethics modules that can be inserted at opportune places in other courses at all course levels throughout the academic training career of CoE undergraduate (and perhaps graduate) students.

▶ The modules would be actively maintained by dedicated faculty and instructors.

▶ Emphasis would be placed on making these interactive and/or hands-on experiences.

  ▶ For example, groups of 15-20 students could be divided into 3-4 cohorts of 5 students each and charged with playing various roles that frame the ethical conflicts that are inevitable to arise in the career of an engineer. These roles (for example) could include design engineers, technicians, marketing teams, basic research teams, etc.

▶ "Studio" course modules in which students produce documentary style videos to capture the essence of the role-playing exercises.

The Current Request for Proposals

▶ The College of Engineering has received a substantial donation

▶ ...to support the enhancement of ethics education in the undergraduate curriculum.

▶ This gift will provide funding <u>for instructors </u>to develop and integrate ethics-related content into engineering courses at all levels, with the goal of substantially enhancing students' exposure to, and understanding of, ethical issues facing 21st century engineers.

▶ This funding will be awarded on a competitive basis.

▶ *Up to four awards of up to $20,000 each in AY 2019-20.*

▶ ... for summer or academic-year salary support, appropriate travel, and other justifiable expenses.

Development of 4 Course "Modules"

▶ <u>Modules</u> of instruction that can be deployed in a variety of course settings

▶ ... should be designed to provide rich and engaging learning experiences in Engineering Ethics for CoE students <u>at all levels.</u>

▶ ... should provide experiences aimed at actively engaging students in exercises (both in and outside the classroom) including:

    ▶ Role-playing scenarios

    ▶ Simulations

    ▶ Real-world investigations

    ▶ Self assessment

▶ ... with the goal of immersing students in the <u>ethical aspects of engineering practice</u> and providing them with the tools and knowledge to <u>navigate contemporary ethical challenges</u>

Further expectations for modules

- Modules must …
- … be topically focused.
- … include plans for
  - didactic training
  - participatory experiences
  - tangible outcomes/artifacts to document the experience and potentially inform other students and members of society.
- … be <u>self-contained curricular units</u> that can be integrated into *existing engineering courses.*
- … be broadly applicable across multiple engineering disciplines and
- … be [easily] adaptable for use in multiple courses across all 4 years of undergraduate training.
- Preference will be given to proposals with the potential for broadest impact throughout the College Curriculum.

Potential Topics

▶ Global and Diversity Issues

▶ Environmental Impact/Sustainability

▶ Personal Privacy

▶ Public Safety and Health

▶ Societal Impacts of Machine Intelligence

▶ Source and Supply-chain Issues

▶ Social Capital Respect

▶ Transparency and Accountability

Time Table

▶ Design of initial 4 modules during summer (and possibly early Fall) 2019

▶ Deployment in AY 2019-2020 in at least 1 course.

▶ Additional funds *may* be available to adapt modules for other courses and/or refinement based on assessment

Proposal Structure

1. Focus of ethical topic choice
2. Target course (and other courses to which the module could be applied),
3. Expected number of students impacted,
4. Sufficient detail of experiential learning aspects to allow evaluation of degree of student engagement
5. Plan for assessment of effectiveness
6. Budget