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EGS 3060: Engineering Professional Development for a Global Society (3 credit hours)

Class meeting times and location: Tuesdays and Thursdays from 2:00 - 3:15 p.m.

Instructor: Dr. Bruk Berhane

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Office Hours: By appointment

Catalog Description This course will equip engineering students with an understanding of core competencies that tomorrow's engineers are expected to possess, while offering them opportunities to develop these skills themselves in "real time." Students will read a broad range of topics ranging from leadership development, effective communication, focusing largely on developing global engagement, global awareness, and a global perspective. The final project will involve a response to a real or fictitious technical scenario, using core competencies developed in this course. This is a discipline-specific global learning course that counts towards your FIU Global Learning (GL) graduation requirement.

Course Justification

In the past, engineers were often defined by their discipline and academic training, often leading them to creating professional silos while still grappling with broad challenges. Today's evolving technical landscape, however, calls for more culturally responsive and civically engaged engineers, who can work on interdisciplinary teams with scientists, business leaders, policymakers, and other stakeholder groups. In the context of global challenges like developing techniques to ensure clean water, improving virtual reality, and even supporting a collective response to current challenges like the Coronavirus, the imperative for developing engineers who are ready to face these issues has perhaps never been more urgent. Simultaneously, major stakeholder groups that include the Accreditation Board for Engineering and Technology (ABET) and the National Academy of Engineering (NAE) have underscored the need for engineers who can work on these evolving and very important issues. ABET notes, for example, that engineering baccalaureate degree programs should train engineers who have a "knowledge of the impact of engineering technology solutions in a societal and global context." Finally, engineering colleges across the U.S., including the College of Engineering and Computing at FIU, frequently receive feedback from top employers through annual surveys about vital skills that graduates are lacking in the workforce. To date, there have been very few courses developed in the country that are designed to actively address the needs that are voiced by these stakeholders. This course directly responds to concerns raised by these organizations, while also challenging students to think about a world in which engineers improve the quality of life in bold new ways.

Global Learning Course Outcomes

Global Awareness

- Students will identify some of the most salient, interrelated needs and trends of local, global, and international engineering stakeholders, both in the U.S. and throughout the world.

Global Perspective

- Students will develop well-articulated, multi-perspective approaches to one or more technical or scientific local, global, international, and intercultural challenges that require global and diverse perspectives.

Global Engagement

- Students will demonstrate an understanding of engineering cultural norms specific to one or more engineering post-secondary institutions located in a different country.

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Course Objectives

Through the activities within this course, students will improve their ability to:

- Understand the principles of the “mindset” of innovators, such as an ability to anticipate changing and/or future needs
- Apply the values of diversity, equity, and global citizenship to recent case studies, or current events
- Actualize the concepts of leadership, teamwork, and innovation in their everyday lives

Course Organization

Course Materials. There are no required textbooks. Most course materials will be posted to Canvas. Online course materials (pre-reading before class) will be based on topics related to global engagement, technological needs of the 21st century, leadership, and communication. Participants will also be exposed to literature from key stakeholder groups, such as NAE, in order to situate their learning and to underscore the relevance of this course. Literature may include, but not be limited to, the following:

- Agrawal, A. K., & Harrington-Hurd, S. (2016). Preparing next generation graduates for a global engineering workforce: Insights from tomorrow's engineers. *Journal of Engineering Education Transformations*, 29(4), 5-12.
- Bosman, L., & Fern Haber, S. (2018). Teaching the entrepreneurial mindset to engineers. Springer International Publishing.
- Komives, S. R., & Wagner, W. (Eds.). (2016). *Leadership for a better world: Understanding the social change model of leadership development*. John Wiley & Sons.
- Jesiek, B. K., Zhu, Q., Woo, S. E., Thompson, J. R., & Mazzurco, A. (2014). Global engineering competency in context: Situations and behaviors. *Online Journal for Global Engineering Education*, 8(1), 1
- Male, S. A., Bush, M. B., & Chapman, E. S. (2010). Perceptions of competency deficiencies in engineering graduates. *Australasian Journal of Engineering Education*, 6(1), 55-68.
- National Academy of Engineering (2010). *NAE grand challenges for engineering*. <http://www.engineeringchallenges.org/challenge/11574.aspx>

Evaluation. Below please find an explanation of how grades will be calculated for the course:

- 20% of students' grades will come from in-class participation, which requires extensive engagement via active learning
- 25% of students' grades will be generated from their performance on a final project that incorporates the skills gained through this course; part of the final assignment grade will incorporate elements of the “21 Day Challenge” (see below for details)
- 30% of students' grades will come from short and/or extended essays that require students to synthesize and respond to major topics in the course
- 25% of students' grades will come from other out-of-class assignments that incorporate themes relevant to the course, such as surveys and elements of the “21 Day Challenge” (see below for details)

Assessments

Reflection Essays:

- I. **Engineering Innovation:** You will submit a three to four-page reflection essay on innovation, exploring opportunities to introduce engineering innovations locally, globally, and internationally. This essay will serve as an assessment of your Global Awareness.

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- II. **The 14 Grand Challenges of Engineering:** You will submit a reflective essay regarding your perception of the 14 Grand Challenges in Engineering, as outlined by the National Academy of Engineering. You will respond to questions that include, How would you as a new engineer incorporate a possible interest in the Grand Challenge that appeals to you into your work after graduating? What are practical steps that you can take if you might be interested in pursuing more global work with this specific Grand Challenge in the future? This essay will serve as an assessment of your Global Perspective.
- **Evaluation:** Each essay is worth a maximum of 100 points possible. Up to 20 points will be awarded for completion/thoroughness, up to 20 points for insight in terms of depth of thought, up to 20 points for the organization of the essay, up to 20 points for spelling and grammar, and up to 20 points for adherence to the requirements/guidelines for the essay.

21 Day Challenge: Students will complete an activity called the 21 Day Challenge in collaboration with engineering students from the Pontifical Catholic University of Chile (PUC). The 21 Day Challenge asks students to explore a habit that they would like to develop over a three-week period, and that habit should be one that will allow them to be more academically/professionally engaged with engineering collaborators in Chile. At the same time, the students in Chile will be asked to develop a habit that will allow them to be more academically/professionally engaged with engineering collaborators from the US. This assignment will serve as an assessment of students' Global Engagement.

- Students will be required to submit an individual video reflection and series of group video reflections, in which individuals and groups of PUC/FIU students talk about their specific challenge, and how their efforts to develop this habit are progressing over time.

Evaluation:

- 1) Daily reports, as noted above. This will be associated with the 25% of your grade that comes from "other out of class assignments," as outlined in the syllabus.
- 2) Documented written and video group discussions. Written group discussions should be documented via the team's online group platform. Video group discussions should be recorded on Zoom (either as a video file or a URL to a video) and uploaded onto your team's online platform. This will be associated with the 25% of your grade that comes from "other out

Make-up Policy/Late Work: In general, late work or make-up assignments will only be allowed in exceptional cases. Please consult the instructor if you believe that your circumstances merit an extension to the respective due date.

Academic Honesty: Students violating the Academic Dishonesty Policy as stated in the current Student Conduct Code will be penalized by the rules of the University and will also be immediately dismissed from this course and will receive a final grade of "F". All course assignments are individual assignments, unless otherwise stated by the instructor. This applies to all homework or and any other assignments to be graded. While collaboration is encouraged, students ultimately should do their own work in the course. If quoting from another source, appropriate citation is required.

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Students with Disabilities: Students requesting classroom accommodation must first register with the office of the Dean of Students, and receive the proper documentation. This documentation must be provided to the instructor at the beginning of the semester when requesting accommodations.

The grading scale for the course is included below.

Letter	Range (%)	Letter	Range (%)	Letter	Range (%)
A	Above 93	B-	80 - 83	D+	67 - 70
A-	90 - 92	C+	77 - 79	D	64 - 66
B+	87 - 89	C	74 - 76	D-	61 - 63
B	84 - 86	C-	71 - 73	F	< 60

Course Schedule and Associated Topics

(15 week schedule) – Note that the schedule provided below is tentative, and discussion topics listed in bullets do not represent the entirety of topics to be covered.

Week 1	Dates: Tuesday, January 12th and Thursday, January 14th Introduction to the course; overview and expectations; inclusion and difference; introduction to entrepreneurship; growth mindset vs. fixed mindset.
Week 2	Dates: Tuesday, January 19th and Thursday, January 21st The “Entrepreneurial Mindset” and engineering in a global context.
Week 3	Dates: Tuesday, January 26th and Thursday, January 28th Personality assessment and personality types; personality in the context of the engineering workforce.
Week 4	Dates: Tuesday, February 2nd and Thursday, February 4th Introduction to leadership development theory; discussion of the Leadership Identity Development Model; present differences between effective leaders and managers; survey of leadership styles and applications of those leadership styles in engineering and computing fields. <Note Meagan Pollock video and discussion resources from her 12/10/21 email would be perfect for this...>
Week 5	Dates: Tuesday, February 9th and Thursday, February 11th Globaly-engaged engineers; profiles of engineering organizations with a global “footprint”; engineering leadership in a global context. This assignment will serve as an assessment of your Global Perspective.
Week 6	Dates: Tuesday, February 16th and Thursday, February 18th Teamwork: Intra- and inter-connectedness in engineering, STEM, and beyond. Discuss ways in which to develop collaboration and teamwork within and across distinct engineering and computing fields, across STEM fields like biology, computer science, chemistry, and physics, and in

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	<p>other fields like business. Submit essay on variations in the “mindset” of change agents. Interview a student or professional in another discipline.</p>
Week 7	<p>Dates: Tuesday, February 23rd and Thursday, February 25th</p> <p>“What are they <i>really</i> looking for in new engineers?” Conversations with engineering professionals. Initial meetings in-class with project teams. Decide on project teams for semester and assignment of final project.</p>
Week 8	<p>Dates: Tuesday, March 2nd and Thursday, March 4th</p> <p>Effective oral and written communication. Collaboration through online and interactive activities in a global context. Preparation for engagement with colleagues at Pontificia Universidad Católica de Chile (Pontifical Catholic University of Chile) or PUC.</p>
Week 9	<p>Dates: Tuesday, March 9th and Thursday, March 11th</p> <p>On the Topic of Change: The 21 Day Challenge – Students at FIU and UC participate in joint lecture designed to introduce the concept of a 21-day challenge. Students will complete an activity called the 21 Day Challenge in collaboration with engineering students from the Pontifical Catholic University of Chile (PUC). The 21 Day Challenge asks students to explore a habit that they would like to develop over a three-week period, and that habit should be one that will allow them to be more academically/professionally engaged with engineering collaborators in Chile. At the same time, the students in Chile will be asked to develop a habit that will allow them to be more academically/professionally engaged with engineering collaborators from the US. This assignment will serve as an assessment of your Global Engagement.</p>
Week 10	<p>Dates: Tuesday, March 16th and Thursday, March 18th</p> <p>Innovation discussion. Global case studies, global issues addressed by the United Nations, and potential solutions offered through engineering innovation. This assignment will serve as an assessment of your Global Awareness.</p>
Week 11	<p>Dates: Tuesday, March 23rd and Thursday, March 25th</p> <p>Consent, sequence maps, and conflict resolution for engineers in a global marketplace.</p>
Week 12	<p>Dates: Tuesday, March 30th and Thursday, April 1st</p> <p>Social entrepreneurship, social innovation, and human-centered design for engineers in a global society. Conclusion and group reflections on 21 Day Challenge with colleagues from PUC.</p>
Week 13	<p>Dates: Tuesday, April 6th and Thursday, April 8th</p> <p>Research, Non-Profit, and Policy: The relevance of engineering professional skills in areas outside of engineering industry. Employment opportunities outside of the US and requisite skills for success.</p>
Week 14	<p>Dates: Tuesday, April 13th and Thursday, April 15th</p>

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	"What will they be looking for in the <i>future?</i> " Reflections for the future in an increasingly global and interconnected society.
Week 15	Dates: Tuesday, April 20th and Thursday, April 22nd Team presentations for final project.

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