EML 4551 Ethics and Design Project Organization GL (Core)
FALL 2020

Catalog Description: Organization to include problem definition, goals, survey, conceptual and preliminary design, ethics and cost components, social and environmental impact, presentation to enhance communication skills (1 credits).

This is Global Learning Discipline Specific course and is a required requisite to obtain the Mechanical Engineering Degree at FIU.
This is a Discipline-specific Global Learning course that counts towards your FIU Global Learning graduation requirement.

Pre-Requisites: EML 3126**; Co-requisites:** EML 4140, EGM 3311, EML3500, EML 4700 and senior standing.

Textbook: No formal text.

Global Learning outcomes
1. Students will be able to identify, analyze and integrate ethics similarities and differences in multiple markets and cultures.
2. Students will be able to conduct an analysis of an engineering problem and its multicultural and/or international impact by identifying different factors such as technology, economics and society, and their contributions to the problem and/or solution.
3. Students will work in teams to develop solutions and action plans to address local, global and/or international engineering problems.

Each of the three Global Learning Course Outcomes (Global Awareness, Global Perspective, and Global Engagement) through various assignments during class and final reports and presentation documents by faculty and IAB members.

Course Objectives:
Upon completing this course, students will be able to:

- apply knowledge from their engineering courses to find a feasible solution to an open-ended design problem.
- utilize team skills to accomplish the necessary design tasks in the project.
- learn global competition, take advantage of international cooperation and manufacturing products which can be easily used in other countries.
- develop and use critical thinking skills to brainstorm solutions to their design project, select among several alternative solutions, and then to perform detail design work.
- strengthen written and oral technical communication skills.
- develop and become more aware of the engineering ethics that apply to design.
- apply their engineering course material to solving an open-ended design problem. Detailed engineering analysis will be performed to ensure the design is successful in meeting its requirements.

Topics Covered:
1. Course Overview and Policies
2. Team Building / Iterative Design, Design Practices
3. Ethics case study, review and test
4. Global learning and multinational manufacturing operations
5. Project Selection/Specification
6. Design Methods
7. Project Plans Presentations
8. Design Selection Methods; Critical Path Method; Decision Tree
9. Brainstorming; Design Selection Analysis
10. Drawing and Report Formats
11. Project Presentation

Class Schedule: 2 x 1hr 15min sessions/wk

Global Readings and Presented Information to Students

- Case study of what would happen if a flood happened in Miami and what the consequences are
- Case study reading and watching video of what happened to the Spider Lunar Module
- Other examples given for groups specifically such as:
- Design for manufacturability in different parts of the world
- Cost analysis for different regions and in different currencies
- Preparation of multi-lingual user's manuals; graphics-based user's manuals
- Use of universal units - US/SI
- Provision of universal power adapters in design (110 volt/220 volt)
- Maintenance schedules for different parts of the world considering different climates, practices, available resources
- Warning labels in different languages or use of graphical warnings
- Survey of UN and international charters to comply with all existing international standards
- Survey of related patents and identification of similar previous work (Check the United States Patent and Trademark Office)
- Contacting students, faculty or engineers in different parts of the world to discuss the design problem at hand, identify similarities and differences, and develop design concepts that address global needs

Development of Senior Design Projects in Relation to Global Learning: As senior design project problems and solutions are developed, student teams will employ a global perspective. For this purpose, relevance of engineering problems and solutions will be researched and evaluated in terms of different regions, ethnic or cultural settings. For instance, major regional samplings will include the USA, South America, Eastern Asia, Middle East, Europe, and Africa. Each team will also be able to target different regions, ethic or cultural groups as appropriate to the specific project.

Student teams will analyze and evaluate their proposed solutions for multiple markets and cultures. If necessary, modification strategies will be developed for targeted cultural, ethnic or geographical settings to approach the "global design" concept. Student teams will also analyze design alternatives relative to the (1) available technology in different parts of the world, and (2) economic development of regions; select the best concept for each targeted region; and then evaluate whether a globally-unified design or regionally-adjustable design offers the most viable solution.

Each design team will identify relevant solutions in solving the targeted engineering problem in terms of the global issues addressed and the possible global impacts. Hence, this is a global learning course that counts towards the global learning graduation requirement.

Course Contribution:
Engineering Design: 100%

Relationship of the course to student outcomes:

(1) An ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematic (✓)

(2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental and economic factors (✓)

(3) An ability to communicate effectively with a range of audiences (✓)

(4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts (✓)

(5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives (✓)

(6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (✓)

(7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies (✓)

Person(s) who prepared this description and date of preparation:
Dr. Boutsen, Assistant Teaching Professor, Mechanical and Materials Engineering, August 1st, 2020