Course Description:

Synopsis: Senior design project organization to include problem definition, goals, survey, conceptual and preliminary design, ethics and cost components, social and environmental impact, presentation to enhance communication skills.

Senior design teams will be organized, initial design work will be completed, and the teams will be prepared to complete the work in the following major semester.

Design teams will develop senior design project topics, set specific but realizable goals (also called metrics), conduct in-depth literature survey including a multi-national and multi-cultural dimension, complete the conceptual and preliminary design phases, feasibility study, ethics and cost components, social and environmental impact, and evaluation of proposed designs with an international perspective.

Teams will make several presentations during the semester to enhance their communication skills. The final presentation will be presented to the departmental Industrial Advisory Board for their evaluation of the proposed project.

In addition, engineering ethics case studies will be covered. This course will also discuss the impact of proposed solutions in different regions of the world and possible adjustments in design so that the final product is successful regardless of the location it is produced or sold. Hence, this is a global learning course that counts towards the global learning graduation requirement.

Furthermore, students will be given the nationally-administered Fundamentals in Engineering (FE) Computer-Based Testing (CBT) style exams to assess their preparedness for the senior design project.
Pre- and Co-requisites:

Prerequisite: EML 4140 Heat Transfer.

Lectures:

T 3:30 – 4:45 pm. EC 1112.

Office Hours:

R 2:00-3:00 pm. For other times, by appointment via email.

Reference Books (Students are not required to purchase these books):

- A free electronic copy of the Fundamentals in Engineering Reference Handbook (Version 9.2 for Computer-Based Testing) may be downloaded from the NCEES site by providing your email address and receiving a password from NCEES to download the entire reference book for free.

Course Outline:

- Assessment of educational engineering background in terms of FE CBT style exams
- Review of engineering ethics; review and discussion of ethics case studies
- Global engineering: Global awareness, global perspective and global engagement practices; review and case studies
- Review of possible areas for senior design project
- Team presentations on selected topics, timeline, division of responsibilities, literature survey, applicable standards, global design, alternate designs, initial structural design, 1-page project synopsis, 10% and 25% senior design team reports
- Preparation of professional team poster describing the senior design project
- Final team presentation to the Industrial Advisory Board and Mechanical Engineering faculty
Course Objectives:

- Assessment of educational engineering background
- Engineering ethics, case studies
- Global engineering perspective, case studies
- Senior design team formation, selection of faculty advisors and topics
- Completion of literature survey, alternate designs and initial structural design

Course Learning Outcomes:

I. Global Learning Course 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 global impact by identifying different factors such as technology, economics and society, and their contributions to the problem and/or solution.
3. Students will be willing to work in teams to develop solutions and action plans to address local, global and/or international engineering problems.

II. SACS Learning Outcomes - ABET Student Outcomes Supported by the Course:

Mechanical Engineering student outcomes supported by this course:

(a) an ability to apply knowledge of mathematics, science, and engineering
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multi-disciplinary team
(e) an ability to identify, formulate and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and a ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills and modern engineering tools necessary for engineering practice
Note Regarding SACS Learning Outcomes - ABET Student Outcomes:

SACS Learning Outcomes/ABET student outcomes are defined for the ME program that must be achieved by graduating students. Each course supports several of the outcomes incrementally but must not necessarily achieve them fully.

FE CBT Style Exams (See the exemption condition from FE CBT exams below):

Content of each FE CBT style exam is organized as follows:

**FE Exam 1:** Math, Probability and Statistics, Electricity and Magnetism, Computational Tools, Engineering Economics, Ethics and Professional Practice

**FE Exam 2:** Statics, Dynamics, Vibrations, Mechanics of Materials

**FE Exam 3:** Mechanical Design and Analysis, Material Properties and Processing, Measurements, Instrumentation and Controls,

**FE Exam 4:** Fluid Mechanics, Thermodynamics, Heat Transfer

**FE Exam 5:** Course midterm exam: Practice Comprehensive FE Exam (All areas covered in Exams 1 through 4 are included)

**FE Exam 6:** Course final exam: Comprehensive FE Exam (All areas above are included)

<table>
<thead>
<tr>
<th>FE CBT Exam No</th>
<th>Mechanical Engineering Subject Area</th>
<th>Number of Questions*</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Min</td>
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<tr>
<td>1</td>
<td>Math</td>
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<td></td>
<td>Probability and Statistics</td>
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<td>Computational Tools</td>
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<td>Ethics and Professional Practice</td>
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<td>Engineering Economics</td>
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<td>Electricity and Magnetism</td>
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<tr>
<td>2</td>
<td>Statics</td>
<td>8</td>
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<td></td>
<td>Dynamics, Kinematics and Vibrations</td>
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<td>Mechanics of Materials</td>
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<tr>
<td>3</td>
<td>Mechanical Design and Analysis</td>
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<td>Material Properties and Processing</td>
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<td></td>
<td>Measurements, Instrumentation and Controls</td>
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<td>4</td>
<td>Fluid Mechanics</td>
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<td>Thermodynamics</td>
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<td></td>
<td>Heat Transfer</td>
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<td>5 and 6</td>
<td>Comprehensive FE Exam (Practice and Final Exams)</td>
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<td>Total</td>
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* Number of questions in the actual FE CBT Exam. The number of questions in FE style exams given in EML 4551 will be proportional to the time available for each exam.
FE CBT Exam Calculator Policy:

Students can use only the calculators allowed by NCEES for the FE CBT exams:

Allowable calculators are listed at NCEES site. Texas Instruments TI-36X Pro is currently the most advanced allowable TI calculator. HP 33s and HP 35s are allowed as well as Casio’s fx-115 MS, fx-115 MS Plus, fx-115 MS SR and fx-115 ES Plus. Check the NCEES site for policy changes.

Students can use only their own calculator and their copy of the NCEES Reference Handbook. No material can be shared between students. Cell phones, computers, mp3 players and electronic devices cannot be used in the classroom – during lectures, quizzes or exams.

Exemption from FE CBT Exams:

Students who prove that they have passed the official FE CBT exam by the finals week will be excused from taking the FE CBT-style exams and will be awarded full grades for the 6 FE CBT exams.

Grading:

<table>
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<tr>
<th>Activity</th>
<th>Percent</th>
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<tbody>
<tr>
<td>Attendance</td>
<td>5%</td>
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<tr>
<td>Ethics Case Assignments + Technical Writing</td>
<td>5%</td>
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<tr>
<td>Global Learning Case Assignments + Roundtable Event + Technical Writing</td>
<td>5%</td>
</tr>
<tr>
<td>FE CBT Style Exams (Only NCEES Reference Handbook Allowed)</td>
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<tr>
<td>FE Exam 1 (See the table above to see sections included for each exam)</td>
<td>3%</td>
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<tr>
<td>FE Exam 2</td>
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<td>FE Exam 3</td>
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<tr>
<td>FE Exam 4</td>
<td>3%</td>
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<tr>
<td>FE Comprehensive Practice Exam</td>
<td>3%</td>
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<tr>
<td>FE Comprehensive Final Exam</td>
<td>10%</td>
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<tr>
<td>10% BS Thesis - Team Report</td>
<td>10%</td>
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<tr>
<td>25% BS Thesis - Team Report</td>
<td>20%</td>
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<tr>
<td>Team Poster</td>
<td>5%</td>
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<tr>
<td>Final Team Presentation to the IAB</td>
<td>25%</td>
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</table>

Note that each team will make a 10-minute formal presentation to the Industrial Advisory Board and ME faculty during the final week of classes.

Rehearsal presentations will take place one week prior to the final presentations.

Teams that do not make the rehearsal or the final presentation to the IAB will fail the course regardless of the performance in other areas.
All team reports should use the “Senior Design Final Report – BS Thesis” format and include all required sections that contain literature survey, survey of applicable standards, alternate designs, initial structural design, prototype design, cost analysis, hours spent individually and as a team, discussion and conclusions, reference list, engineering drawings, standards used, etc.

Students are required to review and consistently apply technical writing rules described in the document “Style Guide for Technical Report Writing” available at the course site.

Bonus Grade:

By joining the social media presence of the Department of Mechanical and Materials Engineering, students associate themselves with the professional world, which enhance their profiles, and offer new opportunities to them.

Hence, students that join or like the following MME social media outlets will receive a full FE exam grade which will replace the lowest of the FE Exam 1, 2, 3, or 4 grade:

- [https://www.linkedin.com/in/sabritosunoglu](https://www.linkedin.com/in/sabritosunoglu)
- [https://www.facebook.com/sabri.tosunoglu](https://www.facebook.com/sabri.tosunoglu)
- [https://www.facebook.com/fiumme](https://www.facebook.com/fiumme)
- [https://instagram.com/fiumme](https://instagram.com/fiumme)
- [https://www.linkedin.com/grp/home?gid=8392213](https://www.linkedin.com/grp/home?gid=8392213)
- [https://twitter.com/fiumecheng](https://twitter.com/fiumecheng)

Make-up Exams:

Make-up exams will be allowed only after the student provides a medical doctor’s original report describing the problem and a statement that it was an emergency. The report must include the doctor’s address and phone number. The Department will contact and verify the situation before a test day is scheduled.

Late Reports:

Project and report due dates will be strictly enforced. Late project submissions will not receive full credit, and the following policy will apply: Submissions after the class hour on due date or the following day will lose 10 points out of 100. Submissions on the second or third day after the due date will lose 10 additional points each day.
Attendance:

Attendance will be monitored throughout the semester.

Ethics:

All work prepared and submitted in this course in the form of projects, presentations, problem solutions in quizzes and exams are expected to be original and produced by the submitting student. Any portion that may have been borrowed from a previous work must be clearly identified and referenced to indicate the original author along with the title of the work, and where and when it appeared. It is extremely important to realize that not doing so may result in an accusation of plagiarism.

Projects must contain the following statement and include each team member’s signature:

**Ethics Statement**

The work submitted in this project is solely prepared by NAME LASTNAME 1, NAME LASTNAME 2, and NAME LASTNAME 3, and it is original. Excerpts from others’ work have been clearly identified and listed in the list of references.

All of the engineering drawings, computer programs, formulations and related files submitted on the accompanying CD are also original and prepared by NAME LASTNAME 1, NAME LASTNAME 2, and NAME LASTNAME 3.

<table>
<thead>
<tr>
<th>Signature1</th>
<th>Signature2</th>
<th>Signature3</th>
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</thead>
<tbody>
<tr>
<td>Member1</td>
<td>Member2</td>
<td>Member3</td>
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</tbody>
</table>

Plagiarism Prevention at Turnitin.com

Final versions of 10% and 25% reports will be submitted to [www.turnitin.com](http://www.turnitin.com) to be evaluated against plagiarism.

The site compares the submitted document for similarities against the works published by others and assigns a similarity index. Lower similarity percentages (0 to 10%) indicate less similarity and are interpreted as good. Higher percentages mean that plagiarism is likely and your report grade will be adversely affected.
Each team is required to upload their reports by one team member since multiple entries of the same report result in very bad similarity indices for later submissions. In order to improve the similarity index, the same team member will be permitted to resubmit the revised report before the deadline expires.

**Correspondence via Email:**

Each student is required to provide a reliable email address for correspondence. Various announcements and reminders will be sent via email throughout the semester.

Students are expected to check their email regularly and make sure their inboxes are not full as the bounced mail messages will not be sent again.

**Incomplete Grades:**

A grade of “incomplete” will not be assigned to replace an unwanted grade. In order to be eligible to receive “incomplete,” only a single component of the entire coursework needs to be missing. The reason for failure to fulfill the requirement in time must be officially proved by the student (e.g., a medical doctor’s official letter), and verified by the Department in order to receive an “incomplete” grade.

**Academic Misconduct:**

Academic dishonesty is a serious offense and will be treated according to the University policy as outlined below.

Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly to demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook.
# Overview of Activities and Deadlines

<table>
<thead>
<tr>
<th>(Week) Date</th>
<th>Activity</th>
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<tbody>
<tr>
<td>(1) Tuesday, January 12</td>
<td>Intro, Project Topics, Teaming</td>
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<tr>
<td>(2) Tuesday, January 19</td>
<td>Project Topics, GL Case Study, GL Assignment, Technical Writing</td>
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<tr>
<td>(3) Tuesday, January 26</td>
<td>Project Topics, Ethics Case Study, Ethics Assignment, PPTX Preparation</td>
</tr>
<tr>
<td>(4) Tuesday, February 2</td>
<td>FE-CBT Exam 1: Math, Probability and Statistics, Electricity and Magnetism, Computational Tools, Engineering Economics, Ethics and Professional Practice</td>
</tr>
<tr>
<td>(5) Tuesday, February 9</td>
<td>FE-CBT Exam 2: Statics, Dynamics, Vibrations, Mechanics of Materials</td>
</tr>
<tr>
<td>(6) Tuesday, February 16</td>
<td>Formal Team PowerPoint Presentations: Intro to Senior Design Projects, 2 minutes per team (Title, Project Description, Literature Survey, Related Standards, Global Design) – Upload PPTX file to Dropbox</td>
</tr>
<tr>
<td>(7) Tuesday, February 23</td>
<td>FE-CBT Exam 3: Mechanical Design and Analysis, Material Properties and Processing, Measurements, Instrumentation and Controls</td>
</tr>
<tr>
<td>(8) Tuesday, March 1</td>
<td>One-Page Project Synopsis Due (to be sent to IAB members) – Upload DOCX file to Dropbox</td>
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<tr>
<td>(8) Tuesday, March 1</td>
<td>FE-CBT Exam 4: Fluid Mechanics, Thermodynamics, Heat Transfer</td>
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<tr>
<td>(9) Tuesday, March 8</td>
<td>10% BS Thesis Due (Chapters 1, 2 and others – Project Description, Motivation, Literature Survey, Survey of Related Standards, Objectives, Design Specs, Global Design Components, Gantt Chart, Division of Responsibilities, References, Appendices) – Upload PDF file to Dropbox</td>
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<tr>
<td>(9) Tuesday, March 8</td>
<td>GL/Ethics Case Study</td>
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<tr>
<td>March 14-19</td>
<td>Spring Break</td>
</tr>
<tr>
<td>(10) Tuesday, March 22</td>
<td>Softcopy of Team Poster Due – Upload PPTX file to Dropbox</td>
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<tr>
<td>(10) Tuesday, March 22</td>
<td>Teams Submit 5-min Team Presentation Videos on CD (50% of teams reviewed and critiqued in class)</td>
</tr>
<tr>
<td>(11) Tuesday, March 29</td>
<td>5-min Team Presentations (50% of teams reviewed and critiqued in class)</td>
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<tr>
<td>(12) Tuesday, April 5</td>
<td>Softcopy of Final Revised Team Poster Due – Upload to Dropbox</td>
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<tr>
<td>(12) Tuesday, April 5</td>
<td>Engineering Standards and Global Design Integration</td>
</tr>
<tr>
<td>(13) Tuesday, April 12</td>
<td>25% BS Thesis Due (Chapters 1-5, 9, 10, References, Appendices) – Upload PDF file to Dropbox</td>
</tr>
<tr>
<td>(13) Tuesday, April 12</td>
<td>FE-CBT Practice: Comprehensive FE-CBT Exam</td>
</tr>
<tr>
<td>(14) Monday, April 18</td>
<td>Final Team Posters Due</td>
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<tr>
<td>(14) Monday, April 18</td>
<td>Rehearsal Team Presentations, EC 2300</td>
</tr>
<tr>
<td>(14) Tuesday, April 19</td>
<td>Rubric for Teamwork Assessment by Peers (Individual evaluation of team member performance; submit one for each team member)</td>
</tr>
<tr>
<td>(15) Monday, April 25</td>
<td>Final Team Presentations to the IAB, EC 2300</td>
</tr>
<tr>
<td>(16) Tuesday, May 3</td>
<td>Final Exam, Comprehensive FE-CBT Exam, 2:15–4:15 pm</td>
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</table>