

# Syllabus

## ME 481 – Design Project I

### Fall 2023

---

#### Overview

- Lectures on: Engineering design methodology, design process, project planning and management, decision making, materials selection, economic analysis, quality control, finite element analysis, and Engineering Ethics. Initiation of an open-ended design project.

#### Objectives

- Heuristic learning of a structured engineering design process that emphasizes developing creative designs that are conscious of social, ethical, environmental, and political issues and based on rigorous scientific and/or engineering analysis through a two-semester, open-ended, group design project.
- Students will learn to apply engineering analysis tools to an open-ended design problem, including pertinent application of Computer Aided Design (CAD) tools such as Computer Aided Modeling (CAM – SolidWorks) and Finite Element Analysis (FEA).
- Effective, engineering specific, written communication. There is a significant communication component to this course. In particular, this is a writing intensive (WI) course, and thus, students are required to do a substantial amount of written communication (the equivalent of at least 16 pages per student) intended to mimic report formats often used in industry. Drafts of these reports will be discussed during weekly team meetings to provide an opportunity for improvement before the due dates, and written feedback will be provided for all reports after grading. The reports are submitted as a group, but each student must contribute to each report (identifying the percentage of contribution for each team member). Students will be required to label the sections they write with their initials.
- This course has a Contemporary Ethical Issues (E) Focus designation. Contemporary ethical issues are fully integrated into the main course material and will constitute at least 30% of the content. At least 8 hours of class time will be spent discussing ethical issues. Through the use of lectures, discussions and assignments, students will develop basic competency in recognizing and analyzing ethical issues; responsibly deliberating on ethical issues; and making ethically determined judgments. Ethical content is covered in lectures and incorporated into the design process. Students will develop 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.
- Students will develop oral communication skills through frequent technical presentations.

## Prerequisites

- ME 322, ME 341, ME 372, ME 375

## References:

- Course Websites:
  - <http://rip.eng.hawaii.edu/courses/me-481482-design-project-iii/>
  - Laulima
- McCauley, J. C., et al. "Machinery's handbook." (2012) (or more current)
- Slocum, Alexander, (2008). *FUNdaMENTALS of Design*, Alexander Slocum, <http://pergatory.mit.edu/resources/FUNdaMENTALS.html>
- Dieter, George E. (1991). *ENGINEERING DESIGN: A Materials and Processing Approach*. New York: McGraw-Hill, Inc. ISBN: 0-07-016906-3
- Ulrich, Karl T. & Eppinger, Steven D. (2004). *Product Design and Development, Third Edition*, Boston: McGraw-Hill, Inc. ISBN: 0-07-247146-8
- Wertz, James R., David F. Everett, and Jeffery J. Puschell. *Space Mission Engineering: the new SMAD*. Microcosm Press, 2011.
- Academic and professional sources (e.g., Applicable research papers, product catalogs, industry standards, etc.)

## Staff:

| Instructors   | Teaching Assistants   |
|---|---|
| Mehrdad Ghasemi Nejhad<br>POST 207F<br>+1(808) 956-7560<br><a href="mailto:nejhad@hawaii.edu">nejhad@hawaii.edu</a><br>Office Hours: MW 6:30-8:00<br>PM or by Appointment             | Anh Tuan Nguyen<br>POST 28B<br>+1(808) 956-6510<br><a href="mailto:anhtuann@hawaii.edu">anhtuann@hawaii.edu</a><br>Office Hours: MW 12:00<br>– 1:30 PM or by<br>Appointment |
| Trevor Sorensen<br>POST 509C<br>+1(808) 956-4715<br><a href="mailto:sorensen@hsfl.hawaii.edu">sorensen@hsfl.hawaii.edu</a><br>Office Hours: MW 4:30 to<br>6:30 p.m. or by Appointment | Anh Tuan Nguyen<br>POST 28B<br>+1(808) 956-6510<br><a href="mailto:anhtuann@hawaii.edu">anhtuann@hawaii.edu</a><br>Office Hours: MW 12:00<br>– 1:30 PM or by<br>Appointment |

## Assignments and Grading

|   |         |
|---|---------|
| Homework/workshops  | 10%     |
| Solid Modeling and FEA  |         |
| Design Project  | 90%     |
| Project Proposal  | 10%     |
| A request for proposal will be provided covering the rubrics and guidelines for these required sections.  |         |
| Project Statement/Functional Requirements   |         |
| Team Mission Statement  |         |
| Preliminary Project Planning & Scheduling   |         |
| Literature Review   |         |
| Length: ~15 pages, plus appendices  |         |
| Preliminary Design Review/Report (PDR)  | 15%     |
| Technical details and analysis focused. Rubrics, based on common DoD rubrics will be provided. Required sections:                                   |         |
| Systems Modeling & Analysis   |         |
| Detailed Project Planning & Scheduling  |         |
| Strategies  |         |
| Concepts  |         |
| Modules   |         |
| Length: ~50 pages, plus appendices  |         |
| Sales Pitch   | 10%     |
| Example marketing materials will be provided for the three required aspects   |         |
| Marketing Materials (tri-fold brochure)   |         |
| Website   |         |
| Elevator Pitch  |         |
| Website templates will be provided, and websites can be hosted on the RIP server. Opportunity for several iterations and continuous update expected |         |
| Critical/Comprehensive Design Review/Report (CDR)   | 30%     |
| Technical details of modeling and analysis will be focused and included. Rubrics, based on common DoD rubrics will be provided. Required sections:  |         |
| Design Process  |         |
| Project Planning & Scheduling   |         |
| Modeling & Analysis   |         |
| Design Details  |         |
| Constitutes an extended revision of PDR.  |         |
| Length: ~100 pages  |         |
| Design Notebooks  | 15%     |
| Examples of design notebooks provided   |         |
| Weekly progress tracked through documentation in the design notebooks   |         |
| Notebooks require internal team peer reviews  |         |
| Presentations   | 10%     |
| An oral presentation is required prior to each report   |         |
| Peer Evaluations  | 0.5-1.1 |
| Multiplier on group grade   |         |