EML 4502: Mechanical Engineering Design 3

Fall 2020 Syllabus

Modifications to this syllabus may be required during the semester.
Any changes to the syllabus will be posted on the course website and announced in class.

Instructors

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Teaching Assistants TBA

Course Online Resources:

MS Teams: Course documents, engineering documentation, individual and team coursework, general announcements

Canvas: Major announcements will be posted to Canvas as required. Canvas is not meant as a primary means of communication.

Required Texts and Software

SolidWorks 2020 and SolidWorks PDM are ***required*** for this course and will be used to facilitate assessment of student participation and effort. **Failure to install and use PDM for class activities will negatively impact your grade**. Information for downloading/installing will be posted on Teams.

MS Teams is ***required*** as the primary communication tool for inter- and cross-team discussions. The EML4502 (Summer 2020) Team must be linked to your computer and your smart phone with push notifications allowed for your relevant channels. **Failure to communicate effectively and in a timely manner will negatively affect your grade**. If groups use other messaging platforms for communication, your grade will be similarly impacted.

Course materials will be posted to the General Files tab in MS Teams.

Recommended Texts:

Shigley's Mechanical Engineering Design by R. G. Budynas and K. J. Nisbett
Machinery's Handbook by E. Oberg
Materials Selection in Mechanical Design by M. F. Ashby

Course Description

Design and realization of a mechanical engineering system, component, or process subject to appropriate standards and constraints. Team Project. Credits 3.

Course Pre/Co-Requisites

Prerequisite: EML 4501 Co-requisite: EML4321

Course Objectives

The principal goals of the MAE Senior Design Realization Laboratory are threefold:

1. Work in teams to apply the design process to a real-world problem and develop a solution that can be realized using traditional and non-traditional manufacturing processes.
2. Demonstrate an understanding of how critical dimensional tolerancing and manufacturing precision is to component cost and performance.
3. Justify material choices and consider ease of manufacturing and ease of assembly in the design phase.

Specifically, at the end of this course every student should:

1. Identify and apply the steps of the design process with emphasis on data driven justifications pertaining to project performance, budget, material selection, and manufacturability.
2. Effectively work with a team to allocate project resources to prototype, test, improve, and present a working device satisfying all principal project objectives within the time-frame of the working semester.
3. Professionally document a design as it progresses through prototyping iterations and present using graphical, oral, and written communication (i.e. revision documentation of CAD model, detailed and assembly drawings, BOM, budget, schedule, and regular progress updates).

Course Structure

Each "lecture" period will serve as group meetings for two product development teams. The fall 2020 semester will be focused on production and test engineering for the prototype designs from EML4501. Corresponding lab periods are designated sub-team meeting times. In person lab attendance will occur for assembly, testing, and troubleshooting exclusively.

Individual team members will assume roles related to their sub-team components and will need to coordinate between sub-teams to ensure fulfillment of deliverables and customer requirements. Roles are defined as follows:

Roles:	**Responsibilities:**
Responsible Engineer *	Part/assembly ownership, CAD updates, maintaining Gannt chart / BOM, final documentation
Manufacturing Engineer	**In-lab assembly**, part QC, communicating necessary changes to RE, updating assembly instructions
Test Engineer (Mech)	Builds test rig, conducts tests, collaborates with Test Engineer (Instrumentation)
Test Engineer (Instrumentation)	Builds rig instrumentation (including Lab View / Arduino code), conducts tests, collaborates with Test Engineer (Mech), sends data to Analyst
Data Analyst *	Analyze data, ensure specifications are met, communicate to RE's

** Role can be completed working remotely*

Design Concept:	Team 1 **PACE Printer** **Roles**		Team 2 **Cancer Cannon** **Roles**		Team 3 **Neo** **Roles**	
Subteam 1	Print Head	Responsible Engineer (3) Manufacturing Engineer (3)	Print Head	Responsible Engineer (3) Manufacturing Engineer (3)	Print Head	Responsible Engineer (3) Manufacturing Engineer (3)
Subteam 2	Hydraulics / Actuation	Responsible Engineer (3) Manufacturing Engineer (3)	Hydraulics / Actuation	Responsible Engineer (3) Manufacturing Engineer (3)	Hydraulics / Actuation	Responsible Engineer (3) Manufacturing Engineer (3)
Subteam 3	Testing Mechanical	Test Engineer (Mech) (2) Test Engineer (Integ.) (2) Data Analyst (2)	Testing Mechanical	Test Engineer (Mech) (2) Test Engineer (Integ.) (2) Data Analyst (2)	Testing Mechanical	Test Engineer (Mech) (2) Test Engineer (Integ.) (2) Data Analyst (2)
Subteam 4	Control Integration	Test Engineer (Mech) (3) Test Engineer (Integ.) (3)	Control Integration	Test Engineer (Mech) (3) Test Engineer (Integ.) (3)	Control Integration	Test Engineer (Mech) (3) Test Engineer (Integ.) (3)

Design Concept:	Team 1 **Gaiter Aid** **Roles**		Team 2 **Wombark** **Roles**	
Subteam 1	Frame	Responsible Engineer (3) Manufacturing Engineer (3)	Translation System	Responsible Engineer (3) Manufacturing Engineer (3)
Subteam 2	Dynamic Offset System	Responsible Engineer (3) Manufacturing Engineer (3)	Dynamic Offset System	Responsible Engineer (3) Manufacturing Engineer (3)
Subteam 3	Human Machine Interface	Responsible Engineer (3) Manufacturing Engineer (3)	Frame / Housing	Responsible Engineer (3) Manufacturing Engineer (3)
Subteam 4	Testing	Test Engineer (Mech) (2) Test Engineer (Integ.) (2) Data Analyst (2)	Control Integration	Test Engineer (Mech) (3) Test Engineer (Integ.) (3)

Assessments

This is a graded course and grades will be assigned based on the following individual and team deliverables. Further descriptions of the assignments can be found below. Additional resources for these assignments will be posted on the course CANVAS site as needed.

Assignment	
Individual Participation Ability to communicate within and between sub-teams in a timely manner Production of high quality work Establishing weekly deliverables that meet project timeline Weekly progress reports on each part, test, or analysis Contributions to meeting weekly deliverables Peer feedback	*60%*
Final Design Report Finalized part drawings, assembly drawings, and BOM Manual assembly time / cost Product development data - Safety - Testing - Analysis - Certification of Customer Needs	*20%*
Design Presentation	*20%*

Grade Distribution

A: 90-100 B: 80-89
C: 70-79 D: 60-69
E: 0-59

More information on UF grading policy may be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Course Schedule

Week of:	Aug 31	Sep 7	Sep 14	Sep 21	Sep 28	Oct 5	Oct 12	Oct 19
Course Objective	Lab Intro / Safety / Design Discussion	Gannt Chart / Individual Responsibilities BOM updated with RE's and status	*TBD*	*TBD*	*TBD*	*TBD*	*First fitment of full assembly completed by* ***Oct 16*** *Test rigs running & able to log data*	*TBD*
Week of:	Oct 26	Nov 2	Nov 9	Nov 16	Nov 23	Nov 30	Dec 7	Dec 14
Course Objective	*TBD*	**all powder coated or anodized parts will be sent out on Nov 2nd*	*TBD*	Functioning products **LAST WEEK IN LAB**	*Thanksgiving Week*	Final Assembly Instructions Final Testing Results / Analysis Product Brochure	Final Presentations	

**modifications to course schedule may be required. Any changes will be announced in class and posted on Teams*

Laboratory Schedule

	M	**T**	**W**	**R**	**F**
Section 1 (PACE, Neo)	10:40	8:30-10:25 *(Subteam 2)* 10:40 - 12:35 *(Subteam 1)*	EML 4501	8:30-10:25 *(Subteam 4)* 10:40 - 12:35 *(Subteam 3)*	10:40
Section 2 (Cancer Cannon)	11:45	10:40 - 12:35 *(Subteam 1)* 1:55 - 3:50 *(Subteam 2)*	Open Lab	10:40 - 12:35 *(Subteam 3)* 1:55 - 3:50 *(Subteam 4)*	11:45
Section 3 (Gaiter-Aid, Wombark)	1:55	1:55 - 3:50 *(Subteam 1)* 4:05 - 6:00 *(Subteam 2)*		1:55 - 3:50 *(Subteam 3)* 4:05 - 6:00 *(Subteam 4)*	1:55

Contribution of the Course to Meeting the Professional Component:

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	Medium
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.	High
3. An ability to communicate effectively with a range of audiences.	High
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	Low
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.	High
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	Medium
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	Low

**Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.*

Attendance

Attendance is required for all lectures and laboratory sessions. A sign-in sheet will be used to track attendance for both formal lab sessions and office/shop hours. If you must miss a lecture or lab, coordinate in advance with your team and sub-team to prevent missed deadlines. Excused absences must be consistent with university policies in the undergraduate catalog (https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx). Unexcused absences will incur a grade penalty.

Honesty Policy

Honesty Policy: UF students are bound by The Honor Pledge which states, "*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity. On all work submitted for credit by students at the university, the following pledge is either required or implied: On my honor, I have neither given nor received unauthorized aid in doing this assignment*."

The Honor Code (https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Note that failure to comply with this commitment **will** result in disciplinary action compliant with the UF Student Honor Code Procedures. See https://sccr.dso.ufl.edu/process/student-conduct-code/

COVID-19 Accommodations

We will have face-to-face instructional sessions to accomplish the student learning objectives of this course. In response to COVID-19, the following policies and requirements are in place to maintain your learning environment and to enhance the safety of our in-classroom interactions.

- You are required to wear approved face coverings at all times during class and within buildings. Following and enforcing these policies and requirements are all of our responsibility. Failure to do so will lead to a report to the Office of Student Conduct and Conflict Resolution.
- This course has been assigned a physical classroom with enough capacity to maintain physical distancing (6 feet between individuals) requirements. Please utilize designated seats and maintain appropriate spacing between students. Please do not move desks or stations.
- Sanitizing supplies are available in the classroom if you wish to wipe down your desks prior to sitting down and at the end of the class.
- Follow your instructor's guidance on how to enter and exit the classroom. Practice physical distancing to the extent possible when entering and exiting the classroom.
- If you are experiencing COVID-19 symptoms (Click here for guidance from the CDC on symptoms of coronavirus), please use the UF Health screening system and follow the instructions on whether you are able to attend class. Click here for UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms.
    - Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. Find more information in the university attendance policies.

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Accommodation for Students with Disabilities

Students requesting classroom accommodation must first register with the Dean of Students Office through the Disability Resource Center (https://drc.dso.ufl.edu/). That office will provide the student with documentation that s/he must provide to the course instructor when requesting accommodation.

UF Counseling Services

Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

• UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, https://counseling.ufl.edu/, counseling services and mental health services

• Career Connections Center, Reitz Union, 392-1601, https://career.ufl.edu/, career and job search services
• University Police Department 392-1111

Software Use
All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Evaluations
Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results.