EML4502
Mechanical Engineering Design 3
"Realization, Build, & Test"

Last Updated 8/18/2024

EML4502 is a dynamic course. 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.

Academic Term: Fall 2024

Class Periods: Section 682V, T & R: P6-7 (Artificial Cow Stomach)
Section 663U, W & F: P4-5 (Millipede Bar)
Section 723W, W & F: P6-7 [DEPTX] (AIBL Tech Prosthetic Arm)

Instructor:
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Office Hours: By appointment

Teaching Assistant/Peer Mentor/Supervised Teaching Student:
(Office hours posted on Canvas)
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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-Requisites / Co-Requisites
Prerequisite: EML 4501 or EAS 4700 or EAS 4710;
Corequisite: EML 4321

Materials and Supply Fees
Course Material & Supply Fee: $295.00 (Verified 8/4/2024)
Course Equipment Pool Fee: $90.00 (Verified 8/4/2024)

Course Objectives
1. 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 [Final Design Deck & Final Design Report]
2. Communicate effectively with a range of audiences [Final Design Deck & Final Oral Presentation]
3. Function effectively on a creating, collaborative, and inclusive team that establishes goals, plans tasks, and meet objectives [Peer Evaluations]
4. Acquire and apply new knowledge as needed using appropriate learning strategies [Performance Evaluations]

Relation to Program Outcomes (ABET):

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	High

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

Required Computer

Students must have their own computer whose specifications meet or exceed the capabilities required by the College (https://www.eng.ufl.edu/students/resources/computer-requirements/) and MAE Department (https://mae.ufl.edu/academics/prospective/undergraduate/computer-requirements/).

Required Textbooks and Software

1. Engineering Capstone Design, M. J. Traum, S. R. Niemi, J. Iklaas, et al., University of Florida, 2020
   Free OER Download: https://merge.mae.ufl.edu/outreach/textbook/ [Chapters posted when assigned]

2. "Less Boring Lectures" YouTube channel, A. Rubiano [free to access]
   https://www.youtube.com/c/LessBoringLectures

3. DC Electrical Circuit Analysis, A Practical Approach (Version 1.0.8), J. M. Fiore, Mohawk Valley Community College, 2021
   ISBN13: 978-1654515478
   Free OER Access: https://www2.mvcc.edu/users/faculty/jfiore/books/DCElectricalCircuitAnalysis.pdf

4. Technology Readiness Assessment Guide, U.S. Government Accountability Office, GAO-20-48G, January 2020
   Free Access: https://www.gao.gov/products/gao-20-48g

5. https://wokwi.com/ , browser-based Internet of Things (IoT) simulation platform [free to use online]

6. Arduino IDE 1.8.19 (or later) coding software [free to download]: https://www.arduino.cc/en/software

7. AutoDesk Fusion 360 and AutoDesk EAGLE
   Educational account freely available at: https://knowledge.autodesk.com/support/fusion-360

8. PrusaSlicer 3D printing slicer software [free to download]:
   https://www.prusa3d.com/page/prusaslicer_424/ 2.8.0 or Later, Joseph Prusa

Recommended Materials:

1. Shigley's Mechanical Engineering Design, 10th Ed., R. G. Budynas and K. J. Nisbett, McGraw-Hill, 2015 ISBN: 9780073398204

2. Materials Selection in Mechanical Design, 5th Ed., Michael F. Ashby, Butterworth-Heinemann, 2016 ISBN: 0081005997

3. Machinery's Handbook, E. Oberg, 30th Edition (or later), ISBN-13: 978-0831130916

4. Roark's Formulas for Stress and Strain, 7th Edition, W. C. Young, R. G. Budynas, McGraw-Hill, 2002 ISBN 007072542X

5. Programming Arduino: Getting Started with Sketches, 2nd Ed., Simon Monk, McGraw Hill, 2016 ISBN-10: 1259641635

6. Dimensioning for Interchangeable Manufacture, Earlwood T. Fortini, 1967

7. Product Design and Development, 7th Ed., S. Eppinger & K. Ulrich, McGraw Hill, 2019

8. Product Design: Techniques in Reverse Engineering and New Product Development, K. Otto & K. Wood, Pearson, 2001

Attendance Policy, Class Expectations, and Make-Up Policy

It is important to attend class regularly. If you miss a class, you are responsible for acquiring notes or other resources covered. The teaching team will endeavor to make all course materials available through the Learning Management System. However, some experiences cannot be replicated asynchronously. Students are held responsible for knowledge of all scheduling and policy announcements made in class. Excused absences must be consistent with university policies in the undergraduate catalog (https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/) and require appropriate documentation and advance communication with the instructor.

Policies on Clear Communication, "Ghosting", Free Riders, Sources of Truth, Essay Writing AI's, Lab Use Priority, & Assignment Grade Disputes:

1. Once students are assigned into groups, all Emails and communications to the EML4502 Teaching Team related to group business must clearly identify the group's number/name. Each time any member of a group fails to identify the group by number/name in a communication to the Teaching Team, the group loses 1 point.

2. Individuals who fail to support their group or "ghost" the course as demonstrated by peer evaluation scores, group feedback/emails, and/or low participation tracked in Canvas/Teams/F360, will earn a failing grade in EML4502 regardless of points accumulated in the class.

3. On each peer evaluation (both online and in-person), all twelve metrics will be scored on a 1-5 Likert scale. Any student who accumulates two peer evaluations with an aggregate score of 3/5 or lower on any two peer evaluation metrics will be considered a Free Rider and will receive a failing grade in EML4502 regardless of points accumulated in the class.

4. Online platforms, notably GroupMe, provide venues for course discussion that exclude the instructor and EML4502 Teaching Team. Discussion platforms beyond UF-sanctioned Learning Management Systems will not be monitored or curated by the instructor. Thus, information propagated through these platforms can be incorrect. It is each student's responsibility to verify information obtained from these external discussion services with reputable reference sources or UF-affiliated subject matter experts. Erroneous information obtained from external discussion platforms used in EML4502 will be marked incorrect on graded assignments and assessments.

5. All team communication must occur through a UF-sanctioned MS Teams channel established for the group in the course. These channels will be monitored. If the Teaching Team deems that team communication is not occurring through MS Teams, a single written warning will be given. After the warning, teams still not communicating through MS Teams will fail the course.

6. The EML4502 MS Teams General Channel is shared by the whole class and the teaching Team for information propagation. Individuals or teams who post comments or files not relevant to EML4502 in the General Channel will be penalized one letter grade for each infraction.

7. Unauthorized use of ChatGPT or similar AI's is prohibited in EML4502 and is defined as cheating by the UF Honor Code, section (a)2, https://regulations.ufl.edu/wp-content/uploads/2021/12/4-040_2021-12-06.pdf :

"(a) Cheating. A Student shall not use or attempt to use unauthorized materials or resources in any academic activity for academic advantage or benefit. Cheating includes but is not limited to:
2. Using any materials or resources, through any medium, which the Faculty has not given express permission to use and that may confer an academic benefit to the Student."

Material suspected of being AI-generated will be vetted through a detection algorithm. If this tool deems the material to be AI-generated, a 0 will be given on the suspected assignment.

8. EML4502 students receive priority access to and use of the MAE-C-010 design lab space from 8:30am to 6:00 pm Tuesdays through Fridays unless another class is running in the space. Outside these hours, other users including EML4501 students and UF MAE Design Teams have priority use of the space.

9. If an individual or group has as assignment grading dispute, the issue must first be addressed with the Teaching Team member who did the grading. If individuals/groups can show where grading errors occurred, Teaching Team members will correct grades accordingly. Only after communication with a Teaching Team member fails to resolve a grading dispute may the individual/group bring the dispute to an instructor.

Laboratory Safety:
EML4502 is a laboratory course. To ensure safety of all participants appropriate attire, personal protective equipment (PPE), and behavior are always required in the lab. Failure to follow lab safety rules will result in students' immediate removal from the lab and forfeiture of course points at the instructor's discretion.

1. Lab Attire
• No open-toed shoes are permitted in the lab.
• No shorts are permitted in the lab.
2. PPE
• Sanitizing supplies are available in the lab to wipe down desks prior to sitting and at the end of class if needed.
• Eye protection is required in the laboratory for proximity to hands-on activities.
• Respiratory protection is required in the laboratory for proximity to activities producing harmful fumes.
• Ear protection is required in the laboratory for proximity to activities 85 decibels or louder.

3. Behavior

• Disruptive or destructive behavior will not be tolerated.
• No food or drink is allowed in the machine shop, 3D print farm, or metrology areas of the lab.
• Food & drink are allowed at work desks, in conference rooms, at the coffee bar / kitchen area

4. Emergencies

• Inform Teaching Team members immediately of injury or exposure.

Evaluation of Grades

This course is graded. Grades are earned based on the following individual and group deliverables*,†. Further descriptions will be given when assignments and assessments are announced in class. Additional resources supporting these assignments will be posted on the course Learning Management System as needed.

Assignment	Points	Percent
Individual Assignments		
Informed Consent Forms	2	0.2
Intellectual Property Agreements	2	0.2
Resume Assignments	6	0.6
Local Affinity Survey	1	0.1
Software Onboarding	5	0.5
Personal Goal Setting	13	1.3
Personal Reflection	14	1.4
Labs & Quizzes		
3D-Printing Lab Report	5	0.5
3D-Printing Quiz	15	1.5
Electronics & Motors Lab Report	5	0.5
Electronics & Motors Quiz	15	1.5
DFM Quiz	15	1.5
Group Reports		
AI Driven Hedgehog Concept	15	1.5
Team Charter	10	1.0
Project Charter	35	3.5
Ideation Design Report (IDR)	50	5.0
Preliminary Design Report (PDR + CAD)	65	6.5
Design Review Memo (DRM)	25	2.5
Risk Assessment Report (RAR)	50	5.0
Final Design Report (FDR)	150	15.0
Final Group Deliverables		
Performance Evaluation 1	50	5.0
Performance Evaluation 2	50	5.0
Final Demonstration	50	5.0
Final Project Abstract	10	1.0
90-Second Elevator Pitch Video	25	2.5
Final Presentation	150	15.0
Final Presentation Slide Deck	1	0.1
Group Photos 1 & 2	1	0.1

Picture & Rendering of Final Project	2	0.2
Interactive 3D Model	1	0.1
Final CAD, Code, Artifact, & Cleanup	10	1.0
Planning, Attendance, & Peer Review		
Team Goal Setting Sheets	36	3.6
Peer Evaluations	80	8.0
Time & Tool Logging Sheets	36	3.6
Total	**1000**	**100**

See Policies on Clear Communication, "Ghosting", Free Riders, etc.
** Per Policy #2 Individuals who "ghost" as demonstrated by peer evaluation scores, etc. fail EML4502 regardless of points accumulated in the class.*
† Per Policy #3, students accumulating two peer evaluations with an aggregate score of 3/5 or lower on any two of more peer evaluation metrics fail EML4502 regardless of points accumulated in the class.

Any changes in evaluation of grades will be posted on the CANVAS page & MS Teams site and announced in class.

Grading Policy

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

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

Grade Definitions
A : Student demonstrated course mastery in all regards and with distinction.
A- : Student performed outstandingly in all regards and is exceptional.
B+ : Student performed with excellence in the course.
B : Student showed high command of course content.
B- : Student has done a commendable job with course content.
C+ : Student demonstrated ample grasp of course content.
C : Student demonstrated adequate grasp of course content.
C- : Student demonstrated fair grasp of course content.
D+ : Student met fair curse expectations.
D : Student attained below average expectations.
D- : Student met minimal expectations to pass.
E : Student failed to meet minimal expectations to pass.

Students Requiring Accommodations
Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/ . It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/ . Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/ . Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/ .

In-Class Recording
Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University 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 honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, 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/process/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.

Commitment to a Safe and Inclusive Learning Environment
The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed,

color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:
• Your academic advisor or Graduate Program Coordinator
• HWCOE Human Resources, (352) 392-0904, student-support-hr@eng.ufl.edu
• Dr. Pamela Dickrell, Associate Dean of Student Affairs, (352) 392-2177, pld@ufl.edu
• Dr. Toshikazu Nishida, Associate Dean of Academic Affairs, (352) 392-0943, nishida@eng.ufl.edu

Software Use
All faculty, staff, and students 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 Privacy
There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: https://registrar.ufl.edu/ferpa.html .

Campus Resources:

Health and Wellness

U Matter, We Care:
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at (352) 392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: https://counseling.ufl.edu , and (352) 392-1575; and the University Police Department: (352) 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance** , located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu .

Sexual Assault Recovery Services (SARS)
Student Health Care Center, (352) 392-1161.

University Police Department at (352) 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/ .

Academic Resources

E-learning technical suppor*t*, (352) 392-4357 (select option 2) or e-mail to Learning-support@ufl.edu . https://lss.at.ufl.edu/help.shtml .

Career Connections Center, Reitz Union, (352) 392-1601. Career assistance and counseling; https://career.ufl.edu .

Library Support, http://cms.uflib.ufl.edu/ask . Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, (352) 392-2010 or (352) 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/ .

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/ .

Student Complaints Campus*:* https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/ ; https://care.dso.ufl.edu .

On-Line Students Complaints*:* https://distance.ufl.edu/getting-help/ ; https://distance.ufl.edu/state-authorization-status/#student-complaint .

"Don't let anyone rob you of your imagination, your creativity, or your curiosity."

--Mae Jemison

Week #	Date	Day	Synchronous Content	Assignment Due
1	22-Aug	R/F	Course Introduction Intellectual Property Brief by Guest Lecturer Rick Croley (UF Tech Transfer) TRL Brief by Guest Lecturer Shawn Martin (US DoD)	
2	27-Aug	T/W	No Class - Attend Dr. Traum's Seminar for Extra Credit	
	29-Aug	R/F	Team Principles, Customer Needs, Kano Model, Hedgehog Concept, Value Proposition Explain Team Goal Setting & Sign in Sheet Assignments	• Team Goal Setting & Time 1 • IP & NDA Agreements • Entry Resume + AI Score • Informed Consent Forms • Local Affinity Survey • Personal Goal Setting
3	3-Sep	T/W	Venture Capital Brief by Guest Lecturer Ryan Bailey (Groundswell) Meet Client & Project Introduction	
	5-Sep	R/F	Review of Design for Manufacturing (DFM)	• Team Goal Setting & Time 2 • Peer Evaluation A • Software Onboarding • AI Driven Hedgehog Concept Generation • Team Charter • Project Charter
4	10-Sep	T/W	3D-Printing Lecture/Lab	
	12-Sep	R/F	Project Lecture	• Team Goal Setting & Time 3 • DFM Quiz
5	17-Sep	T/W	Project Lecture Design Matrices	
	19-Sep	R/F	Electronics, PCBs, Strain Gages & Motors Lecture/Lab	• Team Goal Setting & Time 4 • Peer Evaluation 1 • 3D-Printing Quiz • 3D-Printing Lab Report • IDR
6	24-Sep	T/W	**No Class** **Career Showcase**	
	26-Sep	R/F		• Electronics, PCBs, Strain Gages & Motors Quiz • Electronics, PCBs, Strain Gages & Motors Lab Report
7	1-Oct	T/W	Work Week	
	3-Oct	R/F		• Team Goal Setting & Time 5
8	8-Oct	T/W	Branding (If Needed) Part Ordering Form/Manufacturing Queue	
	10-Oct	R/F	Design Review 1	• Team Goal Setting & Time 6 • Peer Evaluation B • PDR + CAD
9	15-Oct	T/W	Work Week	
	17-Oct	R/F	**No Class** **UF Homecoming**	
10	22-Oct	T/W	Product Pitching by Guest Lecturer Julia Sander Work Day	
	24-Oct	R/F	Work Day	• Team Goal Setting & Time 7 • Peer Evaluation 2 • DRM
11	29-Oct	T/W	Project Lecture Design Matrices	
	31-Oct	R/F	Electronics, PCBs, Strain Gages & Motors Lecture/Lab	• Team Goal Setting & Time 8 • RAR
12	5-Nov	T/W	Build/Test Week	
	7-Nov	R/F		• Team Goal Setting & Time 9 • Peer Evaluation C • Performance Evaluation 1
13	12-Nov	T/W	Build/Test Week	
	14-Nov	R/F		• Team Goal Setting & Time 10 • Peer Evaluation 3 • Performance Evaluation 2 • Project Abstract • 90-Second Elevator Pitch Video • Group Photo 1 • Exit Resume + AI Score
14	19-Nov	T/W	Test Week	
	21-Nov	R/F		• Team Goal Setting & Time 11 • Peer Evaluation D • Final Demonstration
15	26-Nov	T/W	**No Class**	
	28-Nov	R/F	**Thanksgiving Break**	
16	3-Dec	M/T/W	Final Presentations Lab Cleanup	• Team Goal Setting & Time 12 • Peer Evaluation 4 • Personal Reflection • Final Product Picture • Final Product Rendering • Product Interactive 3D Model • Final Presentation • Final Slide Deck • Group Photo 2 • FDR • Code, CAD, Artifact, Lab Cleanup
	5-Dec	R/F	**No Class**	
17	10-Dec	T/W	**No Class**	
	12-Dec	R/F	**Finals Week**	