EML2322L – Design & Manufacturing Laboratory, Summer 2020
Lecture Uploads: Tuesday, 2nd Period (9:30-10:45) ONLINE FORMAT

1. Catalog Description:

Study and application of design; problem formulation; conceptual design, evaluation & prototype development; study of common manufacturing processes. Credits: 2

2. Prerequisites *(definition: **noun: things required as a prior condition for something else to happen):***

- ENC3246 – Professional Communication for Engineers
- EML2023 – Computer Aided Graphics/Design
- EG-ME, EG-ASE major or UES (undecided) major if space is available after drop/add concludes

3. Course Objectives:

The principal goals of the MAE Design and Manufacturing Laboratory are threefold:

- to educate students in traditional manufacturing processes
- to provide an understanding of how critical dimensional tolerancing is to component cost and performance
- to teach students to think about how each component will be manufactured and assembled *in the design phase*

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

- be able to identify and apply the steps of the design process, with an emphasis on data driven justifications
- be familiar with typical traditional manufacturing processes and equipment
- be familiar with CNC machine tools (programming, operation, flexibility)
- understand the fundamental methods of electric arc welding
- design & test aspects of a prototype device
- create a proper design report, focusing on content, formatting and proofing
- understand the importance of efficient project (time & resource) management

4. Contribution of course to meeting the professional component:

EML2322L aids the students in developing the ability to work professionally in the design and realization of mechanical systems (**ME Program Outcome M4**). Specifically, it addresses mechanical design, fundamentals of manufacturing and prototyping, resource allocation and teamwork. This course also emphasizes oral, written and graphical communication via formal design reports and group collaboration. Its content is 80% engineering design and 20% engineering sciences.

5. Relationship of course to program outcomes:

This course achieves the following ABET outcomes [note that the outcome number corresponds to the respective ABET outcomes (a) through (k)]:

(a)** Apply knowledge of mathematics, science, and engineering **[outcome (a), medium coverage (25%); method of assessment is required analysis of mechanical systems in the design project]

(c)** Design a system, component, or process to meet desired needs within realistic constraints **[outcome (c), high coverage (60%); method of assessment is ability to successfully design and prototype a working solution to a practical robotics task within the size, cost, speed and manufacturability requirements set forth within the project description]

(d)** Function on multi-disciplinary teams **[outcome (d), high coverage (50%); method of assessment is evaluating students' ability to effectively allocate resources while working together in groups from various engineering disciplines on the design project. Students submit project timelines and resource allocation schedules that are used to benchmark their progress for the duration of the design project. (Activities range from brainstorming, mechanical design, basic electrical circuits, manufacturing, testing and formal documentation.)]

(g) *Communicate effectively* ***[outcome (g), high coverage (60%); method of assessment is two- fold: (1) formal design reports which include initial hand concept sketches and complete CAD drawings of their final designs, as well as background research and detailed written descriptions explaining how the ideas contained therein solve the required problem; (2) students must clearly communicate their ideas to the instructor and their team members in order to successfully complete the design problem in the allotted time.]***

(k) *Use the techniques, skills, and engineering tools necessary for engineering practice* ***[outcome (k), high coverage (100%); method of assessment is personal evaluation of students' understanding of (1) what operations are possible with each type of manufacturing process examined in this course, (2) how critical proper dimensional tolerancing is to the overall cost and method of manufacturing and (3) the importance of thinking about how each component will be manufactured and assembled during the design phase.]***

(M4) *Possess ability to work professionally in mechanical systems areas, including the design and realization of such systems* ***[outcome (M4), high coverage (60%); method of assessment is consistent with those for outcomes (c), (d), (g) and (k) listed above]***

6. Instructor: **Michael Braddock, MS**

a. Office location: ~~**MAEC 002** (north end)~~ **ONLINE**
b. Telephone: **(352) 392-3496**
c. E-mail address: mjb@ufl.edu
d. Website: http://www2.mae.ufl.edu/designlab/main.htm
e. Office hours: noted weekly on website, or by appointment (flexible)

7. Teaching Assistants:

a. Office location: ~~**MAEC 002**~~ **ONLINE**
b. Office hours: **M/F 2-5 PM; W 5-6:30 PM** (select TAs) unless noted otherwise on course website

8. Meeting Times:

Lecture: **T2 (target day/time for weekly video uploads)**
Lab: **T3-4 / T5-6 / W1-2 / W3-4 / W5-6 / R1-2 / R3-4 / R5-6**

9. Class/Laboratory Schedule: during formally assigned meeting times

10. Meeting Locations:

Lecture: ~~**TUR L005** (campus map)~~ **ONLINE**
Lab: ~~**MAE-C 002** (north end of building, entrance on NE corner)~~ **ONLINE**

11. Material and Supply Fees: included in lab fee

12. Textbooks, Materials and Software Required:

- Relevant notes developed by instructor and posted on course web site under *Lab Assignment and Notes* link
- **3-ring binder** in which all course handouts are stored for weekly reference
- **SolidWorks (SW) CAD software** is required for this class; information will be given **after drop/add ends** for downloading SW again; the software is for academic use in this course only
- **CAD reference** is highly recommended; students are responsible for solid CAD knowledge (if you no longer have your CAD reference text or notes, there are plenty of online references you can use)
- Review the COE undergraduate computer requirements which apply to this course **(if you cannot run the current versions of SolidWorks, MS Word, and MS Excel on your laptop, do not take the course)**

13. Required Reading:

- Cutting Tool Applications by George Schneider Jr., CMfgE (available for free via download)
- See Required Reading handout for the homework assignment that is due week two in the semester.

14. Course Outline / Schedule:

	LECTURE DATE	LECTURE TOPIC	LAB ACTIVITY
1	May 12	Course / ONLINE intro Design process review	Collect exp. / knowledge surveys Lab intro & safety videos Design project demonstrations
2	May 19 ***[1]***	Evaluation matrices Electric motors & gearing	Lathe / mill safety overview
3	May 26 ***[DR1]***	Fasteners & threading	Lathe / mill demonstrations
4	June 2 ***[2]***	Mechanical power transmission Wheel hub & motor mount design	Lathe / mill demonstrations
5	June 9 ***[3] [DR2]***	Sheet metal processes	Sheet metal demonstration Lathe / mill demonstrations
6	June 16 ***[DR2R]***	Welding	Welding demonstrations
7	June 23	**SUMMER BREAK – PLEASE ENJOY YOURSELVES BUT BE SAFE !!**	
8	June 30	**SUMMER BREAK – PLEASE ENJOY YOURSELVES BUT BE SAFE !!**	
9	July 7 ***[4]***	Design for manufacturability Design review keynotes	Remaining equipment training DFM demonstrations
10	July 14 ***[DR3]***	CNC Manufacturing Abrasive water jet machining	**Formal (graded) design review** [1]
11	July 21 ***[DR3R]***	Machining feeds & speeds	Speeds & feeds demonstration
12	July 28 ***[5]***	Dimensions, tolerances & part sizes	Designing for CNC machining[2]
13	August 4[2]	Casting & forging processes Final exam review	Optional topics[2]
14	August 11[2]	Course evaluation/summary	**FINAL EXAM** during lab period

Note: this schedule is tentative and subject to change depending upon the progress of the class.

[DR#] Denotes design report due promptly AT THE BEGINNING of your normal lab period.
[#] Denotes formal homework assignment due promptly AT THE BEGINNING of your normal lab period.
[1] Denotes every student must have their laptop, SolidWorks, Word and Excel software.
[2] Denotes OPTIONAL LECTURE that does not count against your perfect attendance bonus.

15. **Attendance and Participation Expectations:**

Participation is mandatory for course lectures, laboratory sessions, and planned weekly meetings. Open-note quizzes will be given each week to ensure you are reviewing the posted lecture videos and/or notes***; these quizzes are to be completed INDVIDUALLY***. ***Missing more than 2 required quizzes coupled with poor group evaluations will result in failure of the course.*** ***Perfect participation*** *(i.e. submitting all weekly lecture quizzes and attending all required laboratory sessions)* ***for the entire semester is rewarded with a 7.5% bonus added to your final course grade*** *(if you pass the final exam and have no poor group evaluations)***.**

This class is NOT being taught asynchronously. ***You will be expected to be available to meet via Zoom or Microsoft Teams during your assigned lab periods (Eastern time) each week. You will also need to meet regularly with your teammates to complete the time intensive group project assignments. If your personal schedule prevents you from meeting as noted above, please take this course another semester when you can.***

Although working in groups, **each student will receive a grade commensurate to the effort invested in the project.** Throughout the semester each group member will have the opportunity to fill out peer evaluations for members who are doing a great job (beyond what is expected or required) and those who are underperforming (the latter only after discussing the issues with the teammate(s) involved and giving them a chance to respond and improve). These peer evaluations will be used to make individual grade adjustments at the end of the semester.

16. **Grades in this course are based on four components:** (click here for a course grade calculator)

1. **Design project (60%)** – Completion of the design project based on the criteria provided in the project description. Focus on working well with your group members, producing quality design reports and prototyping a successful design solution. ***Failure to participate in a respectful, routine, and meaningful manner can result in failure of the course.***

2. **Final exam (30%)** – Cumulative exam to evaluate how much was learned during the semester. Exam includes all material and handouts covered in lecture, lab, homework assignments and the design project. ***Receiving a grade lower than 60% on the final coupled with poor group evaluations will result in failure of the course;*** this is not trivial, so make use of the weekly lecture quizzes, lab, homework, and project assignments to prepare for the final throughout the semester. **Students that are here to learn and contribute to their group project in an equal and respectful manner have no trouble passing the final if they prepare properly.**

3. **Homework assignments (10%)** – Homework assignments review the important material covered in class. The weekly lecture quizzes, laboratory sessions and final exam draw heavily from the homework assignments, so make sure you understand them. All homework assignments are to be completed INDIVIDUALLY; **DO NOT WORK WITH OTHER STUDENTS.** If you have questions about the HWs, ask a course TA or the instructor.

17. **Grading Scale** – Below is the course evaluation scale. Minus grades are generally not used in this course.

A	B+	B	C+	C	D+	D	E
100 - 90	89 – 85	84 - 80	79 - 75	74 - 70	69 - 65	64 – 60	59 – 0
4.00	3.33	3.0	2.33	2.00	1.33	1.00	0.00

18. **Make-up Exam Policy** If the final exam conflicts with another course or a reading day, talk to the instructor to arrange a solution.

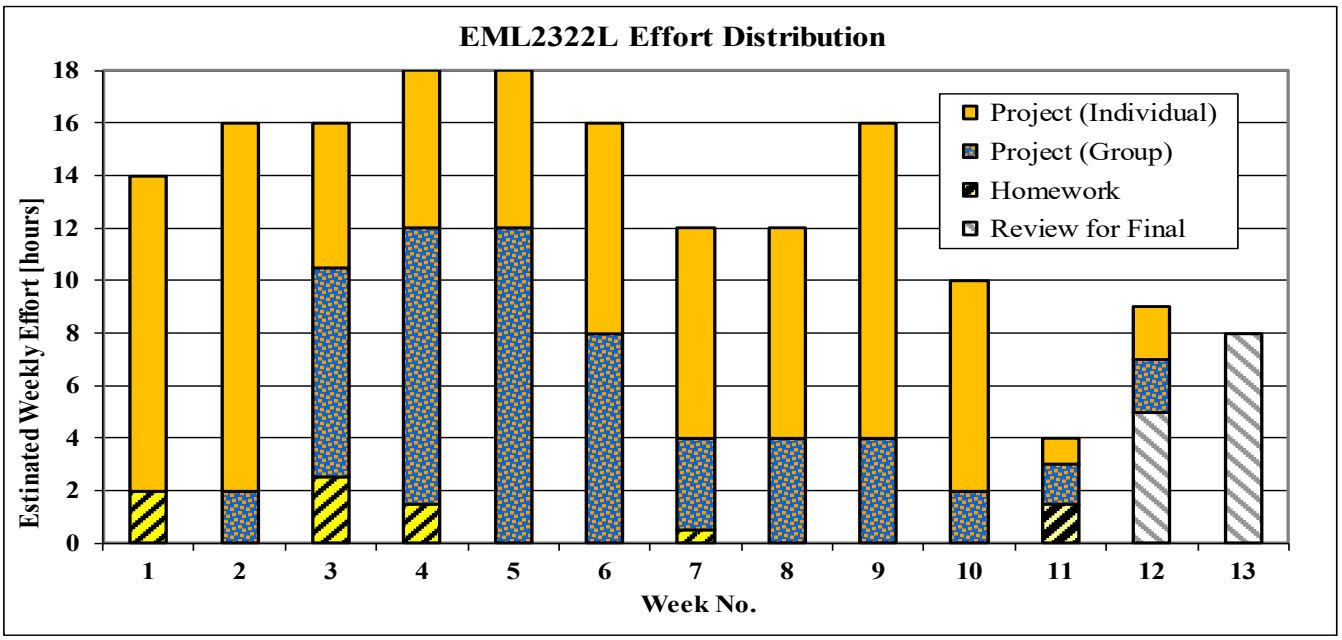
19. **Course Evaluation** – Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations. Evaluations are open during the last two weeks of the semester, and students will be given specific instructions at that time. Summary results of these assessments are available to students.

20. Effort Distribution – The following table and chart show the effort distribution in this course for students desiring to learn and achieve a successful solution to the design problem. You will get out of this course what you put into it. ***As you can see the course will require an average of eleven hours of effort outside the classroom each week to remain on task. The course is also heavily front-loaded,*** *which will work in your favor because it requires less effort in the latter half of the semester when other courses become more difficult.*

EML2322L Effort Distribution

Week No.	Lecture Topic	Homework Assignment	Project Waypoint	Estimated Effort (hours) Homework	Project	**Total**
1	course introduction design process review		introduction	2	12	14
2	evaluation matrices electric motors & gearing	milling, turning & drilling processes hw due		0	16	16
3	fasteners & threading		DR1 due	2.5	13.5	16
4	power transmission	fasteners & threading hw due		1.5	16.5	18
5	sheetmetal processes	drawing & dimensioning hw due	DR2 due	0	18	18
6	welding		revised DR2 due	0	16	16
7	**summer break**				11.5	12
8				0.5	12	12
9	design for manufacturing	safety review hw due		0	16	16
10	CNC manufacturing; abrasive water jet		DR3 due; design review	0	10	10
11	machining speeds & feeds		revised DR3 due	1.5	2.5	4
12	dimensions & tolerances	milling & turning review hw due		0	4	9
13	casting & forging final exam review			0	0	8
14	course summary			0	0	0

AVG: 12



21. **Accommodation for Students with Disabilities** – Students requesting accommodation should provide the relevant documentation from the **Dean of Students Office** to the course instructor the first week of the semester.

22. **UF Counseling Services** – Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
    - UF U Matter, We Care, if you or a friend is in distress, please contact umatter@ufl.edu or 392-1575.
    - UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
    - UF Career Resource Center, Reitz Union, 392-1601, career and job search services.
    - I am **ALWAYS** available to talk about academic, career and life goals, personal struggles or anything else

23. **Tutoring** – If at any time you do not understand the course material or need additional assistance, please attend TA hours or contact me so I can answer your questions. **Do not wait until the end of the semester, as your weekly assignments rely on your understanding of the material taught in lecture and lab!**

24. **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.

25. **UF E-mail** – All students taking this course are required to have an active e-mail account listed with the Office of the Registrar THAT IS CHECKED REGULARLY, as **I send important notes weekly.**

26. **Modifications to Syllabus** – Modifications to this syllabus may be required during the semester based on the progress of the class and ability of the instructor to effectively communicate the lecture materials via online format. Changes to the syllabus will be posted on the **Weekly Deliverables** portion of the course web site.

27. **Honesty Policy** – All students admitted to UF signed a statement of academic honesty pledging to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and examinations taken in this course. Specifically, do not collaborate on quizzes or homeworks; submit course work of which you are not the original author; use materials obtained from former students; or use unauthorized materials during an exam. **Think about what your integrity is worth before jeopardizing it.**

28. **Consequences of Cheating** – The reputation and foundation of our University are based on the integrity of each graduate. Consequently, **cheating will absolutely not be tolerated. EVERY incident of cheating WILL be turned over to Student Conduct and Conflict Resolution. First offenses receive a failing course grade and second offenses (in this course or if you had a previous incident in another course) receive a two semester suspension from the university. Please believe me when I tell you your integrity is worth more than any fraudulent assignment you will ever submit.**

29. **Instructor's Comments** – This class is a real-world, practical introduction to engineering design and prototyping with an emphasis on design for manufacturability (DFM). **This class IS NOT an easy A.** This class will teach basic design principles, fundamental manufacturing processes, important communication skills, and strategies for successfully working in groups. **This IS NOT a class where you can expect your teammates to perform your share of the required work, as you will receive the grade YOU deserve, not the grade the rest of the group earned. This class is fast-paced and enjoyable. Like the real world, you get out of it what you put into it. This IS a class where you can come to the instructors at any time with questions but we're not going to do the work for you. We will match your effort and give guidance so you can learn what we're teaching IF you pay attention, read the provide material, work diligently, and ask questions.**

30. **COVID-19 Comments** – This class is very demanding during a normal semester; the Corona virus is going to make it even more so. Distance learning places additional challenges upon us: us for teaching and you for learning. I will have to learn how to convey the information I'm teaching with less hands-on and more video demonstrations. And you will have to work harder to process the information and ask questions along the way. But what we cannot do is use the virus as an excuse to teach a watered-down version of this course, as that would only cheat you out of the opportunity to be better prepared for your next design project, internship, or your transition to industry.

    I'm looking forward to an exciting semester with you!