Design and Manufacturing Lab

Summer 2022 Syllabus

Lecture: T Period 1 (8:00 – 9:55 A.M., MCCA G186)
Labs: MAE-C 002; *see one.uf.edu for registered section*

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.

Instructor: Dr. Sean R. Niemi
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Office: Room 132, MAE-C
Hours: TBD

Catalog Description:

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

Prerequisites:

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

Course Objectives:

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

- educate students in traditional manufacturing processes
- provide an understanding of how cost and performance are heavily influenced by manufacturing processes and dimensional tolerancing
- teach students to consider manufacturing and assembly processes in the design process from concept generation to prototyping

Throughout this course, you will develop the ability to create an integrated design and presentation of a mechanical system. This course will require working in groups, preparing engineering documentation of your designs, and manufacturing and inspecting parts to ensure they meet specifications. You will learn design techniques and integration of design analysis and apply your engineering knowledge to solving a variety of open-ended design challenges.

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

- be able to identify and apply the steps of the design process, emphasizing data driven justifications
- be familiar with typical traditional manufacturing processes and equipment
- understand the function of CNC machine tools (programming, operation, flexibility) and where they fit into the prototyping phase of design
- understand the fundamental methods of electric arc welding
- design, fabricate & test a prototype of one device
- generate proper design documentation, with a focus on design justification, revision control, and quality/manufacturing inspection
- understand the importance of efficient project (time & resource) management

Course Materials and Fees:
Course Fee: $46.21

Required Textbooks and Software:
- Cutting Tool Applications by George Schneider Jr., CMfgE (available for free via download)
- **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)
- **SolidWorks CAD** software is *required* for this class; installation information will be provided *after drop/add*; the software is provided exclusively for academic use.
- **SolidWorks PDM** software is *required* for this course; installation information and instruction for using the software will be provided *after drop/add ends. Failure to actively use Solidworks PDM for collaborative CAD modeling will result in grade penalties.*

Recommended Materials:
- A **CAD reference text** is highly recommended; students are responsible for solid CAD knowledge from EML2023 (open-source references are available online, so don't buy another one if you already sold yours)

Course Schedule:
The following table shows the weekly schedule for the semester. *Lecture topics may change as needed based on changes to the course being realized.* Most assignments are due 15 minutes before the start of your assigned lab period; deviations from this are highlighted in the schedule.

Wk	Wk. of:	Lecture Topic	Supplemental Video Content	HW / Quiz	Design Project Assignment	Lab
1	May 09	Syllabus Project Description DML Structure	Intro / Design flow chart	***DRT / Proj. Desc. Quiz (Friday)***		Intro Quiz Project Discussion Location Precision and Fastener Failures
2	May 16	Fasteners and Threading		**HW 1 - Milling and Turning**	***Concept Sketches (Friday)***	Safety Training (Mill or Lathe)
3	May 23	DFM Lecture	Representative models	**HW 2 - Fasteners**		Lathe/Mill Parts
4	May 30	Decision Matrix Objectives PDM & How to Use It CAD Tips & DR2 Organization	DR2 Templates (Cost, MFG Time, Torque Calcs, robot speed)		**DR1** EC: Construct your representative model in advance = 10% bonus to DR1	Lathe/Mill Parts

5	Jun 06	Welding	DR2R Templates (Budget, MFG Time, Schedule)	**HW 3 - Engineering Drawing and Dimensioning**	**Representative model testing**	Sheetmetal / other equip (2) Welding (2)	Lathe/Mill Parts
6	Jun 13	Power Transmission: Motor Mount & Wheel Hub Design	Motor Speed / Torque		**DR2**	Sheetmetal / other equip (2) Welding (2)	Finish Lathe/Mill Parts DR2 Review / Feedback
7	Jun 20	**SUMMER BREAK**					
8	Jun 27	Speeds & Feeds		**Midterm Exam (6/30 evening)**	**DR2R**	Build	
9	Jul 04	CNC			Tap Quiz (In-Lab)	Build	
10	Jul 11	Abrasive Waterjet Cutting		**HW4 - DFM**		Build	
11	Jul 18	Casting / Forging				Competition	
12	Jul 25	Additive Manufacturing / Composites		**HW 5 - Exam Review**		***TBD*** ***Adv. Manuf. Demo***	
13	Aug 01	Final Exam Q/A			**DR3**	**Final Exam (in lab)**	

Changes to the schedule may be required throughout the semester. Any significant changes will be announced on Canvas.

Attendance:

Attendance is mandatory for both lecture and laboratory sessions. Some weeks will have pre-recorded video lectures in addition to the in-person lecture for the week. Weekly lecture quizzes may be assigned to ensure students are current on required materials for the course. **You cannot be successful in the lab if you are repeatedly behind on lecture content.**

Starting the week after drop/add (Week 2), attendance will be taken for each lab session. ***Students who arrive more than 5 minutes late will be marked tardy (2 tardies = 1 absence).*** ***More than 2 unexcused lab absences results in failure of the course.*** *This course is dependent on group work, and members who miss lectures and labs are an unfair burden to the rest of their group (hence the strict attendance policy).* **Being tardy the day when there is an assignment is due counts as a late submission and will result in a 10% grade penalty for that assignment.**

Excused absences must be consistent with university policies in the undergraduate catalog and require appropriate documentation. If you are absent, or know that you will need to be absent, it is **your responsibility to notify the course instructor and your TA in a timely manner.**

Turn off cell phones during lab periods. Cell phones are a major distraction and inhibit *proper and safe* operation of the equipment. Students who use their cell phones in lab for non-course-related activities (e.g., Instagram, TikTok, etc.) will be asked to leave their phone with their backpack. Repeated incidents will result in the student being asked to leave the lab and they will be marked as absent for that period.

Make-up / Late Assignment Policy:

There are no make-ups for lecture quizzes as they are used to measure attendance. Late assignment submissions will incur a 10% late penalty per day and will not be graded if submitted 5 or more days late. If you must miss a lab due to an officially excused absence, please discuss make-up options with the course instructor.

Course Assignments and Grade Distribution:

Assignment	Grade Percent	Due Date	Notes *Specific assignment requirements will be detailed in the Canvas assignment description*
Participation & Safety	15%	*n/a*	Lecture quizzes, lab attendance & preparedness, peer evaluations; missing two or more labs or results in receiving 0%; arriving more than 5 minutes late to lab twice counts as an absence. Being unprepared for lab (improper PPE, no safety sheets, etc.), not paying attention, disobeying TA instructions, and/or disregarding safe machine operating practices (chuck keys, 5-step check, etc.) will result in grade penalties.
HW	15%	*multiple*	5 HWs total, each worth 3%
DRT Quiz	2.5%	*5/13/2022*	Project Description and Design Report Requirements
Concept Sketches	5%	*5/20/2022*	Sketches of proposed manipulator concept. Messy and/or illegible sketches will receive zero points
DR1	10%	*week of: 5/30/2022*	Preliminary CAD model for one (1) mechanical system; spec table for system; show attachment method to mobile platform; brief (1 paragraph) explanation of how system works.
Representative Models	5%	*week of: 6/6/2022*	Simple model to test functionality and reliability of system design
DR2 and **DR2R**	15%	*week of: 6/13/2022* ***6/27/2022***	Trade studies, design down-selection; motor torque calculations; CAD model; part and assembly drawings; BOM, P.Os., budget. **Feedback from DR2 that is not implemented for DR2R may result in double grade penalties.**
Midterm	7.5%	*6/30/2022*	Machine nomenclature, operation, tooling, safety, HW 2&3 review
DR3	5%	*week of: 8/01/2022*	Prototyping documentation, performance evaluation, proposed design changes.
Competition	5%	*week of: 7/18/2022*	Bonus for top five teams
Final Exam	15%	*week of: 8/1/2022*	**Earning below a 60% on DR1, the Midterm Exam, and Final Exam is grounds for receiving a failing grade in the course.**
Peer Evaluations	*var.*	*multiple*	Students who do not contribute meaningfully to their groups will receive severe grade penalties Students who significantly contribute to their group's efforts can expect a corresponding bonus.
	100%		Breakdown of work for course: 70% individual / 30% group

Grading Policy:

	A: 93-100	A-: 90-92.99
B+: 88-89.99	B: 83-87.99	B-: 80-82.99
C+: 78-79.99	C: 73-77.99	C-: 70-72.99
D+: 68-69.99	D: 63-67.99	D-: 60-62.99
	E: 0-59.99	

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

Laboratory Safety:

Students are expected to wear proper personal protective equipment (PPE) at *all times* when in the lab. The minimum required PPE includes safety glasses, closed toed shoes, and long pants (pajama pants or leggings are insufficient protection). Use of specific equipment may cause a change in the required PPE for a given task. Safety glasses, facemasks, and equipment specific PPE are available for students who do not have their own.

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.

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.	
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.	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	

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

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu/evals. 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/.

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://www.dso.ufl.edu/sccr/process/student-conduct-honor-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 broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

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
- Jennifer Nappo, Director of Human Resources, 352-392-0904, jpennacc@ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- 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: http://www.counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 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, 392-1161.

University Police Department at 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 Resource Center, Reitz Union, 392-1601. Career assistance and counseling. https://www.crc.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, 392-2010 or 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://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints*:* http://www.distance.ufl.edu/student-complaint-process.