

Design and Manufacturing Lab

Spring 2025

Lecture: M Period 9 (4:05 – 4:55 PM, PUGH 170)

Labs: MAE-C 002; *see one.ufl.edu for registered section.*

Modifications to this syllabus may be required during the semester.

Any changes to the syllabus will be posted on Canvas and announced in class.

Instructor: Dr. Sean R. Niemi

Email: srn@mae.ufl.edu

Phone: 352-294-3381

Office: Room 132, MAE-C

Hours: *Tuesdays 9:30 – 11:00 am*

Wednesdays 10:30 am – 12:00 pm

*Note: All official course communication must happen through **email** or **MS Teams**.*

Canvas messages are not actively monitored throughout the semester and may go several days/weeks without a response.

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:

This course will require working in groups, preparing engineering documentation, and the manufacturing and inspection parts to ensure they meet engineering specifications. You will learn design techniques, the integration of design analysis, and apply engineering knowledge and processes to solving a variety of open-ended design challenges.

Throughout this course, you will develop the ability to assess the functionality of the components making up a design and determine tolerances and manufacturing procedures to simplify prototyping and production of an assembly. You will also learn to create an integrated design and present quantitative justifications for a mechanical system.

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

- Educate students in both traditional and modern manufacturing processes,
- provide an understanding of how manufacturing time (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, and
- instruct students on the engineering design process and develop an understanding of how to develop quantitative assessment/evaluation methods for design concepts.

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

- be familiar with common traditional manufacturing equipment and processes,
- have a strong understanding of tolerances and how they affect manufacturing quality and time,
- understand common metrology tools, their applications, and be able to conduct basic quality/manufacturing inspection processes,
- be able to properly dimension and tolerance part drawings with a focus on improved manufacturability and component interchangeability,

- understand the function of additive manufacturing and CNC machine tools (programming, operation, flexibility) and where they fit into the prototyping and production phases of design,
- understand the fundamental methods of electric arc welding,
- be able to identify and apply the steps of the design process, emphasizing quantified analysis, and data driven justifications,
- generate proper design documentation, with a focus on quantitative design analysis/selection,
- understand the importance of efficient project (time & resource) management.

Course Materials and Fees:

Course Fee: \$161.20

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.
- **Autodesk Fusion360** software will be used to supplement SolidWorks for this course. Fusion360 is free to use with an educational account. Instructions will be provided after drop/add.

Computer Requirements

Please see the MAE computer requirements: <https://mae.ufl.edu/students/undergraduate/computer-requirements/>

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)
- The [Legacy DML Website](#) is a treasure trove of resources related to design, manufacturing, and other facets of engineering. Many documents for the class will be linked to this site. You are strongly encouraged to browse the site, particularly the material under the "course info" and "design guides" tabs.
- **Machinery's Handbook** (any edition) is a phenomenal resource for any mechanical or aerospace engineering student with an interest in manufacturing or mechanical system/component design.

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	Low
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.

Course Schedule:

The following table shows the weekly schedule for the semester. *Lecture topics may change as needed based on changes to the course coming into effect. Reference Canvas for the detailed due dates and times.* Any changes to the schedule, and further details on exam times, will be announced on Canvas.

DML 2.0 - Spring 2025						
Wk.	Wk. of:	Live Lecture Topic	Video Lecture Topic	HW / Exam Schedule	Design Project Assignment Due	Lab
1	1/13	Introduction & Project Discussion	Design Process Review	No Assignments Due		Introduction
2	1/20	Holiday: No Live Lecture	Functional Design / Air Engine Assembly	HW 1 - CAD / Drawing Review		Safety Training
3	1/27	Tolerances		HW 2 - Turning, Milling, & Drilling	Safety Training Quiz 100% Required	Lathe / Mill Parts
4	2/3	Fasteners	Fasteners pt. 2	Concept Sketches		Lathe / Mill Parts
5	2/10	Cutting Tool Geometries	TBD	Objective Definitions	HW 3 - Fasteners and Threading	Lathe / Mill Parts
6	2/17	Designing for Manufacturability	TBD	Production Drawings	DR 1	Lathe / Mill Parts; Drawing Reviews
7	2/24	Sheet Metal Processes	TBD	HW 4 - Designing for Manufacturability	Revised Production Drawings	Lathe / Mill Parts; Welding; Sheetmetal; Project Build
8	3/3	Welding	TBD	Midterm Exam		Welding; Sheetmetal; Project Build
9	3/10	Cutting Speeds and Feeds	TBD		DR 2	Project Build
10	3/17	SPRING BREAK!				
11	3/24	CNC Machining / CAM	TBD		DR3 - Progress Check	Project Build
12	3/31	2D Cutting	TBD	HW5 - Speeds and Feeds Bonus: CAM		Project Build
13	4/7	Additive Manufacturing	TBD	HW 6 - Review	DR3	Project Build
14	4/14	Casting / Forging / Extrusion	TBD		Air Engine Assembly and Documentation	Assembly Day!
15	4/21	Final Exam Review	STUDY FOR FINAL EXAM			
16	4/28	Final Exam				

Evening Examination	Due Sundays at midnight
Due before start of lab	Due at start of lab

Assignments in italics do not count towards your final grade; however, failure to complete them will result in severe grade penalties with the associated graded assignment.

Course Assignments and Grade Distribution

All assignments required for laboratory activities are due 15 minutes prior to the start of your lab unless otherwise specified. Other assignments are due as specified in Canvas. It is your responsibility to be aware of assignment due dates.

If you have an issue with the grade you earned on an assignment, please contact the grading TA before reaching out to the course instructor. If no suitable explanation can be provided and/or your request is not being considered, then contact Dr. Niemi **via email** and **copy** the grading TA on the email chain. The TAs are largely here to provide you with constructive feedback and help you to learn; they are not “out to get you.”

Assignment	Grade Percentage	Due Date	Notes
Participation & Safety*	15.0%	<i>n/a</i>	Lecture quizzes, lab attendance & preparedness, following proper safety protocols. Having more than two unexcused lab absences will result in receiving 0% for this portion of your grade; arriving to lab tardy by more than 5 minutes twice counts as an unexcused absence. Being unprepared for lab (improper PPE, no safety sheets, etc.), not paying attention, disobeying TA instructions, and/or disregarding safe machine operating practices will result in you being told to leave lab and receiving an unexcused absence for that week.
Design Report 1*	10.0%		Conceptual design generation for device powered by Air Engine. Written description, detailed sketches, critical surface identification, design specification table.
Design Report 2	10.0%		Down-selection of designs; engineering calculations and justifications for design selection.
Design Report 3	10.0%		Manufacturing plan for down-selected design (Assembly and part drawings, materials, manufacturing process selection/justification)
Revised Production Drawings	5.0%		Generation of new part drawings for air engine parts to improve manufacturability and interchangeability of manufactured parts along with justification for tolerances selected at each critical interface.
Air Engine Documentation	5.0%		Finalized air engine assembly and part drawings; manufacturing inspection reports; engineering change notices.
Air Engine Assembly	5.0%		2.5% - Individual air engine assemblies 2.5% - Air engine part interchangeability between assemblies
HW & Quizzes*	10.0%	<i>multiple</i>	
Midterm Exam*	10.0%		Earning failing grades on both the Midterm Exam and the Final Exam will result in failure of the course.
Final Exam*	20.0%		Earning failing grades on both the Midterm Exam and the Final Exam will result in failure of the course.
Peer Evaluations	<i>var.</i>	<i>multiple</i>	Students who do not contribute meaningfully to their groups will receive severe grade penalties on the associated assignments. Students who do significantly contribute to their group's efforts can expect a corresponding bonus.
Total	100.0%		Breakdown of work for course: 65% individual / 35% group

Assignments notated with an asterisk () are individual assignments and should not be worked on in collaboration with other students.*

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>

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 Undergraduate Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@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: <https://counseling.ufl.edu>, 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 support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://elearning.ufl.edu/>.

Career Connections Center, Reitz Union, 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, 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://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>.