

Fundamentals of Production Engineering

EML 6324 Sections 13296/7/8/9

Class Periods: MWF 4th (10:40-11:30) online

Academic Term: Fall 2020

Instructor:

Prof. John K. Schueller

schuejk@ufl.edu

Office Hours: MW 1:30-2:30 by Zoom

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

A teaching assistant, email address, and office hours will be announced.

Course Description (from Catalog)

Fundamentals of metal cutting, metal forming, and welding. Accuracy and rigidity of machine tools. Automation, numerical control, adaptive control. (3 credit hours)

Course Pre-Requisites / Co-Requisites

Graduate standing or instructor permission.

Course Objectives

Upon completion of this course, students will demonstrate:

1. a descriptive and qualitative understanding of traditional and non-traditional manufacturing processes;
2. the ability to use engineering science tools such as advanced mathematics, stress analysis, vibrations, control theory, and heat transfer to analyze manufacturing processes and machines, with an emphasis on metal forming and metal cutting;
3. the ability to rapidly and accurately perform manufacturing evaluations and analyses;
4. the ability to create computational simulations of manufacturing processes and machines; and
5. some knowledge of the contemporary state-of-the-art in manufacturing theory and practice.

Materials and Supply Fees

None

Required Textbooks and Software

Textbook: *Manufacturing Processes and Equipment*, Tlusty, G., Prentice-Hall, 2000.
ISBN 0-201-49865-0 (either a hardcover or softcover printed copy is required)

Software: You will need to be able to program some computer assignments. Most students use the student version of MATLAB since it works well for these assignments and the examples in the textbook are in that language. But any other programming language (except spreadsheets) can be used.

Please note that you may only use printed materials for the exam and you cannot share materials during the exam. So do NOT buy an ebook copy of the textbook. We will tend to follow the textbook closely,

You will have to read or watch some additional materials which will be provided on Canvas or by email.

Recommended Materials

None

Course Schedule

One of the reasons you take a course with a live instructor rather than something pretaped is to take advantage of flexibility. Every cohort of students is different and I can adapt the course slightly to your needs and wants. In addition, manufacturing is a dynamic field and there may be new information I may want to give you. Hence, it

would be stupid for me to give you an exact schedule. If you have trouble with a subject, we can spend more time. If you master a subject quickly, we can move on rather than bore you.

For what is typically about 20% of the course we cover chapters 1, 2, and 3 of the textbook. This is an introduction and establishes a background in mechanics of materials and materials. For many of you it is mostly a review of UF's EMA 3010 Materials and EGM 3520 Mechanics of Materials or equivalent courses elsewhere.

For what is typically about 35% of the course we cover chapters 4 and 5 in the textbook. This is metal forming processes, such as forging, drawing, extruding, rolling, and sheet metal processes.

For what is typically about 30% of the course we cover chapters 7 and 8 in the textbook. This is cutting technologies and mechanics.

The remainder of the course varies a little depending upon class needs and opportunities. Often there is some assembly and welding or some manufacturing machine control.

Note that the course deals practically only with metals, with no significant coverage of polymers, ceramics, or electronics. Also note that it covers traditional processes. Nontraditional or advanced processes (e.g., 3D printing) are covered in other courses. However, these materials and processes may be occasionally mentioned in this course for comparison purposes.

Online Course Recording

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.

Attendance Policy, Class Expectations, and Make-Up Policy

The class will be period 4 on MWF. Live attendance is encouraged so you can ask questions or give input. Such attendance is NOT required nor is absence penalized. However, unless approved by me, you must take two during-semester exams and the final exam at their designated times. I will consider alternate times for the two exams for real and significant work and family reasons. UF requires: "Excused absences must be in compliance with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation."

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (about 10)	10 each	10%
Midterm Exams (2)	100	60%
Final Exam on 18 December	100	30%
		100%

Grading Policy

Percent	Grade	Grade Points
93	A	4.00
90	A-	3.67
87	B+	3.33
83	B	3.00
80	B-	2.67
77	C+	2.33

73	C	2.00
70	C-	1.67
67	D+	1.33
63	D	1.00
60	D-	0.67
Below 60	E	0.00

Note the above are minimum averages. (E.g., 89.99999999 is a B+)

All exams will be conducted using Honorlock. The exams will allow you to use anything on paper (books, notes, Xeroxed or printed materials, etc.). You will be allowed to use calculators, but no other electronic devices. Computers and cell phones are included in that exclusion. (So you will want a hardcopy of the textbook.) The two midterm exams will be conducted during regular class periods. You will be given at least ten days notice of the exam dates. The final exam will be 7:30 – 9:30 a.m. on Friday 18 December. Please note that the final exam will NOT be given early. So make your December plans accordingly.

There will be approximately ten homeworks. You must do the first homework to pass the course. Students in section 13297 (new to the USA) must also participate in an October on-campus manufacturing familiarization activity.

You are expected to regularly check your Gatorlink (@ufl.edu) email. Announcements of assignments, exam dates, and other matters may be made by listserv emails to that address.

More information on UF grading policy may be found at:
<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

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/>.

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/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.

All homeworks you submit must be your own work. You may not copy or submit anyone else’s work or provide work to anyone else. Use of the textbook’s instructors’ manual or internet sources such as Chegg, Course Hero, etc., are included in this prohibition. Any cheating on homework or exams will be treated harshly and taken to the Honor Court.

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
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.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 support, 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://care.dso.ufl.edu>.

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

Topics

The exact topics and the extent of the coverage of those topics will be chosen by the instructor during the semester in response to the students' progress, abilities, and interests and the instructor's evolving understandings and opinions. But the topics likely will be many, but not all, of these:

- Manufacturing organization and management
- Engineering materials (primarily metal alloys) and their properties
- Primary metalworking (steelmaking, casting, powder metallurgy)
- Metal forming technology and machines
- Metal forming mechanics (forces, pressures, redundant work, and failure in drawing, extruding, rolling, and upsetting)
- Sheet metal processes (forces, stresses, and failure in shearing, bending, and deep drawing)
- Cutting technology (single-point and multipoint operations)
- Cutting mechanics (forces, pressures, and temperatures)
- Cutting tools (materials, wear, and breakage)
- Machine tools (accuracy, vibrations, and chatter)
- Automation (automation and numerical control, positional servomechanisms)
- Material handling and assembly
- Welding (processes, control of arc, heat transfer)
- Nontraditional processes (water and chemical cutting, electrical and laser cutting, electronics manufacturing, rapid prototyping)
- Industrial organization and line balancing

(Some of the last six topics on the above list are less likely to be covered.) There is a lot of descriptive and empirical learning that is needed in this course. But the approach of the textbook is more analytical than most manufacturing textbooks. We will therefore also learn how to use various tools from engineering science to analyze manufacturing processes to develop a deeper understanding. For example, why are titanium alloys cut at slower speeds than aluminum alloys? We might write a simple finite difference heat transfer program to analyze the temperature in the cut material to see how the slower cutting speed is needed in the titanium alloy machining to moderate the tool-workpiece temperature rise due to titanium's low thermal diffusivity. As another example, we will use the principles of solid mechanics and the strain-hardening properties of the workpiece materials to calculate forces and pressures in the dies to show why steel is more commonly drawn than aluminum alloys, which are commonly extruded. This course does have a fair amount of overlap with the undergraduate course EML 4321 *Manufacturing Engineering* or its equivalent elsewhere.