

ECE 202 Fall 2022

Computational Tools for ECE

Catalog Description

An introduction to using computer applications to solve engineering problems. Learning the rudiments of MATLAB and Excel in order to design and/or visualize systems. Emphasis is on learning to use these applications appropriately and efficiently, with well structured code that is commented and includes checks to find errors. (3 credits).

Learning Objectives

During this course students will:

- learn basic functionality of MATLAB and Excel, from computing numerical answers to graphing results;
- learn how to use these applications properly and efficiently;
- learn how to apply math, science, and engineering concepts and principles to solve interesting problems;
- begin to learn about the design process; and
- learn how to check their answers, an essential skill for professional engineers.

Instructional Approach

We will be using a Mastery approach in this course. In other words, you will learn primarily by writing scripts and organizing worksheets, then getting detailed feedback, so that you can make changes and submit new solutions. Incentives are given for continuing to work until you have earned a perfect score on each assignment. Additional incentives are given for doing this "early".

Instructor

Bill Leonard

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Office Hours: Email me to set up a Zoom meeting

Zoom Meeting Room: [https://umass-amherst.zoom.us/j/6422877665?](https://umass-amherst.zoom.us/j/6422877665?pwd=dGNtNEdvdXlmRCs1TzZ0M1h6c21VUT09)

[pwd=dGNtNEdvdXlmRCs1TzZ0M1h6c21VUT09](https://umass-amherst.zoom.us/j/6422877665?pwd=dGNtNEdvdXlmRCs1TzZ0M1h6c21VUT09)

Zoom ID / Passcode: 6422877665 / 508929 (if the link above does not work)

Prerequisites

A passing grade in MATH 132 (Calculus II) and PHYSICS 151 (Physics I) is required to enroll in this class.

Textbooks

There is no formal text for this course. Written materials will be provided as needed.

Components and Resources

Lecture Recordings. During class time, we will write scripts in MATLAB and/or workbooks in Excel. If you follow along, you will also have a fully functioning script or workbook at the end of each lecture. If you miss class or want to review what we did, there will be a recording available later in the day. The links are in their own section below. The list of links is accompanied by a Table of Contents, so that you know what is covered in each lecture.

Sample scripts and Workbooks. Most of the files created in class are available under "Lecture PDFs (and other files from class)". Some are needed to get started on assignments or projects.

Lecture Notes. It is impossible to take notes during class, so everything we do in class will be organized and summarized in a set of lecture notes.

MATLAB Exercises. There are 8 MATLAB exercises, designed to show you the fundamentals of scripting with MATLAB. Each exercise is worth 20 points, with 5 "Mastery" points for a perfect solution uploaded at any time, and another 5 Bonus points for a perfect solution uploaded before a certain date. There is no penalty for resubmissions. (Max = 200 points + 40 Bonus points)

Excel Exercises. There are 8 Excel exercises, designed to show you the fundamentals of setting up and organizing an Excel spreadsheet. Like the MATLAB exercises, each is worth 20 points, with 5 "Mastery" points for a perfect solution uploaded at any time, and another 5 Bonus points for a perfect solution uploaded before a certain date. There is no penalty for resubmissions. (Max = 200 points + 40 Bonus points)

Projects. There are two projects, worth up to 100 points each, including Mastery points. Each project is broken up into "phases" to provide an example of how a typical project proceeds, from the beginning phase of getting something to work as quickly as possible, through all the phases of creating an efficient, robust, user-friendly product at the end. There is no penalty for resubmissions. (There are no Bonus points for doing the Projects "early".)

Midterms. There are two midterms, administered by Moodle, each worth up to 120 points (not including Bonus points). Secure testing software (RPNOW) will be used to guarantee individual accountability. The use of RPNOW also means that you do NOT need to be physically present at the midterm. In other words, you will be allowed to find any suitable location, in which you are alone, with internet access, but without the likelihood of being interrupted. You will need to have your email application open during each midterm, so that I can broadcast messages about it in real time. It is also possible that I will contact you individually during the midterm. (Max = 240 points + 24 Bonus points)

Bonus Surveys. A weekly check-in to see how everything is going. Most are worth 2 Bonus points each and are due on Sundays. The first is worth 6 Bonus points and is due on Sunday, September 11. There are also two surveys to complete BEFORE watching a certain lecture. (Max = 45 Bonus points)

Final Exam. There is no Final Exam.

Other resources. There is no textbook for this course. However, there will be other resources made available, such as an overview of navigating Excel on a PC and a video to help you get started in MATLAB.

Grading

There is a total of 840 points possible, including Mastery points, but not including Bonus points. To earn a B+ or better, you must earn a total of 750 points, with at least 15/20 on each individual MATLAB and Excel exercise, 60 points on each of the Projects (including Mastery points), and 160 points (combined) on the two midterms. To earn a C+ or better, you must earn 600 points, including Bonus points, also with at least 15/20 on each individual MATLAB and Excel exercise and 160 points (combined) on the two midterms, but 60 points on only ONE of the Projects (including Mastery points) and the points from the other Project do not count toward this total. To earn a D or better, you must earn 425 points, NOT including Bonus points, again with at least 15/20 on each individual MATLAB and Excel exercise and 160 points (combined) on the two midterms, but NONE of the Project points count toward this total. Every 25 points is a grade increment, e.g., D to D+.

In other words, the Projects can be considered optional, in the sense that you can pass with a D without doing either one. However, to reach a good grade (C+ to B), you need to complete one of the Projects with at least 60/100 points. And to reach a very good or excellent grade (B+ to A), you must complete both Projects with at least 60/100 points each. (For grades below B+, because some or all of your Project points do not contribute directly to the total, 20% will count as Bonus points.)

Here is a table that organizes everything.

Grade	Min. Score on MATLAB Exercises	Min. Score on Excel Exercises	Min. Score (combined) on Two Exams	Min. Score on ONE Project	Min. Score on SECOND Project	TOTAL Points	Notes
A	15/20 each	15/20 each	160	60	60	800	1
A-	15/20 each	15/20 each	160	60	60	775	1
B+	15/20 each	15/20 each	160	60	60	750	1
B	15/20 each	15/20 each	160	60	[none]	650	1, 2
B-	15/20 each	15/20 each	160	60	[none]	625	1, 2
C+	15/20 each	15/20 each	160	60	[none]	600	1, 2
C	15/20 each	15/20 each	160	[none]	[none]	500	1, 3
C-	15/20 each	15/20 each	160	[none]	[none]	475	1, 3
D+	15/20 each	15/20 each	160	[none]	[none]	450	1, 3
D	15/20 each	15/20 each	160	[none]	[none]	425	4

NOTES:

1. Including Bonus points
2. "Second" Project points count 20% as Bonus
3. ALL Project points count 20% as Bonus
4. NOT including Bonus points

Note that Bonus points cannot be used to reach a passing grade.

These grading cutoffs are guaranteed. Therefore, you are not in competition for grades with your classmates. If you are close to meeting one of the minimum scores, the requirement will be waived and a small penalty will be assessed (to be fair to those who met all of the minimum criteria).

Exams / RPNow

There are two Midterms. You will be using your computer during the exams, and you will be monitored using secure testing software called "RPNow" (Remote Proctor Now). This service costs \$40 for the course. If you have used RPNow for a previous course, you will need to use a different email address so that the system prompts you to pay another \$40.

During each exam, RPNow will record two videos, one using your web cam and another of your computer screen. The software does not prevent cheating. Instead, it verifies that you did not cheat. In other words, after the exam, each video is reviewed. If anything even mildly suspicious is found, the course instructor is notified, and a decision is made about what to do about it.

Time Management

As you can see, good time management will pay large dividends, with up to 80 Bonus points available to people who can complete Exercises early. Therefore, at the beginning of the semester, it is extremely useful to start developing beneficial habits, such as starting assignments early; checking in with the instructor and tutors when you are stuck; and developing the skill of switching your focus when you are not being productive.

A critical feature of the Exercises and Projects is that you are given detailed feedback after each submission, and you are allowed to resubmit your solution without penalty. Only the last score matters, but the first score is often very poor. Thus, it could take three or more attempts before something is perfect. Submissions are graded within 24-48 hours, so it will usually take a week or so after your first submission to complete an Exercise or any one phase of the Projects.

As an example, let's look at the first two MATLAB exercises, M1 and M2. You should notice that M1 is "due" on Friday, 9/16, and M2 is "due" on Monday, 9/19. These are not actually due dates, at least in the conventional sense. They are "Bonus" dates. If you can complete these two Exercises, submitting two perfect solutions before 11:59pm on these dates, then you will earn 10 Bonus points (5 points per Exercise). However, to do that you will need to plan accordingly, because you will NOT be able to finish M1 before starting M2. Each will take about a week, so you will likely need to start M2 when M1 is less than perfect. In other words, in general, you will NOT have time to complete one Exercise before moving on to the next. The Exercises are largely independent of each other, so there is no reason to wait. While you are waiting for feedback on one Exercise, you can start working on the next. You should start a new Exercise every day or two. At any one time, you might have four or five Exercises in different stages of being complete.

Then, usually 3 or 4 weeks after the Bonus date, the assignment is due, in the conventional sense. (The time gets shorter near the end of the semester.) This is a final deadline, so you will need to plan accordingly. In

particular, MATLAB exercise M5 is due on Friday, 10/28. If you cannot complete M1-M5 by this date, then you should consider withdrawing from the class and try again later, rather than fail the class. (The last date to drop with a W is Tuesday, 11/1.)

Projects are different. First, there are no Bonus dates. They are both due at the end of the course (in the conventional sense). Second, each Project has distinct phases, and it's VERY hard to move on to the next phase before you have finished the current phase. Therefore, in the background, behind everything you are doing for the 16 required Exercises, you will be working on the Projects, one phase at a time. There are 11 phases in all, six for Project 1 and five for Project 2. You can start Project 1 about the same time as you are finishing up MATLAB Exercise M4. You can start Project 2 about the same time as you are starting MATLAB Exercise M6.

Even though there are no Bonus dates for the Projects, time management is still critical and has major consequences. With good time management, you can start early and complete one or both Projects, increasing the likelihood of a very good or excellent grade. For instance, you must earn at least 60/100 on both Projects to earn an A in this class.

You may request an extension of the Bonus dates for a day or two. However, you should make the request at least 24 hours before the Bonus date. In other words, you should assume that it will take at least 24 hours to grade something you have submitted, and that your first and second submissions are very likely to need to be revised before they are perfect. Of course, if you have an accident or become suddenly ill, then you should contact me when you are feeling better and we can work out an arrangement for getting back on track.

If you would like to talk about time management, just let me know.

Health and Wellbeing

Studying engineering can be stressful and time-consuming, and success often depends on your personal health and wellbeing. Therefore, please don't assume that you need to sacrifice sleep, nutrition, and/or exercise to be successful. Sometimes, spending more time on schoolwork is not the only solution. Instead, there are ways to be more efficient with your time. There are also multiple resources on campus for dealing with stress, anxiety, personal problems, and more.

Center for Counseling & Psychological Health (umass.edu/counseling, Middlesex House, 413.545.2337)
Single Stop Resources (umass.studentlife/single-stop)
Office of Student Affairs (College of Engineering, Marston 126)
Community, Equity and Inclusion (CEI) Hub (College of Engineering, Marcus 128)

Accommodations

The University of Massachusetts Amherst is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with Disability Services (DS), you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements.

Disability Services (umass.edu/disability, 161 Whitmore, 413.545.0892)

Inclusivity

The diversity of the participants in this course is a valuable source of ideas, problem solving strategies, and engineering creativity. If you feel that your contribution is not being valued or respected for any reason, please speak with me privately. If I ever do something or say something that offends you in any way, please let me know. If you wish to communicate anonymously, you may do so in writing. You may also speak with Assistant Dean Paula Rees (rees@umass.edu, 413.545.6324, Marcus 128B which is within the CEI Hub located across from the coffee shop in the Guinness Student Center), or submit your concern through the College of Engineering Climate Concerns and Suggestions on-line form (<http://tinyurl.com/UMassEngineerClimate>). We are all members of an academic community with a shared responsibility to nurture a classroom environment in which all students and individuals are valued and where all ideas are treated with respect. (See below for ideas on how to act with kindness and respect.)

Pronouns and Names

Everyone will be addressed by the name and pronouns that they use for themselves. Please update yours on SPIRE, so that they will appear on my roster.

The Stonewall Center (umass.edu/stonewall, Crampton Hall, 413.545.4824)

Inclusive Restrooms (umass.edu/stonewall/campus-restrooms, and signs outside each restroom in CoE with the location of the nearest inclusive restroom)

What Are Your Pronouns? (umass.edu/stonewall/sites/default/files/pronouns_intro.pdf)

Title IX

Any conduct that has the purpose or effect of unreasonably interfering with an individual's performance by creating an intimidating, hostile, or sexually offensive academic environment is considered sexual harassment.

Title IX at UMass Amherst (umass.edu/titleix)

William Brady, Interim Title IX Coordinator (wdb Brady@umass.edu, 413.545.6204)

Confidential Resources: Center for Women & Community, UHS, CCPH, UMPD

Kindness and Respect

Please treat each other with kindness and respect. For instance...

- Encourage those around you to speak and contribute, especially if they seem reluctant to participate.
- Listen without interrupting. Ask questions to make sure you understand.
- Assume that others are doing their best.
- Give each other the benefit of the doubt.
- Pay attention to others. Learn their quirks and ways of thinking and doing.

- If someone is acting out of the ordinary (for them), reach out, ask how they are doing, and offer to help them. (And if they decline help, don't push too hard. For example, all you need to say is something like, "Let me know if you change your mind.")
- Unless you know someone very well, don't make fun of them.
- If you disagree with someone, respect their point-of-view. You might both be correct, in the sense that you might be using different starting points or different assumptions. Look for common ground and build from there. You both might learn something as a result.

Collaboration vs. Cheating

You are encouraged to work together, however, ultimately you must learn how to compute yourself, so do not rely too heavily on other students for help. You also may not work too closely with someone on the exercises and projects. In particular, you can brainstorm before you start programming, and you can compare results after you are finished, but you should not be sharing formulas or lines of code with each other. Occasionally, you might need or know a useful command or function, and you may collaborate. But the intent is that your script or spreadsheet is your own. It should reflect your own understanding and your own way of organizing the solution. If you need additional help, you should be asking me, not your classmates.

I will deal informally with most cases of academic dishonesty, however, I am required to report all cases, formal or informal, to the Academic Grievance Office. Note that the Academic Grievance Office is required, in turn, to inform the University administration if there are three or more reports of academic dishonesty regarding the same individual, who then decides if more serious disciplinary action is warranted.