

ChEE 205
Introduction to MatLab and Excel
Fall 20xx
University of Arizona

Instructor: Dr. Paul Blowers Dr. Byron Hempel
blowers@email.arizona.edu byronhempel@email.arizona.edu
128 Harshbarger 105D Harshbarger
Ph: 520-626-5319 Ph: 520-621-6055

Office Hours TBD

Lecture: Days/Time TBD Location TBD

Instructional Managers:

Instructional Managers TBD

These are the people you should contact if there is a problem with a quiz, if you have a technology issue, if there is an aspect of the course that you are having an issue with, and if you do not know where else to turn. They have created an email that they both will monitor, and it is: cheeinstructionalmanager205@gmail.com

Learning Assistants: **Office Hours TBD**

Assistants TBD

Course Description:

This course will introduce students to the fundamental principles of numerical computations and analyses through the use of MatLab and Excel, in particular Visual Basic applied in Excel. MATLAB can be used for math computations, modeling and simulations, data analysis and processing, visualization and graphics, and algorithm development. Excel can be used for linked calculations, graphing tools, pivot tables, and a macro programming language called Visual Basic for Applications. MatLab will comprise approximately two of the three credit units, and Excel/VBA will comprise approximately one of the three credit units. Skills learned in this course will aid students in understanding how to calculate various parameters of interest in complex engineer scenarios.

Texts: Required:

MatLab: A Practical Introduction to Programming and Problem Solving, 5th Ed. Stormy Attaway. Link: https://arizona-primo.hosted.exlibrisgroup.com/permalink/f/1h28lag/TN_els_book_whole9780128154793

Helpful optional resource for VBA:

https://arizona-primo.hosted.exlibrisgroup.com/permalink/f/1h28lag/TN_safari_s9781771370080

Additionally, course handouts will be available on the D2L course website.

Learning Outcomes:

Upon completion of this course, students will be able to:

- 1) estimate computational errors using computer applications to solve problems
- 2) develop Taylor series approximations for general functions
- 3) apply linear algebra techniques to solve systems of equations
- 4) apply root finding techniques for complex functions
- 5) write short computer programs for specific applications
- 6) integrate all of the above techniques with engineering problem solving

Other meta-concepts the students should be proficient at:

- 1) comfortably organize and present group material
- 2) identify and rectify group conflicts
- 3) identify personal difficulties during problem solving and to take corrective action

- 4) knowledgeably think of everyday examples programming and Excel can make your work easier
- 5) conceptually link levels of information and ideas in a problem-solving framework

Course Prerequisites:

The courses you must have taken before this course are:

MATH122B or MATH125. If you have not fulfilled the co- or prerequisite courses, you may be dropped from the course at the instructor's discretion since you may not succeed based on past student performance.

Important Dates to Keep in Mind:

A listing of all important drop and add dates is here: http://registrar.arizona.edu/dates-and-deadlines/view-dates?field_display_term_value=184 and here <https://catalog.arizona.edu/calendar/2018-2019-academic-calendar>

Course Grading Policy:

Pre-Class Activities and Pre-Quizzes (12.5% of grade):

Part of sophomore year in engineering is learning that spacing out your work with small pieces continually is a lot more effective than studying a whole lot at the last minute. This class is designed to build in pre-activities that allow you to be ready for what is going to happen when we meet. Doing these small pieces is very important to becoming a successful engineer.

Homework (25 % of grade)

Doing homework in small sections where you practice the skills taught in the pre-class and class activities will help you know what to focus on for exams and become successful on those. Homework is due at 5 pm on Friday to the d21 assignment box. If you are late, you can submit up until 11:59 pm on that day and will be penalized 10%. Only the last submission with all required files in that submission will be graded.

To eliminate confusion and difficulties in staying current, students will have 2 weeks from the date homework, quizzes, or exams are returned to discuss grading criteria and scores. After the time limit has passed, students will not be able to petition for changes. Additionally, students who do their homework with a team are responsible for knowing their score and retaining copies of the scored coversheet for their records. On the final exam, students will have 1 week into the new semester to petition on final grading scores.

Group Presentation: (equivalent to two HW grades):

Employers routinely ask students if they have given a presentation when they are interviewing for internships or permanent employment. Each week, a team will give a presentation on some part of Excel/VBA/MatLab programming and will be evaluated by their peers on their ability to give a good presentation that has elements that are rewarded in industry. A grading rubric will be available that details exactly what a good presentation should contain. The presentation topic is described in the week one materials for group 1 presenting next week. The group should cover those topics, plus one useful Excel shortcut/tip. The presentation should also have students do an activity that helps them understand the material.

Presentation: 50% of this HW

Peer review by team: 25% of this HW

Peer review by class: 25% of this HW

Exam (two midterm exams, 20 % of grade total).

Tests are a way of demonstrating to yourself and the professor that you have mastered the objectives of the class and will be able to use what you have learned when you go out into your future career. The in-class exam is **comprehensive** and is scheduled for the eighth week of class. Because all of the work in this class is in Excel, VBA and MatLab, you will need to have a computer you are familiar with using in class on the days of the midterm exams. You will be expected to download an Excel file that has data, instructions, and details about what you are answering and to work on that in class and then submit to the dropbox as this will simulate how you will function in the workplace. You are allowed any resources you have on your computer, including notes you made to yourself, old homework files, etc. If you do not have a laptop you routinely use for homework and solve the problems for class, you can borrow one for free from the library. If you will be doing this, you should begin borrowing from the library, testing out what those computers can and cannot do, how you enable the tools you need to use on a computer that is wiped clean each night, and the mousepad/keyboard. You do not want to be slowed down by an unfamiliar computer on the day of the exam. Because you know this is coming, it is your responsibility to practice and make sure you can use the tool(s) you will have on the midterm exams. The same rules will apply for the final exam. If

you are borrowing a computer from the library, they are available from the Main Library, Engineering Library, and Fine Arts Libraries and can typically be checked out for 3-day periods so you can practice with the same computer for a few days before each exam. Remember to charge your computer the night before or throughout the day as access to electricity may not be possible during the exam.

During the exam, you will be expected to download the exams from D2L, which will be in Excel, with one problem per sheet. You will then work on and answer those questions, clearly putting your answers into the cells provided that are highlighted in yellow near the question statements. The exams will test you only on material you should be able to do in a reasonable amount of time and are based on the content you have received graded homework back on. A sample midterm will be available in D2L at least one week before the exam so you can practice with the format and your computer, or the one you borrow from the library. The instructor/preceptors will remind students 2 weeks before the exam, one week before the exam, and the day before the exam on the rules and that you MUST have a computer to solve the exam on that you are comfortable with.

Make-up exam: A make-up exam may be arranged if you notify the instructor before the regularly scheduled exam. A make-up exam will be scheduled only if the student has a valid reason for missing the regularly scheduled exam. Verifiable illness with notification from the emergency dean or family emergencies are valid reasons for missing an exam.

Project: (small pieces will be submitted as homework, but the final technical memo will be 10%):

Most programming is learned best in context of a real-world problem that has to be solved. We will be using a combination of Excel tools, VBA and MatLab to break the data analysis up and to create a program that can achieve a specific goal, with small pieces being due every week or so. The project will be due on the last day of classes before Dead Day.

Final exam: (20 % of grade).

A comprehensive final will be given during the scheduled period during finals.

Attendance: (12.5% of grade)

Showing up and participating in class is important for student success. While you might not have had to show up in high school or some freshmen year classes and still gotten an A, those times are about over. You will be rewarded for showing up and participating with this portion of the grade. At the end of group presentations (discussed later in this document), teams will evaluate the audience for their ability to pay attention and remain respectful. Their rating will be used to set a score for the class. The first two weeks will be done without the grades being recorded to explore what being a good audience means so that students will not be penalized until they know the qualities that teams notice.

Grading Policy:

Letter grades on exams or assignments will not be determined; a final letter grade will be given at the end of the semester instead. This course will be graded on a straight scale as follows:

<u>Total percentage of points earned</u>	<u>Final Grade</u>
90 - 100 %	A
77 – 89.9 %	B
65 – 76.9 %	C
52 – 64.9 %	D
<52.9%	E

Course Lectures and Policies:

This class uses an active learning environment and attendance is not optional for students to be able to learn the material. A variety of measures will be used to ensure students are in class and excuses are not accepted unless they are substantiated by documented and verifiable methods. Some of the methods that will be used to verify attendance include submission of homework, submission of extra credit assignments in class, and visual inspection of the classroom. The instructor will know all student names and recognize students by the end of the third week of class so students are expected to be present at all times during class. Please note that the campus health center does not verify illnesses so other means must be used. The instructor will work with students to meet this requirement with email prior to class absenteeism.

SALT Center: Students who are able to use the services of the Strategic Alternatives Technology Center or may have other educational needs may see the professor at any time to discuss accommodations for their needs. However, this should be done at least 1 week prior to the first exam to allow for preparations that may be needed.

Standards for Homework Problems and Quizzes:

1. Briefly restate the problem using a sketch or diagram where appropriate. Label the sketch or diagram with all quantities involved.
2. Indicate the basis you select and indicate any change of basis within the problem. State assumptions.
3. Include both the numerical value and units for all quantities involved, including intermediate results.
4. Answers should be circled or otherwise marked and reported to an appropriate number of significant digits.
5. Values obtained from a handbook or other reference should be accompanied by a citation. For example:

CCl₄ boiling pt. 76.5 °C (CRC, pg C-373)

6. Show how you have checked your work if appropriate.
7. Be clear and concise when writing answers to questions.

Standards for Style and Presentation of Problem Sets

1. All assignments are to be submitted on 8.5 x 11 inch paper with writing on one side only. Multiple pages must be stapled together. Unlined paper may be used if the work is done neatly. Handwriting must be legible.
2. Each page must have the student's name, the course number and the page number in the upper right-hand corner.

Substandard work will result in a loss of credit.

Plagiarism: Although this course is not writing intensive, plagiarism is strongly discouraged. The plagiarism policies within the Student Code of Academic Integrity will be strictly followed:
<http://doc.web.arizona.edu/uapolicies>.

Threatening Behavior: The general policies against threatening behavior by students will be followed:
<http://policy.web.arizona.edu/~policy/threaten.shtml>

Required Extracurricular Activities: none

Special Materials Required for the Class: It is expected that you will have an electronic device for evaluating group presentations when we meet in class each week. The survey will work on any smart-device or laptop. We will also be coding, testing Excel, and doing activities that will be most useful if you have Excel on your computer. You will be able to work with other students on the in class activities, but you'll learn more if you have your own device. If you do not have a portable device, the library system will allow you to check out devices for use for free.

Changes to the Syllabus: The information contained in the course syllabus, other than the grade and absence policies may be subject to change with reasonable advanced notice as deemed appropriate by the instructor.

ChEE 205 Fall Class Schedule (subject to change - check website for updates):

Week	Date	Reading Due	PLQ	Homework / Group Presenting	Topics
1	XX/XX	None			No Class
	XX/XX	None			Class Start – Team Formation – MatLab, Excel and VBA
	XX/XX	Intro to class	PLQ 1	Resume	Resumes, Start of Project, Importing Data into Excel
2	XX/XX	Sections 1.1-1.3	PLQ 2		Ch 1: Intro to MatLab
	XX/XX	Sections 1.4-1.6	PLQ 3		Ch 1: Intro to MatLab
	XX/XX	Sections 2.1-2.2	PLQ 4	HW1	Ch 2: Vectors and Matrices
3	XX/XX	None			Labor Day - No classes
	XX/XX	Sections 2.3-2.4	PLQ5		Ch 2: Vectors and Matrices
	XX/XX	Sections 2.5	PLQ6	HW2	Ch 2: Vectors and Matrices
4	XX/XX	Sections 3.1-3.2	PLQ7		Ch 3: Introduction to MatLab Programming: Algorithms and Scripts
	XX/XX	Sections 3.3-3.4	PLQ8		Ch 3: Introduction to MatLab Programming: Input/output
	XX/XX	Sections 3.5-3.6	PLQ9	HW3	Ch 3: Introduction to MatLab Programming: Simple Plots
5	XX/XX	Sections 3.7-3.9	PLQ10	Resume	Ch 3: Introduction to MatLab Programming: Commands and Functions
	XX/XX	Sections 4.1-4.2	PLQ11		Ch 4: Selection Statements: if and if-else Statements
	XX/XX	Section 4.3	PLQ12	HW4	Ch 4: Selection Statements: nested if-else
6	XX/XX	Section 4.4	PLQ13		Ch 4: Selection Statements: Switch Statement
	XX/XX	Section 4.5	PLQ14		Ch 4: Selection Statements: “is” Functions
	XX/XX	Section 5.1	PLQ15	HW5	Ch 5: Loop Statement and Vectorizing Code
7	XX/XX	Section 5.2	PLQ16		Ch 5: Loop Statement and Vectorizing Code
	XX/XX	Section 5.3	PLQ17		Ch 5: Loop Statement and Vectorizing Code
	XX/XX	Section 5.4	PLQ18	HW6	Ch 5: Loop Statement and Vectorizing Code
8	XX/XX	None			Ch 1-5 Combination

	XX/XX	None			Review for Midterm
	XX/XX	None			Midterm
9	XX/XX	None			Questions about ChEE or EnvE B.S. Programs for Lori
	XX/XX	Sections 6.1-6.2	PLQ 20		Ch 6: MATLAB Programs: User-defined functions and organization
	XX/XX	Sections 6.3-6.4	PLQ 21		Ch 6: MATLAB Programs: Menus and Variable Scope
10	XX/XX	Section 6.5	PLQ 22		Ch 6: MATLAB Programs: Debugging
	XX/XX	Sections 7.1-7.2	PLQ 23		Ch 7: String Manipulation: Operations on Text
	XX/XX	Section 7.3	PLQ 24	HW7	Ch 7: String Manipulation: "is" for Text
11	XX/XX	Section 8.1	PLQ 25		Ch 8: Data Structures: Cell Arrays
	XX/XX	Section 8.2	PLQ 26		Ch 8: Data Structures: Structures
	XX/XX	Section 9.4	PLQ 27	HW8	Ch 9: Data Transfer: Data Transfer from Websites
12	XX/XX	Sections 10.1-10.2	PLQ 28		Ch 10: Advanced Functions: Variable Numbers and Nested Functions
	XX/XX	None			Veterans Day - No classes
	XX/XX	Sections 11.1-11.2	PLQ 29	HW9	Ch 11: Introduction to Object-Oriented Programming and Graphics
13	XX/XX	Sections 12.1-12.3	PLQ 30		Chapter 12: Advanced Plotting Techniques: Custom Plots
	XX/XX	Sections 12.4-12.5	PLQ 31		Chapter 12: Advanced Plotting Techniques: Plot Applications
	XX/XX	Section 14.1	PLQ 32	HW10	Ch 14: Advanced Mathematics: Stats
14	XX/XX	Section 14.3	PLQ 33		Ch 14: Advanced Mathematics: Fitting Curves to Data
	XX/XX	Section 14.4	PLQ 34	HW 11	Ch 14: Advanced Mathematics: Complex Numbers
	XX/XX	None			Thanksgiving Holiday - No classes
15	XX/XX	Section 14.5	PLQ 35		Ch 14: Advanced Mathematics: Matrix Solutions to SOLAE
	XX/XX	Section 14.6	PLQ 36		Ch 14: Advanced Mathematics: Symbolic Mathematics
	XX/XX	Section 14.7	PLQ 37	HW 12	Ch 14: Advanced Mathematics: Integration and Differentiation
16	XX/XX	None			Review for Final Exam & Course Evaluations
	XX/XX	None			Review for Final Exam & Course Evaluations

Areas of Focus for Excel and VBA

As the course primarily focuses on MatLab, the following chapters from our MatLab book will have additional materials over Excel and VBA, noted with an “X”:

Chapter	Excel	VBA
1		
2		
3	X	X
4	X	X
5		X
6		X
7		
8	X	
9	X	X
10		
11		X
12	X	X
14	X	X

Discussion Session Projects

The class meetings will involve different teams of students who will present a targeting topic to the class. A grading rubric is available online and will be used to assign scores and students should try to structure their talk to earn as many points as possible. The group will typically present on at least one topic that is on a homework assignment due later on in the week.

Group duties may be divided among the students as they see fit, as long as each person contributes something to the finished presentation. Possible tasks that can be divided up are: group presenter, developer of a hand out, fielding questions during the presentation, creation of supplementary material, general preparation, etc. Students are encouraged to be creative while keeping their presentation to approximately 15 minutes in length.

The objectives of the presentations are to:

- 1) learn how to use the strengths within your group to produce a finished product
- 2) become more comfortable and capable of giving good presentations
- 3) learn how to apply computer methods more successfully
- 4) learn how other students approach topics
- 5) learn how to ask and respond to verbal questions

This is not meant to be a high stress event, but it is designed to help you develop strong presentation skills and teamwork skills that will be asked about in future presentations.

Grading: The class will use an online survey tool to assign scores in the five minutes after the presentation and those submissions of peer ratings will make up the record of attendance for class participation. Teammates will evaluate each other on a teamwork rating rubric as another measure for evaluation. One-quarter of the presentation grade will be the group grade while 1/2 will be from the team peer evaluations. After completion of the presentations, the team should review the recording of their presentation and then rate themselves, as a team, giving the score they felt they earned. This self-evaluation will be submitted along with an explanation of 2 concrete things the team could have done differently to improve their score, and is due at the beginning of class in the next class meeting after their presentation. This part of the team project will make up ¼ of the presentation grade. This set of exercises is teaching the skill of self-reflection for improvement.