CAAM 210: Introduction to Engineering Computation - Fall 2018

Contact Information:

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Course Information:

Lectures: MW 1:00 - 1:50 PM, Keck Hall 100
Labs: R 6:00 - 6:50 PM or F 1:00 - 1:50 PM, locations individually assigned
Rice Learning Assistants RLAs: Zhuoyuan Xu, Jack Trouvé, Taka Iida, Johann Gann, Sarah Cao, Raymond Lau, Blaine Schmidt, Kevin Peng, Victor Gonzalez, Natalie Pippolo, Sean Hart, Adam Subel, Jose Morales-Wade, Duncan Salmon

Course Description:

Overview: This course serves as a reasonably fast-paced and intense introduction to mathematical and scientific computing via MATLAB. Programming concepts may include: variables, programming arithmetic, if-else statements, while and for loops, arrays and matrices, cells, and data management. Mathematical concepts may include: finding roots via bisection method and Newton's method, continuous optimization, bridge-load modeling, Monte Carlo methods and the Metropolis algorithm, population model via ODE, graph and biograph visualization, solving combinatorial graph problems by graph algorithms and integer programming, basics of graph theory, machine learning and shape analysis, and evolutionary game theory and the prisoner's dilemma. At any time questions are welcome and encouraged.

Course Objectives and Learning Outcomes: Among the goals of this course are for students to

- develop MATLAB programming skills; easily translate between English and mathematics; identify appropriate numerical methods to aid in the solution of a problem; be able to successfully produce graphs and other visuals to help present results;
- take real-world problems and be able to successfully develop and design code via MATLAB to compute a solution;
- develop the necessary fortitude to persevere through difficult projects (particularly the debugging) from beginning to end;
- improve problem solving skills and abstract thought

Textbook and Materials: There is no required textbook for this class. All material will be distributed in class meetings or on the course website on Canvas.
All students are required to have a fully functional copy of MATLAB with the "*Optimization*" toolbox (other toolboxes may be used, but will be optional and announced in advance). Rice University provides MATLAB to all students for free. To obtain your copy go to https://kb.rice.edu/page.php?id=74615 and follow the instructions.

Assignments: Students are expected to complete weekly MATLAB projects where they will be required to translate written instructions into a MATLAB program that will produce the desired output. *Every assignment is pledged to some degree, it is the student's responsibility to understand what assistance is allowed for each assignment.* (see below for more details). If there are any questions, ask! There will be three "fully pledged" assignments where no assistance from others can be used (though students may use any notes or references). For the other assignments, *students are allowed and encouraged to compose and troubleshoot with one another, but each student is required to write, document, understand, and submit his or her work.* In all cases, you are required to follow the guidelines set forth in the Honor Code section.

Assignment Procedure: For each MATLAB project students are expected to submit a lab report with the following format:

```
First Name Last Name, CAAM 210, Fall 2018, Lab #
file name
program description
program usage instruction
program usage example
```

This report should consist of a single pdf containing a copy of the code, a list of commands written in the command window, and each of the figures the code generated. The reports should be uploaded to the course Canvas page. IN ADDITION, students should upload all .m files used for the project. (For questions in quizzes, submitting a pdf file is sufficient.)
Each project will have a submission deadline. Labs may be submitted up to two days beyond their due date, with penalties in increments of 10% beginning at 0%. For example, the third late submission would incur a 20% penalty. Note that this means you get one late submission for "free." Projects submitted later than two days beyond the posted due date will not be accepted without a valid written excuse. There will be NO extension for the deadline of quizzes!

Be forewarned that some of the assignments are cumulative in nature. That is, a few of the assignments require knowledge or use of assignments from the previous weeks. The solutions to previous lab projects will NOT be given out in this course. Therefore, failing to complete an assignment by the due date does not excuse a student from the material if it is needed for a subsequent project.

Grade Policies The grade for this class will be broken down as follows: Unpledged labs (50%), Pledged labs (30%), Quizzes (10%), RLA session attendance and participation (10%). While assignments may be worth different point totals, all recorded grades will be based on percentages (i.e. not points) unless otherwise stated in advance. Please see the table below to determine how letter grades will be assigned for this course. Note that grades will not automatically be rounded up, meaning that (as an example) an 89.9 will be considered a B+.

	A	B	C	D
+	100			
	99	89	79	69
	98	88	78	68
	97	87	77	67
	96	86	76	66
	95	85	75	65
	94	84	74	64
	93	83	73	63
-	92	82	72	62
	91	81	71	61
	90	80	70	60

Absence Policy: Except for extreme circumstances, no extensions or exemptions will be granted on projects or lab attendance. Keep in mind that attendance at lab sessions comprises 10% of the final grade for this course. It is the student's responsibility to foresee any obstacles in completing the assignments and complete them ahead of time. If a student cannot attend the lab session on a regular basis, he or she should not take the course. In the event of an excused absence or emergency situation, please communicate with your instructor and RLA as soon as possible.

Rice Honor Code: In this course, all students will be held to the standards of the Rice Honor Code, a code that you pledged to honor when you matriculated at this institution. If you are unfamiliar with the details of this code and how it is administered, you should consult the Honor System Handbook at `http://honor.rice.edu/honor-system-handbook/`. This handbook outlines the University's expectations for the integrity of your academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process.

Unpledged Projects: On unpledged assignments students are strongly encouraged to work in groups and collaborate with other students in the course. However, students are expected to write, document, understand, and submit their own work. *At no point will copying and pasting the code of others be accepted or tolerated*. Furthermore, in all cases, students should only submit work they fully understand. Students are free to consult any generic sources for help (i.e., class notes, MathWorks help pages, video tutorial websites, etc); however, students are not allowed to consult any person not affiliated with the course (i.e., anyone other than students, TAs, RLAs, or the instructor), including external tutors, without express permission from the instructor.

Quizzes and Pledged Projects: Students may complete the quizzes and pledged projects with any aids or references they wish to use, excepting classmates, TAs, RLAs, etc. In short, students are expected to do so without collaboration.

Disability Resource Center: If you have a documented disability that may affect academic performance, you should: 1) make sure this documentation is on file with Disability Resource Center (Allen Center, Room 111 / `adarice@rice.edu` / x5841) to determine the accommodations you need; and 2) meet with me to discuss your accommodation needs.

Tentative Weekly Schedule: The following schedule is intended to give a general idea of the progression of the course. The topics for each week are tentative and subject to change with advance notice. Each week will follow the general format of a mathematical lecture on Monday, computational lecture on Wednesday, RLA session on Thursday/Friday, labs due on Sunday. Please see `https://registrar.rice.edu/calendars/fall18` for a more thorough list of University-wide important dates.

Week 1: August 20th - 24th	Introduction to MATLAB
Week 2: August 27th - 31st	Introduction to MATLAB
Week 3: September 3rd - 7th (No class Monday)	**Lab 1:** Finding roots of real-valued functions
Week 4: September 10th - 14th	**Lab 2:** Complex Newton's method
Week 5: September 17th - 21st	**Lab 3:** Optimization and Simulated Annealing
Week 6: September 24th - 28th	**Lab 4:** Kaprekar's Constnat (pledged)
Week 7: October 1st - 5th	**Lab 5:** Bridge I
Week 8: October 8th - 12th (No class Monday)	**Lab 6:** Financial Simulator
Week 9: October 15th - 19th	**Lab 7:** Population model
Week 10: October 22nd - 27th	**Lab 8:** Cryptography (pledged)
Week 11: October 29th - November 2nd	**Lab 9:** Minimum Spanning Tree
Week 12: November 5th - 9th	**Lab 10:** Social Networks
Week 13: November 12th - 16th	**Lab 11:** Shape Analysis of Curves
Week 14: November 19th - 23rd (No class Thursday/Friday)	No Lab or RLA sessions.
Week 15: November 26th - 30th	**Lab 12:** Evolutionary Game Theory (pledged)

This Syllabus is Subject to Change.