# Course Syllabus

**AMS10: Mathematical Methods for Engineers I**

*"Essentially, all models are wrong, but some are useful."--- Box, George E. P.; Norman R. Draper (1987). Empirical Model-Building and Response Surfaces, p. 424, Wiley. ISBN 0471810339*

Fall 2018
Thim lecture 003
TuTh 9:50am-11:25am
Sept 27, 2018-Dec 7, 2018


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Office Hours: Tuesdays 3:30-5pm or by appointment

**I. Description:**
Applications-oriented course on complex numbers and linear algebra integrating Matlab as a computational support tool. Introduction to complex algebra. Vectors, bases and transformations, matrix algebra, solutions of linear systems, inverses and determinants, eigenvalues and eigenvectors, and geometric transformations.

**II. Course Aims and Outcomes:**
***Aims***
Understand basic principle concepts in linear algebra.

***Specific Learning Outcomes:***
By the end of this course, students will have learned how to solve linear systems of equations, calculate eigenvalues and eigenvectors of matrices, be able to interpret results, and understand properties of matrices and their implications. Students will also be able to verify answers using Matlab.

**III. Homework:**
Weekly homework will be due Fridays at 5pm starting the second week of instruction. Homework will be posted online https://glab.soe.ucsc.edu/ams10f18 and is to be submitted electronically using Canvas. Please insure a complete and correct submission *before* the deadline. Corrupt or blank uploads will receive no credit. A maximum of three late homework sets are accepted no questions asked to accommodate any unusual circumstances. Exceptional approval from the undergraduate/graduate office or the Disability Resource Center is required for any additional accommodations. Late homework must be turned in within a week of the due date. HW will be graded for completion. HW scores will be posted but HW will not be returned so please retain a copy. Solutions will be posted for your reference.

**IV. Quizzes:** There will be weekly in class quizzes. Quizzes will take place in the beginning of Thursday's lecture and will be administered and submitted through canvas. You are responsible for bringing a smart device or laptop to take the quiz. If you do not have such a device, laptops can be borrowed by all from the library or the EOP office if you are an eligible student. Lowest quiz score will be dropped if a course evaluation is submitted. Picture of evaluation completion page with student ID needs to be submitted via Canvas before posted deadline.

**V. Course Requirements:**

**1.** Class attendance and participation policy: Attendance is not enforced but in class participation will compose 5% of your grade (See section **5**).

**2.** Section attendance and participation policy: Section attendance is encouraged. Sections will be used to help students navigate through assigned homework and Matlab exercises, thereby, reducing time students spend completing HW.

**3.** Recommended text: David C. Lay, *Linear Algebra and Its Applications,* fourth edition. This book will be on reserve for 2hr loan periods at the Science and Engineering Library. It can also be rented on Amazon for a nominal fee. Homework questions will **not** be assigned directly from the book so the book edition can vary. Additional free online references will be posted on the course website. You are expected to use a suggested resource or one of your choice to supplement lectures.

**4.** Assignments: 8 HWs, 1 midterm, 1 final

**5. Top Hat**

We will be using the Top Hat (www.tophat.com) classroom response system in class. You will be able to submit answers to in-class questions using Apple or Android smartphones and tablets, laptops, or through text message.

You can visit the Top Hat Overview (https://success.tophat.com/s/article/Student-Top-Hat-Overview-and-Getting-Started-Guide) within the Top Hat Success Center which outlines how you will register for a Top Hat account, as well as providing a brief overview to get you up and running on the system.

An email invitation will be sent to you by email, but if don't receive this email, you can register by simply visiting our course website: https://app.tophat.com/e/516850
Note: our Course Join Code is 516850

Top Hat will require a paid subscription, and a full breakdown of all subscription options available can be found here: www.tophat.com/pricing.

Should you require assistance with Top Hat at any time, due to the fact that they require specific user information to troubleshoot these issues, please contact their Support Team directly by way of email (support@tophat.com), the in app support button, or by calling 1-888-663-5491.

**VI. Grading Procedures:**

**(a) Homework** (10%)
**(b) Weekly quizzes** (25%)
**(c) Midterm** (30%)
**(d) Final** (30%)
**(e) TopHat activity** (10%)

Note that the percentages add to 105% and so there is an opportunity for extra credit with in class participation.

**VII. Academic Integrity**
No student shall take unfair advantage over any other student. If a situation is unclear please consult me.

You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting"

help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e-mail, an e-mail attachment file, a diskette, or a hard copy.

Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Repeated violations may result in failure of the course and University disciplinary action.

During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam and may lead to failure of the course and University disciplinary action.

**VIII. Accommodations for students with disabilities**

UC Santa Cruz is committed to creating an academic environment that supports its diverse student body. If you are a student with a disability who requires accommodations to achieve equal access in this course, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to me privately during my office hours or by appointment, preferably within the first two weeks of the quarter but no later than Oct 30th. At this time, I would also like us to discuss ways we can ensure your full participation in the course. I encourage all students who may benefit from learning more about DRC services to contact DRC by phone at 831-459-2089, or by email at drc@ucsc.edu.

**IX. Inclusivity Statement.**

We understand that our members represent a rich variety of backgrounds and perspectives. UCSC is committed to providing an atmosphere for learning that respects diversity. While working together to build this community we ask all members to:

- share their unique experiences, values and beliefs
- be open to the views of others
- honor the uniqueness of their colleagues
- appreciate the opportunity that we have to learn from each other in this community
- value each other's opinions and communicate in a respectful manner
- keep confidential discussions that the community has of a personal (or professional) nature
- use this opportunity together to discuss ways in which we can create an inclusive environment in this course and across the university community

**X. Tentative Course Schedule: (*subject to change*)**

| Week # | Topics | Assignment |
|---|---|---|
| **Week 1** | • Vector algebra<br>• Complex numbers<br>• Complex exponentials<br>• Complex roots | Enroll in TopHat |
| **Week 2** | • Systems of linear equations<br>• Existence of solutions<br>• Method for solving linear systems: elementary row operations and reduced row echelon form | HW #1 due |
| **Week 3** | • Linear systems as a Matrix-vector multiplication.<br>• Matrix Algebra (including inverse, | HW #2 due |

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| | determinant)<br>• 2nd Method for solving linear systems: using inverse for non-singular matrix | |
| **Week 4** | • Linear systems as linear combinations of vectors<br>• Span of a set of vectors<br>• Introduce concept of basis and subspace<br>• Concepts in linear dependence/independence of vector sets | HW #3 due |
| **Week 5**<br>In class: **Midterm Nov. 1st** | • Introduce concept of subspace Rank-nullity theorem and its relevance to linear dependence/independence of columns<br>• Introduction to the concept of kernels and images for matrices | HW #4 due |
| **Week 6** | • Matrices as operators<br>• Transformations<br>• Introduce concept of eigenvalues and eigenvectors | |
| **Week 7** | • Relating eigenvalues and eigenvectors back to previous concepts.<br>• What does it mean for a matrix to have an inverse and relation to rank and determinant. | HW #5 due |
| **Week 8** | • Calculating eigenvalues<br>• Calculating eigenvectors | HW #6 due |
| **Week 9** | • Diagonalization of matrices<br>• Orthogonal basis | HW #7 due |
| **Week 10** | • Vector projections and least squares problem<br>• Final exam review | HW #8 due |
| **Week 11**<br>**Final Exam**: Wednesday, Dec 12, 12-3pm | | |