Syllabus for AMS 27
Mathematical Methods for Engineers, Fall 2006

Jorge Cortés

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This is the syllabus for AMS 27 - Mathematical Methods for Engineers, Fall 2006. The course provides the mathematical background for several engineering courses. The content includes linear algebra, ordinary differential equations, and Laplace Transform methods. Concurrent enrollment in course 27L is required.

The core topics of the course are

1. Linear systems and matrices
2. Determinants, eigenvalues and eigenvectors
3. Solution of algebraic linear systems
4. First-order differential equations
5. Higher-order linear differential equations
6. Linear systems of ordinary differential equations
7. Laplace transform solution of ordinary differential equations

Instructor

Jorge Cortés, `jcortes at ucsc.edu`. Office at Baskin Engineering, #147

Teaching assistants

Adrienne Traxler, `atraxler at soe.ucsc.edu`. Office at Baskin Engineering, #142

Bahador Amiri, `bamiri at soe.ucsc.edu`. Office at Engineering Building 2, #258

MSI Learning Assistant

Ben Samuel, `bsamuel@ucsc.edu`

Course Objectives

By the end of the course, you should have the following skills:

1. Knowledge of the rules of matrix algebra
2. Ability to solve simple problems in linear algebra
3. Ability to solve simple ordinary differential equations
4. Familiarity with more advanced methods, such as the Laplace Transform.
5. Ability to use MATLAB at an elementary level (AMS27L)
6. Solve mathematical problems set from the content of AMS27 using MATLAB (AMS27L)

Text

C. H. Edwards and E. Penney. *Differential Equations and Linear Algebra.* Prentice Hall, New Jersey, 2nd edition, 2005.

Additional texts

D. Lay. *Linear Algebra and its applications*, Addison Wesley, 3rd edition, 2003.

C. D. Meyer. *Matrix Analysis and Applied Linear Algebra*, SIAM, Philadelphia, PA, 2001. Available online at http://www.matrixanalysis.com

E. Kreyszig. *Advanced Engineering Mathematics*. John Wiley & Sons, New York, 8th edition, 1999.

Calendar (this version: November 16, 2006)

The following calendar is tentative. Changes will be conveniently announced in the webpage.

Date	Topics	Reading	*Tests & Deadlines*
(1st wk) Sep 21	Syllabus and intro	Chap. 1.1, 2.1, 3.1	
(2nd wk) Sep 26 Sep 28	Matrix operations	Chap. 3.2, 3.3 Chap. 3.4, 3.5	
(3rd wk) Oct 3 Oct 5	Determinants Vector spaces	Chap. 3.6 Chap. 4.1, 4.2, 4.3	*Hmwk #1 due* *Lab assign #1 due*
(4th wk) Oct 10 Oct 12	Eigenvalues & eigenvectors	Chap. 4.4, 4.6 Chap. 6.1, 6.2, 6.3	*Hmwk #2 due*
(5th wk) Oct 17 Oct 19	First-order diff. equations	Chap. 1.2, 1.3, 1.4 Chap. 1.5, 1.6	*Hmwk #3 due* *Lab assign #2 due*
(6th wk) Oct 24	Review		*Hmwk #4 due*
End Part I			
Midterm			*Thursday, October 26 (in class)*
(7th wk) Oct 31 Nov 2	High-order linear diff. equations	Chap. 5.1, 5.2 Chap. 5.3, 5.4	
(8th wk) Nov 7 Nov 9	Linear systems of diff. equations	Chap. 5.5, 5.6 Chap. 7.1, 7.2, 7.3	*Hmwk #5 due* *Lab assign #3 due*
(9th wk) Nov 14 Nov 16	Matrix exp. methods	Chap. 7.5 Chap 8.1, 8.2	*Hmwk #6 due*
(10th wk) Nov 21 Nov 23	Laplace Transform No class	Chap 10.1, 10.2, 10.3 Thanksgiving holiday	*Lab assign #4 due on 11/27*
(11th wk) Nov 28 Nov 30	Review	Chap. 10.4, 10.5	*Hmwk #7 due* *Hmwk #8 due*
End Part II			
Final			*Monday, December 4 12:00pm - 3:00pm*

Read the sections to be covered in lecture **before** you come to class. Reading material will be assumed known during the following lecture.

The material that you have learned in previous calculus courses (e.g., Math11A&B, MATH19A&B) will be frequently used in this class, and it is of course assumed you have mastered it. In particular, basic knowledge on continuity, derivatives, polynomial factorization, first-order differential equations and integration will appear throughout the course.

Homework

There will be a set of homework problems per week taken from the main text. The homework will be collected and returned by your TA. If you are enrolled in Adrienne's section, then your homework is due at your section. If you are enrolled in Bahador's section, then the homework is due in class on Thursdays, at 10:00am (be punctual, as Bahador will be there to collect them, and then he will leave). Your TA is your contact in turning in and getting back homework. Homework assignments are due weekly (specific dates for your reference are included in the calendar above). No late homework will be accepted.

Homework MUST be stapled and MUST be written legibly and in logical order. You MUST include your name (print it!), your ID #, the assignment, and the section on the first page of your homework. Graders will be instructed to reject homework that does not meet the above criteria.

You are encouraged to ask questions about homework problems in discussion section. You are encouraged to work in groups on homework problems but each student MUST turn in homework separately.

As in any math course, a lot of work is required to master the material. Studying two hours a day outside class is strongly advised to succeed in the course.

Sections

Sections are not optional. They are part of the requirements to pass this course and attending them is paramount to getting a satisfactory result. There will be a quiz during each section. The quizzes will count toward the final grade. They also provide you with the opportunity to know how well you are doing in the course. There will be no make-up quizzes. Discussion sections start the second week of classes.

Laboratory

You have to enroll in AMS27L (L stands for Laboratory) concurrently with AMS27. There will be four assignments for the lab, due on the Friday of the 3rd, 5th, 8th and 10th weeks of the course, respectively. **The assignments should be emailed or handed to Adrienne**, at `atraxler at soe.ucsc.edu`. ***All assignments have to be completed on time to obtain a passing grade in the course***. You can download them from the webpage (one suggestion: first, read all the assignments, trying to understand how the Matlab commands work; once you have read them all, start working on the exercises incrementally). You can find a downloadable quick introduction to Matlab in the webpage.

Matlab is also available on the Instructional Computing (IC) Virtual Lab, check out `http://ic.ucsc.edu/services/virtual_computer_labs/`. According to IC,

> Virtual Lab allows students and faculty the ability to remotely connect to a Windows desktop and run applications. It requires the installation of a simple client and an internet connection (broadband is preferred, but not required). This allows students and faculty to run class applications from home, from their dorm room, over CruzNet, or anywhere they have computing resources and an internet connection. This is an experimental service and IC would like feedback on usability or problems. Please direct all Virtual Lab feedback to ic@ucsc.edu

Grading policy

Homework: 15% Lab: 15% Quizzes: 10% Midterm: 30% Final: 30%

In exceptional cases, I reserve the right to give extra points for excellent performance on the midterm and final. Please do not count on it as a way to avoid doing the other assignments.

Official solutions to the midterm and final exam will be posted online.

WebCT

Your grades will be available to you via WebCT. Check out `http://ic.ucsc.edu/docs/webct/students.shtml` for instructions on how to register and log in.

Academic honesty

No form of academic dishonesty will be tolerated. For the definition of academic dishonesty and its (ominous) consequences refer to the UCSC General Catalogue 2006-2008.

Room location and hours

Lectures take place at Kresge, classroom 327, Tuesdays and Thursdays, from 10:00am to 11:45am.

Discussion sections take place at

AMS-27-01A at Baskin Engineering, room 372, on Tuesdays, from 12:30pm to 1:40pm (Bahador)

AMS-27-01B at Engineering 2, room 194, on Thursdays, from 6:00pm to 7:10pm (Adrienne)

Laboratory sections take place at

AMS-27L-01 at Baskin Engineering, room 109, on Wednesdays, from 4:00pm to 6:00pm (Bahador)

AMS-27L-02 at Baskin Engineering, room 109, on Fridays, from 10:00am to 12:00pm (Adrienne)

There is also **Modified Supplemental Instruction (MSI)** Support available for this class. Check the webpage or contact the learning assistant Ben Samuel at bsamuel at ucsc.edu for more information.

Office hours

Instructor: Mondays, from 5:15pm to 6:15pm at Baskin Engineering, #147. Please, send me email describing the problem before coming to office hours, and be prepared to show attempts at solving the problem.

If you have any questions about the course, please send me email. I will try to respond as quickly as possible. Additionally, I will share questions that are particularly good (and their answers) with the rest of the class by broadcasting my answer to the entire class.

Teaching assistants:

- Adrienne on Wednesdays, from 4:00pm to 5:00pm, at Baskin Engineering, #142
- Bahador on Wednesdays, from 2:00pm to 3:00pm, at Engineering Building 2, #258

Course webpage

http://www.soe.ucsc.edu/classes/ams027/Fall06/

The webpage contains this syllabus, a calendar, and the list of homework due. Please check it periodically for updates and other announcements related to the course.

Protected material (if any) can accessed using the login ams27 and a password that will be provided in class.

A final word of advise

Use all the resources you are given to learn and understand the material of the course! Read the book before attending the lectures, do the homework, ask questions in class or in the office hours, email me or the TAs with questions, consult other books, ask other students, use the university resources! After each class, make sure you have understood the concepts taught. If you have questions, don't be shy and ask! Everything is on your side to help you master linear algebra, differential equations and Laplace transforms. Be active about it and make a wise use of the multiple resources at your disposal. At the end of the day, you are very fortunate to have the opportunity of learning this material, so take advantage of it!