Supplies

Texts:

- *Introduction to Applied Mathematics* by Strang.

Calculator:

You may use any calculator you wish for this course. Also, this course is designed around frequent and deep use of the Maple computer algebra system. Worksheets in the homework and presented in class extend and amplify the material in the text, and you should become familiar with them. I encourage you to consider acquiring a copy of Maple for installation on your personal machine. It is available at a good price in the USD bookstore.

Stapler:

A stapler is required. All material longer than one page that you hand in must be stapled together. I will not accept loose bundles of unstapled papers.

Earning Points

You can earn points in this class in the following ways:

- Pop Quizzes ........................................ 5%
- Professional Conduct ........................................ 5%
- Homework ........................................ 15%
- Exam I, Feb 24 ........................................ 25%
- Exam II, April 7 ........................................ 25%
- Exam III, May 19 / May 22 ........................................ 25%

All assessment will be based on a judgment of your ability to solve problems, to make valid arguments, and to communicate and explain your reasoning.

Grading Scale

The grading scale below will determine your final grade.

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>97-100</td>
<td>A+</td>
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<tr>
<td>93-96</td>
<td>A</td>
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<tr>
<td>90-92</td>
<td>A-</td>
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<tr>
<td>87-89</td>
<td>B+</td>
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<tr>
<td>83-86</td>
<td>B</td>
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<tr>
<td>80-82</td>
<td>B-</td>
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<td>77-79</td>
<td>C+</td>
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<td>73-76</td>
<td>C</td>
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<tr>
<td>70-72</td>
<td>C-</td>
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<tr>
<td>67-69</td>
<td>D+</td>
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<tr>
<td>63-66</td>
<td>D</td>
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<tr>
<td>60-62</td>
<td>D-</td>
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</tbody>
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Note: Laughing at the professor’s jokes can only improve your grade.

Topics

- Linear Algebra: Gaussian Elimination; LU decomposition; vector spaces: rowspace, column space, dimension; eigensystems analysis
- Ordinary Differential Equations: first order scalar equations; first order linear equations; second order equations; phase plane dynamics; resonance; non-linear equations: logistic equation; Laplace transforms
- Applications: spring-mass systems; circuits; minimization problems and equilibria; phase plane dynamics; resonance
Introduction

The purpose of this course is to increase your problem-solving abilities and to give you exposure to modern mathematical and computational tools that will be of use to you as an engineer. In a real sense, the study of engineering is nothing more than the application of math and physics to practical problems.

As with any three-unit college course, you should expect to spend a minimum of six hours per week outside of lecture on work for this class. This course is no exception, and in fact will likely demand more than that in case your preparation is not strong. Do not fall behind. If you find yourself lost or confused please come see me at once so that you can get back on track. You are encouraged to work with fellow students, but the final work you hand in must be written by you alone.

The course (both book reading and class time) will depend heavily on the Maple computer algebra system. As a result you will be able to work much more difficult problems with much less computational effort. Beware, though, that while the course will be less tedious than you may be accustomed to, it will be more conceptual and difficult. In order to be a good user of the new tools you have, it will be even more important that you have a deep understanding of the material, and how to use Maple to achieve your aims.

In this course I assume that you are in possession of some “mathematical maturity”, gained over your long experience in the study, practice and application of mathematics. Some of the ideas presented depend on concepts which you should already know, but which may, in fact, be new to you. (Examples: mathematical induction, conic sections, partial fraction expansions, hyperbolic functions and their relation to real and complex exponentials, logs and trig functions, L’Hopital’s rule, infinite limits, Cauchy principal value integrals, differential equations for exponential and logistic growth, etc.) Feel free to let me know when I have assumed you have seen something that you haven’t, and I will try to help. Remember, however, that this is an advanced course, and it is your responsibility, not mine, to ensure that you are adequately prepared for it. This includes, indeed necessitates, the requirement that you take the initiative to find and learn whatever material you need to in order to keep up.

I am very excited about teaching this course this semester. The material is challenging, and mastering it will take work from all of us. In the end we will be rewarded with a rich understanding of beautiful and useful mathematical tools.

Pop Quizzes — 5%

We will have several very short pop quizzes, with the intent of encouraging you to keep on your toes with the material. Don’t let yourself get behind!

Professional Classroom Conduct — 5%

You are expected to conduct yourselves maturely and respectfully in the classroom. Each student will begin with full credit for this portion of your grade, and I intend that each student will also end the course with full credit for this portion. However, in order to insure that the classroom atmosphere remains supportive and positive and is not poisoned by inappropriate behavior, it is possible to lose points for the following behaviors:

1. No whining allowed! This will be a difficult course, we are using a difficult text, and most of you will find the course challenging. We will face the challenge together with a positive attitude. Complaining about the quantity or difficulty of the work required for this course makes the course more unpleasant for you and those around you, and it will not be tolerated in class.

2. Your attitude towards your fellow classmates and your professor must be respectful at all times.

3. You should arrive to class on time so that we can get the most of our limited time together, and you should stay in the classroom until the end of class. If you will need to arrive late or leave class early, you should get my permission before class starts. Take care of any pressing personal needs you may have before coming to class; walking in and out of the classroom during lecture is disruptive.
Homework — 15%
Homework will be assigned nearly every class period, and will be due at the beginning of class on the Wednesday of the week after it is assigned. Assignments more than one page in length must be stapled together. I will spend only a limited amount of class time discussing homework, and I will not answer questions in class about homework due that day. I will not accept late homework under any circumstances.

While I encourage you to work in groups to discuss the problems in your homework, the work that you hand must be your own. This means that you have written each word and symbol on the paper from your own brain without any outside help. I have instructed the reader to give a 0 to any homework assignment which is nearly identical to another homework assignment, or which is nearly identical to the solution presented in the Solutions Manual. In addition, violating this policy is an Academic Integrity violation and will result in your being referred to the Honor Council.

Each homework problem that is graded will be given a score out of 5 points, which is a sum of the three numbers below. Therefore, a sample score on a homework problem will be written $3 + 1 + 1 = 5$, which means you have earned 3 points for correctness, 1 point for showing work, and 1 quality point.

- **0-4 points for correctness**: A measure of the correctness of your answer.
  - 4 pts – A correct methodology is selected for solving the problem. Selected method is correctly applied, with no errors.
  - 3 pts – A correct methodology is selected for solving the problem. Selected method is generally applied correctly, with only minor errors.
  - 2 pts – Method selected is only partially appropriate for problem, or addresses only part of the problem. Or, correct method is carried out only partially, or correct method attempted with major errors.
  - 1 pt – Method selected is not at all appropriate for problem, or no real method is selected but a few random facts are written down.
  - 0 pts – No attempt at problem, or answer is simply written down with no work shown.

- **0-1 pt for showing work**: Minimum standard for showing work is achieved. Major steps shown. Handwriting legible enough to be read easily by grader (type your homework if you cannot make your handwriting legible). If final answer is numerical, then this answer is boxed. Units included if appropriate.

- **0-2 points Extra Credit Quality Points**: A measure of the quality of your written work: Work is neat, easy to read, logically organized, well spaced out, written using complete sentences and correct English grammar, with brief comments interspersed into your calculations if this will aid in clarity.

Note: A generalized version of this grading scale will be used for grading all assignments, in that the minimum standard for showing work will be expected, and that extra credit will be given on each problem answered with a “high quality” solution.

Exams – 75%
There will be 3 exams in the course, on February 24, April 7 and during finals week on May 19 or May 22 at 11:00. These exams are closed book, closed notes, closed friends, open brain, and under the honor system. I will not, under even the most extraordinary, amazing circumstances, give a make-up on a midterm. Please schedule your trips, illnesses, and deaths of pets to not overlap these dates.

Accommodations
Any student with a documented disability needing academic adjustments or accommodations is required to speak with me during the first two weeks of class. All discussions will remain confidential.
Academic Integrity

Any student caught cheating will be sterilized so that their genes cannot be passed on to future generations. Actually, I take cheating very seriously. Unfortunately, I have caught a student cheating in nearly every term I have taught here at USD, and I submitted 10 Academic Integrity Violation reports last semester alone! It is very easy to catch a student cheating, and I will always pursue the matter with the Honor Council. Note that turning in a homework solution that you have not written yourself (including turning in a solution you found in a solutions manual) is an honor code violation. Keep this in mind when working with others.

Miscellaneous

1. (Attendance) You must attend class every single day in order to get maximum benefit (in terms of learning and course grade) from this class. If you do skip class, you must read through a classmate’s notes and the corresponding section in your text before coming to me with questions. At that point, I will be happy to help clarify any ideas that you did not understand. But remember that it is your responsibility to try to make up the missed work; I will not give you a substitute private lecture to teach you the material from the day you skipped from beginning to end.

If you do miss a class, you are still responsible for the homework assigned during that class period, and you are still responsible to get your homework assignment in on time.

2. (Email) I will be sending lots of email this semester to your USD email address. If you have a second email address that you prefer to read, you should set your USD account to forward your email to that address. To do this, go to https://www.sandiego.edu/ac/accounts/, click Forwarding and Vacation Replies, login to the SENDMAIL server and EDIT MAIL FORWARDING LIST. If you need help with any of this, contact the Computing Help Desk (260-2400).

3. (Show your work) On all homework and exams you must show all your work on each problem. This includes explaining what you are doing at each step, in words, where appropriate. No credit will be given for answers with no work shown even if the answers are numerically correct. See description in Homework section of this syllabus for an explanation of how your work will be judged.

4. (Read the text) You will be responsible for all the material in the assigned sections of the text. Some of this material may not be discussed in detail in class. There may also be some material discussed in class which is not in the text; you are responsible for this material, too.

5. (Practice, practice, practice.) Mathematics is not a spectator sport. The only way to learn math is to do hard problems. Just as you cannot become a world-class gymnast by watching the Olympics on TV, you cannot expect to learn math by listening to others talk about it or reading other people’s work. You should expect to spend lots of time on your homework for this class. Some of the problems I assign will be challenging, and you will probably not be able to solve every one. The goal is to think about and struggle with every problem. Once you get the solution to a problem, you should go back and practice it until you can do it easily without recourse to hints or notes. It does not help to practice with problems you can already do - you must pump neural iron on problems that are hard! It is through such struggles that you develop mathematical muscle.

Also, the Maple worksheets accompanying the textbook are an incredible resource for you. You should carefully work through them for all sections we cover. As you do this, try to distinguish the Maple from the Math. Sometimes the commands to accomplish a particular task are rather obscure. Don’t let this get in your way of understanding the mathematics behind it.