

MATHEMATICS 2250-1 and 2250-4

Ordinary Differential Equations and Linear Algebra

Fall semester 2009

Time: MTWHF 7:30–8:20am WEB 103 and TWH 12:25–2:10pm JWB 335

Instructor: Professor Grant B. Gustafson¹, JWB 113, 581-6879.

Thursday Lecture: The graduate assistants are Davide Fusi and Russell Richins.

Office Hours: JWB 113, MWF 8:45–9:35am, TH 2:20–3:10pm and MTWHF by appointment at other times. From computers, read the door card link at the course web site.

Telephone: Gustafson: JWB 113, 801-581-6879. Russell Richins: JWB 321, 801-585-6845. Davide Fusi: JWB 311, 801-581-8823. Please use email whenever possible.

Email: ggustaf@math.utah.edu , fusi@math.utah.edu , richins@math.utah.edu

Web site: <http://www.math.utah.edu/~gustafso/>

Thursday Sessions: The Thursday 2250 classroom is used for exams on three dates. Otherwise, the graduate student lecturers provide review, drill and tutorials on dailies, maple labs and exam preparation. Their main task is **exam review**, which follows a schedule published on the course web site. Please attend as advertised below, e.g., you may attend a different one each week, and close to an exam date, all three.

Gustafson	Thursday 7:30–8:20 a.m.	WEB 103
Gustafson	Wednesday 1:00pm	TBA
Dillies	Thursday 8:35–9:25am	JFB 103

Tutoring: The Math Department Tutoring Center is located in the basement of building LCB. Free tutoring is offered Mon–Thu from 8 a.m. to 8 p.m., and from 8 a.m. to 6 p.m. on Friday. Some, but not all of the math tutors welcome questions from Math 2250 students. To see the times and specialities of various tutors, consult the web address

www.math.utah.edu/ugrad/tutoring.html.

Texts:

Differential Equations and Linear Algebra, by C.H. Edwards Jr. and David E. Penney, 2009 Third Edition (the required text, ISBN-10: 0-13-605425-0). New problems and text material appear in the third edition.

The *2008 Special Edition* at the UofU bookstore, called the *Fatbook*, binds the second edition and the student solution manual into one volume. This action traps the *answers* to selected exercises a few hundred pages inside, instead of at the end of the book, as you might expect. While this book can be used, there have been many edits.

Additionally, we will use several sections from a different Edwards-Penney text, the current 2280 textbook, to cover *electrical circuits* and extra *Laplace transform* material. Students who buy the new text from the bookstore will receive an **access code to download the supplementary material**. Students who buy a second hand text may get copies of the sections needed by xeroxing the few pages necessary from the 2280 book, any edition [available in the math library for checkout].

Student Solution Manual, for the Edwards and Penney text *Differential Equations and Linear Algebra*. This is supplied with the bookstore's *special edition*.

Differential Equations, Cliff's Notes series. Contains concise examples and readable explanations of topics found in the Edwards-Penney text.

Online sources for used textbooks. Yes, they exist. Has anyone been ripped off by online sellers? Yes. Search the web for scary stories. One story documents a \$50 non-refundable shipping charge added on without notice and a 20% restocking fee [what's 20% of \$144?].

¹Pronunciation: In the phrase *Gust of Wind* replace *Wind* by *Sun*.

The total cost for the used book was \$25 more than a new book direct from Pearson Publishing.

WWW documents for 2250 at web site <http://www.math.utah.edu/~gustafso/>. All are pdf or text documents that can be printed from Mozilla Firefox, MS-windows iexplorer, OS/X Safari and other web browsers that support printing of text and pdf files. Author: G.B. Gustafson. The notes and slides may be freely viewed and printed. The typeset material is a 900 page book on differential equations and linear algebra.

Prerequisites

Math 1210 and 1220 or the equivalent (Calculus I and II). This is first-year Calculus, with a very brief introduction to linear differential equations. The old Math courses 111-112-113 of 1997-98 fulfill the requirement. In addition, background is required in planar curves, velocity and acceleration vectors from Physics 2210 or Math 2210 (Calculus III), or their equivalent courses. The co-requisite is Physics 2210 (Phy 301 before 1998), with actual use of physics minimal. There is use made in the course of partial derivatives, the Jacobian matrix and the chain rule in several variables.

To cooperate with the engineering programs on campus, some `maple` contact is required in the course work for 2250. All computer code examples are supplied in `maple` only.

If you want to use only `matlab`, then be aware that you must translate maple code examples to matlab code by yourself. Generally, this is a nontrivial exercise. Some help is available in maple itself, for automatic generation of matlab code from maple code. See `CodeGeneration[Maple]` in maple help.

A passive knowledge of `maple` is assumed. Persons without the passive knowledge of `maple` and `unix` may attend one of the *tutorials* on the subject offered during the first two weeks of the term. The instructor for these tutorials is Angie Gardiner. The dates and times are published at the 2250 web address cited above.

Angie's web page is www.math.utah.edu/ugrad/tutoring.html. Her office is MC 155A in building LCB, next to the Math center, phone 585-9478, email gardiner@math.utah.edu.

Persons without computer training and no maple experience can survive through Chapter 2 with a graphing calculator and Microsoft's Excel or the MathWork's `matlab`. Free software exists for PC Intel hardware to duplicate most of matlab's functionality. Only matlab has a licensed maple engine, and this is the main reason why matlab provides a route through the course, without learning a lot of maple details. Individual copies of matlab after 2008 may no longer have maple engines, but some other computer algebra system, instead.

Free tutoring is available in the LCB tutoring center 8:00 a.m. to 8:00 p.m. daily, except until 6:00pm on Friday, closed weekends and semester holidays. Some maple help is available. Only a few of the tutors are capable of helping you on computer projects or on 2250 homework problems. The work hours of those individuals can be found by calling the math center help desk.

Course material and requirements

This course is an introduction to linear algebra and differential equations in engineering and science. Chapters 1 to 10 in the Edwards-Penney text, supplementary materials from the Edwards-Penney *Differential Equations and Boundary Value Problems* textbook (4/E edition), and class notes published as PDF `www` documents will make up the course material. If you study in isolation, then please know that some topics are enriched in class. Your grade in the course may be reduced by isolation, because the enriched material is tested on exams.

Grading:

Final grades will be based on:

Textbook problems, the major part of the **dailies**, about 130 scores.

Seven computer projects form the minor part of the **dailies**. Each project is counted like several textbook problems, for a total of 27 scores, making $130+27=157$ dailies.

Three written midterm examinations.

Final exam. This in-class 2-hour examination counts as two additional midterm scores.

Written In-Class Exams:

There are three (3) midterm exams. There is a 2-hour in-class final exam as scheduled by the university. The midterm and final exams are graded by G.B. Gustafson and the Thursday graduate assistant lecturers. These exams are scheduled for Thursday Lab time 7:00am and 1:20pm in the Thursday classroom. An additional exam time is scheduled for the next day at 8:45am in 113jwb (my office, 581-6879), to cover people who work, or have baby-sitting limits, or are simply ill and miss the Thursday exam. Please notify me **in advance of the exam date**, that you will miss the exam and take it the next day. Email is best, ggustaf@math.utah.edu . Phone 581-6879 works too. Please know that once you miss the exam, the crisis has ended, and recovery is the next plan. Please respond ASAP.

Hand-written Dailies:

There will be 157 dailies due during the semester, including textbook problems and seven maple labs. They will be graded by a staff of readers employed by Angie Gardiner.

Records:

Accounting of exams and the dailies is initially on paper and ultimately by spreadsheet records. The electronic records are web-posted, without names. Lookup of your electronic record requires that you know your exam scores and a few daily scores. During the course, the first electronic record is printed and distributed in class like returned homework. This usually happens after exam 3. In any case, web-posted electronic records are available after the final exam and for months after the course ends.

If you ask for record information before it is electronic, and web-posted, then the request involves 20-30 minutes of your time, to retrieve it from paper records. This is in general a waste of time, and I will refuse the service, if it is only to find a few missing dailies. Please keep your own records. Correction of records, when required, can be made by email communication, even after the course ends.

Homework, computer labs, midterms and final

Textbook problems

The problems to be submitted for grading are listed at the end of the syllabus and also on the **gradesheet** for the course. A duplicate of this information appears on the **due dates page** at the course web site. Visit the web site for extra copies of the syllabus and gradesheet.

The due dates for problems appear only on due dates page at the course web site. They are dynamically updated to reflect the reality of what was discussed in class. Ideally, problems are submitted shortly after class discussion.

Students are asked to complete each textbook problem and submit their work in their own handwriting. Collaboration is permitted and encouraged on textbook problems in teams of 2 and study groups of a larger size. Submit a separate handwritten report for each partner.

Homework problems are written as one problem per package with your name, class time and a problem label. **Please write 7:30 or 10:45 on your paper, next to your name, and insert a problem label.** Problem labels look like 1.2-5, for problem 5 in section 1.2 of Edwards-Penney. Page numbers: please do not cite or label a problem by page number only. Citation for the supplementary material can look like EPbvp 7.6-4. For extra credit problems, use a label like Xc1.4-5.