

# 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. Gustafson<sup>1</sup>, 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](mailto:ggustaf@math.utah.edu) , [fusi@math.utah.edu](mailto:fusi@math.utah.edu) , [richins@math.utah.edu](mailto: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](http://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?].

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<sup>1</sup>Pronunciation: 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](http://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](mailto: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](mailto: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.

When several problems are submitted together, then please construct a stapled package with the problems in order. Graders try to write the scores on the top page. This plan speeds up return of the work, so please use stapled packaging when it makes sense. No stapler? Just deposit your work in a stack without the staple.

There are certain **rules** for writing up the textbook problems. A full accounting of the *format suggestions* contributed by students of 2250 appears on the internet course page as a pdf document *format for submitted work*. Please apply the ideas found there to your written work.

## Computer projects

There will be seven computer projects assigned during the semester, related to the classroom material. Each project counts the same as 2 to 4 daily problems from the textbook, for a total of 23 scores on the dailies. They will be written by hand and use the software package `maple`.

Maple labs are submitted in a stapled package containing all requested parts.

There is a Math Department Computer Lab in building LCB at which registered students automatically own accounts, and there are other unix labs around campus where `maple` is also available, for example at the College of Engineering CADE lab. Most unix labs can launch remote tty sessions on math hosts using command `ssh user@xserver.math.utah.edu`. To operate in X-windows, replace `ssh` by `ssh -X` or `ssh -X -Y`. Remote files on math hosts can be transferred to your local unix computer with `sftp`. For information on how to do the same for personal computers, visit the campus computer help sites.

There is *free* tutoring support for these projects (Tuesday graduate assistant lecturers) and for your other course work as well. Drop-in tutoring in the *Math Center* (glass doors to the computer lab) in the basement of building LCB starts the second week of the semester. The staff there is best at elementary topics from algebra and calculus. A few of them can handle 2250 questions.

## Midterm exam details

Past midterm in-class exams appear on the web. Your exam is modeled after the old exams. Available on the web page are solution keys to old exams, including all midterm and final exams for the last three years. You may print these for reference. The final exam has a separate study guide, also available at the site.

Books, tables, notes and calculators are not allowed on exam day.

An in-class Midterm exam has different presentation rules, and none of the textbook problem rules apply in this case. Basically, the in-class exam is a first draft. No answer checks are expected.

## Final exam details

Two hours are reserved for this written exam. As published by the university:

**7:30 class** Tue, Dec 15, 2009 from 7:30am to 10am [WEB 103]

**12:25 class** Thu Dec 17, 2009, 10:15am to 12:40pm [JWB 335]

The final exam is comprehensive. It covers explicitly chapters 3, 4, 5, 6, 7, 8, 9 and 10 with weight distributed evenly across the chapters listed. A study guide consisting of problem types by chapter plus several final exam solution keys for previous final exams appear at the web site. There is implicit contact on the final exam with chapter 1 and 2 topics, but there are no matching problems [see last semester's final exam key].

No notes, calculators, tables, books or aids of any kind are allowed on the final exam. Please bring pencils and eraser. Paper will be supplied.

## **Due dates, extra credit and late work**

### **Due dates**

Due dates are updated dynamically at a link on page

<http://www.math.utah.edu/~gustafso/index2250.html>.

Browse this site often. To repeat: **the due dates are not given in class!** Sometimes, email communication about due dates and exams will be made from the registrar's list.

Please prepare submitted work according to the tentative schedule of due dates. The actual due date is the same date, or one day later, as documented on the web site.

### **Email notification**

You will be sent email about due dates, exam reviews and exam dates during the semester. This service depends on your email address being up to date.

Look up your campus information data by visiting the registrar's campus WWW site (where you add classes). Find out your email address, then test it by emailing a message to yourself. To update the information, return to the registrar's site and edit your personal data.

### **When is work late?**

Due to the number of dailies being collected, work is considered late and therefore unacceptable when the stack of papers exits 113JWB and goes to the grader. Registered students whose paper is not in the stack get a zero for the assignment.

Are you an exception? It is better to ask than to assume anything. Depend on extra credit problems (see below) to make up for work not submitted on schedule. The same advice applies, if submitted work earns a grade of 55 or 0. While a zero generally means no work was submitted, graders sometimes reject a paper completely and mark it zero, as though nothing was submitted. You'll get the paper back and maybe an explanation of why they did that.

The state of submitted work is locked at the point the grader gets the stack. A grader's job is to filter out the good work from the bad work and record the result. This record is never appended, it is only corrected for errors.

The lowest six (6) dailies are dropped from consideration in order to eliminate makeups. There is no distinction between a problem from the textbook and a maple lab problem, they earn the same credit.

If more than ten (10) textbook problems have zero scores, then please call 581-6879 or email [ggustaf@math.utah.edu](mailto:ggustaf@math.utah.edu) and discuss the situation and options for completing the work.

### **Extra credit**

Extra credit problems are enumerated at the web site, and do not appear in this syllabus or on the gradesheet. Instructions for extra credit problems appear at the end of this document, just before the lecture and homework list. Briefly, the deadline for extra credit in a chapter is the due date printed on the extra credit page, or as updated on the due dates page at the web site.

### **Withdrawal**

It is the Math Department policy, and mine as well, to grant any withdrawal request until the University deadline. This promise also means that such a withdrawal requires no explanation. Withdrawals are always initiated by the registered student. All paperwork is the duty of the student. My job is the signature.

## ADA statement

The American with Disabilities Act requires that reasonable accommodations be provided for students with physical, sensory, cognitive, systemic, learning, and psychiatric disabilities. Please contact me at the beginning of the semester to discuss accommodation (113 JWB or 581-6879), which is to say, accommodation shall be made.

## Grading details

### Grading Scale

A = 95-100, A- = 92-94, B+ = 88-91, B = 84-87,  
B- = 80-83, C+ = 75-79, C = 65-74, C- = 60-64

This scale is determined from 40% passing use GPA increments. It is used for grading and for final letter grade reporting. This scale is for internal use only. Fractional scores are truncated (not rounded) when fitting a score to a letter grade – see below for examples.

### Final grade

A grade of *E* is assigned if the Dailies score sums to less than 7000, which is 70 dailies, or 40% of the required dailies. Please read the **Rite of passage** paragraph below.

The letter grade is determined from the *Grading Scale* above as follows:

$$\text{Final Grade} = \frac{30}{100}(\text{Dailies Average}) + \frac{70}{100}(\text{Midterm} + \text{Final Average}).$$

An example: the Dailies Average for 150 textbook problems and maple labs is 91% and the Exam Average of the three midterms and the final exam is 86%. The final grade is  $0.3(91) + 0.7(86) = 87.5\%$ , which by the scale above is a *B*. While 87.5 rounds to 88, a *B+*, the deciding factor is really the exam average of 86, which is squarely a *B*. The final grade is *B*. If the dailies average was 93 or higher, then the final grade would be 88.1 or higher for a *B+*.

A precise description of the method of assigning letter grades follows. First, compute the course average  $A = 0.3A_1 + 0.7A_2$  from the dailies average  $A_1$  and the exam average  $A_2$ . Truncate  $A$  to an integer (e.g.,  $A = 94.96$  truncates to 94). Assign a letter grade  $L$  according to the grading scale (see above). Look at the final exam score  $F$  and the exam average  $A_2$ . If  $F$  would give a higher letter grade, then change  $L$  to the next possible higher letter grade, e.g., change a *B+* to an *A-* (but not *B+* to *A*). In some cases, when  $F$  is low or  $A_1$  is low, the average  $A_2$  will be used to decide on the letter grade. An example:  $A = 94.96$ ,  $F = 92$ ,  $A_1 = 94.86$ ,  $A_2 = 95$ . The letter grade is *A-*, but the exam average is 95 or *A*, therefore the letter grade *A-* should be promoted to an *A*.

It is possible with a very low daily average to have rank one or two in the class and yet earn a final grade of **B**. This happens because the influence of the dailies score is just 30%. An example: final exam grade 100, exam average 99, dailies 55. Then

$$0.3 * 55 + 0.7 * 99 = 85.8 = \mathbf{B}.$$

### Rite of passage

A passing grade in the course requires submission of at least 70 of the 157 dailies (dailies include computer projects). A grade of *E* is assigned if less than 70 Dailies are submitted. The scores on the 70 dailies are expected to be 100%. This requirement is met by submitting dailies for chapters 1 through 4, each with a grade of 100.

The right of passage is absolute, similar to the European system, which requires a body of work to be presented before written and oral final exams are taken. For example, the Czech *vypočet* is

a requirement to show a body of completed work as the entrance requirement to administration of written and oral final exams.

## Engineering School Expectations

Mechanical, electrical and chemical engineering departments expect stellar performance in differential equations and linear algebra. They have asked for homework to be collected and graded. All of it, not some minimal portion of the total homework.

The various engineering and science departments served by 2250 decide the list of topics to be taught, not the math department.

Graduation requirements of a **C-** or better in required math courses seem to be counter to departmental requests. Be advised that a grade of **C-** is viewed these days as a failure by all graduate schools and employers.

## How dailies are graded

Graders assign scores on dailies as one of 100, 55 or 0. Based on grading history, about 90% of the scores on a given problem are 100%. A score of 0 is routinely given for work not submitted.

**A grade of 100** usually means a complete, correct solution was written. Graders are asked to be generous, and give a 100 score when the solution method is correct, even if the details contain arithmetic errors and a few missing steps. Flaws in logic are not excused, even if the correct answer was found, due to multiple errors canceling the logic error.

**A grade of 55** means the written work lacked essential details. This score is often given for a written solution with just the answer and a few sketchy details. Examples of sketchy solutions, worth 55 or 0 for a score, appear in the textbook's solution manual. The naive assumption that the textbook's authors have supplied a solution to the problem in the manual is simply false: it is a solution sketch, by design devoid of essential details.

The wrong answer is a reason for the grader to look for a flaw. Because all written solutions must have an answer check, a wrong answer signals a careless report. The graders have license to be kind, or to be unkind.

## Extra credit problems

The actual problems are enumerated at the course web site, and appear nowhere else. It is possible, because of them, to earn 100% credit on each chapter and 100% on each maple lab.

Grades on extra credit problems and extra credit maple lab sections are 100 and 0. Generally expect an extra credit problem to be more difficult than the standard assignment.

**Which problems should I work?** You can choose whichever extra credit problems that you want, to replace scores of 55 or 0, within a given chapter. Just because you missed 1.2-2 is no reason to work Xc1.2-2. Instead, choose a problem from the extra credit problems for chapter 1 that can extend your knowledge or help you to prepare for exams. My advice is to beat on problems you missed, because missing a problem is usually a wakeup call. If it was just a silly mistake, like mis-copying the problem statement, then choose a different problem.

To illustrate **how credit is applied**, suppose that chapter one has 15 dailies and 5 extra credit problems. Consider this record:

Problem Count	Score	
9	100	successful dailies
3	55	dailies with demerits
3	0	failed dailies
4	100	extra credit, success

Then the average on chapter one is the smaller of  $(9 * 100 + 3 * 55 + 4 * 100)/15 = 97.67$  and 100. The fifth extra credit problem could add 100 to the total, then the average is 100.

Extra credit is **applied to each chapter individually**. For example, an extra credit problem like XC1.2-12 applies only to chapter 1. An exception to this rule is end-of-semester extra credit problems, which apply to increase the dailies average up to a maximum of 100%. Generally, this offer applies only to a few dailies which were skipped by decree (snow days can cause this), and to chapter 9 extra credit problems, which add credit across all chapters, not just chapter 9.

## Purpose of the textbook problems

The *purpose* of the problems is to practice doing mathematics, that is, to write out in detail the solutions to problems. A textbook problem is generally an engineering-style “crank” problem, usually devoid of proofs. The process:

- **Understand the problem.** Understanding usually involves reading the *problem notes* and the textbook. Answers are usually not provided. You may get an outline of the solution, to increase the probability that the project gets completed on schedule. Problems are discussed in class in finer detail, often with the aid of transparencies, which are replicated at the web site. Slides cover a similar problem or sometimes the exact problem considered in the project. Classroom slides are mirrored at the web site as pdf files, ready to print from an internet browser.
- **Background reading.** To solve a problem, a second opinion of the theory and method is essential. It might be that you can flesh it out of your book’s examples, the college algebra text, the calculus text or some engineering mathematics book. No matter, go to a source that works for you. This is *reading* and not a tutorial.
- **Scratch Paper Write-up.** The initial creation of a solution is the essence of the learning process. Everyone learns by repetition, and here is where you do it. Use a pencil and a big eraser, lots of paper, and flesh out a first draft at full speed. Don’t submit this draft!
- **Final Copy.** The final copy of the solution uses the scratch paper draft as raw material to *present* the details of the solution. As such, it is more than a collection of formulas on paper. There is no strict requirement, except that *neatness* and *completeness* are a must.
- **Final Copy Format.** The most successful format to date was invented by several engineering mathematics students over the years 1990–2009. This format is described in some detail below and also in the internet document *format for submitted work*.

## Suggestions for Improving Written Work

1. Use engineering paper or plain white paper. Lined notebook paper and graph paper are not acceptable for mathematics, because they introduce flaws in vertical white space.
2. Reports are hand-written in pencil. They start with a problem statement followed by the book’s answer or by a final answer summary. Supporting material appears at the end, like a tax return.
3. Every report has an answer check. For problems with textbook answers, it is usual to see “*the answer matches the textbook,*” or briefly **B.O.B.** For problems without a textbook answer, a full answer check is expected.
4. Mathematical notation is on the left, text on the right, about a 60% to 40% ratio. One equal sign per line. Justify equations left or align on the equal signs.
5. Text is left-justified on the right side. It includes explanations, references by keyword or page number, statements and definitions, references to delayed details, like long calculations, graphics and answer checks.



6. Rules 4 and 5 can be broken. They are suggestions, not rules.

**Cooperative efforts** are allowed and encouraged. Kindly produce individual handwritten reports. There is no penalty for getting help from others – it is encouraged. This includes tutorial staff in the Math Center LCB, teaching assistants and fellow students.

**English language deficiencies** are tolerated but not excused. Graders prefer short, precise English comments. If English is your second language, then try to improve your writing skills: (1) shorten comments and (2) use page references to the textbook.

**Presentation** is expected to improve throughout the 15 weeks of the course. You are not expected to be an expert in the first week. Correctness of answers will be checked. The problem notes might contain answers plus a solution outline. In class, further details are communicated. Your job is to *improve* on the initial start into the solution. Add the particulars, make comments, and chase down the details from algebra and calculus. College algebra and calculus skills need constant and careful review. Writing up the solution identifies the stumbling blocks and forces a review of background material.

**References** are required on the first occurrence. After that, omit the citation. It is appropriate to refer to the previous assignment on which the citations originated. A statement like *References parallel Exercises 1-5* is enough.

## Extra credit instructions

Extra credit problems add credit to the chapter in which they appear. They do not add credit to any other chapter. The exception is Chapter 9 extra credit, which adds credit to any and all chapters. The maximum credit that can be earned in a chapter is 100%. An example:

Standard problems and maple labs might total 1600 for a chapter, which counts as 16 items on the gradesheet. Extra credit problems could potentially add 5 times 100 or 500. If 1355 was earned on standard problems and maple labs, plus 300 on extra credit, then the total earned is  $(1355 + 300)/16 = 103.44$ . This total is truncated to 100, because you may earn no more than 100% for a chapter.

**Location.** The web site <http://www.math.utah.edu/~gustafso/index2250.html> has a link which enumerates the possible extra credit problems for each chapter. They do not appear in the syllabus nor the gradesheet, which reference only standard problems and maple labs.

**Submissions.** Please submit extra credit problems with a special label. To illustrate, extra credit problem **1.2-12** would be submitted with label **XC1.2-12** next to your name and class time.

**Deadline.** The deadline for submitting extra credit is approximately the due date for the last problem of the next chapter. The extra credit stack is delivered on that date to a grader. The records are locked by the grader and never appended, only corrected.

The exact date for submission of extra credit work is set at the web site due date page. This is done to give extra time, when available, due to busy grader schedules. Please check the due dates page often, especially before preparing work to be submitted.

**Which problems should I work?** You can choose whichever extra credit problems that you want, to replace scores of 55 or 0, within a given chapter.

**How do I get credit for a missed maple lab?** You can get credits for maple labs by doing a maple extra credit lab, or math-only extra credit problems. Check that the maple lab appears in the extra credit problem file, then choose *any problem* from that chapter of extra credit exercises.

## Tentative Due Dates and Lectures 2250 Fall 2009

Dailies for 7:30am are collected as indicated.  
Dailies for 12:25pm are collected twice weekly in two packages: Package **1** is Friday+Monday and Package **2** is Tuesday+Wednesday, as marked below.

### Week 1, Aug 24 to 28

Lecture 1.1, 1.2, 1.3, 1.4.

24 Aug, Intro, GB Gustafson, nothing due.

25 Aug, Nothing due. Begin maple lab 1.

26 Aug, Page 16, 1.2: 2,

27 Aug, Intro, Thu. assistants Fusi and Richins.

28 Aug, Page 16, 1.2: 4, 6, 10

### Week 2, Aug 31, Sep 1-4

Lecture 1.5, 2.1, 2.2.

31 Aug, Page 26, 1.3: 8

01 Sep, Page 26, 1.3: 14,

02 Sep, Page 41, 1.4: 6, 12

03 Sep, Exam 1 review, problem 1. Review, drill, Q&A ch1.

04 Sep, Page 41, 1.4: 18, 22, 26

03-04 Sep, First maple special intro, Week 2 in LCB115.

### Week 3, Sep 08 to 11

Lecture 2.3, 2.4, 2.5, 2.6.

07 Sep, Holiday no classes

08 Sep, Page 54, 1.5: 8, 18

09 Sep, Page 54, 1.5: 20, 34

Repeat maple intro, LCB115.

10 Sep, Lecture on Exam 1 review problems 2,3.

10 Sep, Discuss L2.1. Review, drill, Q&A ch1.

11 Sep, Page 86, 2.1: 8, 16

### Week 4, Sep 14 to 18

Lecture 3.1, 3.2, 3.3.

14 Sep, Page 96, 2.2: 10, 14

15 Sep, Submit Maple lab 1: L1.1, L1.2, L1.3, L1.4

16 Sep, Catch-up day. Nothing due.

17 Sep, Exam 1 review problems 4,5.

17 Sep, Discuss L2.2. Discuss exam review problems ER-1, ER-2 [Re-stated in L3.1 and L4.1].

18 Sep, Page 152, 3.1: 6, 16, 26

### Week 5, Sep 21 to 25

Lecture 3.4, 3.5, 3.6.

21 Sep, Page 106, 2.3: 10, 20

22 Sep, Page 162, 3.2: 10, 14, 24

23 Sep, Page 170, 3.3: 10, 20

24 Sep, Exam 1 review, problems 4,5.

24 Sep, Discuss L2.3.

25 Sep, Submit special exam 1 review problems ER-1, ER-2 [Re-stated in L3.1, L4.1]

### Week 6, Sep 28-30, Oct 1,2

Lecture 3.6, 4.1, 4.2, 4.3.

28 Sep, submit maple L2.1

29 Sep, Page 182, 3.4: 20, 30, 34, 40

30 Sep, Nothing due. Catch-up day.

01 Oct, Midterm 1, Five problems ch1 and ch2

02 Oct, Page 194, 3.5: 16, 26, 44

### Week 7, Oct 5 to 9

Lecture 4.4, 4.5, 4.6, 4.7.

05 Oct, Page 212, 3.6: 6, 20, 32, 40, 60

06 Oct, submit maple lab 2 remainder: L2.2, L2.3, L2.4

07 Oct, Page 233, 4.1: 16, 20, 32

08 Oct, Exam 2 review, problems 1,2.

08 Oct, Discuss maple L3.2, L3.3, L3.4.

09 Oct, Nothing due.

### Fall Break: Oct 10 to 18

Happy Holiday!

10-18 Oct, Traveling? Substantial amounts of dailies and maple projects are due after the break.

### Week 8, Oct 19 to 23

Lecture 5.1, 5.2, 5.3, 5.4.

19 Oct, Nothing due.

20 Oct, Page 240, 4.2: 4, 18, 28

21 Oct, Page 248, 4.3: 18, 24

22 Oct, Exam 2 review problems 3,4

22 Oct, Discuss maple L4.2, L4.3, L4.4.

23 Oct, Page 255, 4.4: 6, 24

### Week 9, Oct 26 to 30

Lecture 5.5, 10.1, 10.2, 10.3

26 Oct, Submit maple lab3 remainder: L3.2, L3.3, L3.4

27 Oct, Page 278, 4.7: 10, 20, 26

28 Oct, Page 294, 5.1: 34, 36, 38, 40, 42, 46, 48

29 Oct, Exam review continued.

30 Oct, Page 306, 5.2: 18, 22

### **Week 10, Nov 2 to 6**

Lecture 10.4, 10.5, EPbvp7.6, 5.5

02 Nov, Page 319, 5.3: 8, 10, 16, 32

03 Nov, Page 576, 10.1: 18, 28

04 Nov, Nothing due. Catch-up day.

05 Nov, Midterm 2, Five problems ch3, ch4, ch5.1-5.3

### **Week 11, Nov 9 to 13**

Lecture 5.5, 5.6, EPbvp3.7, 6.1

09 Nov, Submit maple L4 (L4.1 was 25 Sep): L4.2, L4.3, L4.4

10 Nov, Page 588, 10.2: 10, 16, 24

11 Nov, Page 597, 10.3: 6, 18

12 Nov, Exam 3 review. Discuss maple lab5.

13 Nov, Page 606, 10.4: 22

13 Nov, Page 331, 5.4: 20, 34

### **Week 12, Nov 16 to 20**

Lecture 6.2, 7.1, 7.2, 7.3.

16 Nov, Page 346, 5.5: 54, 58, 6, 12, 22

17 Nov, Submit maple lab5: L5.1, L5.2, L5.3

18 Nov, Page 616, 10.5: 4, 22, 28

19 Nov, Exam 3 review. Discuss maple lab6

20 Nov, Page 510 in EPbvp 7.6: 8, 22

20 Nov, Submit maple lab7: L7.1, L7.2, L7.3, 7.4

### **Week 13, Nov 23,24,25**

Lecture 7.4, 7.5 /w Laplace, 8.1, 8.2.

23 Nov, Page 357, 5.6: 4, 8, 18

24 Nov, Page 227 in EPbvp 3.7: 4, 12

25 Nov, Page 370, 6.1: 12, 20, 32, 36

25 Nov, Page 379, 6.2: 6, 18, 28

### **Week 14, Nov 30, Dec 1 to 4**

**Policy on Dailies:** The highest 150 dailies will be counted. The lowest 7 of the 157 dailies will be dropped. Any record with less than 70 daily and lab scores earns a grade of **E**, regardless of midterm and final exam scores. Deadlines set at web site [www.math.utah.edu/~gustafso/](http://www.math.utah.edu/~gustafso/). Work not in the stack sent to the assistant earns a grade of zero. Extra credit exercises can correct these zeros.

**Policy on Exams:** The final exam is doubled before determining the exam average, to count like two midterms.

**Grading Scale:**  $A = 95-100$ ,  $A^- = 92-94$ ,  $B^+ = 88-91$ ,  $B = 84-87$ ,  $B^- = 80-83$ ,  $C^+ = 75-79$ ,  $C = 65-74$ ,  $C^- = 60-64$ .

Lecture 9.1, 9.2, 9.3.

30 Nov, Page 400, 7.1: 8, 20

30 Nov, Page 413, 7.2: 12, 14

01 Dec, Page 425, 7.3: 8, 20, 30

01 Dec, Page 438, 7.4: 6, 24

02 Dec, Submit maple lab6: L6.1, L6.2, L6.3

03 Dec, Midterm 3, Five problems ch5, ch10, ch6

04 Dec, 8.1: 4, 12, 38

### **Week 15, Dec 7 to 11**

Lecture 9.4, Review.

07 Dec, 8.2: 4, 19

08 Dec, 9.1: 4, 8, 18

09 Dec, 9.2: 2, 12, 22

10 Dec, Final Exam review

11 Dec, 9.3: 8, 9, 10

11 Dec, 9.4: 4, 8

11 Dec, Office hours and lectures finished.

12 Dec, Saturday Extra Final Exam review, 2pm, LCB 219

14 Dec, Extra credit Ch9 and maple due.

Deliver under the door 113jwb by 6pm.

Dec 14 to 18, Final Exam period.

See the online final exam study guide.

### **Exam Period, Dec 14 to 18**

Final exam for the 7:30am class is Tue, Dec 15, 2009 from 7:30am to 10am [WEB 103].

Final exam for the 12:25pm class is Thu Dec 17, 2009, 10:15am to 12:40pm [JWB 335].

**Extra Credit:** Under the door, 113jwb.

14 Dec, Ch9 Extra Credit. About 10 problems appear on the ch9 extra credit page.

14 Dec, Maple Makeup Lab 8:

Earthquake L8.1, L8.2, L8.3, L8.4, L8.5

14 Dec, Maple Makeup Lab 9:

Tacoma Narrows L9.1, L9.2

Extra credit records locked at 6pm on 14

December. Ch9 and maple 8,9 credits apply to the semester dailies total, not just ch9.