ORDINARY DIFFERENTIAL EQUATIONS
MATH 334 SECTION 002
WINTER 2012

THE BIG PICTURE:

Differential equations (D.E.'s) are a very rich area of mathematics, with a history, like calculus, dating back to Newton. Part of this richness is that a broad and thorough study of D.E.'s requires a thorough study of many other areas of mathematics, including linear algebra, real and complex (functional) analysis, group theory, topology, and even number theory. (In our introductory course we will only require a modest facility with the first of these six.) It is also arguably the most applied sector of mathematics: almost all physical laws and processes are written quantitatively in terms of D.E.'s. In this respect, one might claim that if mathematics is the language of the gods (obviously true), then D.E.'s are the actual grammar! Differential equations describe dynamical processes associated with such diverse fields as control theory, finance, genetics, optics, demography, epidemiology, medicine, ecology, climatology, artificial intelligence, cryptography and—on the grandest time and space scales of all—cosmology, the details of creation itself. Consequently, phenomena described by D.E.'s have both common and mystical names such as "solitary waves", "revivals", "diffusion", "advection", "dislocation", "spatio-temporal chaos", "strange attractors", "intermittency", "bursting", "turbulence", and "self-organization". In fact most of the words you just recognized in this list have precise, unambiguous meaning only in the context of D.E.'s.

Our life for the next semester will not be as romantic as the above might suggest. If you don't have the constant vision of what D.E.'s can do (as supported, say, by your interest in one of the mentioned fields), this course may be as interesting to you as diagramming sentences. But working hard in this course is likely the required price to become a creator on even the smallest of temporal and spatial scales.

Professor:	**Scott Glasgow**
Office:	**364 TMCB**
Office phone:	**422-9086**
Office Hours:	2:00pm - 4:00 pm MWF[1]
Research Hours:	All day Tuesday and Thursday (and Saturday)[2].
Text:	Elementary Differential Equations, by W. E. Boyce and R.C. DiPrima, Ninth Edition
Course Meeting:	1:00pm - 1:50pm **MWF B092 JFSB**
Final Exam:	Saturday, April 14 2:30 p.m. to 5:30 p.m. See Calendar, second to last page.

Homework and Tests: Homework and tests (3 midterms) will be due/taken as per the attached calendar (at the testing center). I encourage you to work with other students in the class by discussing the problems: a good idea is to exchange phone numbers, etc. However, the assignments you hand in must represent your own work.

Grading Weights:

30% Homework (300 points: best 30 assignments out of 36 graded at 10 points each[3])
40% Three midterm exams (400 points: approximately 133 points each)
30% Final Exam (300 points)

Grade Distribution: the following percentages will guarantee at least the following grades—
93% — A, 90% — A-, 87% — B+, 83% —B, 80% —B-, 77% —C+, 73% —C, 70% —C-, 67 % —D+, 63 % — D, 60 % — D-

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[1] These will be shared with students taking *partial* differential equations.
[2] All mathematics faculty have been asked to communicate to their students the times during which they have "no-contact" activities. The idea is to remind students that they attend a major University at which faculty are expected to perform many functions, including performing research. Please make sacrifices to attend the limited office hours. I am more than happy to help when I can.
[3] Because of this leniency, please do not ask for late homework to be considered "not late".

Reading:

Sections indicated in bold face on the calendar are to be read *before class*. I may often open class with a few general questions about the required reading to determine if you are actively engaged in this excellent cause. Please read the attached article regarding the importance of reading and its relationship to flexible learning in college.

Semester Lecture, HW, Exam and General Academic Schedule: (next page)

~ January 2012 ~						
Sun	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**
1	**2**	**3**	**4** First Day of Classes **1.1,1.2**	**5**	**6** **1.2,1.3,1.4** 1.1: 8,9,15,16,17, 21,23 1.2: 3,4,6,11	**7**
8	**9** **2.1** 1.2: 12-14,16,17,19 1.3: 7,12,17,19	**10**	**11** **2.2,2.3** 2.1: 5,8,13-19 odd,31,33,35, 36	**12**	**13** **2.3,2.4** 2.2: 3-7,22,26,29 2.3: 4,5, 7,10	**14**
15	**16** Holiday	**17**	**18** Add-Drop Deadline **2.4,2.5** 2.3:12,14,17, 19, 24,27	**19**	**20** **2.5** 2.4: 4,5,7,16, 22,25 2.5: 3,5,7	**21**
22	**23** **2.6** 2.5: 10,16,17, 22	**24**	**25** **2.8** 2.6:1,4,7,10, 12,14,16,18	**26**	**27** **3.1,3.2** 2.8:1,5,10,14	**28**
29	**30** **Review** 3.1: 4,6,10,13,18, 20,24, 25, 28 3.2: 3,5,6,8,9, 12	**31**				

~ February 2012 ~						
Sun	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**
			1 **Test 1:1-2.8** **Review**	**2** **Test 1:1-2.8**	**3** **3.3** 3.2: 14,15,18,19, 22,26,27,28	**4**
5	**6** **3.4** 3.3: 7,9,12,18,19, 22,26,27,29	**7**	**8** **3.5** 3.4:7,9,14, 16,19,21,25, 28	**9**	**10** **3.6** 3.5:2,7,11, 14,18,20,22, 31,32	**11**
12	**13** **3.7** 3.6: 3,6,7,11, 16,17,21	**14**	**15** **3.8** 3.7:6,8,11, 14,24	**16**	**17** **5.2** 3.8:5,7,11,15	**18**
19	**20** Holiday	**21** Monday Instruction **5.3** 5.2: 1,5,6,10, 13,16,21	**22** **5.4** 5.3: 2,6,7,10, 13,22,24,28	**23**	**24** **5.5** 5.4: 2,5,9,13, 21,25,29, 33	**25**
26	**27** **6.1** 5.5:7,11,12, 14	**28**	**29** **Review** 6.1: 1,6,8,14, 16,26a-c			

~ March 2012 ~						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2 **Test II: 3,5** **Review**	3 **Test II: 3,5**
4	5 **Test II: 3,5** **6.2**	6	7 **6.3** 6.2: 1,3,8,12, 16,19,21,25, 37	8	9 **6.4** 6.3:2,5,9,12, 15,17,27	10
11	12 **6.5** 6.4:3,7,10,16	13	14 **6.6** 6.5: 1,2,5,11, 15,17	15 Withdraw deadline	16 **7.1,7.2,7.3** 6.6: 1b,3,5,9,14, 17	17
18	19 **7.4** 7.1:2,3,5,8, 11,18,19 7.2: 23,25 7.3: 13,14	20	21 **7.5** 7.4: 1,3,5,6	22	23 **7.6** 7.5: 3,4,8,10, 13, 24,29	24
25	26 **7.7** 7.6:2,7,10,11	27	28 **7.8** 7.7: 4,7,9,13, 16	29	30 Discontinuance Deadline **Review** 7.8: 3,7,11,17,18 **Test III: 6,7.1-7.8**	31 **Test III: 6,7.1-7.8**

~ April 2012 ~						
Sun	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**
1	**2** **7.9** **Test III: 6,7.1-7.8**	**3**	**4** **9.1** 7.9:5,7,12, 13,16	**5**	**6** **Review for Final** 9.1: 2, 7,15,17	**7**
8	**9** **Review for Final**	**10**	**11** Last day of class **Review for Final**	**12** Reading Day	**13** Reading Day	**14** Math 334 Final Exam 2:30-5:30pm
15	**16**	**17**	**18**	**19**	**20**	**21**
22	**23**	**24**	**25**	**26**	**27**	**28**
29	**30**					

Studying Mathematics at the University

Dr. Lynn E. Garner, Former Chair, Department of Mathematics, Brigham Young University

Brigham Young said, "Education is the power to think clearly, the power to act well in the world's work, and the power to appreciate life." Mathematics and quantitative reasoning are fundamental to these three powers, especially in our technological world in which reality is described in increasingly mathematical terms.

The goals of university mathematics courses are not only to develop manipulative skills in arithmetic, algebra, etc., but also to impart an understanding of mathematical ideas in new contexts and with much more flexibility. For example, most of you expect to use mathematics as a fundamental tool. The power to use mathematics effectively in your discipline requires you to have

- a conceptual understanding of both mathematical principles and the principles of your discipline,
- the ability to translate features of your discipline into a mathematical model,
- the knowledge and skill to apply mathematics to the model, and
- the ability to express the mathematical results as predictions in the discipline.

As you see, manipulative skills are necessary but inadequate without conceptual understanding, and this is true in any major. If you wish to study mathematics itself, the expectation is that you will not only master the knowledge and skills of the mathematics courses, but also learn to communicate in mathematical terms. The language and theory of proof will become critically important to you.

Attitudes toward learning in mathematics courses must be consistent with these goals. In high school, most learning took place in the classroom and students usually didn't spend as much time on homework as in class. One who was attentive in class could usually succeed with modest effort. At the university, most of your learning will take place *outside* the classroom and you will be expected to spend at least *twice* as much time on homework and reading as you spend in class. In addition to being attentive in class, you will have to exert considerable effort outside of class in order to succeed. You will be expected to learn the basic ideas in a course from the textbook because there is typically not enough time to cover all of them in class. And, given this change in the location of learning activities, it is obvious that your instructor is no longer primarily responsible for what you learn; *you* are. Finally, go beyond solving problems like the examples in your text. The problems you will meet on the job have not yet been solved and are not in the textbooks. If all you can do is solve text problems, you will be replaced by a computer. Practice solving problems you have not seen before. Learn to think; that, a computer cannot do.

Taking responsibility for your own learning includes gathering pertinent information, enhancing the learning environment, being committed to academic integrity, and using responsibly the exceptions afforded by extenuating circumstances.

- You are responsible to know all the requirements in your major, your minor, the university generally, and every course you take. Verify advice from anyone else with authoritative sources: your instructor, the syllabus, the textbook, or your advisement center. Ignorance is never an excuse. Exert every effort to master the

material of each course. Strive for excellence. You can study harder than you now know.

- Your actions should enhance the learning environment. Avoid distracting activities in the classroom, the library, and the dormitory. Always prepare for class by completing homework and reading assignments.
- Academic integrity means that you will not allow yourself or others to profit from information to which you or they have no right. Not only do you avoid plagiarism, but you do not receive or give inappropriate information about tests, quizzes, or homework. Grades are given only on the basis of academic performance; to ask for grades on any other basis is a form of academic dishonesty.
- Extenuating circumstances include serious illness, family emergency, and official university business. Instructors usually allow you to make up work missed because of extenuating circumstances, but do not expect heroic efforts in your behalf; some activities can't be made up. Arrange ahead of time or as soon as possible afterward. The timing of an extenuating circumstance may be critical, so act quickly.

Strategies for learning in mathematics courses include

- managing your time, now your most precious resource, by observing and adjusting your use of it;
- making sure you are in the appropriate class and have the proper prerequisites;
- studying with classmates, teaching each other the principles involved and discussing difficult concepts;
- getting help after reasonable effort, without wasting too much time "spinning your wheels;"
- being willing to review on your own time topics you have seen but have forgotten;
- using instructor office hours and the Math Lab effectively;
- reading the textbook for basic ideas, additional information, and more examples; and
- Making efficient and responsible use of the library and technology.