Syllabus for Math 238, *Linear Algebra and Differential Equations*, Spring 2012

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TEXT: *Linear Algebra and Differential Equations*, Peterson and Sochacki.

PREREQUISITE: Math 236

COURSE DESCRIPTION: In this course students will develop an understanding of the basic theory, applications and connections of linear algebra and differential equations. We will cover most of chapters 1-6 in the text although not necessarily in order. Topic include vector spaces, matrices, determinants, linear transformations, eigenvectors, first order ordinary differential equations, second order linear differential equations and systems of differential equations. We will use the software system Maple to explore concepts. Maple is unfortunately NOT a free program. Maple is available on the computers in Roop 103 and Burruss 030 and 130.

GRADING: The grading will be assigned on the following scale:

A: 90-100% (486-540)
B: 80-89% (432-485)
C: 70-79% (378-431)
D: 60-69% (324-377)
F below 60% (< 324)

There will be no curves and no extra credit. I will assign +/- on an individual basis. WF's will not be assigned. Points are assigned as follows:

Quizzes (10) - 100 points
Midterm exams (3) - 100 points each
Project - 40 points
Final exam - 100 points

QUIZZES: There will be a 10 point quiz each Friday. This quiz will cover material through the previous class. Quiz questions will be similar to homework questions. The 10 best quiz scores will be kept, and the rest will be dropped. There will be no make up quizzes given for any reason.

PROJECT: A project will be assigned in March. This will involve research into an application of linear algebra or differential equations (or both!) and a poster presentation during the last week of class. The project will be worth 40 points. More information will be available closer to March.

MIDTERMS and FINAL: There will be three midterms during the semester worth 100 points each and a cumulative final exam worth 100 points. The questions on the exams will be similar to homework questions and will contain proofs. If you cannot make it to a scheduled exam, you MUST contact the instructor BEFORE the exam if at all possible, or if an emergency, WITHIN 24 HOURS after the exam if you need to schedule a make up exam. Make up exams will only be given for extreme excuses. A doctor's note or some other physical excuse is required. Dates for exams (subject to change):

Midterm I - Tuesday February 7
Midterm II - Tuesday, March 20
Midterm III - Tuesday, April 17
Final Exam - Section 002 Wed. May 2, 8:00am-10:00am
- Section 003 Tues. May 1, 10:30am-12:30pm

HOMEWORK: Homework will be assigned, but not collected. Homework, however, is of the utmost importance! You must keep up with the homework, and do it everyday. We will have several days in the schedule devoted to homework problems. However, watching someone do problems and understanding them is an entirely different skill than being able to do them yourself. Be sure that you have tried the homework problems BEFORE we go over them in class. Here is a homework strategy that I recommend:

- Before class, read the section that we will go over.
- That evening, read the section again, paying particular attention to the example problems.
- Try each homework problem.
- If you can't get started, look for a similar example problem in the text.
- After getting a solution, check the answer in the back of the book.
- If you are correct, go on.
- If not, put a star by the problem, and try it again.
- If you still cannot solve the problem, even knowing the answer, then put two stars next to it, and ask about it in class.
- The next day, try all of the problems with one and 2 stars again. Be sure that you can do them without looking at the answer.
- When reviewing for quizzes and exams, pay particular attention to the starred problems.

ADDITIONAL HELP: Expect to put a lot of time and effort into this class and homework. Do NOT allow yourself to fall behind! This class will move quickly, and covers a broad range of new topics. If you feel yourself falling behind, come to my office hours to discuss how to keep up. If you need extra help, try to find a study group of other students enrolled in 238. Go to the Science and Math Learning Center in Room 200 Roop Hall. `http://www.jmu.edu/smrc/` You are welcome to e-mail questions to me, but please include the entire question, because I may not have access to a book when I answer your e-mail.

HONOR CODE You are to abide by the JMU honor code at all times. Ignorance of the law is no excuse. Cheating will not be tolerated and will be prosecuted to the fullest extent.

Math 238 Spring 2012 VERY tentative outline

Week 1 **Jan. 9** Class overview, Sections 2.1 (Vector spaces), 2.2 (Subspaces).

Week 2 **Jan. 16** No class Monday, MLK Holiday. Sections 1.2 (Matrices), 1.1 (Systems of Linear Equations).

Week 3 **Jan. 23** Sections 2.2 (Spanning Sets), 1.3 (Inverses of Matrices), 1.4 (Special types of Matrices).

Week 4 **Jan. 30** 1.5 (Determinants), Sections 1.6 (Properties of Determinants).

Week 5 **Feb. 6 Exam 1** Tues, Feb. 7, Ch.1 and 2.1, 2.2. Sections 2.3 (Linear Independence and Bases).

Week 6 **Feb. 13** No Class Feb. 14 - Assessment Day. 2.4 (Dimension, Nullspace, Row Space, Column Space), 2.5 (Wronskians).

Week 7 **Feb. 20** Sections 4.1 (Higher Order Linear Differential Equations), 4.2 (Homogeneous Constant Coefficient linear DEs).

Week 8 **Feb. 27** Sections 4.3 (Method of Undetermined Coefficients), 4.4 (Method of Variation of Parameters), Sections 3.1 (First Order DE's).

Week 9 **March 5 Spring Break**

Week 10 **March 12** 3.2 (Separable DE's), 3.4 (Linear DE's), Sections 3.3 (Exact DE's)

Week 11 **March 19 Exam 2** on Tuesday, Chapters 3 and 4. Section 5.1 (Linear Transformations) Projects assigned.

Week 12 **March 26** Section 5.2 (Algebra of Linear Transformations) Sections 5.3 (Matrices of Linear Transformations).

Week 13 **April 2** Section 5.4 (Eigenvalues and Eigenvectors), Section 5.5 (Similar Matrices, Diagonalization), Sections 6.1 (Theory of Systems of DE's).

Week 14 **April 9** 6.2 (Homogeneous Systems, Constant Coefficients), Section 6.5 Converting DE's to First Order systems.

Week 15 **April 16 Exam 3** on Tuesday Ch. 5 and 6. Section 6.6 Applications.

Week 16 **April 23** Project Presentations, Review. No class Friday.

Week 17 **Final Exam: 11:00 Section 003 Tuesday May 1** 10:30am-12:30pm, **10:00 Section 002 Wednesday May 2** 8:00am-10:00am

Homework

Note: Homework is listed in section order in the book. We do the sections out of order.

Section 1.1 1, 3, 5, 7, 9, 11, 13, 14, 15, 21, 23-28
Section 1.2 1, 3, 7, 8, 9, 13, 17, 18-23, 27, 28, 31
Section 1.3 1, 3, 5, 9, 11, 12, 15, 16, 18, 20, 21
Section 1.4 1-7, 9, 11, 13, 15-19, 23d, 26, 33
Section 1.5 1, 3, 4, 8, 9, 16
Section 1.6 1, 3, 7, 9, 11, 15

Section 2.1 1-5, 7, 8, 12
Section 2.2 1, 2, 3, 7, 9, 11, 12, 13, 15, 17, 18, 19, 20, 25
Section 2.3 1, 3, 4, 5, 6, 7 9, 10, 12, 14, 15, 18-23, 25, 27, 28
Section 2.4 1, 2, 3, 4, 5, 7, 9, 13, 15, 16, 17, 19, 21, 22
Section 2.5 1, 3, 4, 5, 10, 11, 12, 14

Section 3.1 1, 3, 5, 7, 9, 15, 17
Section 3.2 1, 3, 5, 7, 8, 9, 13, 15, 19, 21
Section 3.3 1, 3, 5, 9, 13, 17
Section 3.4 1, 5, 7, 11, 13, 17

Section 4.1 1-5, 7, 9, 12, 13, 16, 21, 23
Section 4.2 3, 5, 7, 10, 13, 15, 18, 21, 23, 26, 27, 29, 38
Section 4.3 1, 5, 7, 9, 11, 13, 15, ‘6, 17, 21, 23-26
Section 4.4 1, 3, 5, 15

Section 5.1 1, 2, 3, 5, 7, 9, 11, 13, 14, 15-19, 21, 23, 25, 27
Section 5.2 1, 3, 5, 7, 9, 11, 13, 15, 17, 20
Section 5.3 1, 3, 5, 9
Section 5.4 1, 3, 7, 9, 17, 20, 21, 22, 26
Section 5.5 1, 3, 7, 9, 17, 19, 21, 23, 25, 27, 31, 32, 34, 36

Section 6.1 1, 3, 5, 7, 9, 11, 13
Section 6.2 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 23
Section 6.5 1, 5, 13
Section 6.6 1, 3, 9, 11